Liberty State Park Circulator

Cost-Benefit Analysis

FINAL REPORT

Prepared for:

City of Jersey City, New Jersey

in collaboration with NJTPA NORTH JERSEY TRANSPORTATION PLANNING AUTHORITY

Prepared by:

Sam Schwartz Engineering, D.P.C.

in association with

Stump/Hausman Partnership

May 31, 2013

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JERSEY CITY

DEPARTMENT OF HOUSING, ECONOMIC DEVELOPMENT & COMMERCE
DIVISION OF CITY PLANNING

ROBERT D. COTTER, PP, FAICP
PLANNING DIRECTOR

JERRAMIAH T. HEALY, MAYOR
CARL S. CZAPLICKI, DIRECTOR

May 31, 2013

Dear Friends,

Liberty State Park is a treasure to Jersey City, offering vast open space, recreational opportunities, and spectacular views, particularly of its namesake, the Statue of Liberty. Liberty State Park is home to many popular destinations including the Liberty Science Center, the historic Central Railroad of New Jersey Terminal, and the Interpretive Center. Each year, millions of people visit the park - the largest green space in Jersey City, the second most populous city in the state - making the park not just a local destination but one that attracts visitors from around the state, the country, and the world.

The findings of the Liberty State Park Circulator Cost-Benefit Analysis are an important first step in restoring transit service to destinations within Liberty State Park. While the park's vast size is an asset, it poses a challenge to visitors who cannot or choose not to drive to the park. A circulator would build on the City's public transportation network that currently serves the edges of the park and would allow visitors to explore the many destinations in the park without their cars. Not only is transit in the park good for the environment, it is a matter of equity. A circulator would make the park more accessible to the 40% of Jersey City households that do not have access to a vehicle.

The Liberty State Park Circulator Cost-Benefit Analysis explored potential options for transit service in the park. The study identified four feasible options for transit service, which were the result of an extensive effort to understand Liberty State Park's unique characteristics and the technical expertise of the consultant team - Sam Schwartz Engineering and Stump/Hausman. Furthermore, this study brought together various stakeholders who were integral in shaping the final report. The consultant team's innovative approach and the collaborative nature of the study process make the findings of this study a valuable guide for future efforts to bring transit back to Liberty State Park.

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TABLE OF CONTENTS

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APPENDICES

(Under Separate Cover)

Appendix A – Liberty State Park Survey Forms

Appendix B – Technical Advisory Committee (TAC) Meeting Materials

Appendix B1 - TAC Meeting #1

Appendix B2 - TAC Meeting #2

Appendix B3 - TAC Meeting #3

Appendix B4 - TAC Meeting #4

Appendix B5 - TAC Meeting #5

Appendix B6 - TAC Meeting #6

Appendix B7 - TAC Meeting #7

Appendix C – Public Meeting Materials

Appendix C1 - Public Meeting #1

Appendix C2 - Public Meeting #2

1 PROJECT INTRODUCTION

1.1 CONTEXT

Liberty State Park is the most visited park in the state of New Jersey and the second most visited state park in the nation. The park, deemed "New Jersey's gift to the Nation", opened in 1976 just in time for the United States bicentennial celebrations. Located in Jersey City, it is adjacent to the New York Harbor offering spectacular views of Ellis Island, the Statue of Liberty, and the skylines of Manhattan and Jersey City. Liberty State Park is by far the largest park in Jersey City covering approximately 1,200 acres with approximately 600 acres consisting of uplands (approximately 250 of these acres in the Interior Park area are closed to the public), open fields, forests, and wetlands with the remaining approximately 600 acres as open water on the Upper New York Bay/Hudson River. The park offers visitors open space and unparalleled ecological and wildlife opportunities located in an urban setting. Within Liberty State Park are several popular destinations including Liberty Science Center, Central Railroad of New Jersey (CRRNJ) Terminal, and the Interpretive Center. Because of these unique characteristics, the park is visited by local residents, as well as tourists from New Jersey, across the country, and around the world.

Jersey City is the second most-populous city in the state and a regional employment center with a growing residential population. Increasing mass transit opportunities within the park would benefit residents and visitors alike. Over five million visitors make trips to Liberty State Park each year. Liberty State Park is a local, regional, national, and international destination with a ferry connection to the Statue of Liberty (designated National Monument and United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Site) and Ellis Island. In 2005, approximately 20 percent of visitors to the Statue of Liberty and Ellis Island (roughly 600,000 people) arrived by ferry departing from Liberty State Park. The Liberty Science Center on the park's western edge is a regional destination with approximately 700,000 annual visitors. The landmark CRRNJ Terminal located on Liberty State Park's waterfront is another regional draw.

While the park's waterfront location is an asset, it is also a challenge, since the park is situated on the periphery of Jersey City and not in the heart of the City. The park is surrounded by water on three sides, limiting access mainly to the western edge. The Liberty State Park station of the Hudson-Bergen Light Rail (HBLR) is located on the western edge of the park, along with a bus stop served by NJ TRANSIT bus route #6. On the park's northern edge is a stop for Liberty Landing ferry service between Downtown Jersey City and Lower Manhattan. However, there is currently no regular public transportation service into or between destinations within Liberty State Park. Furthermore, the park's large size means that the distance between many destinations within the park is beyond a reasonable walking distance, generally considered to be less than a half mile. A high percentage of Jersey City's residents do not have access to a private automobile and rely on public transportation. Even for those with a vehicle, parking in the park is limited and not expected to increase.

Beginning in 2001, NJ TRANSIT operated a shuttle that connected the HBLR station and destinations in Liberty State Park. Due to budget constraints, it was discontinued in 2010. In 2010 and 2011, Hudson Transportation Management Association (TMA) operated a peak summer shuttle service. However, without a dedicated funding stream, the Hudson TMA discontinued shuttle service after the summer of 2011. In the summer of 2012, a private operator, Liberty Loops, provided a short-lived peak summer shuttle service in the park.

The purpose of the Liberty State Park Circulator Cost-Benefit Analysis is to understand the existing and future need for a circulator that serves destinations in and near Liberty State Park and develop

concepts for feasible transportation improvements that meet that need. Jersey City's current population is highly transit-dependent and is anticipated to remain transit-dependent as the City's population grows.

1.2 BACKGROUND

Throughout the 19th and early 20th centuries, the land which is now home to Liberty State Park was an industrial area that was the nexus of an expansive transportation network that moved both passengers and freight. The CRRNJ Terminal still stands today and is a major attraction on the northern end of what is now Liberty State Park. Figure 1-1 depicts the historic CRRNJ Terminal and adjacent port facilities and the scores of rail lines that served them. The CRRNJ transported over half of the immigrants who arrived via Ellis Island between 1892 and 1920 to their new homes throughout the United States.

As railroads were replaced by other means of transportation, and as industry moved out of Jersey City, the area declined. The CRRNJ went bankrupt in the early 1960s and ceased to operate passenger service to the terminal. Time took its toll as buildings on the site were left vacant and began to decay and people used the abandoned land as a dump site. Citizen activists led by Morris Pesin, Audrey Zapp, and Theodore Conrad spearheaded a grassroots campaign between 1958 and 1976 to win citizen and political support for establishing a park on the former railroad site. In 1964, President Lyndon Johnson declared Ellis Island a National Monument. He promised $6 million to beautify not only Ellis Island, but also the area of Jersey City behind it that included the land of what would eventually become Liberty State Park. A year later, in 1965, the City of Jersey City gave the State of New Jersey 156 acres, and this land became the foundation of Liberty State Park. In 1976, New Jersey Governor Brendan Byrne pledged $1.2 million to have Liberty State Park ready for the nation's bicentennial celebrations. Liberty State Park was officially dedicated on June 14, 1976. In contrast to Figure 1-1, Figure 1-2 illustrates how Liberty State Park in its current setting has been dramatically transformed from an industrial rail yard into open space using millions of cubic yards of clean top soil.

Figure 1-1
Historic Central Railroad of New Jersey Terminal (August 1941)

Photo Credit: New York Historical Society (courtesy of Tom Flagg)

Figure 1-2
Liberty State Park Today

1.3 SCOPE OF WORK

The existing conditions were assessed to determine current baseline data including the multi-modal transportation network, parking, existing park attractions, and park visitation. The assessment also examined socio-economic data for the surrounding communities in Hudson County, environmental considerations, and best practices for transit circulators serving parks throughout the country. A detailed travel survey was used as input to the travel demand model for projecting future transit ridership potential for the park. The travel demand model was developed for this study to determine the current and future (2020 and 2035) transit markets for Liberty State Park and the surrounding area. The purpose and need for the Liberty State Park circulator was determined, which justified that the remainder of the study would be conducted.

Potential modes and corridors for service were considered based on analyses of activity centers within the park, ridership on the previous park circulator service, and other considerations that pertain to operating the service in a park environment. Initial screening and analysis led to the elimination of modes of transit that were judged to be inappropriate for the park setting and scale of service being considered. Modes of transit retained for further study, in combination with selected corridors for service, were further evaluated. Detailed descriptions were developed for the service options that were retained including service headways, routes/alignments, bus stop/station alignments, and number of vehicles in revenue service. For each service option, projected ridership, qualitative assessment of potential impacts within the park, and related benefits were evaluated. Capital cost estimates were developed for each service option including annual operating and maintenance costs. The estimated

costs associated with each service option were compared to associated benefits and potential impacts. Strategies were evaluated for implementing the transit options that have been developed to serve Liberty State Park. This included a review of potential funding sources, selection of a lead agency, and implementation timeframes based on likely funding sources available to cover capital and operating costs. During the course of the study, seven meetings were held with the Technical Advisory Committee (TAC) and two meetings were held with the public. A study-specific website was created and updated throughout the study to keep the public informed on study progress.

2 EXISTING CONDITIONS

A thorough review of information relevant to performing a cost-benefit analysis of transit options for Liberty State Park was conducted. This included an assessment of current access and circulation, an inventory of parking and fees, existing park attractions, and park visitation. Detailed socio-economic data were collected for the surrounding communities in Hudson County, including data on household income, race, transit use for work trips, and auto ownership. Environmental considerations were identified including remediation of the park and Section 4(F) review. Best practices for transit circulators serving parks throughout the country were identified and described as they would relate to Liberty State Park. A detailed travel survey was undertaken to better understand travel characteristics of visitors to Liberty State Park. The survey data were used as input to the travel demand model for projecting future transit ridership potential for the park.

2.1 CURRENT ACCESS AND CIRCULATION

Several modes of transportation provide access to the edge of Liberty State Park, including roadways, light rail, bus, ferry, and bicycle and pedestrian facilities, as shown in Figure 2-1 and discussed in this section. This section includes a discussion on the location, quantity, and cost of parking within Liberty State Park.

Figure 2-1
Liberty State Park Area Transportation Map

2.1.1 ROADWAY ACCESS

The primary regional vehicular access route to Liberty State Park is the Newark Bay Extension of the New Jersey Turnpike (I-78) at Interchange 14C. Alternately, local vehicular access is available via Johnston Avenue, Bayview Avenue and Linden Avenue East by way of Caven Point Road. The main entrances to the park are along Audrey Zapp Drive and Morris Pesin Drive. Average monthly traffic volumes for January 2011 through December 2012 (Table 2-1) indicate that more traffic enters the park on Audrey Zapp Drive throughout the year and the highest total entering volumes were observed in July 2011. Internal circulation within the park comprises a road network effectively made up of a loop including Freedom Way, Audrey Zapp Drive, Phillip Drive, and Morris Pesin Drive. Each of these roads accommodates two-way traffic with one travel lane in each direction.

Table 2-1
Liberty State Park Daily Average Entering Traffic Volumes by Month
(January 2011 through December 2012)

Month	Morris Pesin Drive	Audrey Zapp Drive
Jan-11	713	1,053
Feb-11	792	1,238
Mar-11	1,224	1,912
Apr-11	1,072	1,674
May-11	1,113	2,206
Jun-11	1,936	1,974
Jul-11	2,056	2,446
Aug-11	1,623	1,493
Sep-11	1,593	1,891
Oct-11	1,435	1,568
Nov-11	1,057	1,111
Dec-11	735	759
Jan-12	585	668
Feb-12	245	185
Mar-12	422	602
Apr-12	1,511	1,440
May-12	1,397	1,359
Jun-12	1,966	2,142
Jul-12	1,995	2,255
Aug-12	1,624	1,655
Sep-12	1,625	1,490
Oct-12	459	493
Nov-12	0*	86
Dec-12	0*	200

Source: Liberty State Park
' Closed due to Hurricane Sandy*

2.1.2 PUBLIC TRANSPORTATION

2.1.2.1 HUDSON-BERGEN LIGHT RAIL (HBLR)

The Liberty State Park station of the HBLR is located at Communipaw and Johnston Avenues just outside the park. This station opened for service in the year 2000 and is served by both lines of the HBLR, the West Side-Tonnelle Avenue and 8th Street-Hoboken lines. Adjacent to this station is a large park and ride lot that includes approximately 1,300 spaces of which approximately 850 (65 percent) are reserved for permit parking primarily used by commuters. On a typical weekday, approximately 900 (70 percent) of the available spaces are utilized. Prior to the recession in 2008, the daily spaces (i.e., non-permit parking) were fully utilized.

The HBLR system, at just over 20 miles, connects Bayonne, Jersey City, Hoboken, and municipalities in northern Hudson County along the Hudson River waterfront. The system includes 24 stops and connects to regional transit including the PATH system, NJ TRANSIT commuter rail, and numerous bus routes. Average weekday daily ridership on the HBLR system is approximately 22,000 passengers with approximately 2,600 daily passenger boardings at the Liberty State Park HBLR Station in 2011. Service operates daily from approximately 5:00 AM to 2:00 AM, with longer headways over the weekend. A one-way adult ticket costs $2.10 and is valid for 90 minutes from validation.

2.1.2.2 PATH

The PATH train is a heavy rail rapid transit system that connects Newark, Jersey City, Harrison, Hoboken, and Manhattan. Four stops, including Newport, Exchange Place, Grove Street, and Journal Square, are within the boundaries of Jersey City. None of these stops are close enough to Liberty State Park that visitors could be expected to walk from them. However, there is a connection between the PATH system and the HBLR at Exchange Place, which is an 8-minute ride to the Liberty State Park on the light rail. PATH operates 24-hours per day. A single ride on PATH costs $2.25. Annual ridership on the PATH system is approximately 76.6 million people.

2.1.2.3 BUS

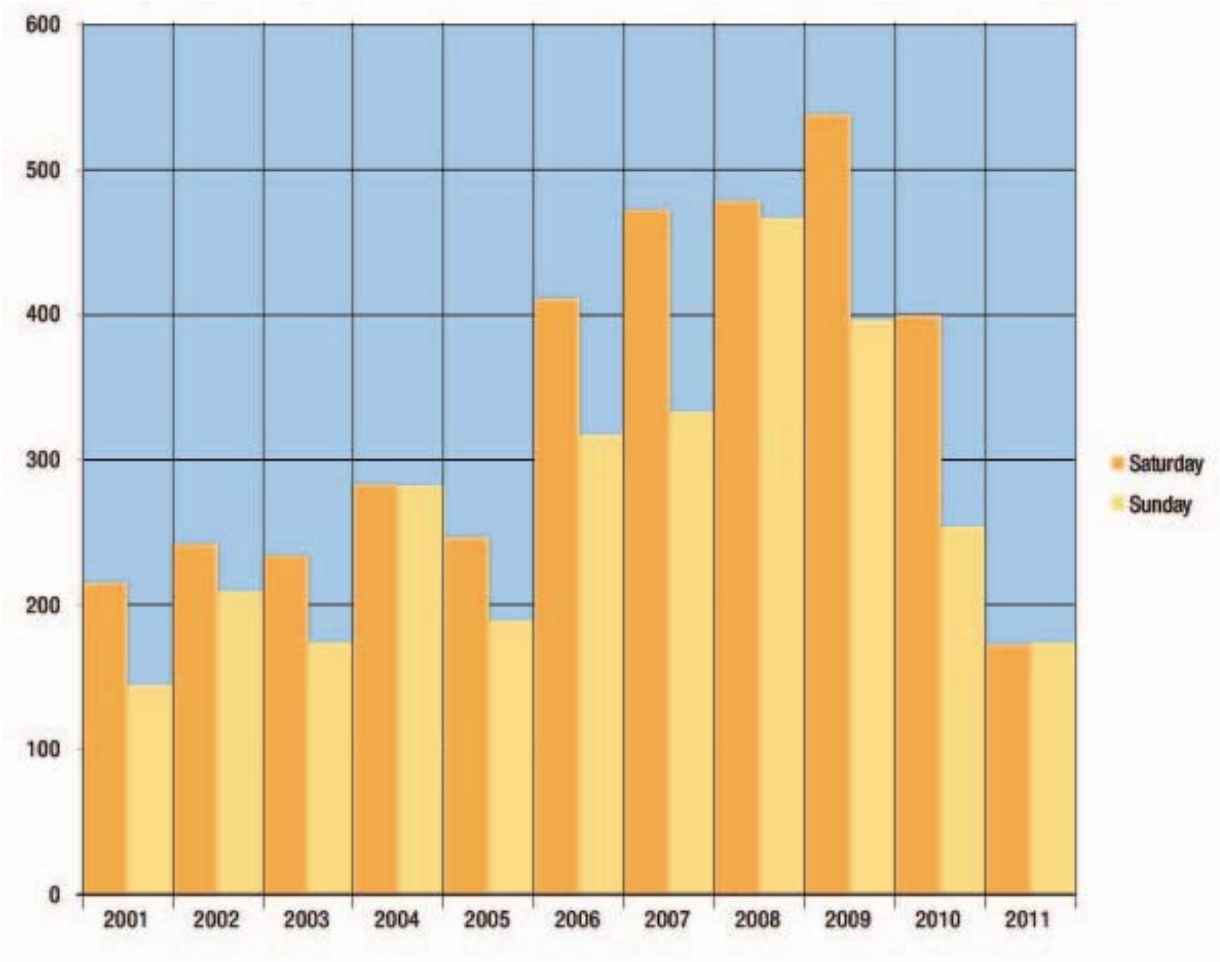
Jersey City has a robust bus network, and several of these buses serve areas close to the perimeter of Liberty State Park. Others connect with the HBLR line and facilitate access to the park via a transfer between systems. NJ TRANSIT #6 serves the HBLR Liberty State Park station on weekdays and connects to Journal Square. The #6 bus does not stop at the Liberty State Park HBLR station on the weekends. Bus fare for travel within one zone is $1.50.

There have been several attempts at running bus service within Liberty State Park. The NJ TRANSIT #305 served Liberty State Park from January 2001 through May 2010 when it was cancelled because of budget shortfalls and low ridership. The route served the Liberty State Park HBLR station and destinations throughout the park including the Liberty Science Center, Liberty Landing marina, CRRNJ Terminal, and the park office. The #305 bus was branded under the WHEELS program and operated every day for the first two years of service in 2001 and 2002. Starting in 2003, service was reduced to weekends from January through March and was operated every day from April through December. This service was operated on 30 minute headways on all days between 2001 and 2005 and was increased to 40 minutes on weekdays in 2006. The service cost a $1.00 cash fare per passenger paid to the driver for unlimited daily rides.

In June 2010, the Hudson Transportation Management Association (TMA) took over the service to replace the cancelled #305. It operated free of charge on weekends through Labor Day with a headway of 35 minutes. This service was also operated on weekends in 2011 during the summer months with a

headway of 30 minutes. In 2011, the cost to ride was a $1.00 cash fare per passenger paid to the driver for unlimited daily rides. The average weekend ridership in August for every year between 2001 and 2011 is provided in Figure 2-2. August was selected for the ridership comparison as it is the only summer month in which data were available for the entire 11-year period between 2001 and 2011 when the park was served by a transit circulator. The data indicates ridership peaked in 2008 for Sunday and 2009 for Saturday.

Figure 2-2
Average August Weekend Ridership
Liberty State Park Shuttle (2001 through 2011)



Sources: NJ TRANSIT and Hudson TMA

Another NJ TRANSIT bus route, the #981, operated between Port Liberte and the Grove Street PATH station. This service was also a casualty of the May 2010 NJ TRANSIT budget cuts. This service provided access to the fringe of the southern side of the park and to the industrial park located adjacent to the southwest quadrant of the park. The routing of the #305 and #981 buses are provided in Figure 2-3.

Figure 2-3
Former Bus Routes Serving Liberty State Park

2.1.2.4 FERRY

Statue Cruises operates ferry service between Liberty State Park and Ellis and Liberty Islands throughout the year. This ferry is provided for the National Park Service to serve visitors of the national monuments. All visitors to the Statue of Liberty and Ellis Island must use the ferry service from either Liberty State Park or Battery Park in Manhattan. From Liberty State Park's ferry slips, the service operates daily about every 40 minutes from 8:30 AM to 4:30 PM.

Liberty Landing Ferry operates service between Liberty Landing Marina in the park, Warren Street in Downtown Jersey City, and the World Financial Center Terminal in Manhattan. On weekdays, a ferry departs Liberty Landing Marina every half hour from 6:00 AM to 8:30 PM. On Saturdays and Sundays, a ferry departs Liberty Landing Marina every half hour from 9:00 AM to 7:30 PM. The fare between Warren Street and Liberty Landing Marina is $2.00 one way.

Statue Cruises and the Liberty Landing Ferry provide service to the 9/11 Memorial in Manhattan from Liberty State Park. Tickets for the Memorial can be purchased as a package on the Statue Cruises website.

2.1.3 BICYCLE AND PEDESTRIAN

In addition to the City street network, pedestrian and bicycle access to the park is provided via the Hudson River Waterfront Walkway on its periphery. The pedestrian bridge at the end of Jersey Avenue crosses over the Mill Creek and connects to Phillip Drive in the park. The Hudson River Waterfront Walkway is being developed piecemeal along the eastern coast of New Jersey with the hope that it will someday stretch an uninterrupted 18.5 miles between the Bayonne and George Washington Bridges.

Within the park, there is a recreational hiking and biking trail parallel to Freedom Way. This trail connects the Hudson River Waterfront Walkway (called Liberty Walk in Liberty State Park), the Green Park, the playground and picnic area, and the Columbus Monument.

The Liberty Walk, designed with decorative lampposts and pavers, spans the eastern and northern edges of the park, terminating at Liberty Landing Marina. At that point, it becomes a narrower paved path that connects with the Jersey Avenue footbridge to the west. It also connects to the Hudson River Waterfront Walkway that provides access along the southern portion of the park and points further south including Liberty National Golf Course and Porte Liberte that are located outside of the park, and Caven Point Beach which is a stand alone section of Liberty State Park.

2.1.4 PARKING

There are a total of approximately 3,100 parking spaces within Liberty State Park. There are nine lots of varying sizes spread throughout the park. The Marina lot, the Liberty Science Center Lot, and the Ferry Lot charge a $7.00 fee, the Boat Launch Lot requires a permit, and all other lots throughout the park are free of charge. The CRRNJ Terminal Short-term lot has a strict limit of two hours. A summary of the capacity and costs are provided in Table 2-2. The Liberty State Park station park and ride lot just outside the park is sometimes used for overflow parking on weekends and for special events held at the park.

The Ferry Lot and the Liberty Science Center Lot are the only lots operated by an outside vendor, Central Parking. Parking data for one and a half years for the Ferry Lot shows that July has highest average cars per day for both the weekday and weekends/holidays (Table 2-3). This lot was closed in November and December 2012 after Hurricane Sandy. Parking data for the same period for the Liberty Science Center Lot shows that April has the highest average cars per day for a weekday and February has the highest average cars per day for weekends/holidays (Table 2-4).

Table 2-2
Liberty State Park Parking Facilities

Lot	Capacity		Cost
	Cars	*Buses/ Trailers*	
Liberty Science Center	753	59	$7.00 daily
Boat Launch	0	34	Permit
Sundial Lot	148		Free
Base Lot	253	8	Free
Interpretive Center	93		Free
Green Park Lot	169		Free
Ferry Lot	731	53	$7.00 daily (cars), $5.00 after 5:00 pm, and $10.00 daily (buses)
CRRNJ Terminal Short-term Lot	111		Free
Liberty Landing Marina Lot	683	8	$7.00 daily
Total	**2,941**	**162**	

Source: Google Earth (June 2, 2011)

Table 2-3
Liberty State Park Ferry Lot Parking Data

Month	Average Cars per Day	
	Weekday	**Weekend/Holidays**
June 2011	382	648
July 2011	546	956
August 2011	485	778
September 2011	209	725
October 2011	199	527
November 2011	148	304
December 2011	200	215
January 2012	98	101
February 2012	116	137
March 2012	170	162
April 2012	337	598
May 2012	210	623
June 2012	380	732
July 2012	545	870
August 2012	450	746
September 2012	224	637
October 2012	184	494
November 2012	Closed due to Hurricane Sandy	
December 2012	Closed due to Hurricane Sandy	

Source: Central Parking

Table 2-4
Liberty Science Center Lot Parking Data

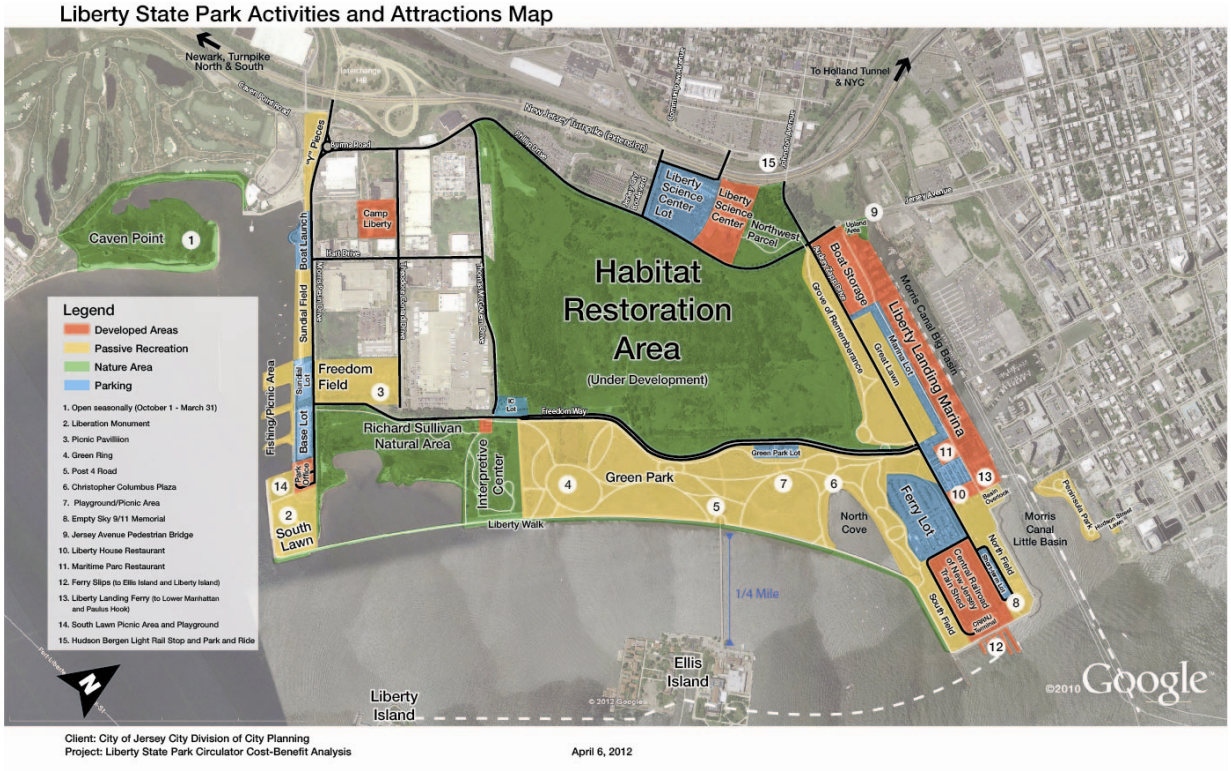
Month	Average Cars per Day	
	Weekday	Weekend/Holidays
June 2011	200	400
July 2011	276	467
August 2011	310	518
September 2011	149	309
October 2011	107	247
November 2011	202	411
December 2011	310	435
January 2012	170	422
February 2012	256	649
March 2012	156	483
April 2012	380	374
May 2012	166	266
June 2012	229	260
July 2012	350	425
August 2012	355	508
September 2012	141	287
October 2012	116	288
November 2012	82	331
December 2012	296	375

Source: Central Parking

2.2 EXISTING PARK ATTRACTIONS

Liberty State Park is home to many interesting and varied destinations and provides visitors with a unique experience. Visitors go to Liberty State Park for its open space, amenities, and attractions. Many of these activities and attractions are identified in Figure 2-4 and discussed in the text that follows.

Figure 2-4
Liberty State Park Activities and Attractions Map



2.2.1 LIBERTY SCIENCE CENTER

Liberty Science Center is an interactive science museum located at the northwestern portion of the park. The museum opened in 1993 and completed a $100 million expansion project in 2007. The museum boasts the largest IMAX screen in the United States and is housed in a “Green Building” which produces one-quarter of its own energy from solar and wind sources. It remains open to visitors year-round, seven days a week with longer hours during the peak summer months.

2.2.2 CENTRAL RAILROAD OF NEW JERSEY (CRRNJ) TERMINAL

One of the main attractions to Liberty State Park, this historic passenger train and ferry terminal, is located in the northeast portion of the park at the water’s edge. The terminal was opened in 1889, replacing an earlier terminal built by the CRRNJ. The three-story Victorian style terminal building includes a distinctive cupola and clock tower facing the Hudson River. The facility contains a dozen platforms and 20 tracks and several ferry slips. The station is listed on both the New Jersey and National Registers of Historic Places. The train concourse and main waiting room occasionally hold events like train shows, antique shows, concerts, festivals and award ceremonies. There is an area for exhibits and public programming available as well.

2.2.3 LIBERTY ISLAND (STATUE OF LIBERTY)

Liberty Island is a 14.7 acre island on which the Statue of Liberty is located. It is situated just off the eastern shore of Liberty State Park. The Statue of Liberty was a gift of friendship from the people of France to the people of the United States. It was dedicated in 1886 and designated a National

Monument in 1924 and listed on the National Register of Historic Places in 1966. The statue was fully restored in 1986. The island and statue are operated by the National Park Service. While not officially part of Liberty State Park, the only way to access Liberty Island from New Jersey is via ferry from Liberty State Park. Liberty Island is also accessible via ferry from Battery Park on the New York side of the Hudson River. According to the National Park Service, Liberty and Ellis Island (described below) receive over 3.5 million annual visitors.

2.2.4 ELLIS ISLAND

Ellis Island is located just off the east shore of the park. The 27.5 acre island is known as the gateway to the new world. From 1892 to 1954, over twelve million immigrants passed through the island's immigration center and entered the United States. The immigration center was opened in 1892 and destroyed by fire in 1897. A new immigration center was constructed in 1900 and still occupies the island. In 1966, Ellis Island was declared part of the Statue of Liberty National Monument. Today the Ellis Island Immigration Museum receives nearly 2 million visitors annually. The island is operated by the National Park Service. Like Liberty Island, Ellis Island is not officially part of Liberty State Park. However, visitors from New Jersey can only access Ellis Island from the park via ferry service that departs from the slips near the CRRNJ Terminal. It is also accessible from Manhattan via ferry.

2.2.5 9/11 MEMORIAL

Called "Empty Sky", this memorial is dedicated to the New Jersey residents who died at the World Trade Center on September 11, 2001. It consists of two 30-foot steel walls over 200 feet long etched with the names of each of the victims.

2.2.6 GROVE OF REMEMBRANCE

The Grove of Remembrance is a living tribute to New Jersey's victims of the attacks on the World Trade Center on 9/11. It is an approximately 10-acre swath of land just south of Audrey Zapp Drive. Dedicated in 2003, this area of the park will eventually have 691 mature trees to represent each of the New Jersey residents who lost their lives on 9/11. The trees are a variety of species and at the center is a Memorial Circle of weeping cherry trees and benches for reflection by visitors.

2.2.7 LIBERTY LANDING MARINA

Liberty Landing Marina contains 520 berths as well as dockside facilities for dry boat storage. The waterfront marina, sidewalk, and parking lot are open to the public.

2.2.8 RESTAURANTS

Liberty House Restaurant, which opened in 2002, is located on the eastern edge of Liberty Landing Marina. It specializes in seafood and has a banquet area for events.

Maritime Parc Restaurant, which opened in 2009, is also located on the eastern edge of Liberty Landing Marina. It specializes in New American cuisine, and also has an area for patrons to hold events.

2.2.9 PARK WELCOME CENTER

The Park Office/Welcome Center is located at the southern edge of the park on Morris Pesin Drive.

2.2.10 PICNIC AREAS AND LAWNS

Liberty State Park is host to several picnic areas, fields and lawns. The picnic areas are located towards the southern end of the park, near the park office. There are lawns and fields throughout the park: South Lawn and Freedom Field are towards the southern end of the park, while South Field, North Field, Green Park, and Great Lawn are towards the northern end of the park.

2.2.11 INTERPRETIVE CENTER

The Interpretive Center, which includes exhibits, classroom space, and an auditorium, focuses on hosting exhibits that detail the environmental and historical issues relevant to the Hudson River and its environs. Adjacent to the Center is a sixty-acre natural area that consists mostly of salt marsh, with nature trails and observation points throughout.

2.2.12 PLAYGROUNDS

There are playgrounds located near the South Lawn Picnic Area and in Green Park.

2.2.13 INTERIOR PARK AREA

There are plans to create a salt marsh and maritime forest within the interior area of the park that is currently undeveloped. The creation of freshwater wetlands and trails are part of the first stage of development. Environmental mitigation measures are needed before this plan can proceed. Currently, the entire interior park area, deemed a habitat restoration area, is off-limits to visitors.

2.2.14 CAVEN POINT BEACH

The Caven Point Beach section of Liberty State Park is not contiguous with the rest of the park and is only readily accessible via the Hudson River Waterfront Walkway. The beach is approximately 5,000 feet long. The area is open from October through March, and swimming is prohibited.

2.2.15 CAMP LIBERTY

The camp moved to its current location on Morris Pesin Drive, adjacent to several functioning industrial uses, in 1980. The camp serves approximately 200 children on 5 acres, which includes a small pool, a softball field, handball courts, and a covered pavilion area.

2.2.16 LIBERTY INDUSTRIAL PARK

Liberty Industrial Park is a 135-acre industrial area located on the southwestern edge of Liberty State Park. It is bordered on three sides by Liberty State Park and shares the park's main access roads. Even though the Industrial Park is surrounded by Liberty State Park, there is little synergy between the areas. Theodore Conrad Drive and Thomas McGovern Drive provide east-west access to the industrial park from Burma Road and Edward Hart Drive provides internal north-south access. Some major tenants of this space include: Suzette Manufacturing, Palermo Manufacturing, Wilman Paper, Streichler Trucking, and the New York Daily News. Employees in the industrial park are potential users of a park transit circulator.

2.2.17 SPECIAL EVENTS

Over the years, Liberty State Park has hosted special events, including Cirque de Soleil, an Andrea Bocelli concert, and the All Points West Music and Arts Festival. Transportation is a very important part

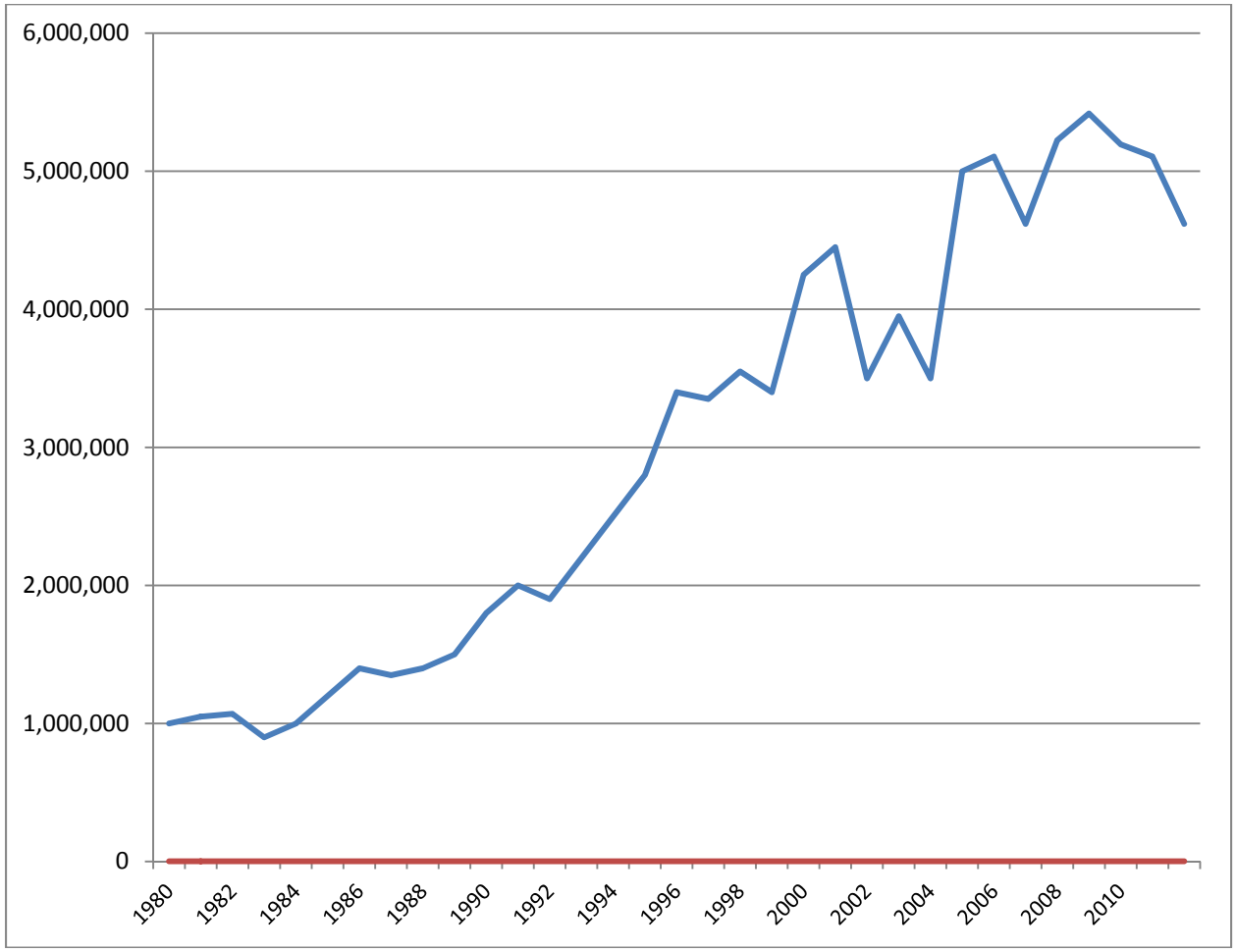
of special event coordination at Liberty State Park. As part of the Special Event Permit Application, each event sponsor must develop an Operation Plan that addresses how people would get to the park and where they would park. The Liberty State Park HBLR park and ride lot is often used for overflow during events. This challenge is lessened when event goers take mass transit rather than drive.

2.3 PARK VISITATION

Liberty State Park estimates daily attendance based on entering visitors in cars using traffic counts on Morris Pesin Drive and Audrey Zapp Drive factored by vehicle occupancy, ferry passengers, estimated bus passengers, Liberty Science Center attendance, estimated walk-ins, and estimated visitors to the Morris Canal Peninsula Park, a portion of the park separated by the Morris Canal Tidewater Basin from the main section of the park. Detailed attendance data is available for the Liberty Science Center and Statue Cruises and is provided later in the chapter.

Attendance at Liberty State Park has been generally increasing since 1980 (Figure 2-5). After a peak of five million visitors in 2001, the early 2000s saw a temporary dip in attendance. However by 2005, park attendance reached five million visitors again. There has been a small decline in attendance since 2009. Park attendance in 2012 dropped drastically due to the closure of large sections of the park and the national monuments as a result of Hurricane Sandy in October 2012.

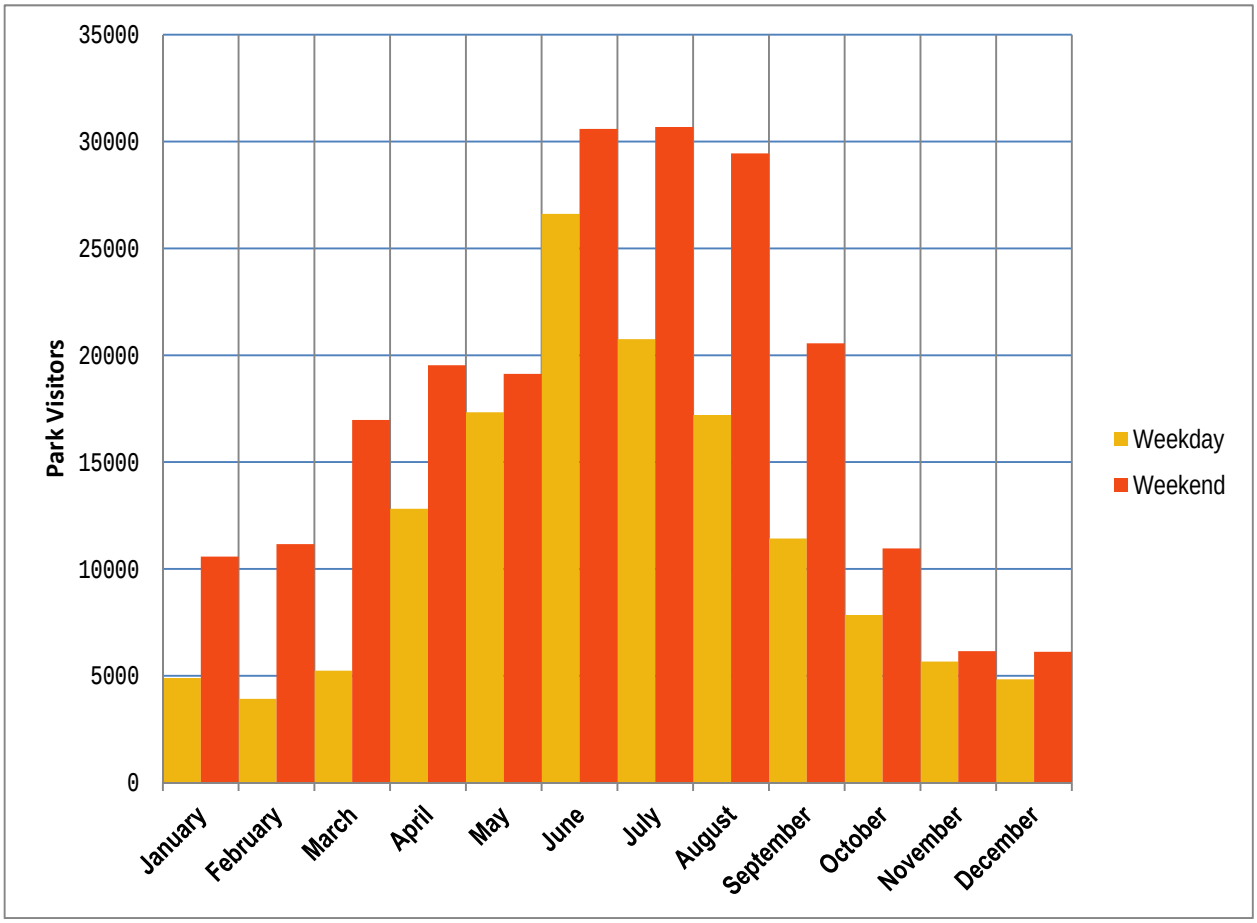
Figure 2-5
Liberty State Park Attendance
(1980 to 2012)



Source: Liberty State Park

Figure 2-6 breaks out the average weekday and weekend attendance by month between January 2011 and December 2012. Not surprising, attendance on Saturdays and Sundays is higher in every month of the year than the remaining five weekdays. Based on the data, the highest visitation over this period was observed in June for weekdays and in July for weekends.

Figure 2-6
Liberty State Park Average Weekday and Weekend Attendance
Two-Year Monthly Average (2011 and 2012)

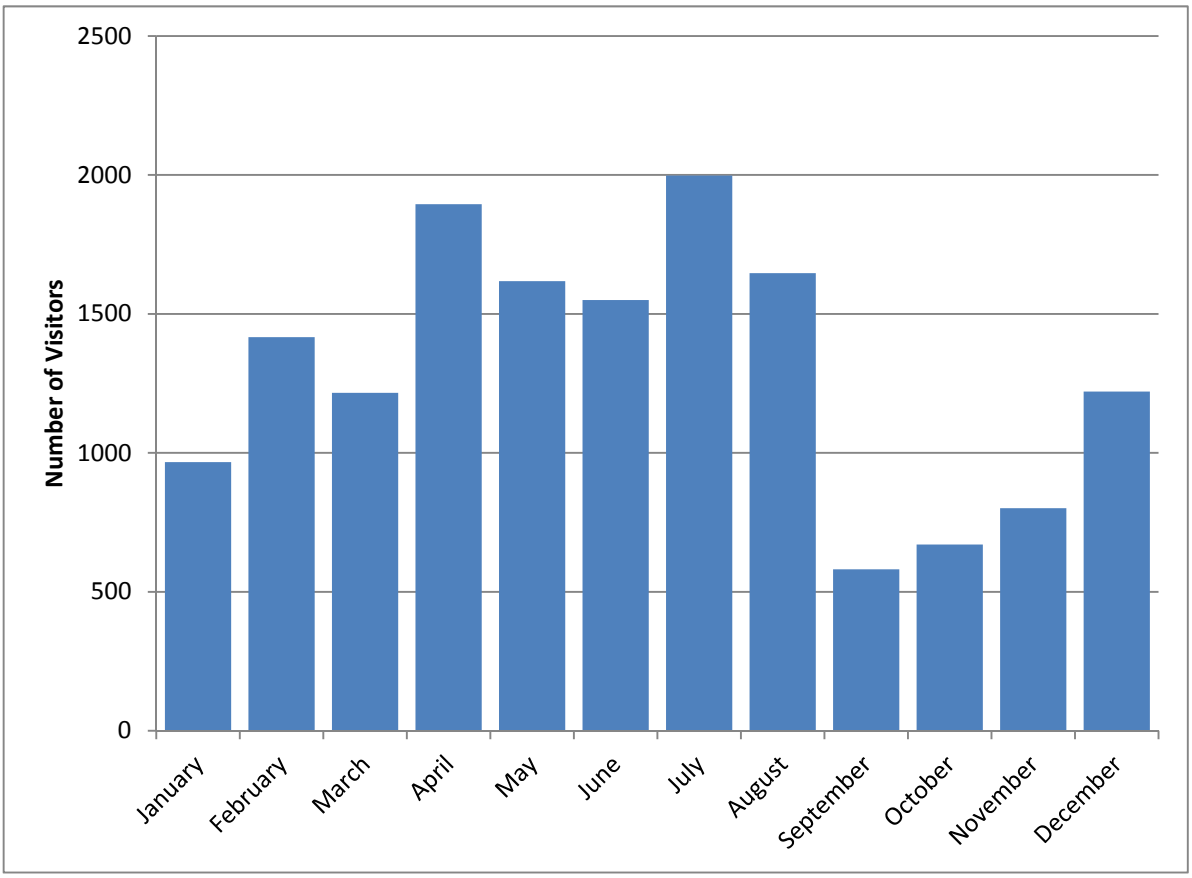


Source: Liberty State Park

2.3.1 LIBERTY SCIENCE CENTER

Figure 2-7 shows the average daily attendance at the Liberty Science Center from January 2011 to December 2012. Based upon the data, July is the month in which the Liberty Science Center receives the highest number of visitors. Average daily visitation is high in the spring and summer and lower through the fall and winter.

Figure 2-7
Liberty Science Center Average Daily Attendance
Two-Year Monthly Average (2011 and 2012)



Source: Liberty Science Center

2.3.2 STATUE CRUISES

Table 2-5 shows the number of Liberty State Park ferry passengers by month for the past five years. Based upon the data, July is the month in which the ferry ridership is highest. The peak year for ferry ridership was in 2010. Ferry service to Liberty and Ellis Islands was suspended in November and December 2012 after Hurricane Sandy.

Table 2-5
Liberty State Park Ferry to Liberty and Ellis Islands Ridership (2008 through 2012)

	Liberty State Park Passengers				
Month	**2008**	**2009**	**2010**	**2011**	**2012**
January	13,861	13,495	13,840	12,269	11,915
February	13,206	13,861	9,091	11,854	12,002
March	48,218	33,673	35,511	38,941	35,271
April	67,068	74,732	76,130	77,234	74,109
May	90,232	82,388	88,145	85,383	85,589
June	97,991	90,309	97,013	100,864	89,959
July	105,858	115,433	114,962	119,518	101,944
August	103,336	99,585	98,671	82,803	81,841
September	43,596	57,959	56,739	51,740	46,230
October	55,035	51,923	57,217	55,517	38,687
November	40,260	41,960	45,761	34,584	0*
December	28,905	25,994	21,318	27,398	0*
TOTAL	**707,566**	**701,312**	**714,398**	**698,105**	**577,547**

Source: Statue Cruises
' The monuments were closed due to Hurricane Sandy*

2.4 SURROUNDING COMMUNITY

Jersey City is the second most-populous City in New Jersey. It is a diverse, densely-populated, urban community with a robust mass transit network. In Hudson County, there is an average of less than one car per occupied housing unit. In particular, a high number of Jersey City residents do not own cars. Many of these transit-dependent residents can get to "the doorstep" of Liberty State Park by transit, using the HBLR, the local bus, or ferry to the edges of the park. However, it can be difficult for these visitors to access many of the park's attractions due to the large size of the park.

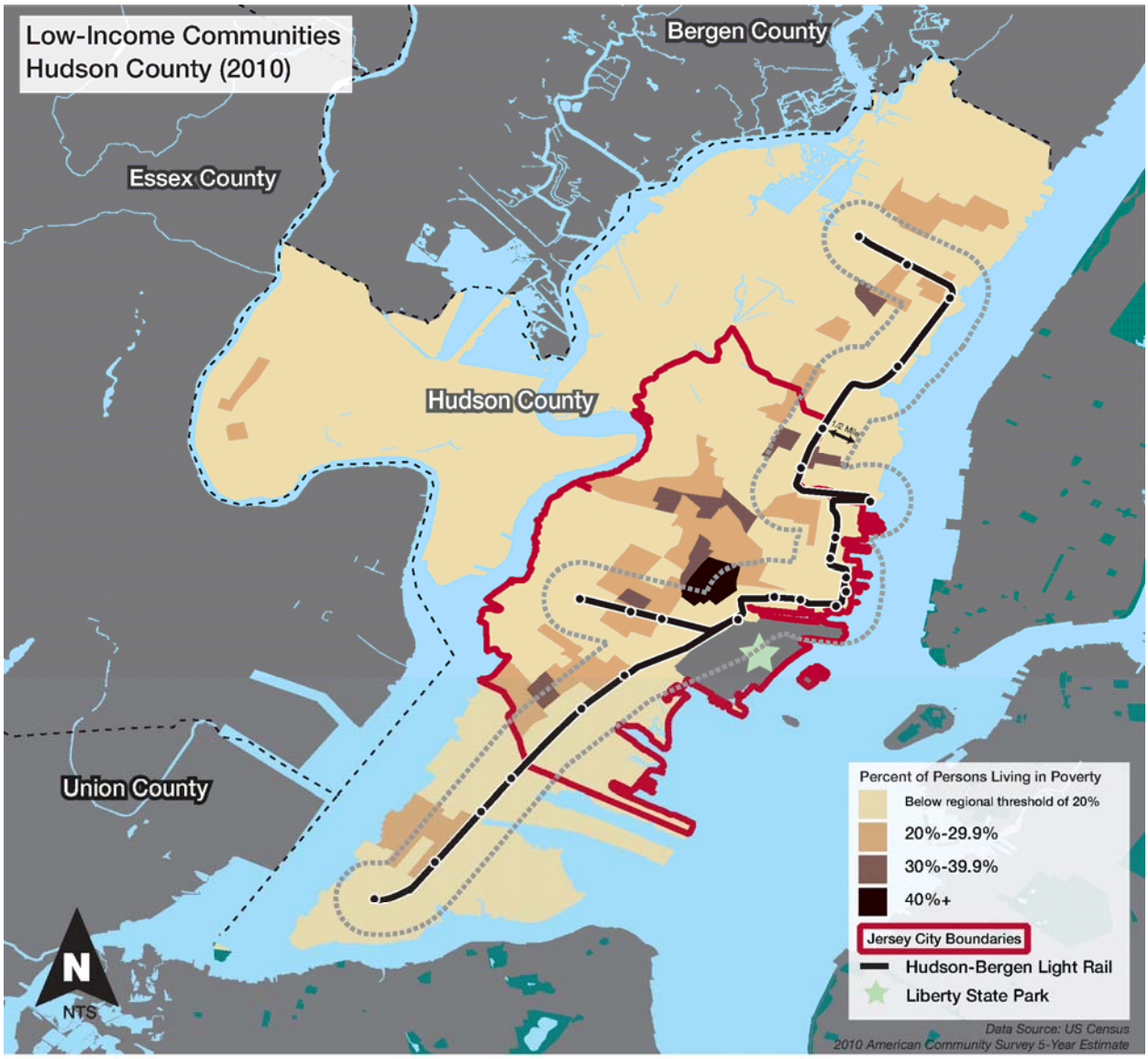
2.4.1 SOCIO-ECONOMIC CHARACTERISTICS

2.4.1.1 LOW INCOME COMMUNITIES

The U.S. Census Bureau's poverty thresholds, which are dependent on family size, are updated yearly. For 2010, a family of two adults and two children was considered to be in poverty if its annual household income was below $22,113. A family consisting of one adult and one child was considered to be in poverty if its annual household income was below $15,030.

Jersey City's poverty rates by Census tract are shown in Figure 2-8. Only one Census tract in Jersey City has more than 40 percent of its households living in poverty.

Figure 2-8
2010 Households in Poverty in Hudson County



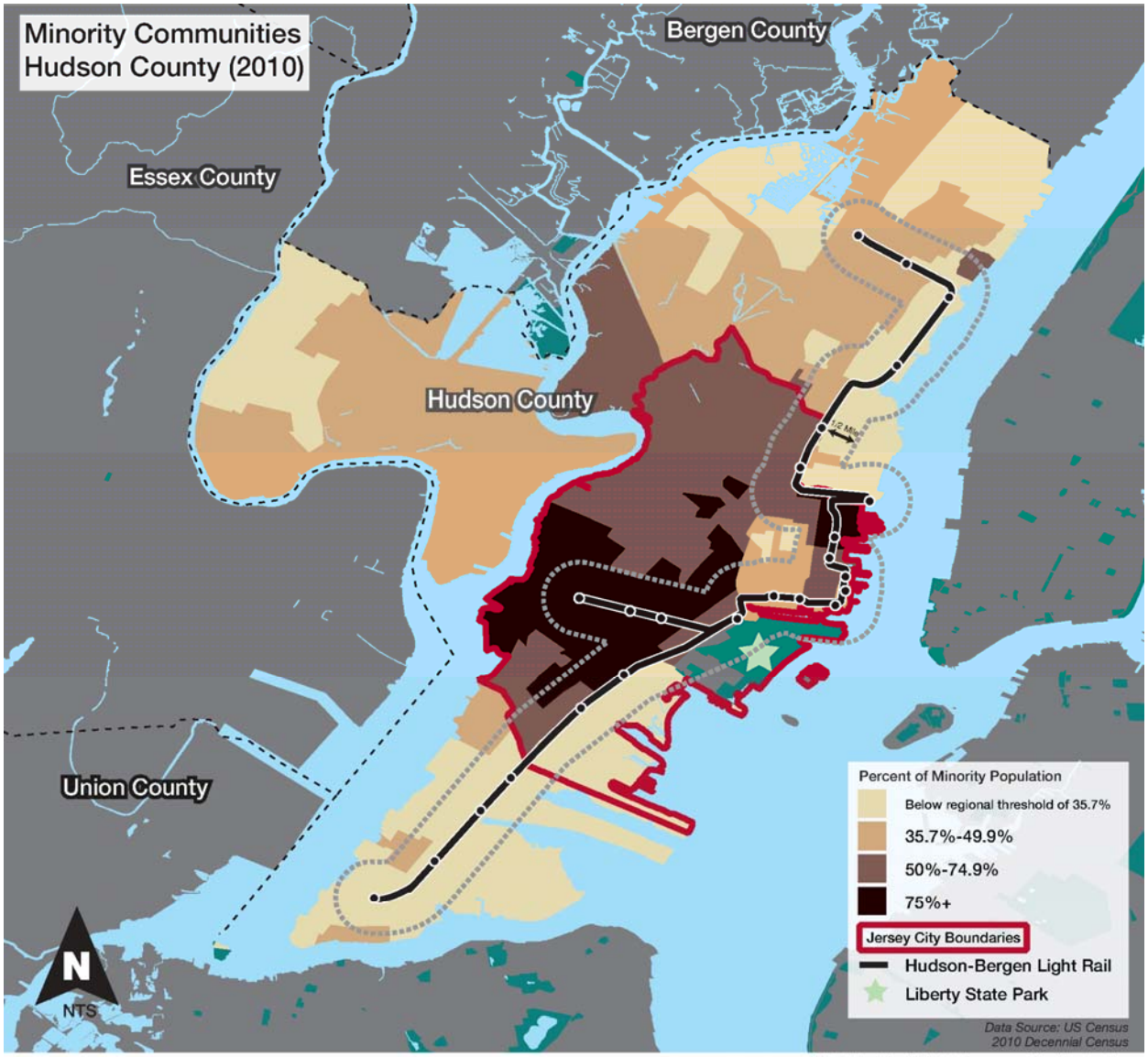
Client: City of Jersey City Division of City Planning
Project: Liberty State Park Circulator Cost-Benefit Analysis

2.4.1.2 MINORITY COMMUNITIES

Minority communities are defined as having persons of the following ethnic groups: Black, Hispanic, Asian, American Indian and Alaskan Native. If the minority population of a Census tract is greater than the regional threshold of 35.7 percent, it qualifies as a minority community.

Jersey City has a large percentage of minority communities (Figure 2-9). Census data show that most of the City's Census tracts are at least 50 percent minority. The populations of only a few Census tracts (in Greenville and Downtown) are less than 35.7% minority. Census tract areas of Jersey City with the highest percentage of minority population are mainly located in the Greenville, Bergen-Lafayette, and West Side neighborhoods.

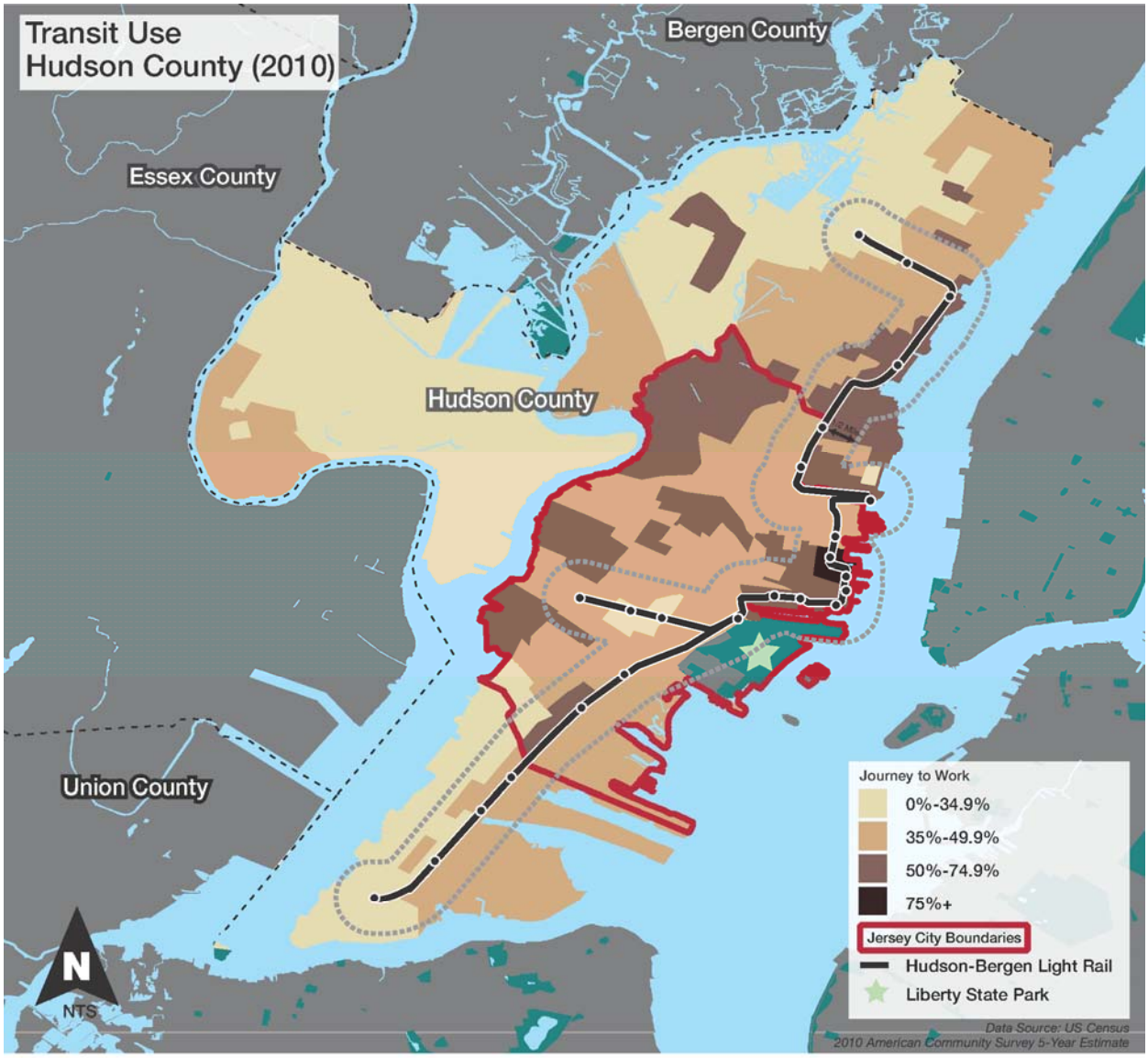
Figure 2-9
2010 Minority Communities in Hudson County



2.4.1.3 TRANSIT USE

At least 35% of the population of most Census tracts in Jersey City (all but four) use transit to travel to work (Figure 2-10). Transit use for journey to work is the highest in the Newport neighborhood, which has access not only to the HBLR system but also to the PATH system. Non-work trips are not included in Census data.

Figure 2-10
2010 Work-Trip Transit Use in Hudson County

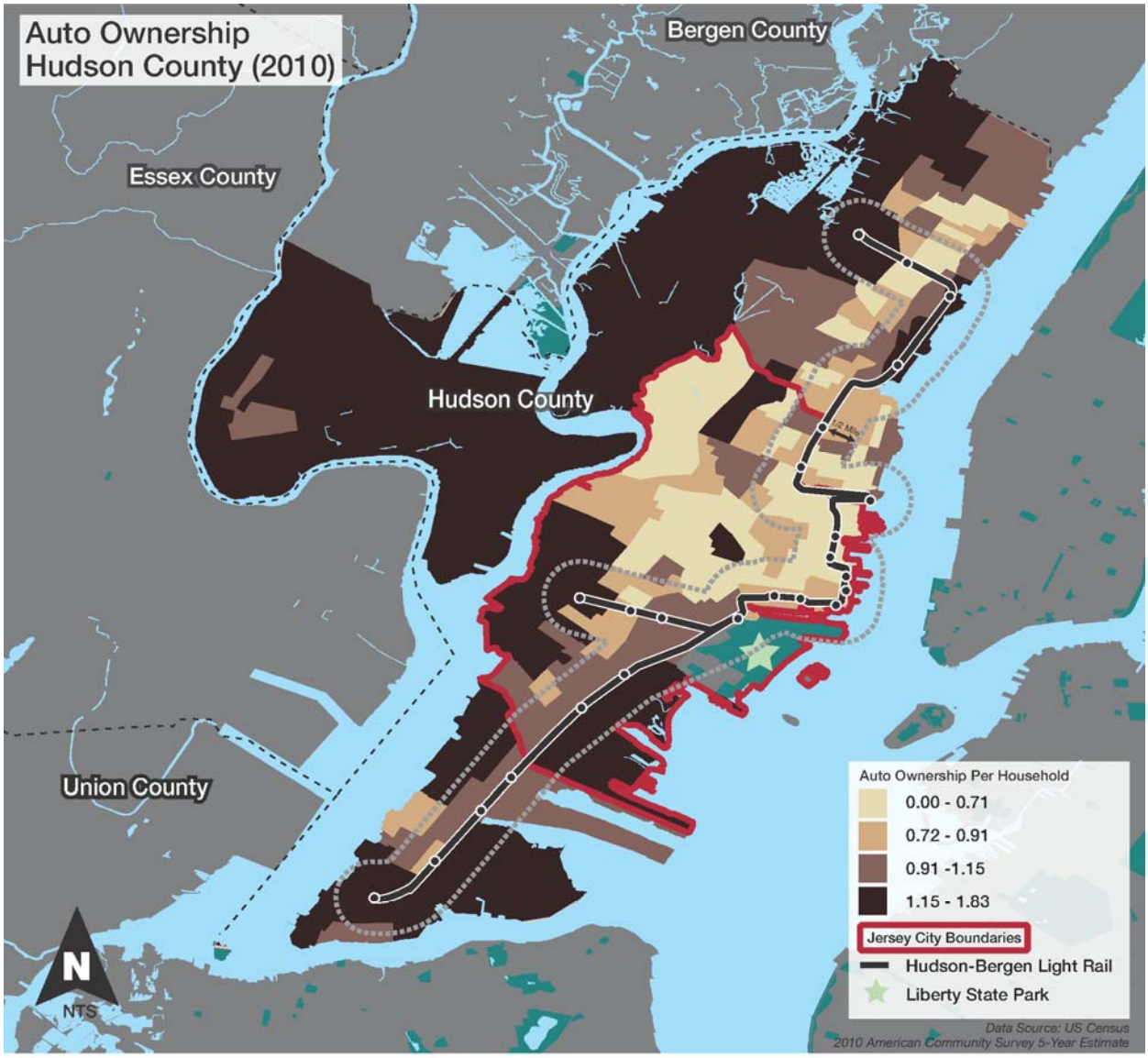


Client: City of Jersey City Division of City Planning
Project: Liberty State Park Circulator Cost-Benefit Analysis

2.4.2 AUTO OWNERSHIP

Overall, auto ownership rates for Jersey City are fairly low when compared to the rest of New Jersey. The rates are highest in areas that are not directly served by the PATH system and have the lowest rates of poverty. Census tracts with the highest rates of household auto ownership (over 1.15 vehicles per household) are located in Greenville, Journal Square, and the Heights, and along the Western Waterfront (Figure 2-11). For comparison, the United States average for vehicle ownership per household is over 2.2.

Figure 2-11
2010 Auto Ownership in Hudson County



Client: City of Jersey City Division of City Planning
Project: Liberty State Park Circulator Cost-Benefit Analysis

2.5 ENVIRONMENTAL CONSIDERATIONS

2.5.1 REMEDIATION

Liberty State Park was originally an intertidal mud flat and salt marsh that was filled by railroad companies between 1860 and 1919 to stabilize the surface. Much of it is non-consolidated material resulting from construction projects in Manhattan, or refuse from throughout New York City and the surrounding area. For more than 100 years, the CRRNJ used the site as a rail yard for both freight and passenger service. In the late 1960s the CRRNJ discontinued operations at the site and the land was subsequently acquired by the State of New Jersey Department of Environmental Protection (NJDEP)

and assigned to the Division of Parks and Forestry (DPF) for management and use as a park. The DPF has spent the past several decades planning and building a park infrastructure that is suitable for public recreation. With more than five million visitors annually, the park's development continues to be an extraordinary success.

Since the soils of the park are classified as “historic fill” and have use restrictions, the portion of Liberty State Park now open to the public was remediated (capped and covered with approximately one-foot of top soil). In the center of the park (interior), approximately 251 acres remain undeveloped. The interior has been re-colonized by various plant communities. These communities represent unique associations of both endemic and non-native species that can be considered the by-product of the way the property had been used during the past several centuries.

A broad-based, goal-driven approach was used to develop the General Management Plan (GMP) for the interior section of the park. Members of an interdisciplinary planning committee, which represented various public and private interest groups, and with several public hearings during a decade of planning, developed a conservation plan that includes the creation of a trail network, tidal marsh, freshwater wetlands, and enhancements to uplands. The interior will be opened to the public as the various stages of the conservation plan are implemented.

2.5.2 SECTION 4(F)

According to the Federal Highway Administration, “Section 4(f) refers to the original section within the U.S. Department of Transportation Act of 1966 which established the requirement for consideration of park and recreational lands, wildlife and waterfowl refuges, and historic sites in transportation project development”. Liberty State Park was acquired and developed in phases utilizing multiple funding sources by the NJDEP to be managed as parkland by the Division of Parks and Forestry. The funding sources include but are not limited to the NJ Green Acres Program, federal Land and Water Conservation Funds, and federal Urban Park and Recreation Recovery. Generally, the funding sources have laws and regulations that encumber the use of Liberty State Park for only those purposes that support the outdoor recreation and/or conservation use of the funded property. Any other use that does not support recreation and/or conservation activities of Liberty State Park is expressly prohibited.

2.6 BEST PRACTICES: PARK CIRCULATORS

Best practices of transit circulators serving national or state parks that could be analogous to Liberty State Park were researched to determine operating characteristics. The selected circulators were identified in conjunction with Federal Transit Administration (FTA) staff involved with the Sarbanes Transit in the Parks program and National Park Service representatives.

2.6.1 HEARST CASTLE

Hearst Castle, on the central coast of California, is a State Historic Park that comprises over 90,000 square feet of buildings. The castle itself, with over 50 bedrooms, sits atop a hill at an altitude of 1,600 feet. The park provides shuttle bus service from the Visitor Center to the castle. The trip is about five miles long, and would be arduous for most people to walk. In this way, Hearst Castle is somewhat analogous to Liberty State Park.

The shuttle buses are transit-type buses, branded with Hearst Castle’s logo (Figure 2-12). Because the Castle provides scheduled tours, the buses are scheduled only to bring patrons to the Castle in time for these tours. In this way, the service differs from the potential Liberty State Park circulator, which would, ideally, depart on a schedule that is coordinated with nearby public transportation.

Figure 2-12
Hearst Castle State Historic Park Shuttle Bus

(http://www.hearstcastle.org/tours/the-bus-route)

2.6.2 LOWELL NATIONAL HISTORIC PARK

Lowell National Historic Park is located just outside Boston, Massachusetts, in Lowell, a town known for its role in the industrial revolution. Within the Park, the town's historic nature has been preserved. This includes its mode of transportation, a functioning heritage trolley system that people ride to get around the park and to take official tours.

The trolleys run on two miles of track and are operated by the National Park Service. The trolleys only run from March until November, and are free for all visitors to the Park (Figure 2-13).

The length of the trolley's route in Lowell National Historic Park is similar to what the potential Liberty State Park circulator would need to be. Therefore, development and operating and maintenance costs may be somewhat analogous, should Liberty State Park choose to study a rail option.

Figure 2-13
Lowell National Historic Park Trolley

(http://www.nps.gov/lowe/planyourvisit/upload/newtroll.pdf).

2.6.3 STONE MOUNTAIN

Stone Mountain Park, located outside of Atlanta, Georgia, is the most-visited attraction in Georgia. It is five square miles and surrounds what is considered the world's largest piece of exposed granite.

Stone Mountain Park has a heritage railway system, but it does not function as a park circulator because there is only one place to get on and off the vehicle. However, Stone Mountain Park does have another type of circulator, a high-speed Swiss-built cable car that transports visitors to the top of Stone Mountain (Figure 2-14). The cable car offers unparalleled views of another of the Park's features, the Confederate Monument, carved into the side of Stone Mountain.

While a cable car is not an appropriate application for Liberty State Park (since it does not feature a steep enough grade to deem this type of vehicle necessary), the takeaway is that the cable car transports visitors up the mountain and directly past the Confederate Monument. The cable car has become its own attraction at Stone Mountain Park and carries visitors who not only want to go to the top of the mountain, but those who want to experience the novel mode of transportation.

Figure 2-14
Stone Mountain Park Cable Car

(http://www.stonemountainpark.com/attractions-shows/attraction-detail.aspx?AttractionID=48)

2.6.4 CUYAHOGA VALLEY NATIONAL PARK

Cuyahoga Valley National Park, near Cleveland and Akron, Ohio, is Ohio's only national park. It offers hiking, camping, and historic attractions. Cuyahoga Valley National Park also features the Cuyahoga Valley Scenic Railroad, which operates on 51 miles of the former Baltimore & Ohio Railroad right-of-way using refurbished, climate-controlled vintage cars built in the 1940s and 1950s (Figure 2-15). The railroad functions not only as a park circulator but as an attraction. It passes through the park, but also extends almost to Cleveland to the north and to Akron and Canton to the south. The train operates on weekends only from November through May, with a more limited schedule in December. During June through October, the train operates from Wednesday through Sunday. The Cuyahoga Valley's experience shows that using historic infrastructure can be a tremendous asset when planning a park circulator system.

Figure 2-15
Cuyahoga Valley Scenic Railroad

(http://www.cvsr.com/resources/1/footer_images//i14.jpg)

2.6.5 ACADIA NATIONAL PARK

Acadia National Park, in Maine, was the first National Park east of the Mississippi River. It consists of over 47,000 acres and includes an ocean coastline, lakes, mountains, and woodlands. Acadia National Park has not only a circulator, but an entire transit system connecting it with hotels, inns, campgrounds, and neighboring villages. The system is called "Island Explorer" and is operated by Downeast Transportation. It features eight free bus routes (Figure 2-16).

Acadia National Park's system is thorough, but its situation is not analogous with that of Liberty State Park. Liberty State Park is surrounded by densely populated urban areas with an existing, well-utilized public transportation network. While any circulator system in Liberty State Park should be well integrated with the existing systems (mainly, the HBLR), it would be duplicative to install an entirely new transit network in the park and surrounding area. However, the Acadia National Park example illustrates the importance of connecting multiple destinations with transit.

Figure 2-16
Arcadia National Park Shuttle Bus

(http://www.exploreacadia.com/)

2.6.6 ZION NATIONAL PARK

Utah's Zion National Park is known for its canyons, hiking, climbing, and spectacular views. Zion National Park established a shuttle system to eliminate traffic and parking problems and to protect vegetation in the Park. There are two shuttle routes: one through the town of Springdale, and one through the Park. Visitors can transfer between shuttles as the Park Visitor Center. Visitors are encouraged to park in Springdale, ride the Springdale Shuttle to the Park Visitor Center, and ride the Park Shuttle into Zion National Park. Spring through fall, Zion Canyon Scenic Drive, a main route through the park, is open only to shuttle bus traffic. The shuttles are free. They have headways as short as seven minutes. Schedules are posted at each shuttle stop. The shuttles themselves are low-floor, low-emission minibus-style vehicles, similar to airport shuttles (Figure 2-17). They are branded with the name of the park.

While Zion National Park is very different from Liberty State Park, there are several lessons to be learned from this example. Despite the fact that Liberty State Park is located in an urban environment with a robust transit system, and Zion National Park is located in a rural environment with no transit system whatsoever except for its own shuttle service, Zion's Springdale Shuttle/Park Shuttle connection is analogous to the potential HBLR/Liberty Park Circulator Connection insofar as it demonstrates that people are willing to transfer to access a park if the service is frequent enough, and timed well enough, to preclude an inconvenient wait.

Figure 2-17
Zion National Park Shuttle Bus

(http://www.nps.gov/zion/planyourvisit/shuttle-system.htm#)

2.7 TRAVEL SURVEY

A detailed travel survey was undertaken to better understand why people visit Liberty State Park, how they get there, how often they visit, and where they come from. The main reason for the survey was to collect data that would serve as input to the travel demand model used to project future transit ridership potential for the park. Existing data are typically focused on work trips during the peak weekday travel periods and not on recreational trips and the weekend periods. The results of the survey were used as the main source of data to perform the analysis of recreational trips in the model. It was estimated that a minimum of approximately 1,000 returned surveys were needed for input into the model for a representative sample. In total, over 2,000 surveys were completed.

2.7.1 SURVEY METHODOLOGY

Generally, the surveying was conducted throughout the month of July 2012. Separate survey forms were developed as a tool to gather data from the various populations of people that use or could potentially use Liberty State Park. The surveys were intentionally kept short (one page long taking, on average, about one minute to complete) as a means to garner maximum participation from the public. Another measure used to encourage participation was that all of the survey forms were available in Spanish. All survey forms were developed with input from the Technical Advisory Committee. In addition, the survey was field tested prior to survey deployment to ensure that questions were properly-worded and easy to understand. Several different survey forms were developed (see Appendix A) to acquire the necessary data including:

- Liberty State Park Interview Survey
- Liberty Science Center Interview Survey
- On-line User Survey
- Generic Survey (Off-site)

In order to raise awareness of the survey and the study in general, the City of Jersey City issued a press release to announce the study and survey effort in July 2012. The City also distributed flyers to advertise the survey and used social media to announce the survey. Several member agencies of the TAC helped to get the word out by posting announcements for the survey on their agencies' websites.

2.7.2 LIBERTY STATE PARK INTERVIEW SURVEY

The purpose of this survey was to target actual visitors of Liberty State Park to determine their travel characteristics, frequency of visits, and trip purpose. The consultant team conducted the survey on one weekday (Wednesday, July 11, 2012) and on one day over the weekend (Sunday, July 15, 2012) between 10:00 AM and 8:00 PM both days so that data from a representative sample of visitors could be collected. These surveys were performed on good weather days without rain to maximize participation and to represent "normal" summer conditions. The goal was to collect 300 to 400 completed surveys per survey day.

Staff assisted people as needed when completing the survey forms. The staff was positioned at the following five key locations throughout the park as a means to maximize responses and to cover all populations of people visiting the park:

- Ferry/CRRNJ Terminal
- Liberty Landing Marina/North Field/9-11 Memorial
- Park Headquarters/South Lawn/ Boat Launch
- Green Park/Playground/Liberty Walk
- Park Entrance on Audrey Zapp Drive/Marina/Grove of Remembrance

In addition, the Friends of Liberty State Park surveyed park visitors at a concert on July 24, 2012, and Liberty State Park personnel conducted some additional surveys in the park.

2.7.3 LIBERTY SCIENCE CENTER INTERVIEW SURVEY

This survey was developed to target visitors to the Liberty Science Center due to their large numbers and their unique travel characteristics. The Liberty State Park interview survey form was modified for use at the Liberty Science Center. Surveying was conducted by Liberty Science Center volunteers at the facility on eight days (five weekdays and three weekend days) including:

- Friday, July 20
- Saturday, July 21
- Sunday, July 22
- Tuesday, July 24
- Wednesday, July 25
- Thursday, July 26
- Friday, July 27
- Saturday, July 28

The Liberty Science Center offered incentives for participation in the survey. The goal was to collect 600 completed surveys (300 total on weekdays and another 300 total on weekend days).

2.7.4 ON-LINE SURVEY

This survey was developed to target both visitors and non-visitors to Liberty State Park and to identify their unique travel characteristics. The Liberty State Park interview survey was modified for use as an on-line survey for previous visitors to the park. Separate survey questions were developed for non-visitors. The response to the first survey question (Approximately how often do you visit Liberty State Park?) was used to determine whether the respondent would take the visitor or non-visitor survey. Park visitors were asked about their most recent visit to the park. The survey was accessible on-line for about one month from July 17, 2012 to August 15, 2012. Both fully and partially completed surveys were tabulated. The goal was to collect 300 completed surveys.

2.7.5 GENERIC SURVEY (HANDOUT)

This survey was developed in printed form to target both visitors and non-visitors to Liberty State Park at various locations throughout Jersey City to insure that persons without access to a computer could take part in the survey. The questions for this survey followed the on-line survey; the first survey question determined whether the respondent would be directed to answer the user or non-user survey questions. The goal was to collect 100 completed surveys. Paper copies of the survey were made available at:

- Information Desk at CRRNJ Terminal in Liberty State Park
- Liberty State Park Office (200 Morris Pesin Drive)
- City Hall, Mayor's Action Bureau (280 Grove St, Room 105, Jersey City, NJ)
- Jersey City Division of City Planning (30 Montgomery St, Suite 1400, Jersey City, NJ)

2.7.6 SURVEY RESULTS

Overall, 2,046 surveys were returned, exceeding both the number of surveys needed for the modeling and the upper limit goal of 1,800. Returns for three out of four of the survey types exceeded their original goals (the exception being the Generic Survey). Only 26 surveys were completed by people who have never visited Liberty State Park and only four surveys were returned in Spanish. The break-down of the surveys are shown in Table 2-6.

Table 2-6
Returned Surveys by Type

Survey Type	Number of Returned Surveys
Liberty State Park Interview Survey	733
Liberty Science Center Interview Survey	738
On-line Survey	528
Generic Survey (off-site)	47
Total	**2,046 surveys**

The survey results were tabulated by question and survey type. The Liberty State Park and Liberty Science Center survey questions and answers were almost identical so they were grouped together. Since characteristics are different on weekdays and weekend days, the results were disaggregated

accordingly for these surveys. Since the questions and answers were almost identical for the On-line Survey and Generic Survey, the results for these surveys were grouped together.

The Liberty State Park Interview Survey concluded that recreational trips were mostly from the local areas, visitors to Ellis and Liberty Islands mostly come from great distances (out of state and foreign), average length of stay was approximately three hours, the average group size was just over three people, and approximately two-thirds of respondents visit on a relatively infrequent basis. The Liberty Science Center Interview Survey concluded that a high number of visitors came from New York State, average length of stay was approximately four hours, average group size was close to four people, and most travel by car. The On-line Survey concluded that leisure was the most frequent purpose for visiting the park, more than half of respondents come from Jersey City, average group size was about two and a half people, almost half visit several times a year, and more than half travel by car.

2.7.6.1 HOME ORIGIN

The origins of visitors to the Liberty Science Center differ from those of visitors to the rest of Liberty State Park. The visitors to the park are either from very close (Jersey City and Hudson County) or far away (from other states or other countries). Most of the recreational trips were made by people from the local areas while visitors to Ellis and Liberty Islands come from a much greater distance. For the Liberty Science Center, the highest number of people came from New York State on both weekdays and weekends. The home origins of respondents to the Liberty State Park and Liberty Science Center surveys are provided in Figure 2-18 for the weekday survey and Figure 2-19 for the weekend survey. The home origins of respondents to the On-line and Generic surveys are predominantly Jersey City, as shown in Figure 2-20.

Figure 2-18

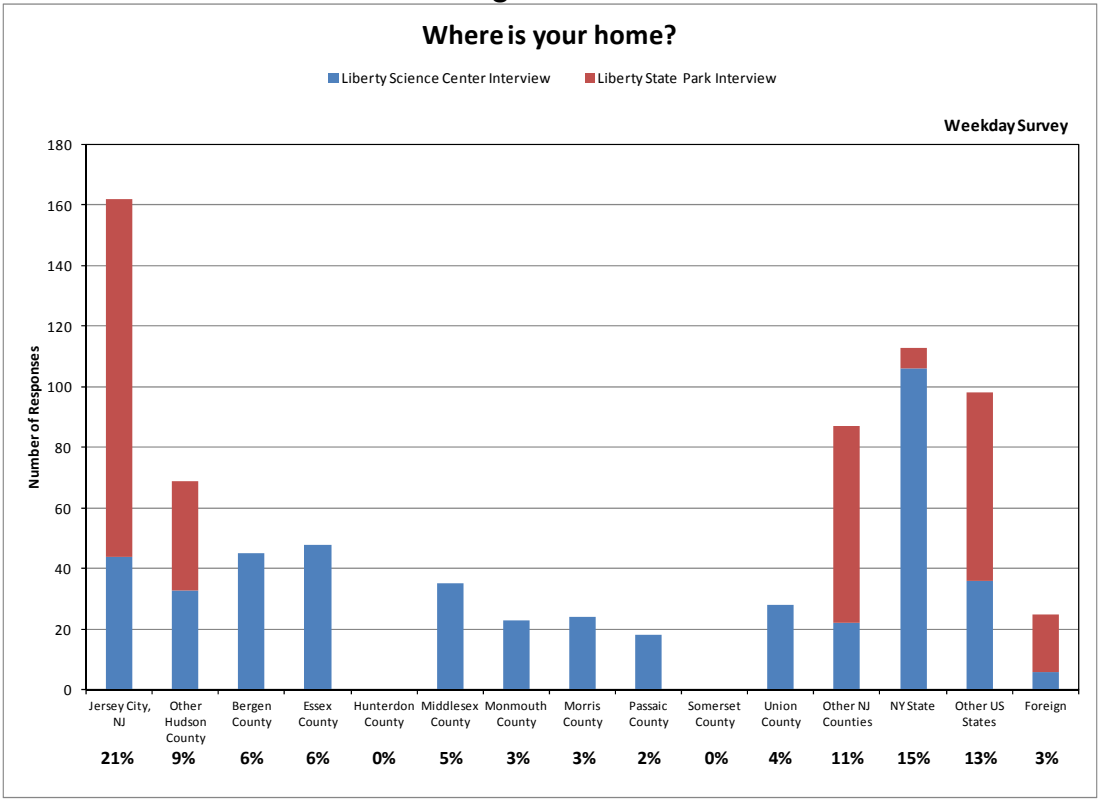


Figure 2-19

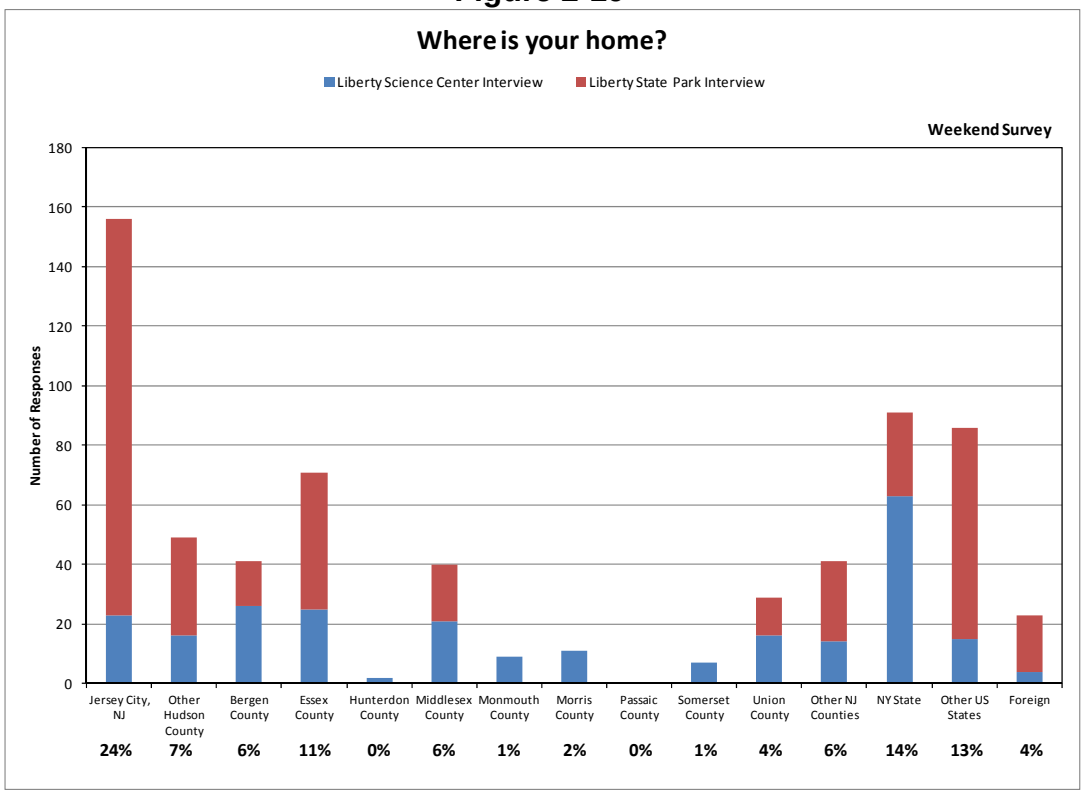
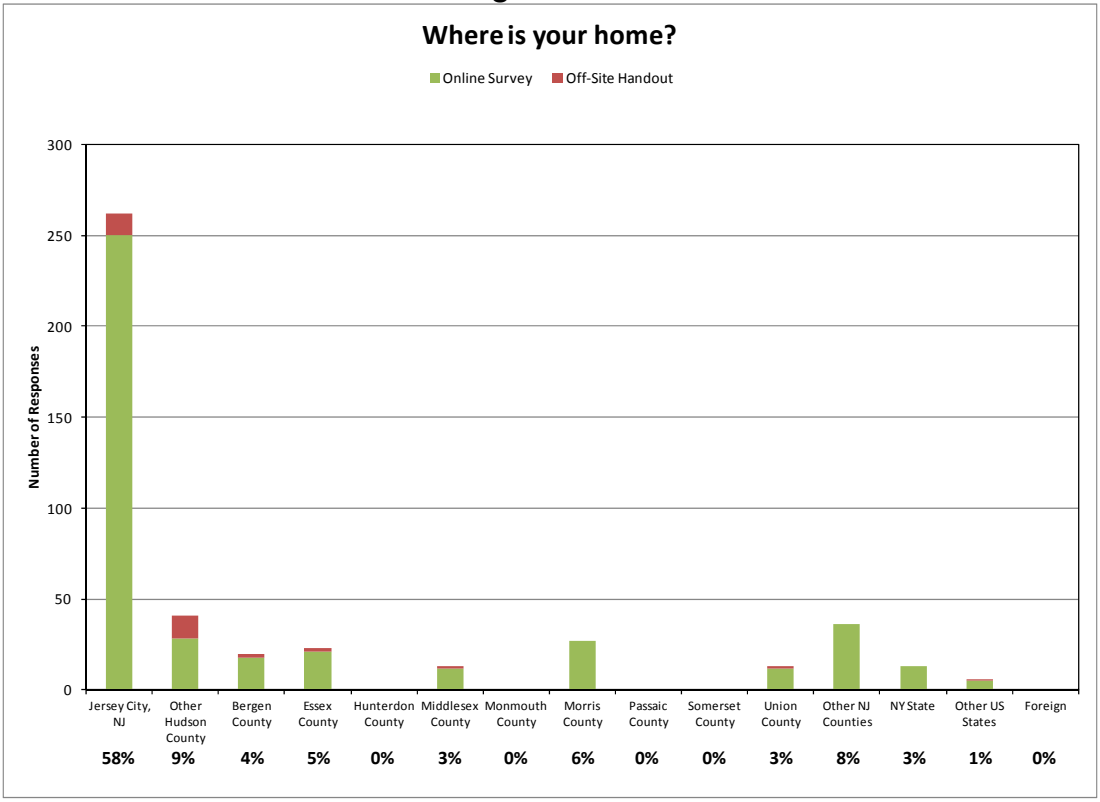


Figure 2-20



2.7.6.2 VISITATION CHARACTERISTICS

Primary Reason

The primary purpose for visitation to Liberty State Park based on the Liberty State Park interview survey is to Ellis/Liberty Islands followed by leisure on a weekday. This trend is reversed on the weekend as the park is used more for leisure during this time. The primary reason for visiting Liberty State Park is depicted in Figure 2-21 for the weekday survey and Figure 2-22 for the weekend survey. The Liberty Science Center is also a major generator of visitors to Liberty State Park as evidenced by the yearly attendance figures. As shown in Figure 2-23, the primary trip purpose for the On-line and Generic Surveys are predominantly leisure, exercise, and Liberty Science Center. It was assumed that the primary trip purpose of visitors surveyed at the Liberty Science Center was a visit to the Liberty Science Center.

Figure 2-21

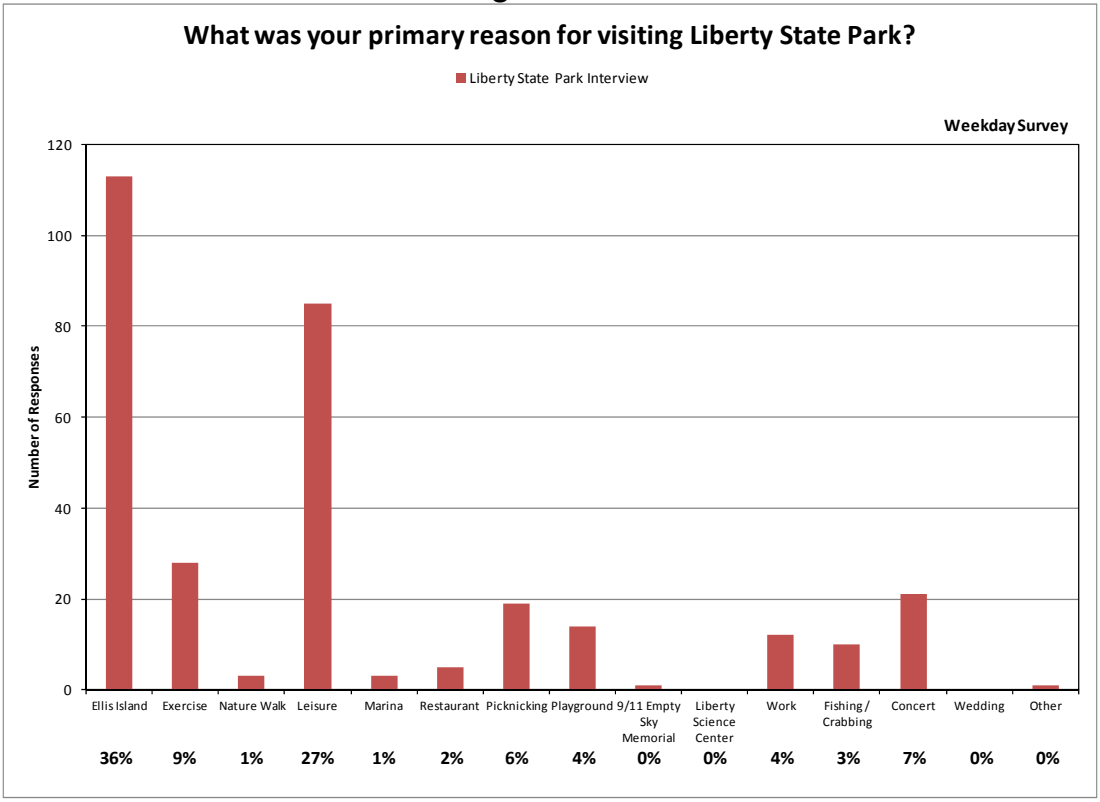


Figure 2-22

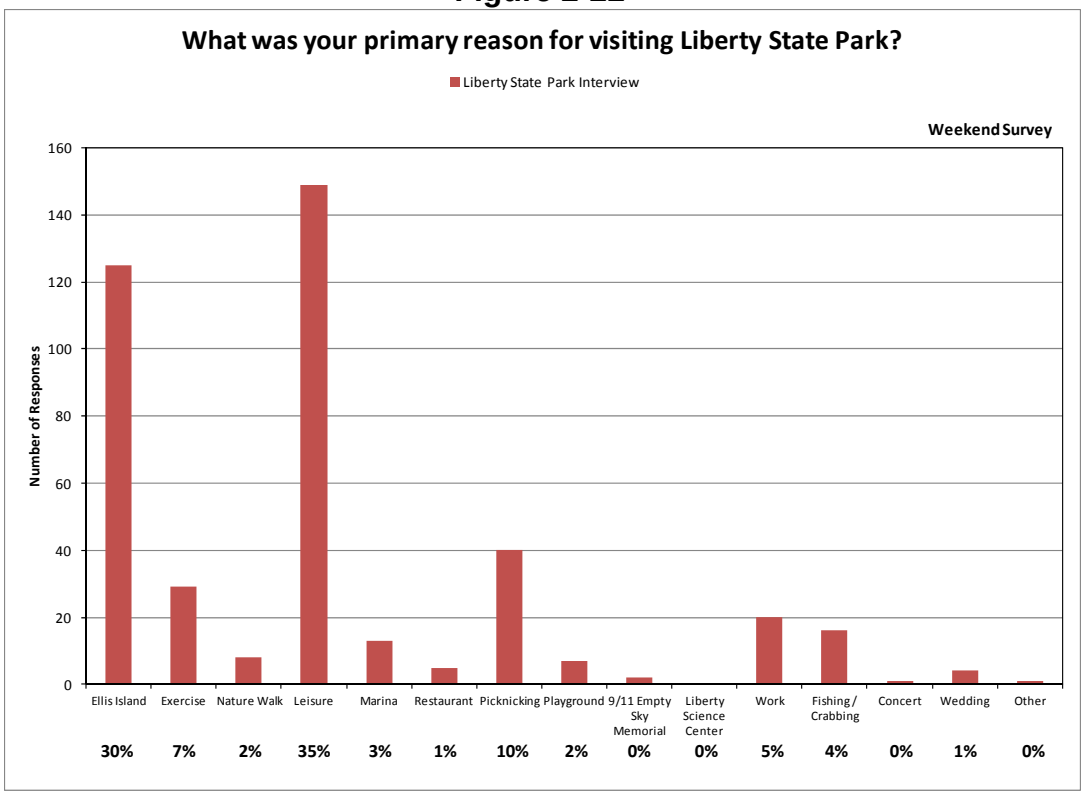
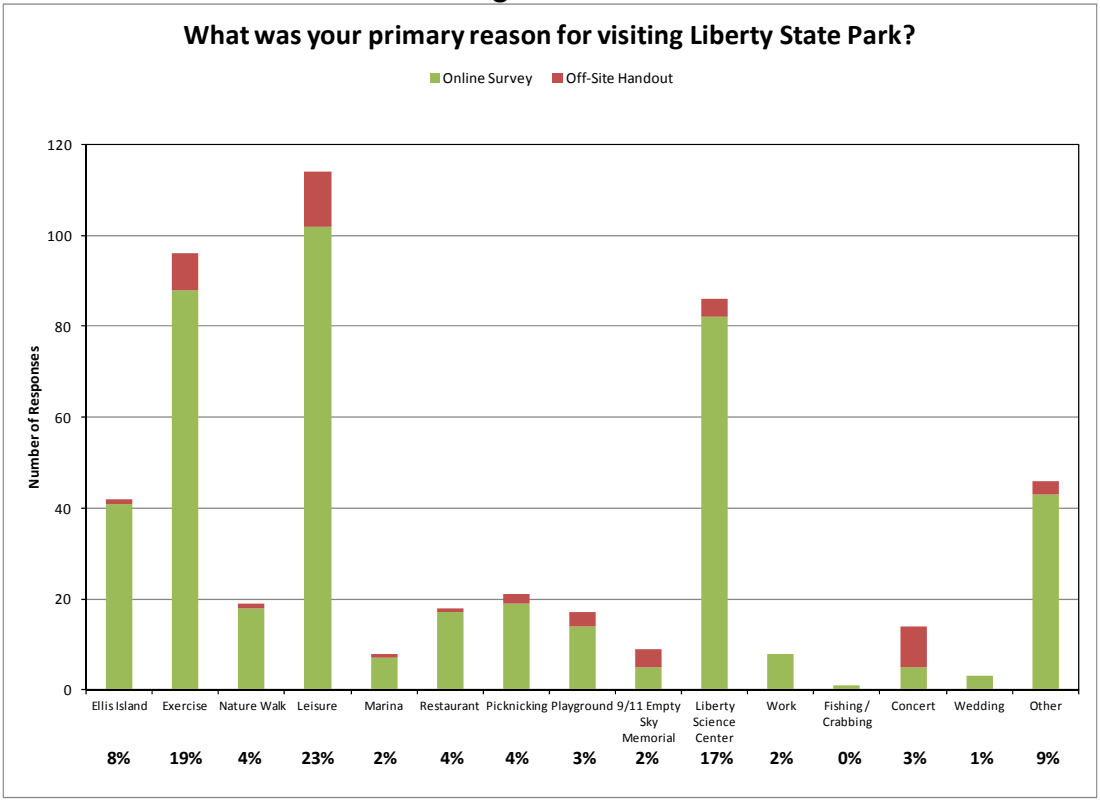


Figure 2-23



Secondary Reason

Most respondents for all of the surveys answered that they did not have a secondary purpose for their visit. For the park and Liberty Science Center visitors, none of the other secondary visitation purposes exceeded seven percent on a weekday or over the weekend. The results of the Liberty State Park and Liberty Science Center surveys on a weekday and weekend are provided in Figures 2-24 and 2-25, respectively. As shown in Figure 2-26, for the On-line and Generic surveys, leisure, exercise, and nature walk were all well-represented as secondary visit purposes.

Figure 2-24

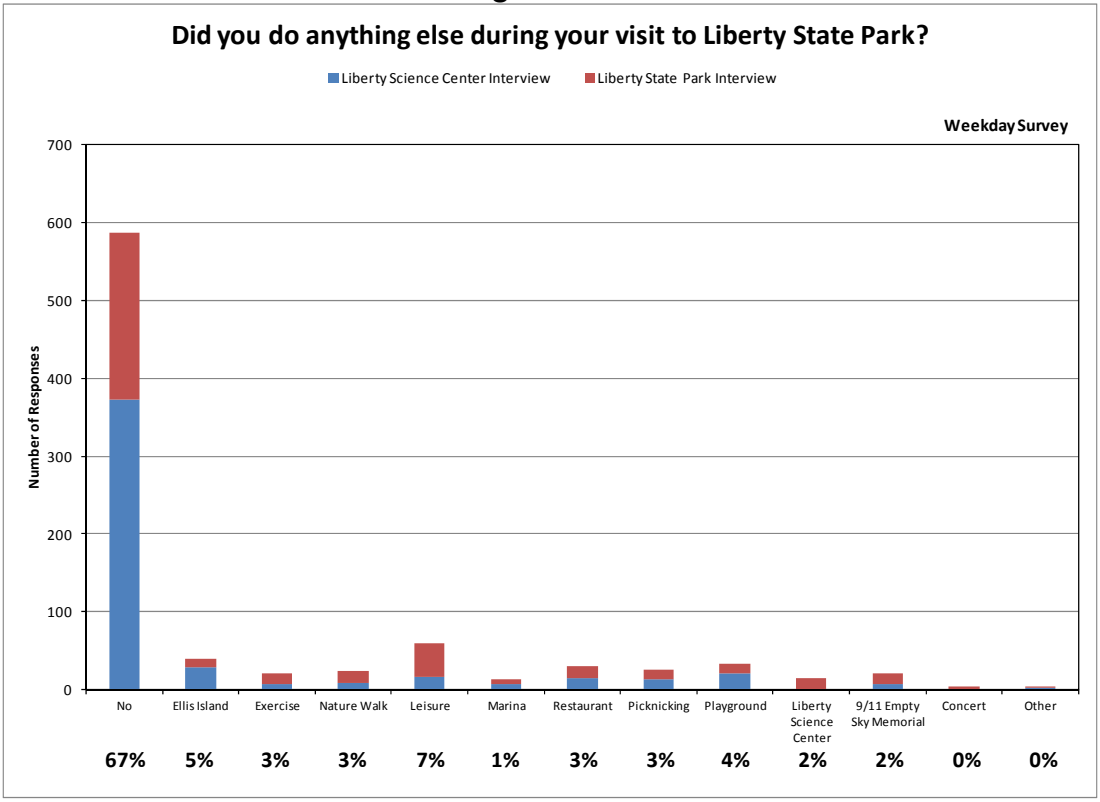


Figure 2-25

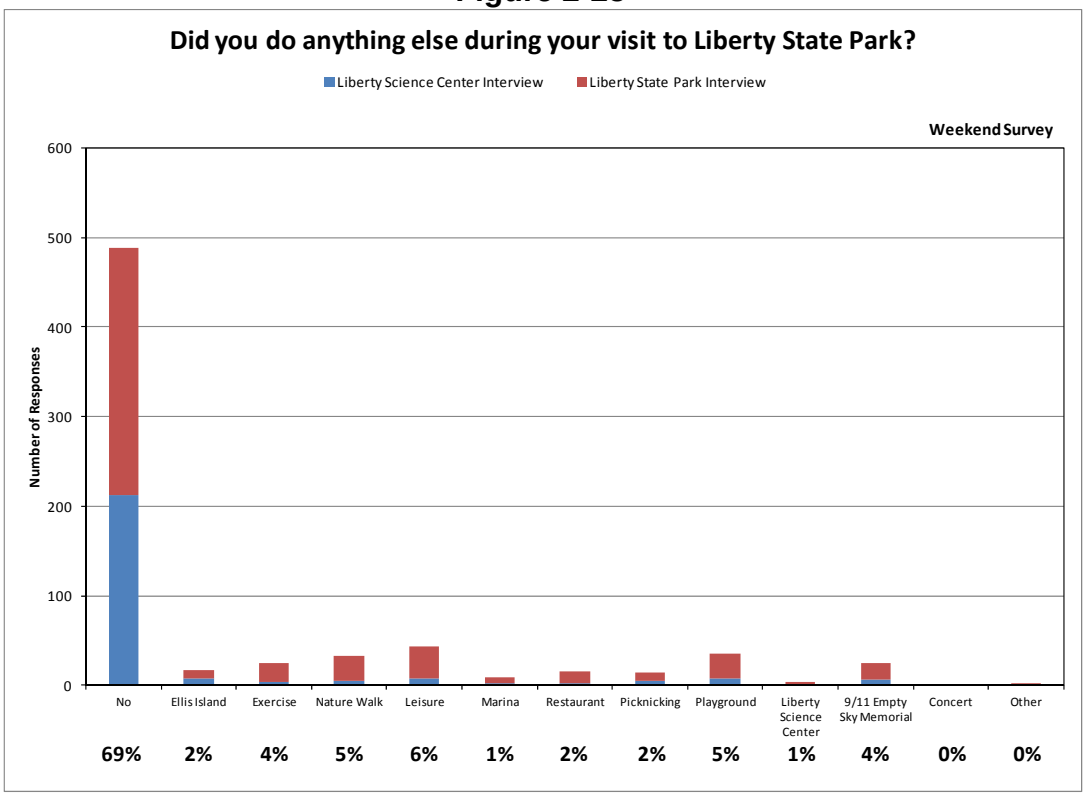
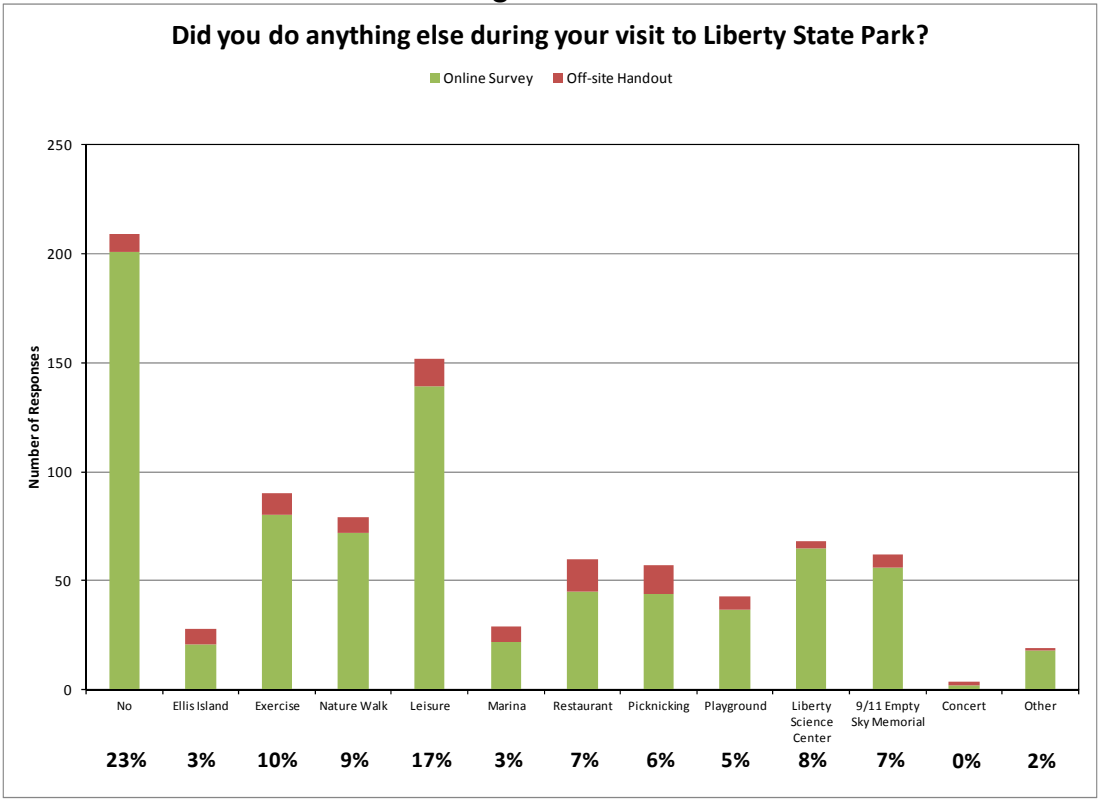


Figure 2-26



Secondary Reason- Travel Mode

Respondents who indicated that they had a secondary trip purpose were asked to select their mode of travel between their primary and secondary destinations. For the park and Liberty Science Center visitors, the most common mode of travel was by car on a weekday (Figure 2-27) and walking on a weekend (Figure 2-28). On both a weekday and a weekend day, park visitors overwhelmingly walked between their primary and secondary destinations while Liberty Science Center visitors continued to use their cars. For respondents of the On-line and Generic surveys, walking was the primary mode between their primary and secondary destinations (Figure 2-29).

Figure 2-27

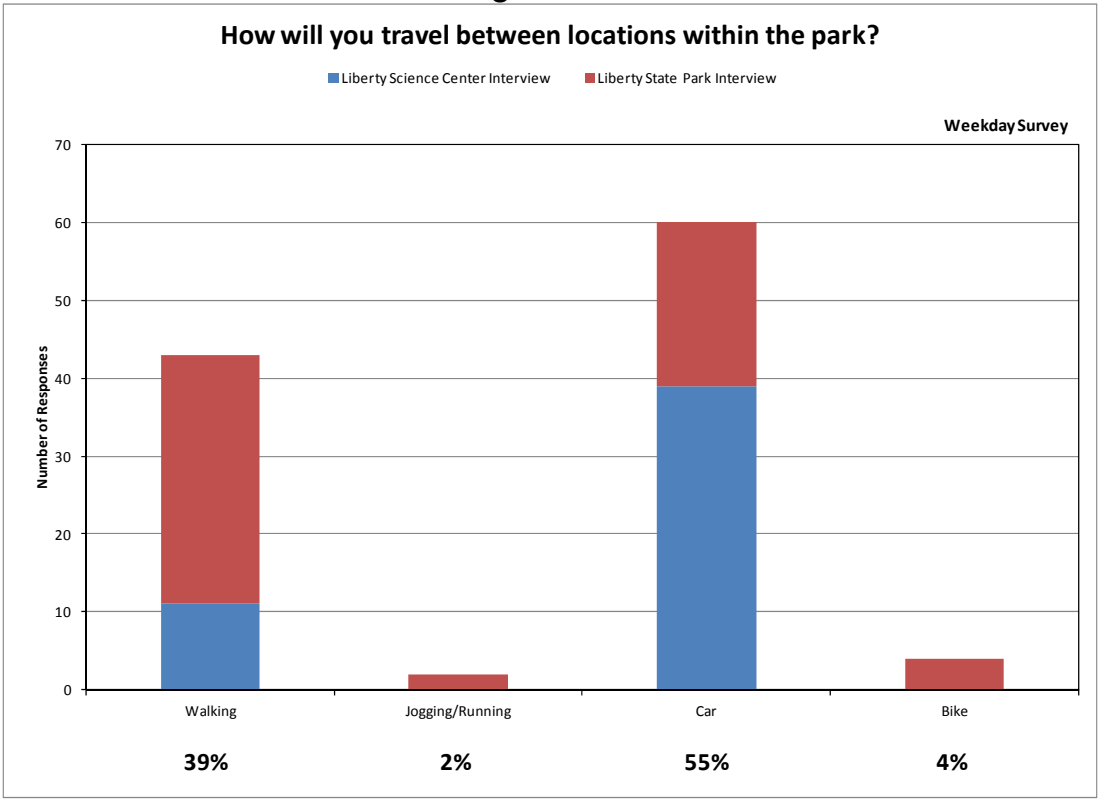


Figure 2-28

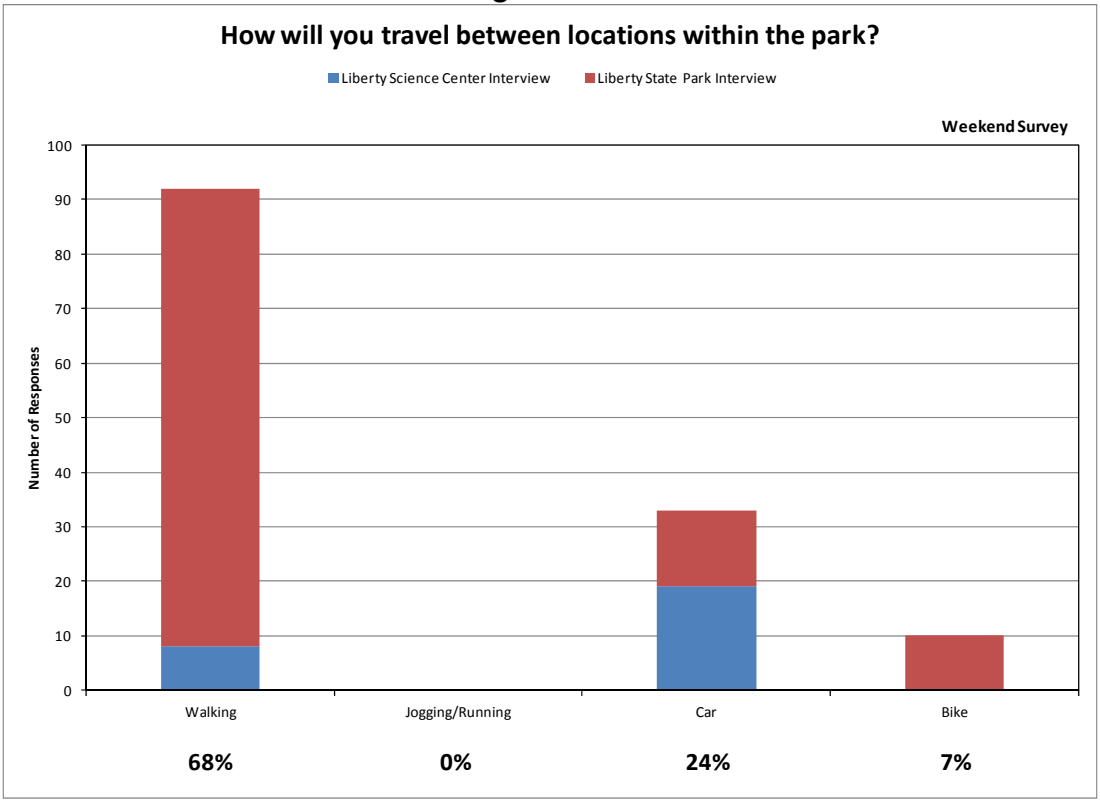
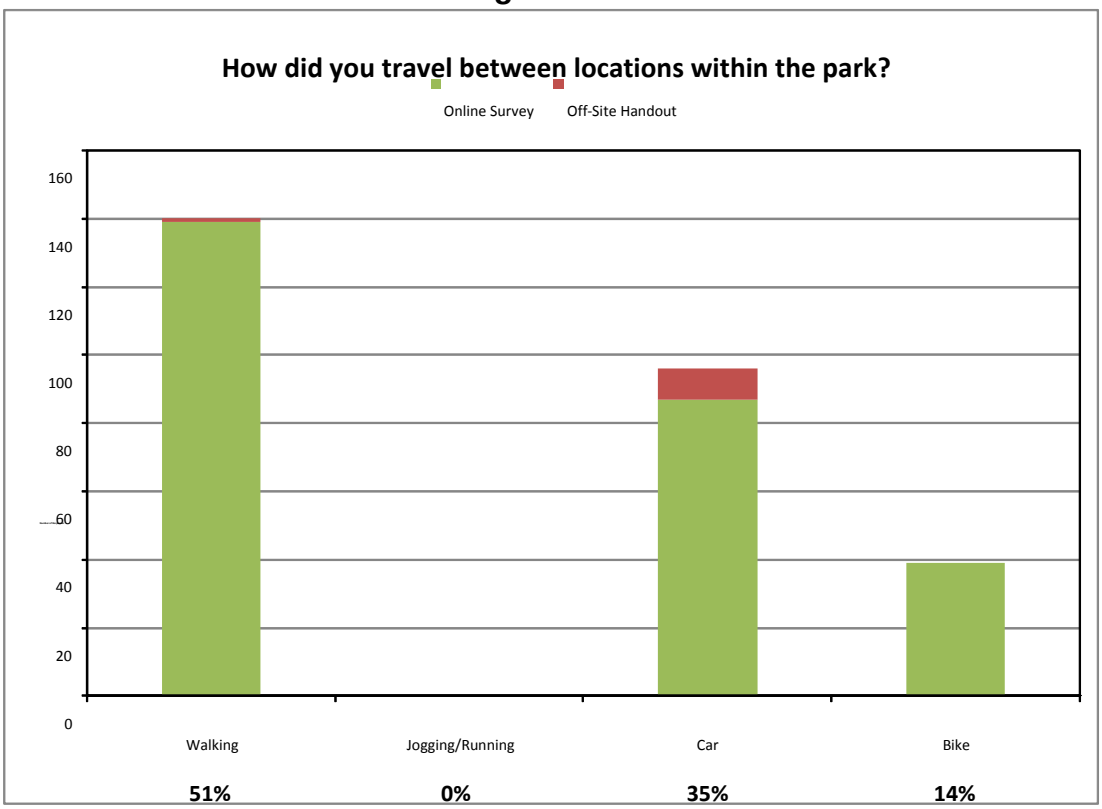


Figure 2-29



Length of Stay

For both Liberty State Park and Liberty Science Center, the highest frequency for length of stay was three hours for both the weekday and weekend (Figures 2-30 and 2-31, respectively). The average length of stay for park visitors is approximately three hours, while the average length of stay for visitors to the Liberty Science Center is approximately four hours. The On-line and Generic surveys did not ask about length of stay.

Frequency of Visits

Based on the survey of park visitors, approximately two-thirds visit the park on a relatively infrequent basis (several times a year or less). This is true for park visitor respondents on both weekdays (Figure 2-32) and weekend days (Figure 2-33). For the On-line and Generic (off-site) survey respondents, a similar pattern of visitation frequency held true. The highest frequency was first time visitors to Liberty State Park, which accounted for more than one-quarter of all visitors on both survey days. Nine percent of respondents indicated that they visited the park on a daily basis during the week but only three percent visit daily on a weekend day. Just under half of the respondents to the On-line and Generic surveys indicated that they visit Liberty State Park several times a year (Figure 2-34). There were no first time visitors for either of the On-line and Generic surveys.

On weekend days, Liberty Science Center visitors were comprised of about 45 percent first time attendees, about 37 percent of infrequent attendees (once a year or longer), and about 18 percent of more frequent attendees (more than once per year). On weekdays, Liberty Science Center visitors were comprised of about 40 percent of first time attendees, about 45 percent of infrequent attendees, and about 15 percent of more frequent attendees.

Figure 2-30

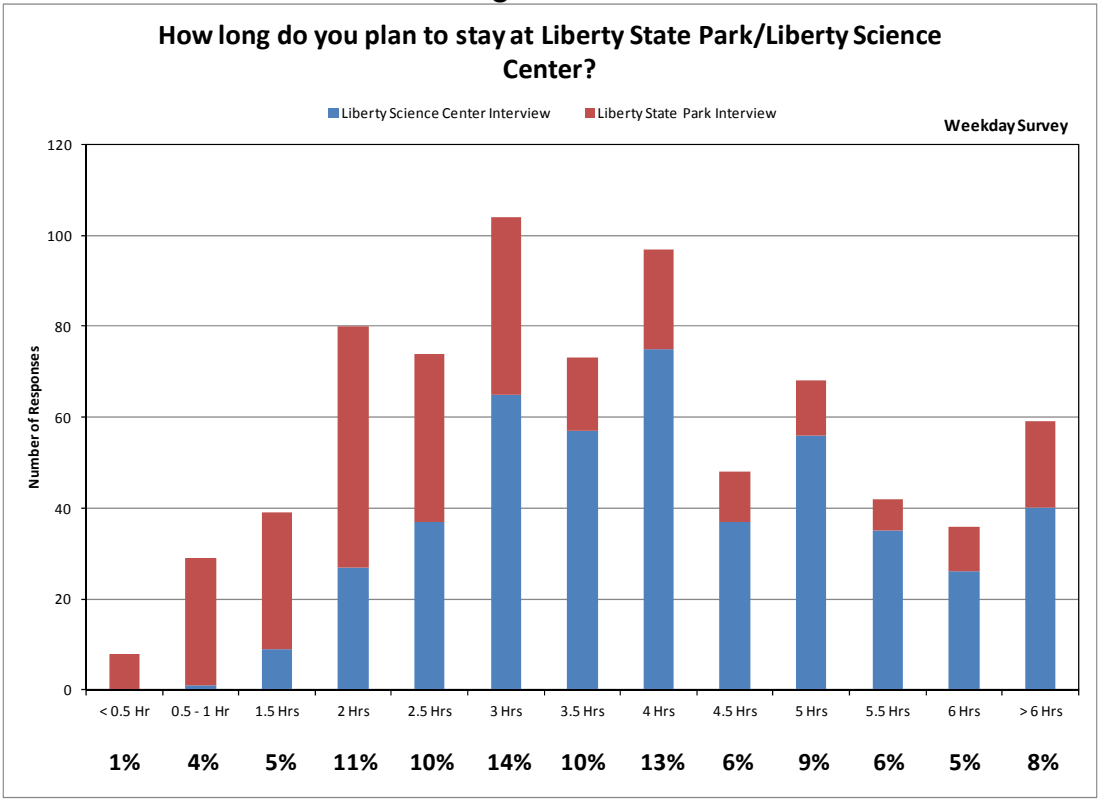


Figure 2-31

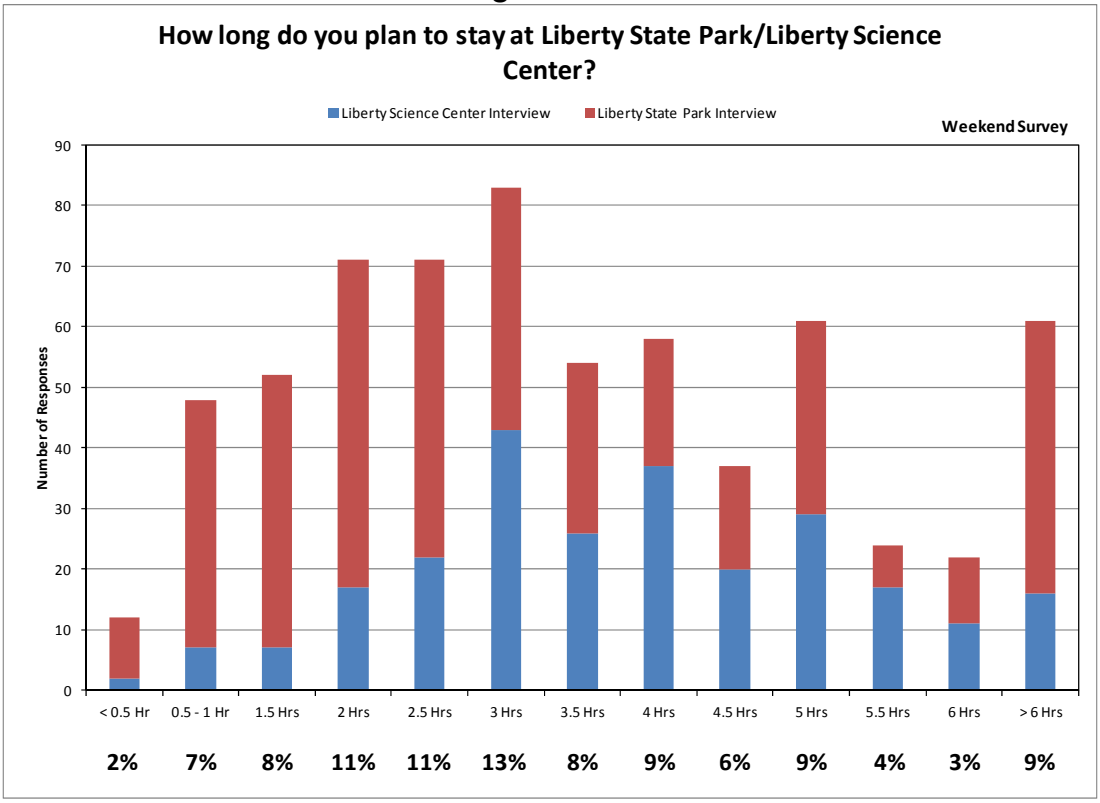


Figure 2-32

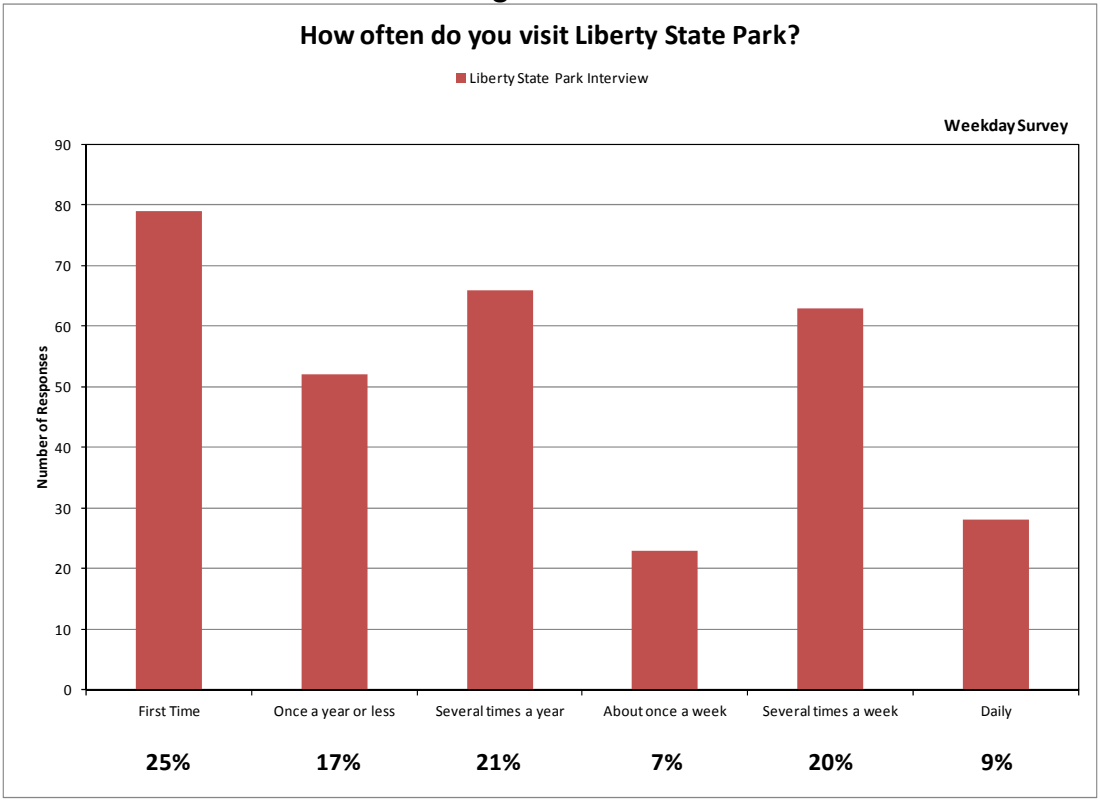


Figure 2-33

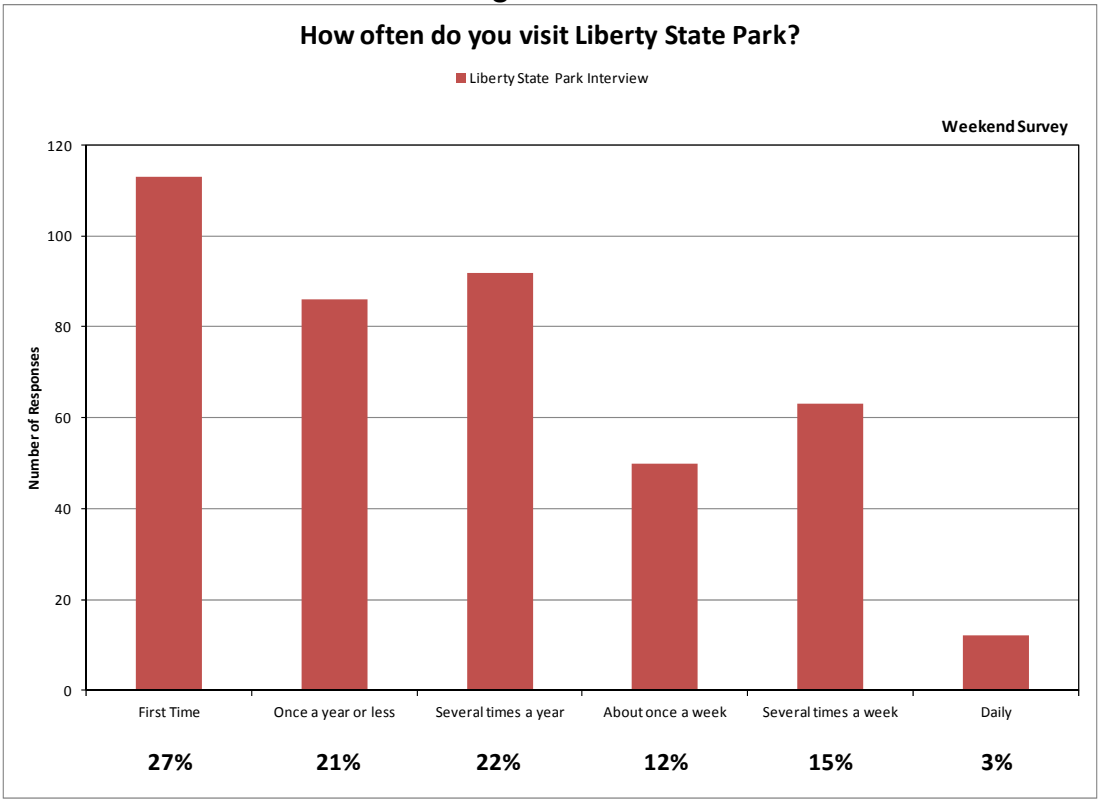
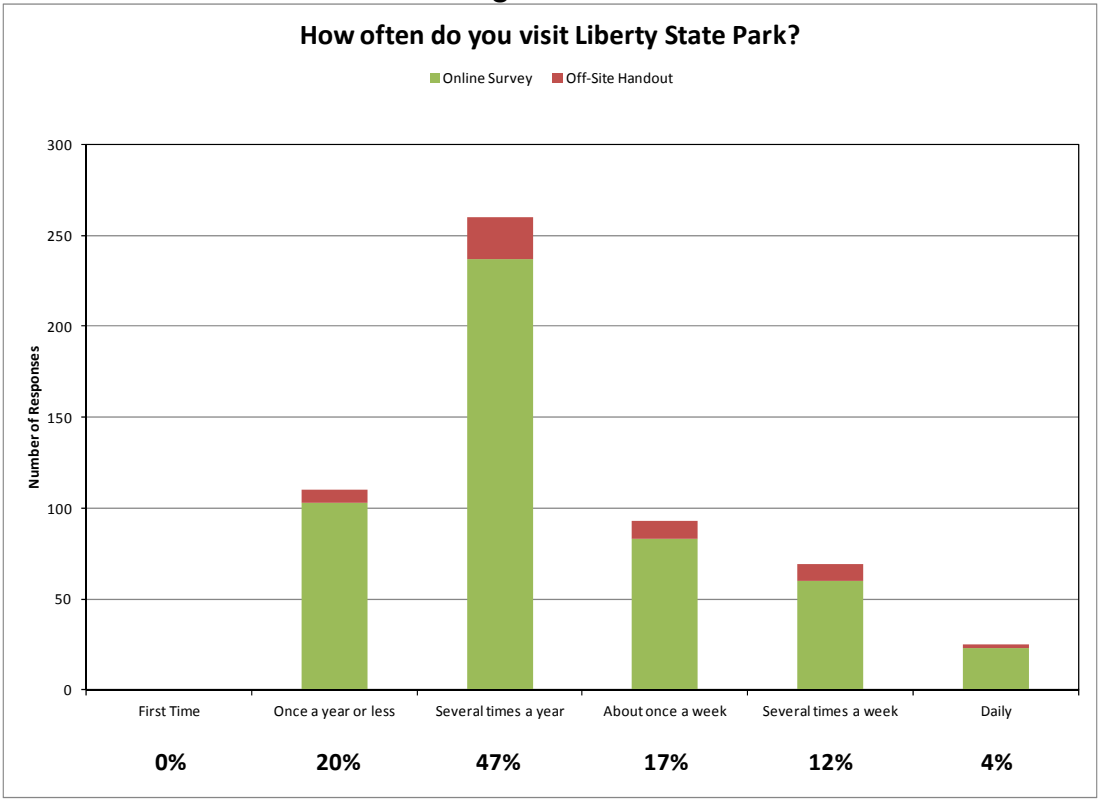


Figure 2-34



2.7.6.3 TRAVEL PATTERNS

Primary Mode of Transportation

Overall, visitors predominantly drove to the park and Liberty Science Center, with 78 percent arriving by car on a weekday (Figure 2-35) and 80 percent on a weekend day (Figure 2-36). Specifically, approximately 80 and 75 percent of Liberty State Park visitors traveled by car on weekdays and weekends, respectively. For the Liberty Science Center visitors, approximately 77 and 89 percent of Liberty State Park visitors traveled by car on weekdays and weekends, respectively. However, only about two-thirds of the respondents to the On-line and Generic surveys traveled by car to the park (Figure 2-37). This difference could be explained by the fact that a much higher proportion of respondents to the On-line and Generic surveys were from the local area (including Jersey City) with better access to other modes of transportation.

Figure 2-35

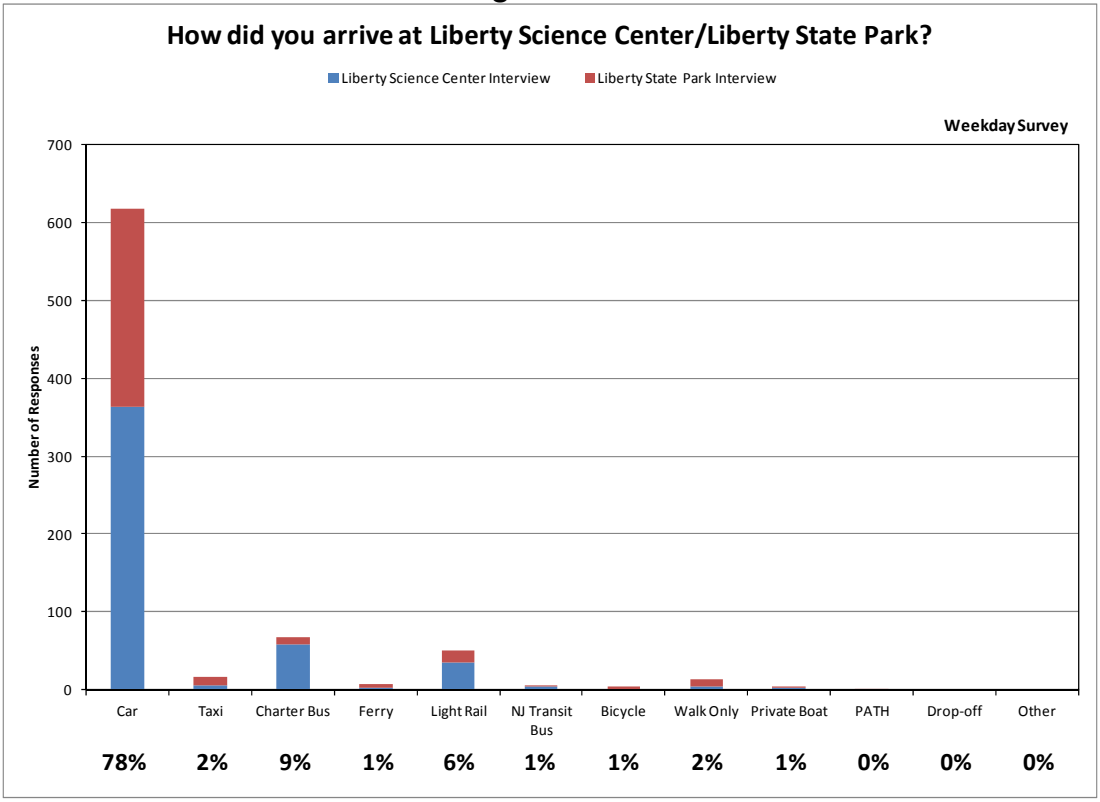


Figure 2-36

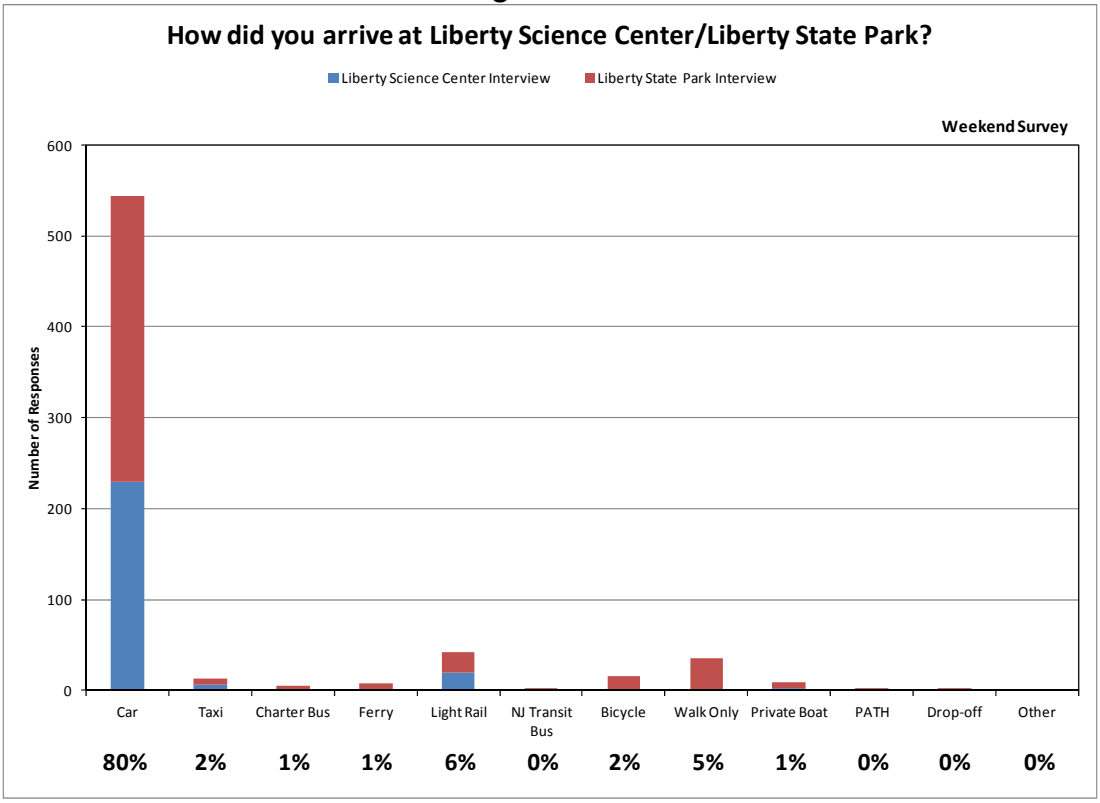
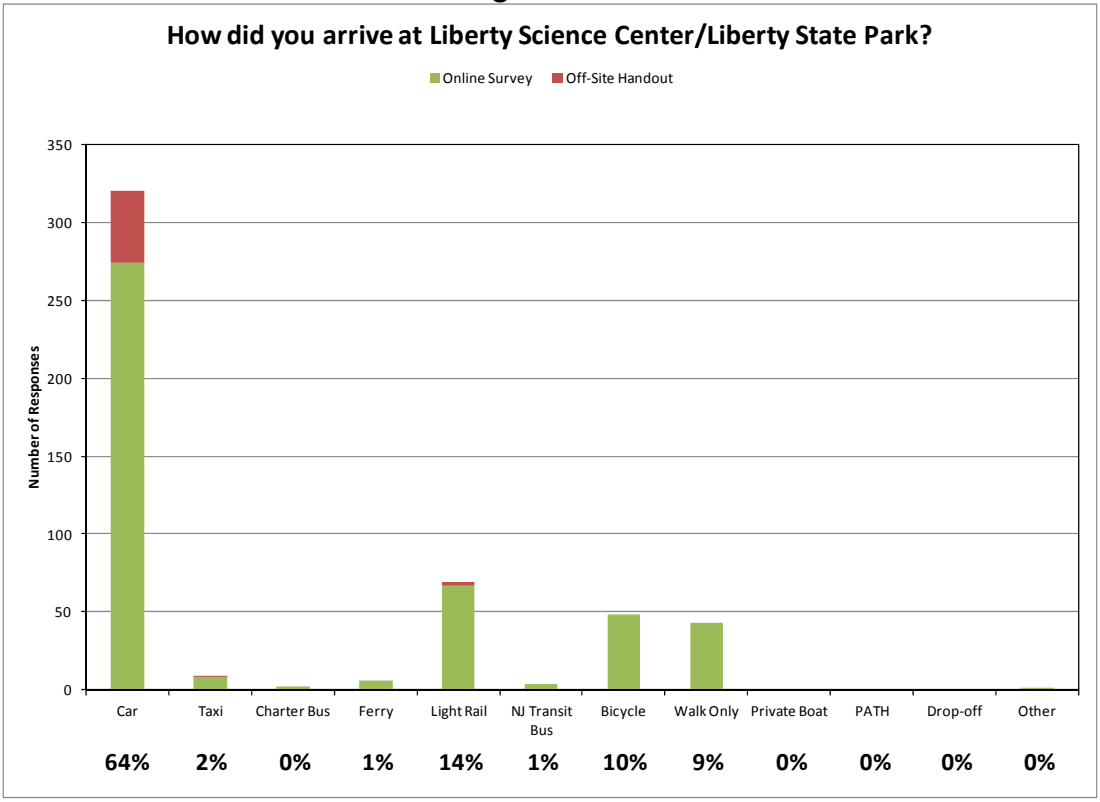


Figure 2-37



Parking

Overall, visitors to the park predominantly parked their cars in two parking lots on a weekday: Base Lot and Ferry Lot (Figure 2-38). On the weekend, visitors to the park parked their vehicles in three lots: Ferry Lot, Green Lot, and the Terminal Short Term Lot (Figure 2-39). It is important to note that all of the visitors to the Liberty Science Center parked their vehicles in the Liberty Science Center Lot. Respondents to the On-line and Generic surveys said they parked their vehicles in several locations during their most-recent visit, including the Terminal Short Term Lot, Base Lot, Liberty Science Center Lot, and Ferry Lot (Figure 2-40).

Figure 2-38

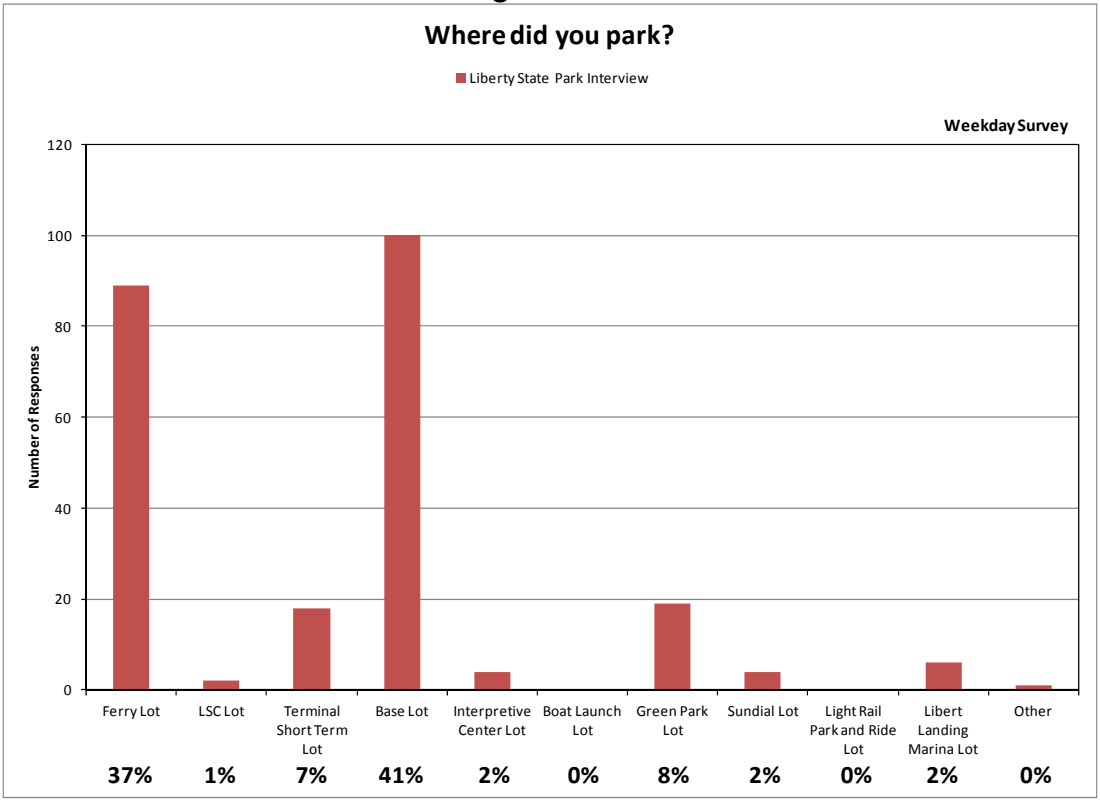


Figure 2-39

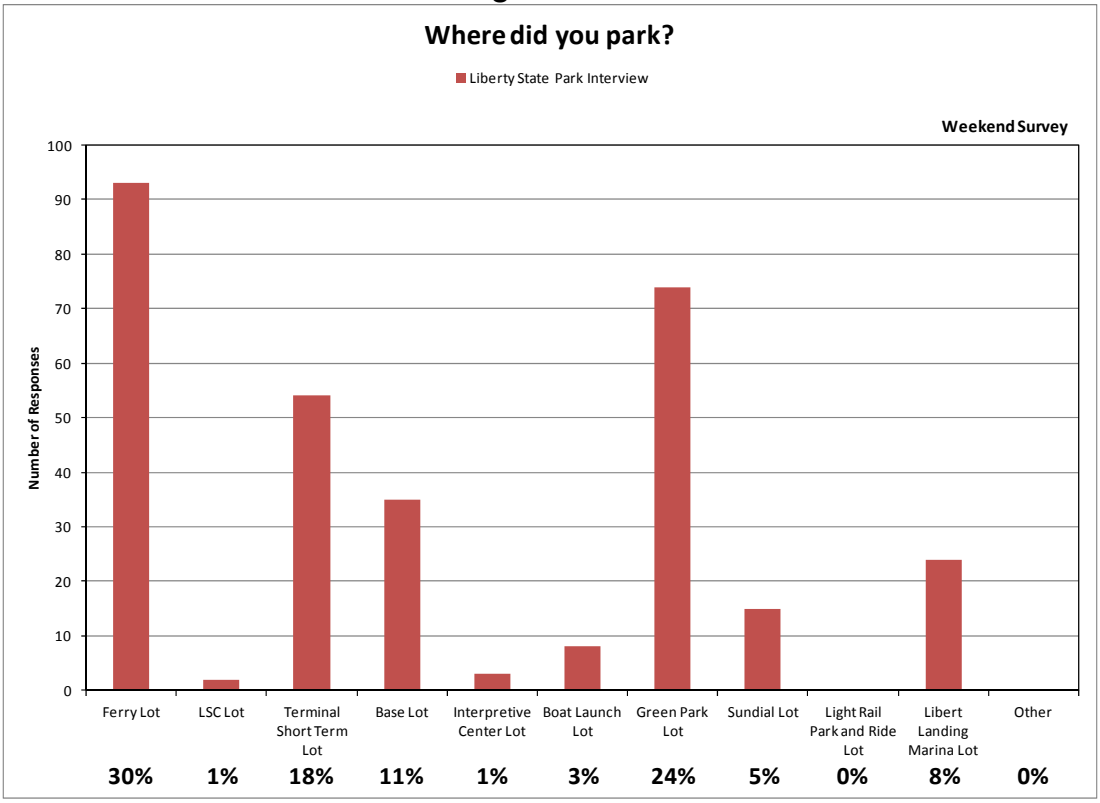
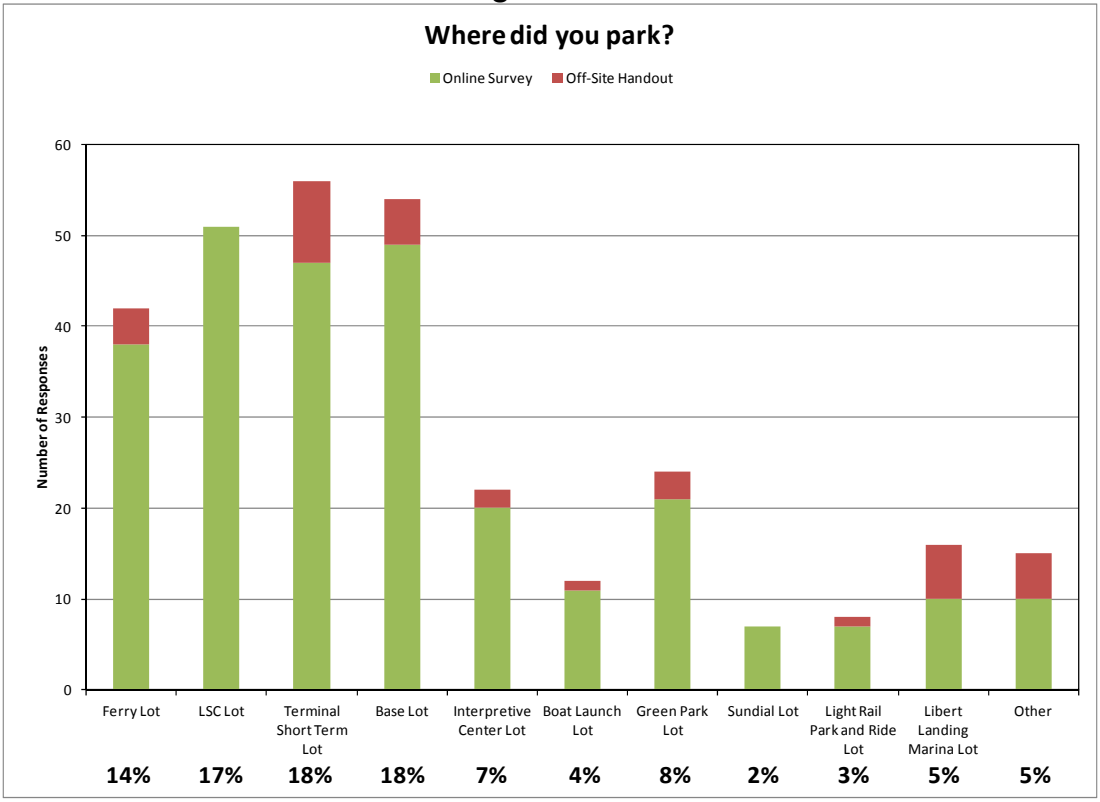


Figure 2-40



Auto Ownership

Overall, the results of all of the surveys indicated that respondents had high auto ownership rates, between 77 and 84 percent. The results for Liberty State Park and Liberty Science Center are shown in Figure 2-41 for the weekday survey and Figure 2-42 for the weekend survey. The results for the On-line and Generic surveys are shown in Figure 2-43.

Figure 2-41

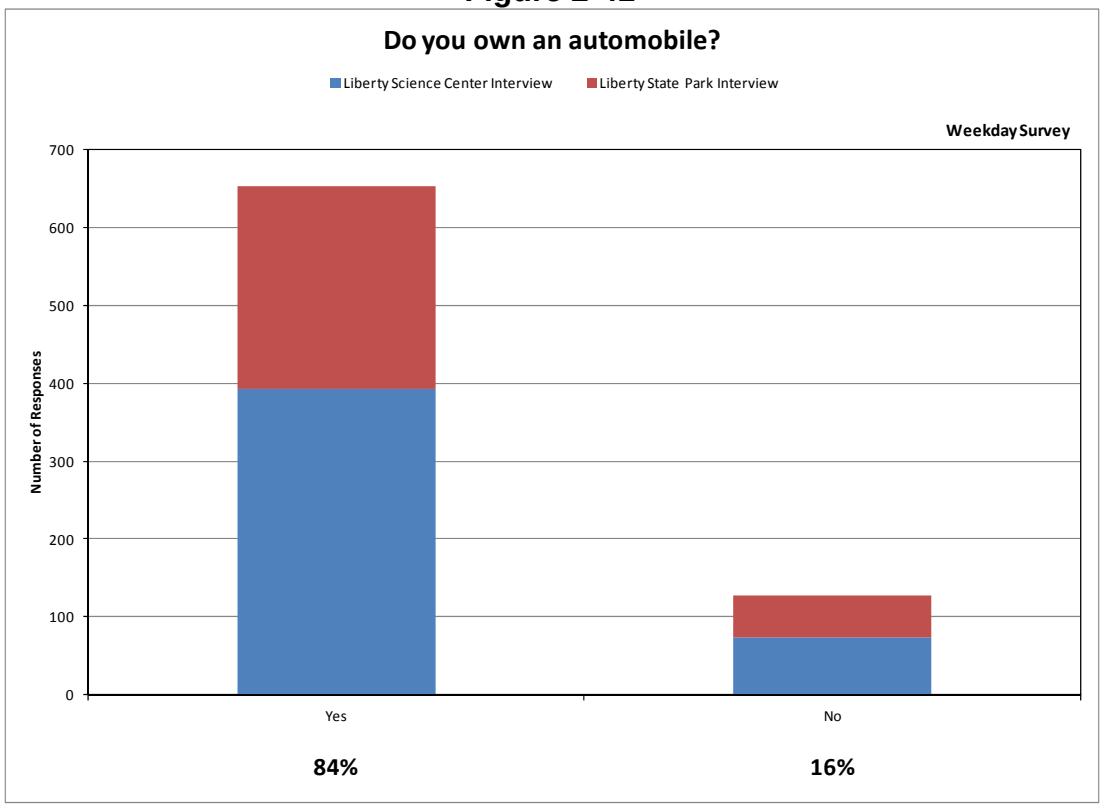


Figure 2-42

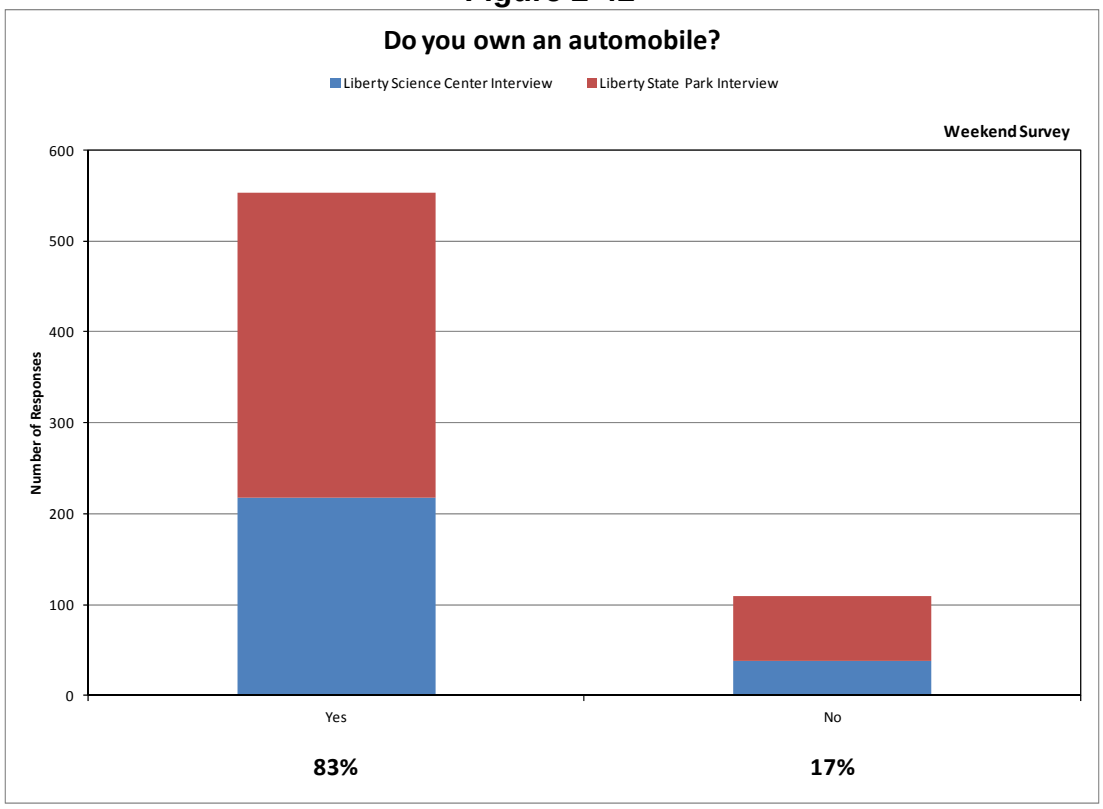
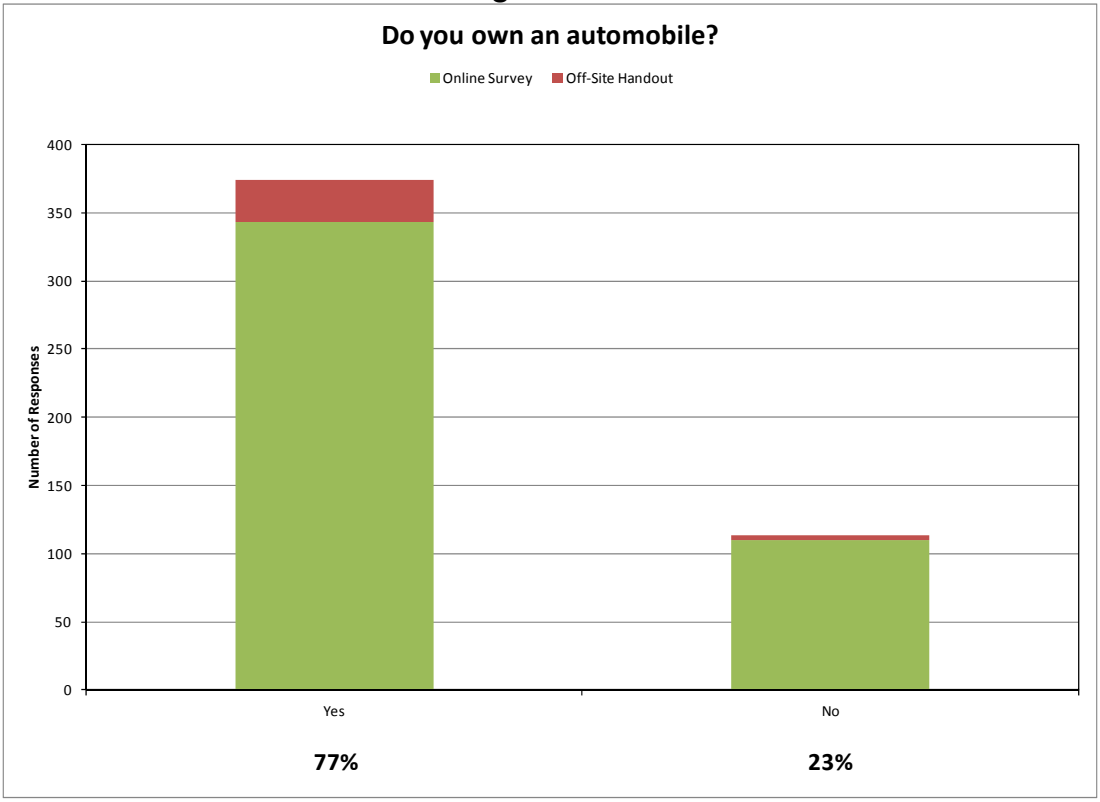


Figure 2-43



2.7.6.4 GROUP CHARACTERISTICS

Size

On a weekday, about one-quarter of respondents said that they traveled to Liberty State Park or Liberty Science Center as part of either a group of two or a group of more than five (Figure 2-44). On a weekend day, one-quarter of visitors traveled to the park in a party of two, but the number of larger groups was smaller than on the weekday for visitors to the park and Liberty Science Center (Figure 2-45). Average group sizes for the Liberty State Park visitors were 3.1 and 3.2 people on a weekday and weekend, respectively. Average group sizes for the Liberty Science Center visitors were a lot larger at 4.1 and 3.8 people on a weekday and weekend, respectively. The results of the On-line and Generic surveys in Figure 2-46 show much smaller group sizes (one and two people per group) than the park and Liberty Science Center surveys.

Figure 2-44

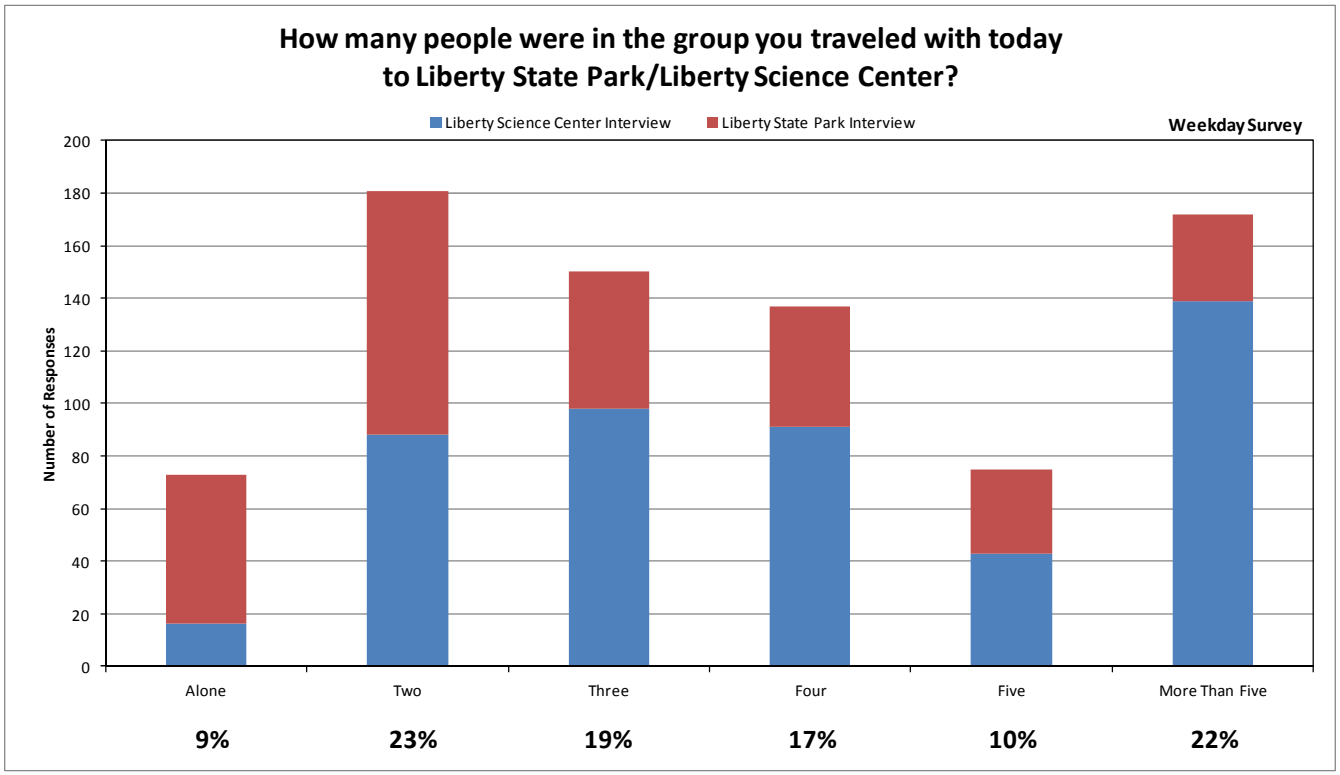


Figure 2-45

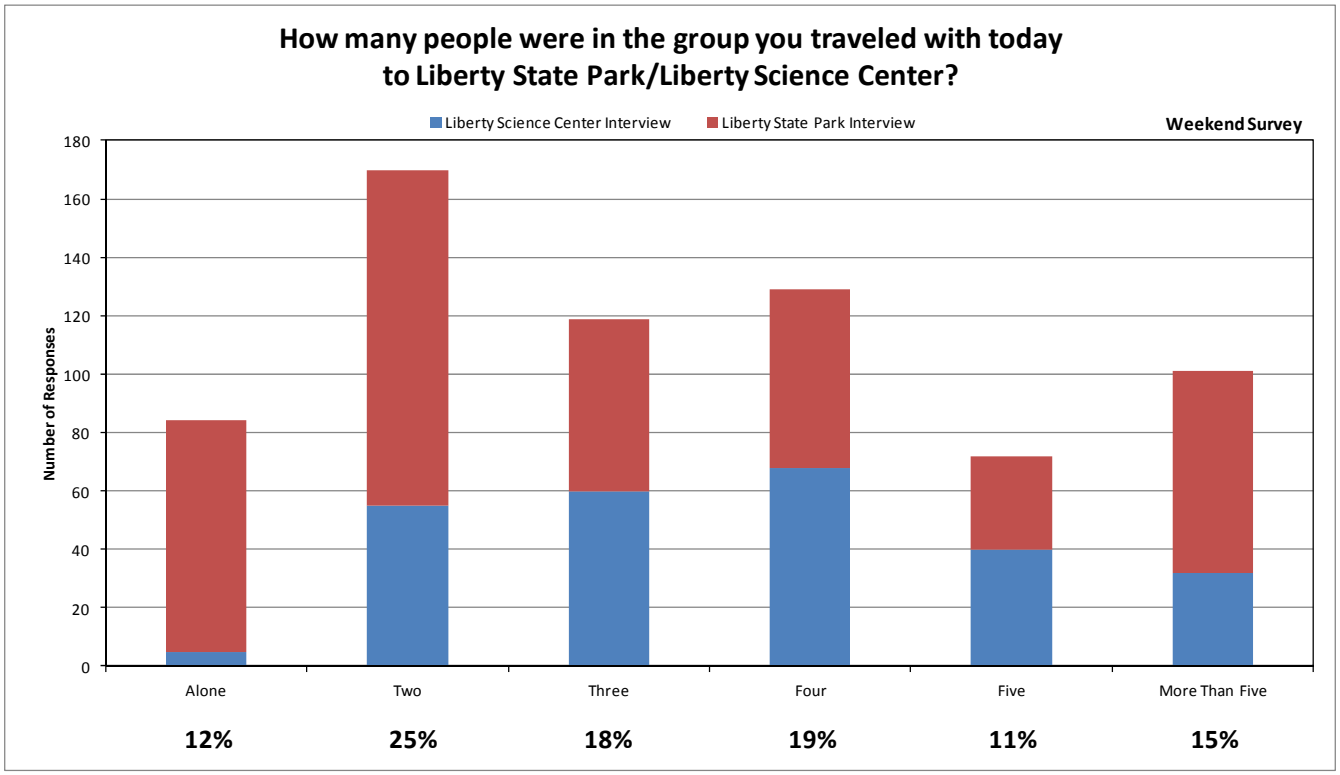
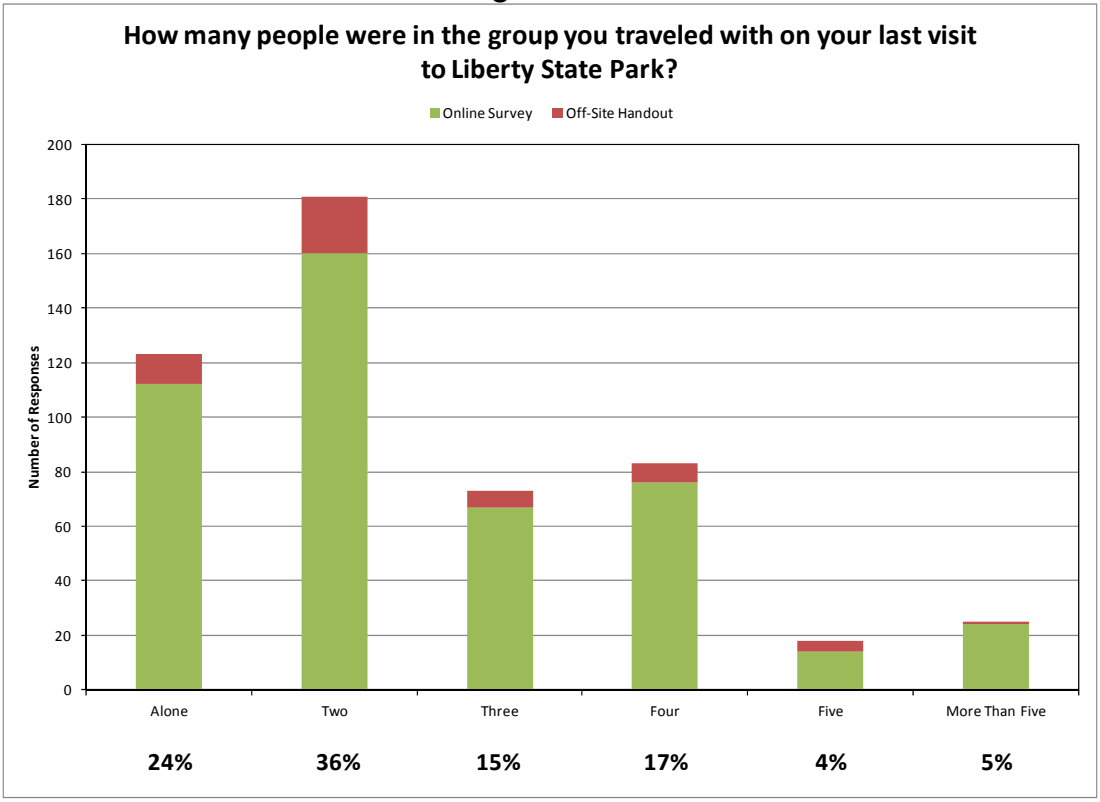


Figure 2-46



Number of Children

Overall, visitors predominantly accompanied children (about two-thirds) to the park and Liberty Science Center on a weekday (Figure 2-47) and just over one-half on a weekend day (Figure 2-48). However, only about 30 percent of the respondents to the On-line and Generic surveys accompanied children to the park (Figure 2-49).

Figure 2-47

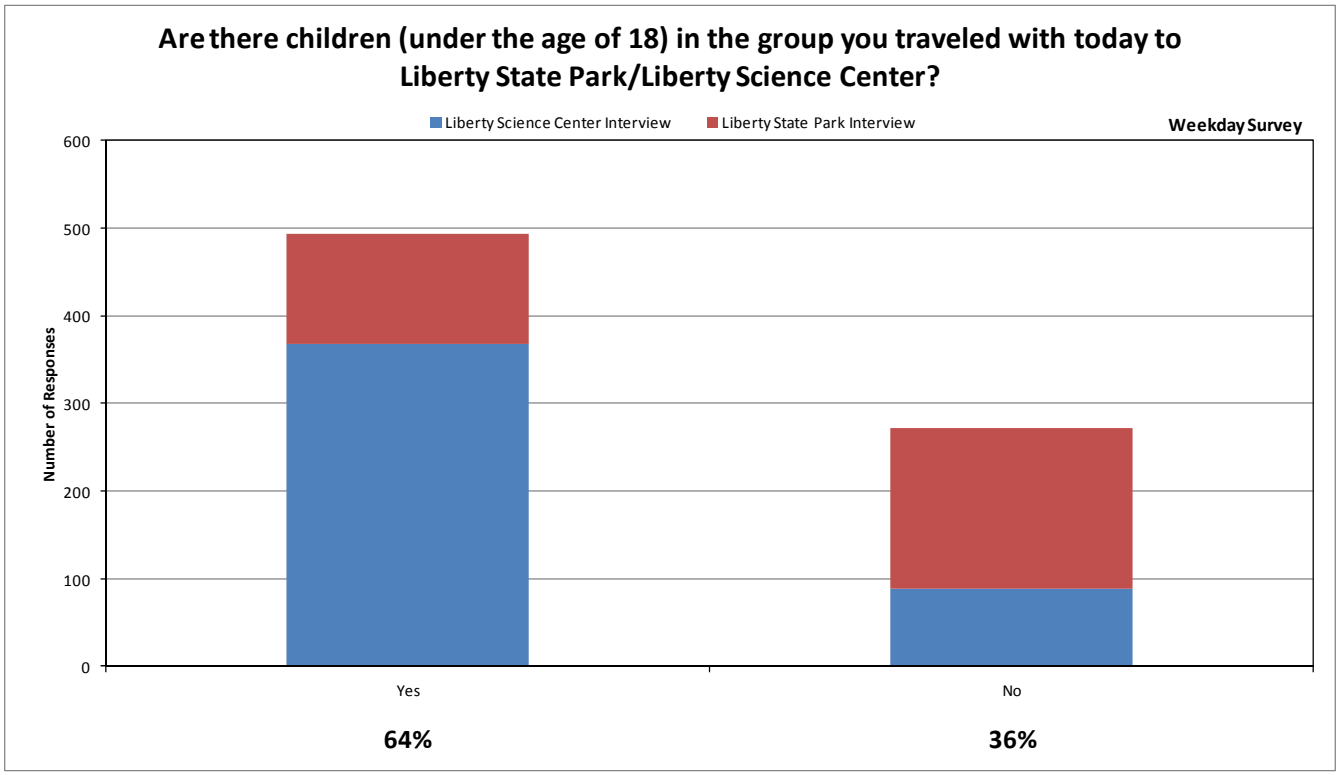


Figure 2-48

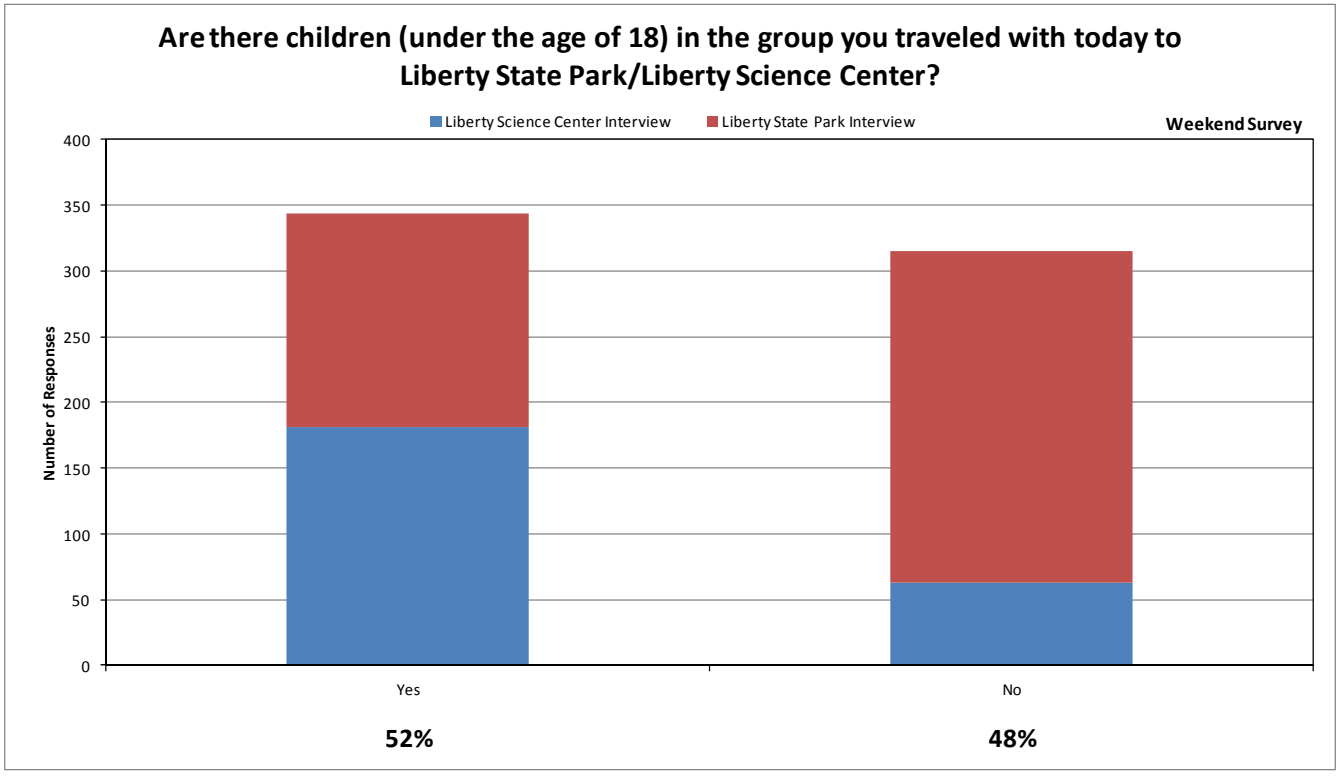
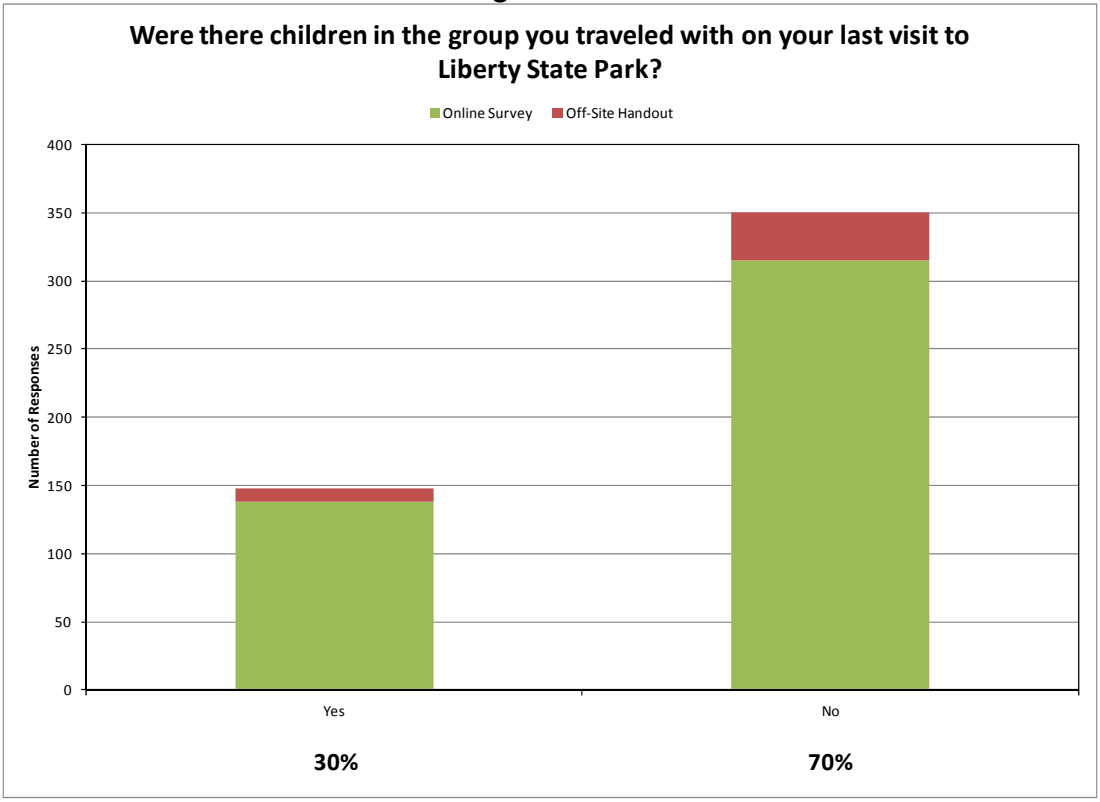


Figure 2-49



2.7.6.5 USE OF PUBLIC TRANSPORTATION

All of the surveys were consistent in that approximately 30 percent of respondents said they would be "very likely" to use public transportation between the Liberty State Park Light Rail Station and destinations within Liberty State Park if it were available, while 30 percent of respondents said would be "very unlikely" to use public transportation. In addition, just under half (between about 46 and 48 percent) of the respondents to the surveys were at least "somewhat likely" to use public transportation if it were available. Alternatively, between about 40 and 43 percent of the respondents to the surveys were at least "somewhat unlikely" to use public transportation if it were available. The results for Liberty State Park and Liberty Science Center are provided in Figure 2-50 for the weekday survey and Figure 2-51 for the weekend survey. The results for the On-line and Generic surveys are provided in Figure 2-52.

Specifically, Liberty State Park respondents were more likely to use transit than Liberty Science Center respondents. For Liberty State Park visitors, a total of 41 percent (weekday) and 36 percent (weekend) were very likely to use transit while 23 percent (weekday) and 29 percent (weekend) were very unlikely to use transit. For Liberty Science Center visitors, a total of 25 percent (weekday) and 35 percent (weekend) were very likely to use transit while 21 percent (weekday) and 36 percent (weekend) were very unlikely to use transit.

Figure 2-50

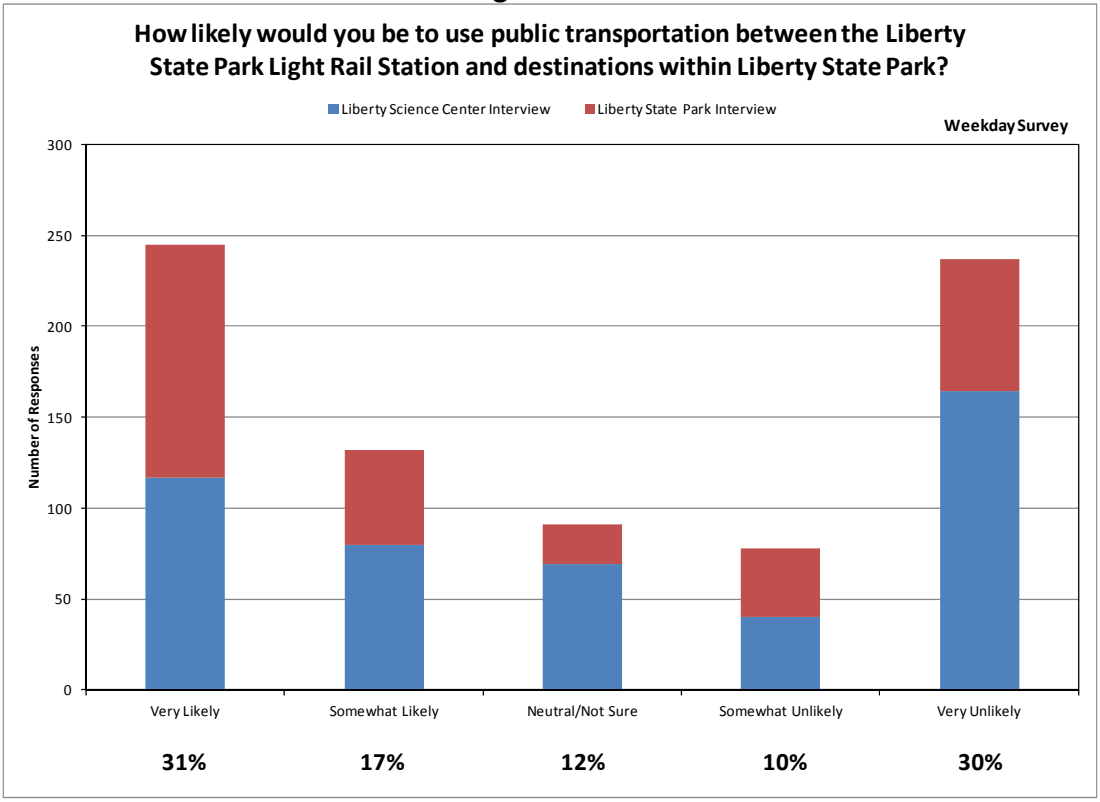


Figure 2-51

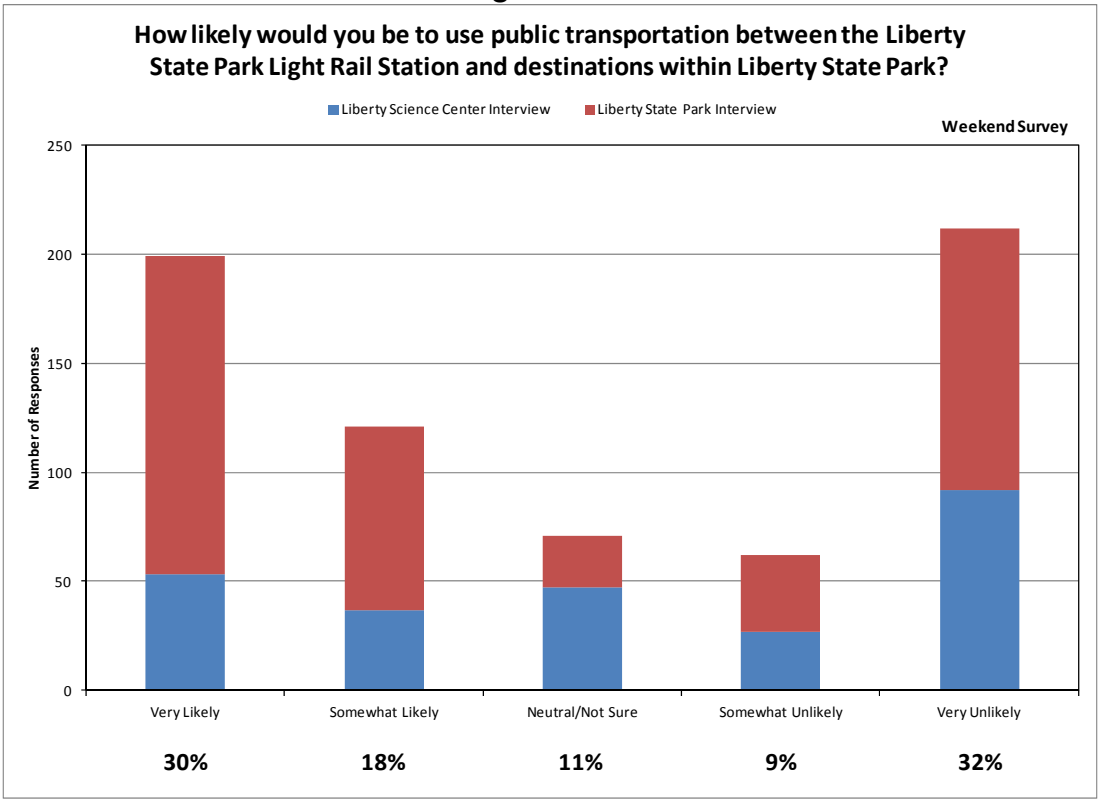
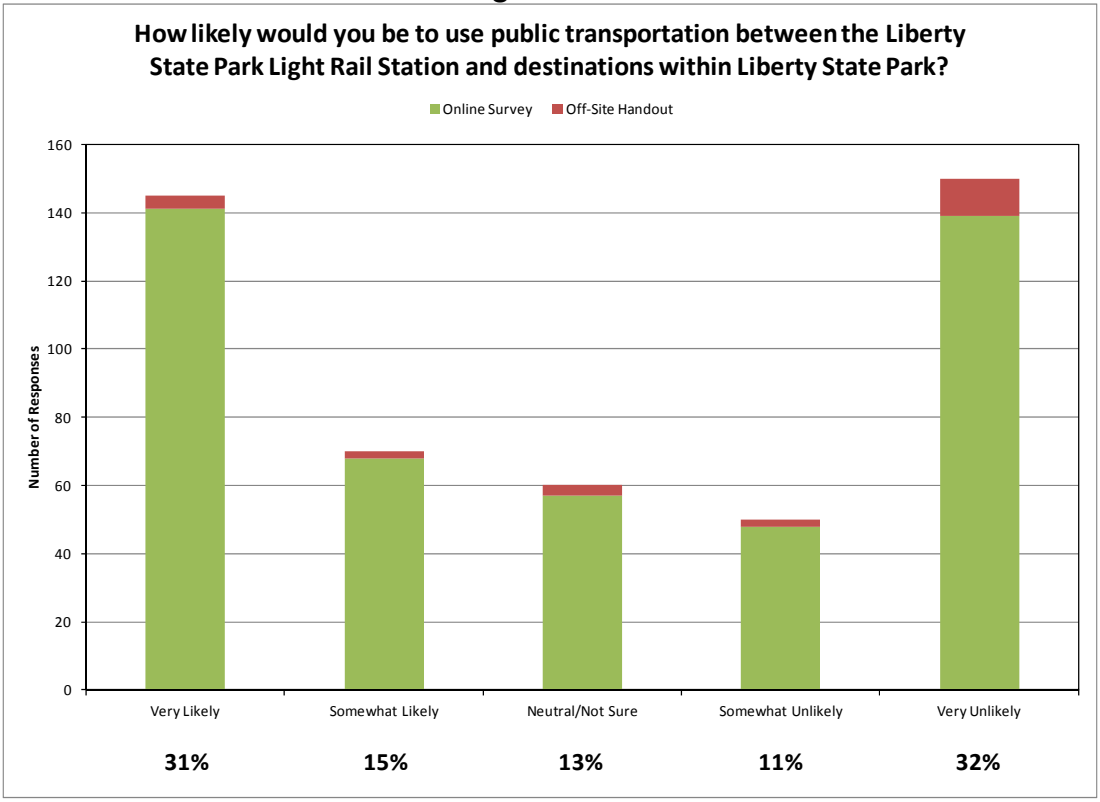


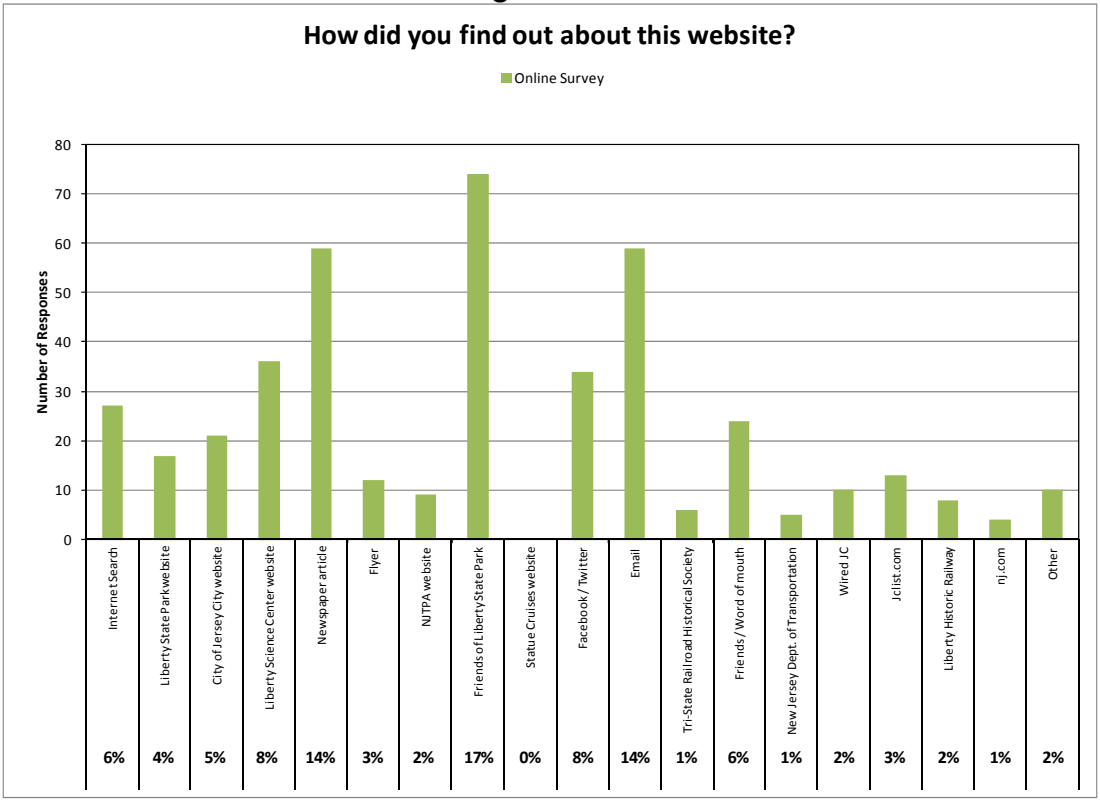
Figure 2-52



2.7.6.6 WEBSITE

The On-Line survey included a question on how respondents found out about the survey (Figure 2-53). The Friends of Liberty State Park (17 percent) was the most frequent answer, followed by both a newspaper article and e-mail from a colleague or friend (14 percent each) and Liberty Science Center website and Facebook/Twitter (8 percent each).

Figure 2-53


How did you find out about this website?
Online Survey
Number of Responses
80
70
60
50
40
30
20
10
0
Internet Search
Liberty State Park website
City of Jersey City website
Liberty Science Center website
Newspaper article
Flyer
NJTPA website
Friends of Liberty State Park
Statue Cruises website
Facebook / Twitter
Email
Tri-State Railroad Historical Society
Friends / Word of mouth
New Jersey Dept. of Transportation
Wired JC
Jclist.com
Liberty Historic Railway
nj.com
Other
6%
4%
5%
8%
14%
3%
2%
17%
0%
8%
14%
1%
6%
1%
2%
3%
2%
1%
2%

3 FUTURE CONDITIONS

The NJ TRANSIT #305 circulator shuttle service connected the HBLR Liberty State Park station with major and minor destinations within Liberty State Park for more than ten years. Service was provided by NJ TRANSIT between 2000 and 2010 before it was discontinued in the spring of 2010 as part of state budget cuts. The Hudson TMA operated shuttle service during parts of 2010 and 2011. This service allowed visitors who walked into the park or arrived at the park via transit to more easily visit distant and multiple destinations throughout the 1,200 acre park.

One of the purposes of this study is to determine the current and future (2020 and 2035) transit markets for Liberty State Park and the surrounding area. Four potential primary markets for a new Liberty State Park circulator shuttle service were identified including: Regional Attractions Visitors, Local Recreational Visitors, Liberty Landing Ferry Commuters and Visitors, and Industrial Park Workers. Each of these markets has very different characteristics; the potential ridership for each of the markets needed to be determined separately.

Regional transportation models are tools that are frequently used to estimate ridership for proposed transit services. However, regional transportation models typically focus on the weekday commuter periods and the work trip. The large majority of Liberty State Park trips are recreational trips. Since work trips for both Jersey City residents and park workers represent only a small percentage of the potential transit market, the North Jersey Regional Transportation Model – Enhanced (NJRTM-E) could not be directly used for ridership forecasts. In addition, the home origin distribution and mode choice characteristics of each of the four markets noted above are unique. Therefore, it was not desirable to develop a single model for the “average” park visitor. Instead, separate models were developed for each of the four markets using available park visitor data as well as the data collected by surveys of park visitors conducted as part of this study.

The Liberty State Park visitor survey was conducted during a typical weekday and weekend during the summer of 2012. Over 700 survey responses were collected from visitors to Liberty State Park. In addition, surveys were conducted at Liberty Science Center during the same period yielding an additional 700 completed visitor surveys. These surveys were used to identify information regarding the home origin of the visitor, the purpose or purposes of the park visit, the frequency of visits by local park visitors, and the mode of travel. The On-line and Generic surveys were not used for the home origin of the visitor since these surveys would be biased toward Jersey City residents compared with the random interview surveys conducted at the Park.

All new models must be calibrated to reflect existing conditions before they can be applied to predict future conditions. The most recent complete year of shuttle ridership was 2009 when approximately 60,000 visitors used the NJ TRANSIT #305 shuttle service. This ridership was used in the modeling process, and ridership characteristics were estimated based on the visitor survey data.

A key finding of the modeling process was that both the local recreational market and passengers of the Statue of Liberty / Ellis Island ferry service would be large components of the projected shuttle ridership. Liberty Science Center visitors comprise a smaller percentage of the ridership. Few ferry commuters and visitors and/or industrial park workers were identified in the survey. Potential ridership is forecast to grow by 40 percent by 2020 and more than double by 2035, largely driven by high growth in the number of transit-dependent, local recreational visitors.

3.1 MODELING PROCESS

The regional transportation model (NJRTM-E) was obtained from the North Jersey Transportation Planning Authority (NJTPA) for use in this study. The model's geographic extent (Figure 3-1) includes all of northern and central New Jersey (as far south as Burlington and Atlantic Counties), all of southern New York (as far north as Sullivan, Orange and Dutchess Counties), and eastern Pennsylvania (including Scranton/Wilkes-Barre, Lehigh Valley and Bucks County). The model zone structure and roadway network for the Hudson County area is shown in Figure 3-2. The regional model includes data on existing and future population and employment as well as the existing and future highway and transit networks. However, the focus of regional models is to forecast travel during the average weekday commuter peak periods and to model the home-to-work trip. Recreational and other non-work trips have much different characteristics than work trips and are typically not well represented in regional transportation models. Although the recreational trip data in the NJRTM-E was not applicable to this study, the population and transportation data from the regional model were used as key inputs to the Liberty State Park model development process.

Liberty State Park trips are a function of distance from the park, household size, household income and auto availability. The NJRTM-E does not address the impact of auto availability and household size on recreational trip making. To account for these factors, data from the Census Bureau's five-year American Community Survey (ACS) for 2006 through 2010 were used to estimate the number of households in each zone with and without children, with and without a vehicle available, and median household income.

Future year population forecasts for regional models are typically developed by disaggregating municipal forecasts rather than aggregating individual proposed developments. In order to properly account for the new developments in the vicinity of Liberty State Park, the NJRTM-E population forecasts were not used for Jersey City. Instead, individual residential developments in Jersey City identified by the Division of City Planning were used to forecast future population.

Due to their different characteristics, separate models were developed for each of the four potential primary markets for the Liberty State Park circulator shuttle service.

- Regional Attractions Visitors – These are visitors whose primary trip purpose is visiting the regional attractions at the park: the ferry service to the Statue of Liberty / Ellis Island and the Liberty Science Center. These visitors come from the local community, from throughout the North Jersey region, as well as from other states and other countries.

- Local Recreational Visitors – These are local residents whose primary trip purpose includes exercise, nature walk, leisure, picnic, playground, fishing, crabbing, etc. These visitors primarily come from the local Jersey City community. However, some local visitors also come from other Hudson County communities, Newark, and from the surrounding region.

- Liberty Landing Ferry Commuters and Visitors – These are commuters and visitors that use the Liberty Landing Ferry to travel to Lower Manhattan. The ferry service also makes a second stop in Downtown Jersey City and provides a connection for some park visitors.

- Industrial Park Workers – These are workers in the industrial area adjacent to the south end of the park in the vicinity of Burma Road.

Figure 3-1
NJRTM-E Model Extent

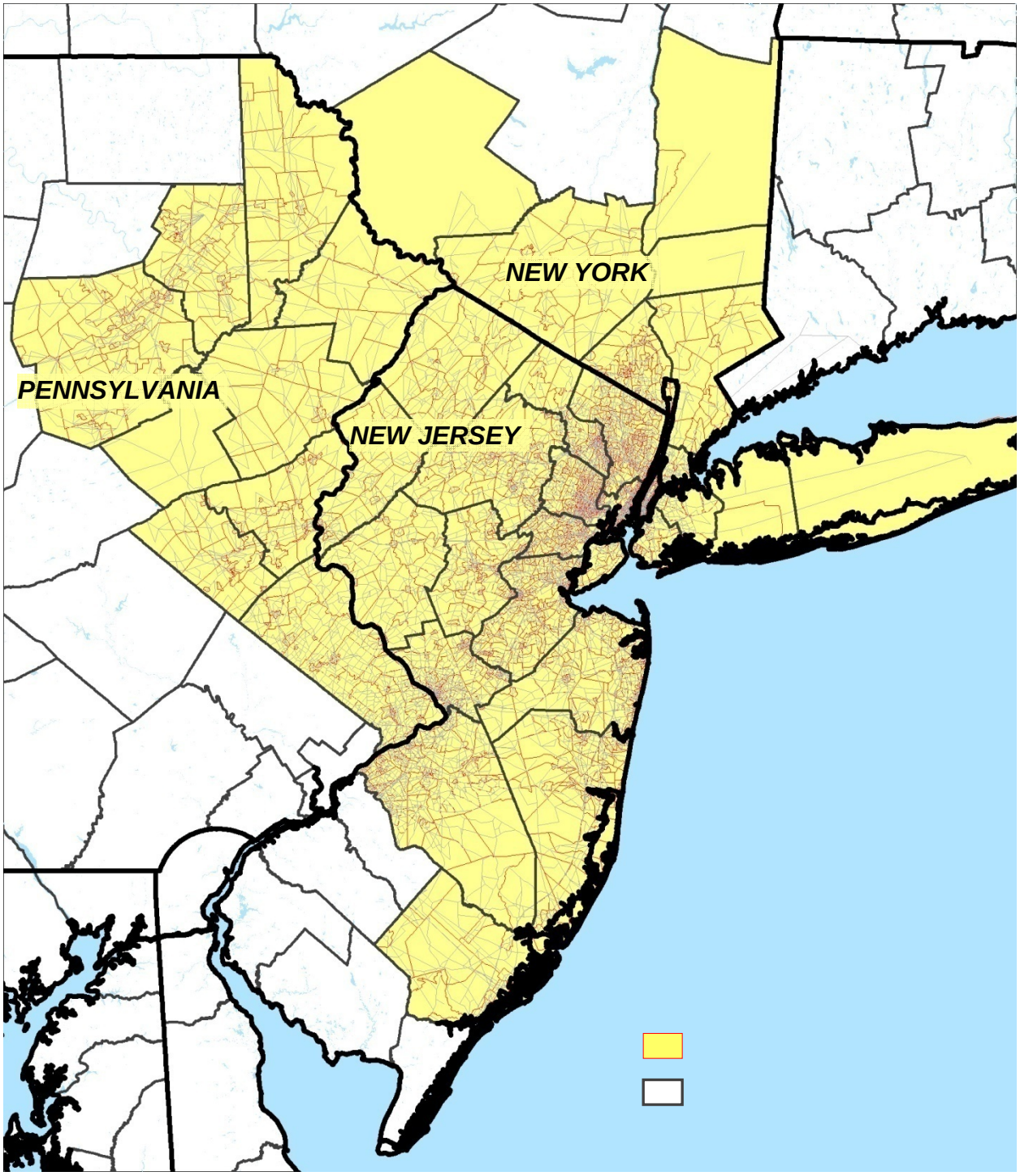
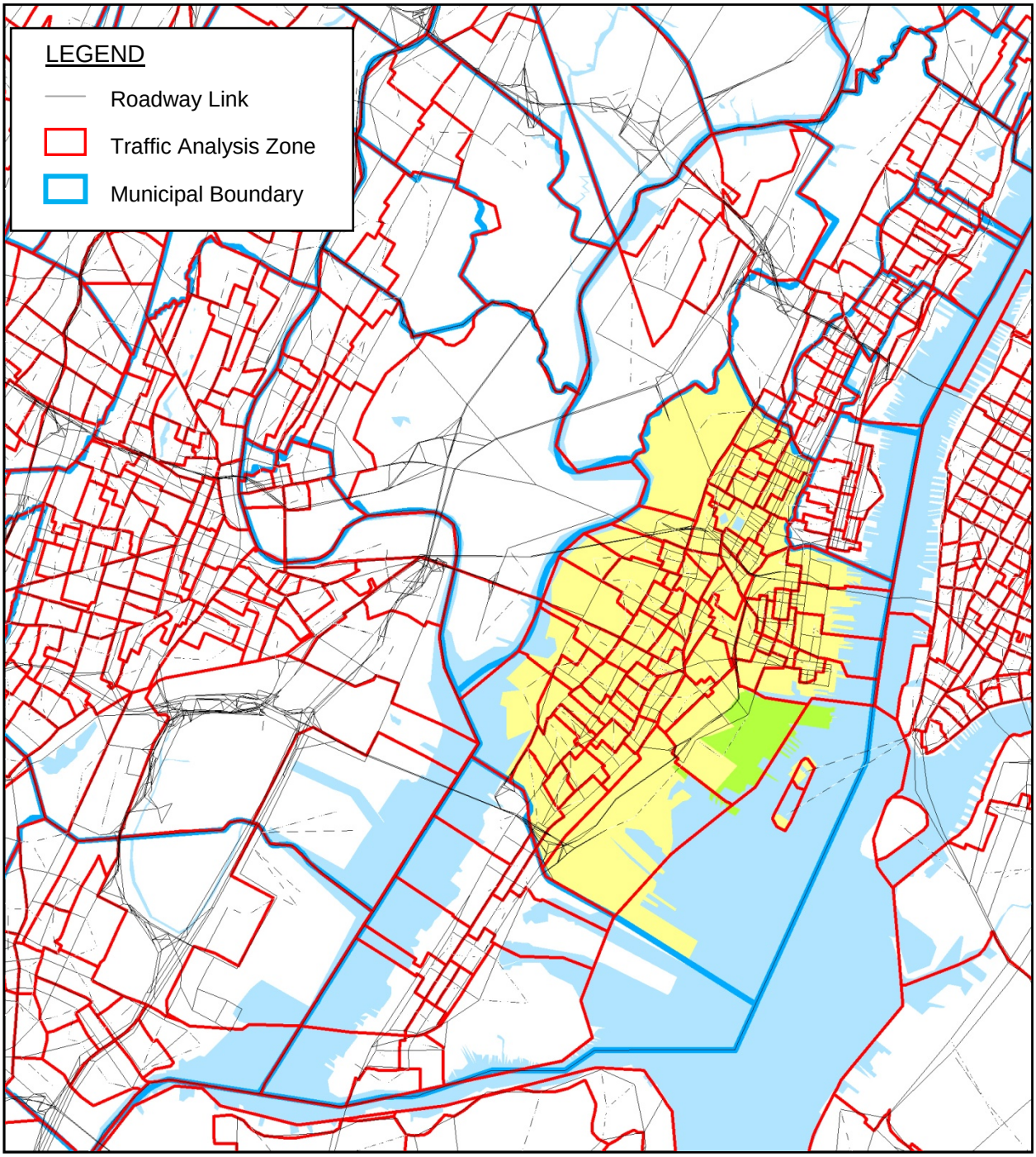


Figure 3-2
NJRTM-E Model Detail



3.2 REGIONAL ATTRACTIONS VISITORS: LIBERTY SCIENCE CENTER VISITORS

From available data, it was estimated that there were approximately 500,000 annual Liberty Science Center visitors in 2011. The geographic and modal distribution of Liberty Science Center visitors was estimated using data collected by the visitor survey conducted as part of this study. A total of 738 survey records for Liberty Science Center visitors were identified. These survey records were then divided into three separate categories for analysis:

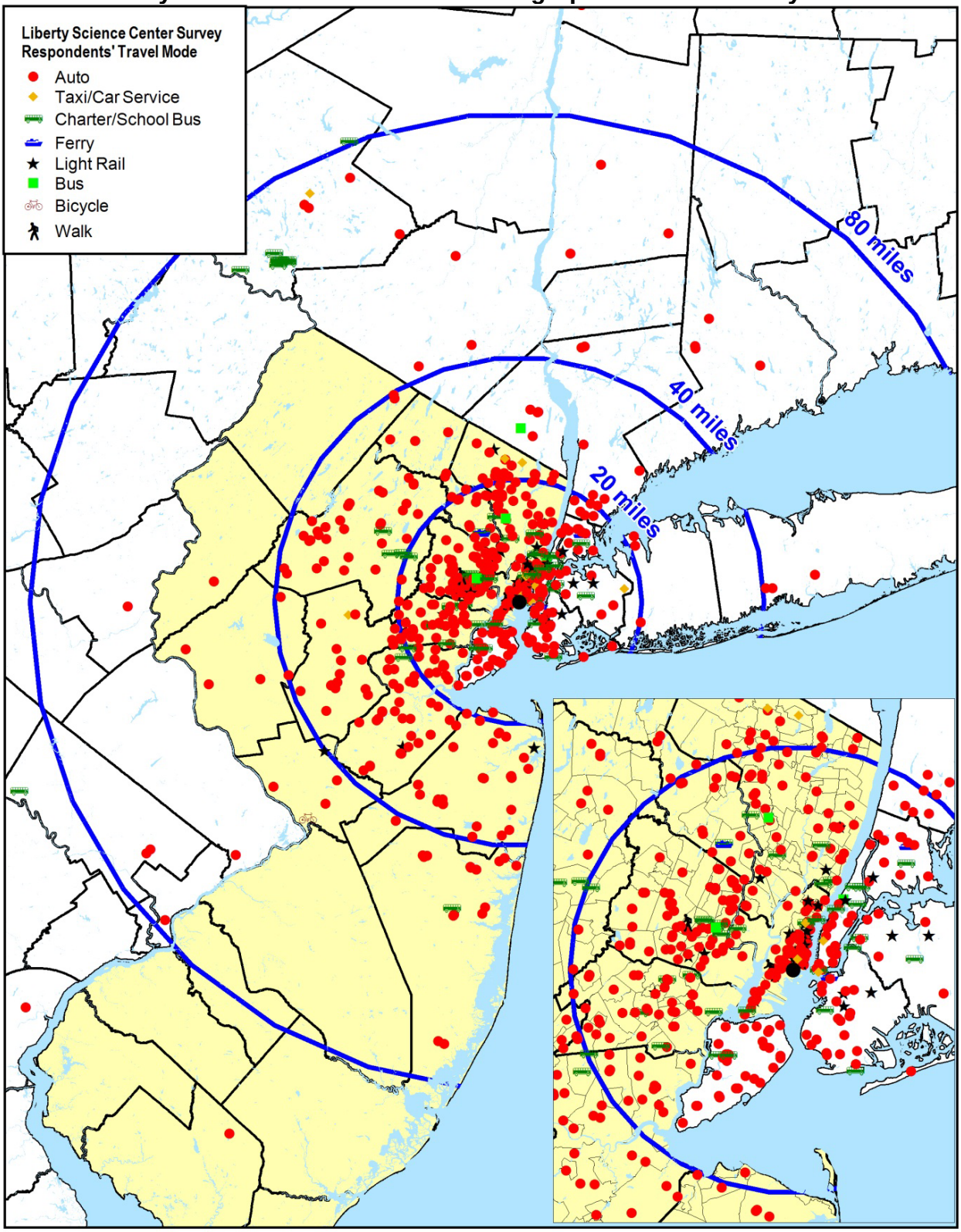
- Auto / Van / Motorcycle (includes taxi / car service) – 606 (82%)
- Non-Auto (includes Ferry, Light Rail, NJ TRANSIT Bus, Bicycle and Walk) – 72 (10%)
- Charter / School bus – 58 (8%)

The Liberty Science Center provided an estimate of the number of student bus visitors for FY 2012. From this data, it was estimated that approximately 40 percent of all Liberty Science Center visitors are student bus groups. As seen above, Liberty Science Center school and charter bus group visitors were likely under-represented in the survey, which was limited to adults only. This group of visitors is unlikely to divert to alternative modes and, therefore, needs to be treated as a separate category for this analysis.

As part of the survey, the home municipality was obtained for each respondent. For Jersey City residents, the closest intersection to the respondent's home and/or neighborhood was obtained as well. The NJRTM-E was used to estimate auto and transit travel times to Liberty State Park. Each survey record was assigned to an NJRTM-E traffic analysis zone (TAZ). The TAZ data was then aggregated based on its auto and transit travel time to Liberty State Park. The Liberty Science Center draws from the immediate local area, as well as the region. From the survey, it was estimated that approximately 16 percent of Liberty Science Center visitors reside in Hudson County, 53 percent come from other locations in Northern New Jersey, 17 percent from New York City, six percent from other locations in New York State, and one percent from Pennsylvania. Of the remaining visitors, six percent are from other states, and one percent is international visitors.

The geographic distribution of Liberty Science Center visitors from the survey data is shown in Figure 3-3 with one map feature plotted for each survey. Approximately 59 percent of all visitors live within 20 miles of Liberty Science Center. An additional 23 percent live within 40 miles of Liberty State Park. Using the data from the NJRTM-E, the average travel time for an auto and transit visitor from the region was approximately 43 and 42 minutes, respectively.

Figure 3-3
Liberty Science Center Visitors – Geographic Distribution by Mode



Separate models were developed to estimate Liberty Science Center auto and transit resident visitor trip rate as a function of travel time based on an exponential curve. The models matched observations to an R^2 of 0.73 and 0.76 for auto and transit visitors, respectively. R^2 (the coefficient of determination) is a statistical measure of how well a regression equation correlates with observed values. Presumably, it provides an indication of how well the model would predict future data. An R^2 can range from 0.00 (no correlation) to 1.00 (perfect correlation). A value of 0.76 indicates that 76 percent of the variation in values can be explained by the explanatory variable(s), in this case - travel time. As seen in the models, visitor trip rate decreases with increasing travel time.

- Annual Trips per Person (Auto Visitor):

$$-0.027 \ln(Auto\ Travel\ Time) + 0.0673 \qquad (R^2=0.73)$$

- Annual Trips per Person (Transit Visitor):

$$-0.063 \ln(Transit\ Travel\ Time) + 0.1154 \qquad (R^2=0.76)$$

Note: "ln" is natural logarithm

Using the 2020 and 2035 NJRTM-E regional household growth data of 7.8% and 20.9%, respectively, the number of Liberty Science Center auto, transit and charter bus visitors can be estimated as shown in Table 3-1.

Table 3-1
Liberty Science Center Annual Visitors

	Existing (2011)	Year 2020	Year 2035
Auto	275,000	297,000	333,000
Transit	25,000	27,000	30,000
Charter Bus	200,000	216,000	242,000
Total Liberty Science Center Visitors	**500,000**	**539,000**	**605,000**

3.3 REGIONAL ATTRACTIONS VISITORS: STATUE OF LIBERTY/ELLIS ISLAND FERRY VISITORS

From available data, it was estimated that there were approximately 700,000 annual Statue of Liberty/Ellis Island Ferry (Ferry) visitors to Liberty State Park in 2011. The geographic and modal distribution of Ferry visitors was estimated using the visitor survey conducted as part of this study in July 2012. A total of 237 survey records completed by Ferry visitors were identified. These survey records were then divided into three separate categories for analysis:

- Auto / Van / Motorcycle (includes taxi / car service) – 192 (81 percent)
- Transit (includes Ferry, Light Rail, NJ TRANSIT Bus, Bicycle and Walk) – 37 (16 percent)
- Charter / School bus – 8 (3 percent)

Liberty State Park staff provided an estimate of 13,000 buses that traveled to the park in 2011. An estimated average bus occupancy rate was used to project that approximately 280,000, or 40 percent, of all Ferry visitors arrived in a bus group. As seen with Liberty Science Center, school and charter bus group visitors for the Ferry were likely under-represented in the survey, which was limited only to

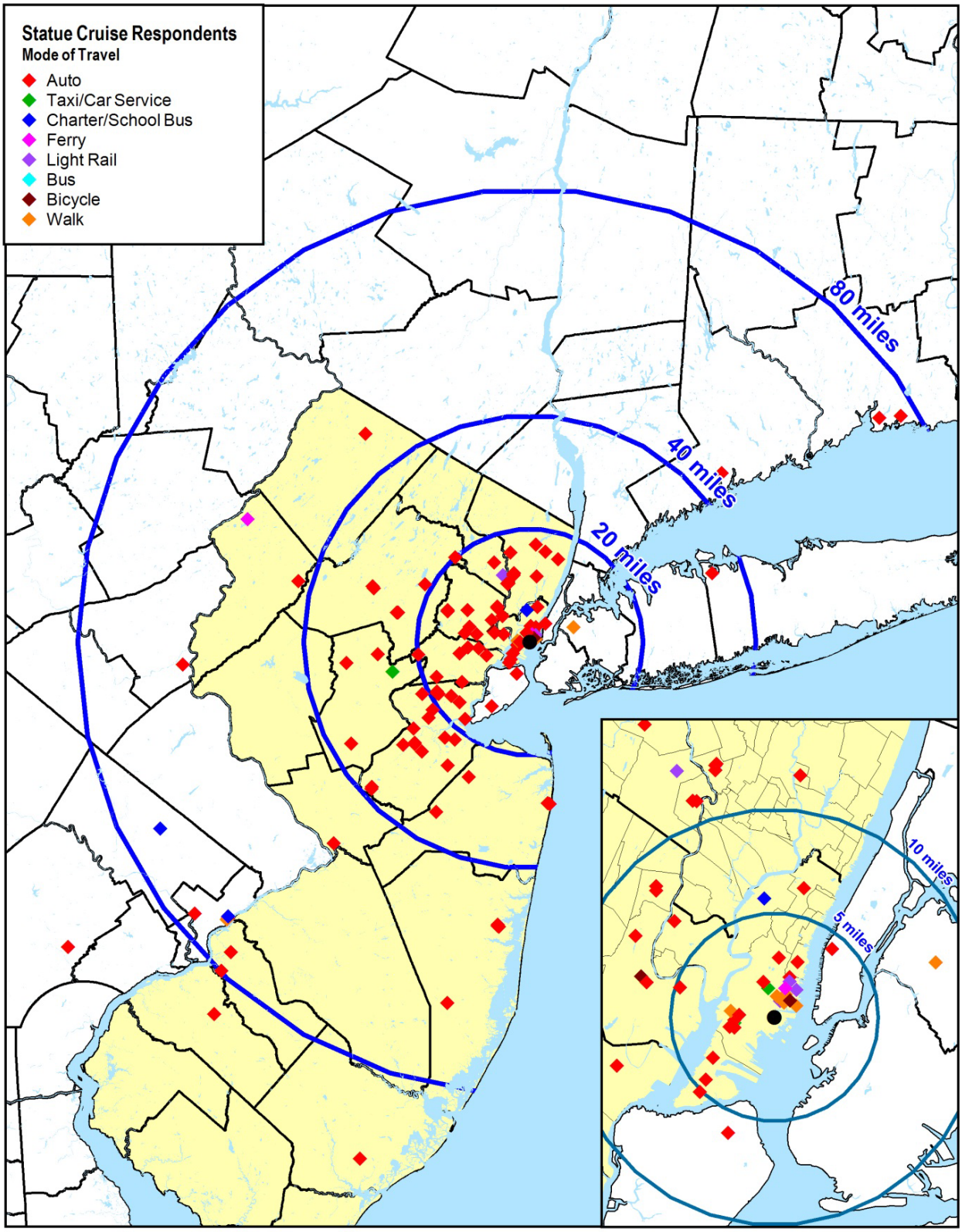
adults. Furthermore, Ferry service begins at 9:00 AM during the summer months, and it was suspected that many of the charter bus visitors may have arrived prior to the 10:00 AM start of the survey. These visitors were unlikely to be surveyed when they returned to the park later in the day, because surveyors stationed at the CRRNJ Terminal building primarily interviewed those buying tickets or waiting to board the ferries. School and charter bus group visitors are unlikely to divert to alternative modes and, therefore, need to be treated as a separate category for this analysis.

Ferry visitors who use transit are likely over-represented in the survey data. In an effort to have robust transit user data, park goers were specifically targeted for interviews as they walked into the park from the Liberty State Park light rail station. This included a number of Ferry visitors. Among Ferry visitors interviewed in and around the CRRNJ Terminal building, only six percent had used transit as their primary travel mode.

As part of the survey, the home municipality was obtained for each respondent. For Jersey City residents, the closest intersection to the respondent's home and/or neighborhood was also obtained. The NJRTM-E was used to estimate auto and transit travel times to Liberty State Park. Each survey record was assigned to an NJRTM-E TAZ. The TAZ data was then used to determine an average auto and transit travel time to Liberty State Park. The Ferry draws visitors from a wide geography, including the immediate local area, throughout the region, out-of-state, and internationally. Using both the survey results and the additional available data regarding Ferry visitors, it was estimated that less than half (40 percent) of all Ferry visitors are residents of the NJRTM-E region. Of the remaining visitors, 50 percent are from out-of-region and 10 percent are international visitors. As expected, given the competing Statue of Liberty/Ellis Island Ferry in Battery Park City in Manhattan, the survey found that less than one percent of Ferry visitors are from New York.

The geographic distribution of Ferry visitors from the survey data is shown in Figure 3-4 with one map feature plotted for each survey. Approximately 29 percent of visitors live within 20 miles of the ferry, and an additional 12 percent live within 40 miles. Using the data from the NJRTM-E, the average travel time for auto and transit visitors from the region was approximately 45 and 27 minutes, respectively.

Figure 3-4
Statue of Liberty / Ellis Island Ferry Visitors - Geographic Distribution by Mode



Separate models were developed to estimate Ferry auto and transit visitor trip rates as a function of travel time on an exponential curve. The models matched observations to an R^2 of 0.72 and 0.81 for auto and transit visitors, respectively. As seen in the models, visitor trip rate decreases with increasing travel time.

- Annual Trips per Person (Auto Visitor):

$$-0.031 \ln(Auto\ Travel\ Time) + 0.0712 \qquad (R^2=0.72)$$

- Annual Trips per Person (Transit Visitor):

$$-0.438 \ln(Transit\ Travel\ Time) + 0.6391 \qquad (R^2=0.81)$$

Note that these equations can be applied to the NJRTM-E regional area residents only. Out-of-region and international visitors are assumed to continue to maintain their existing travel patterns in the future.

Using the 2020 and 2035 NJRTM-E household growth data, the estimated number of Ferry auto, transit and charter bus visitors are shown in Table 3-2.

Table 3-2
Statue of Liberty / Ellis Island Ferry Annual Visitors

	Existing (2011)	Year 2020	Year 2035
Regional Visitors	**280,000**	**302,000**	**339,000**
Auto	193,000	208,000	233,000
Transit	17,000	18,000	21,000
Charter Bus	70,000	75,000	85,000
Out-of-Region Visitors	**343,000**	**370,000**	**415,000**
Auto	162,000	175,000	196,000
Transit	6,000	6,000	7,000
Charter Bus	175,000	189,000	212,000
International Visitors	**71,000**	**77,000**	**86,000**
Auto	30,000	32,000	36,000
Transit	6,000	6,000	7,000
Charter Bus	35,000	38,000	42,000
All Visitors	**700,000**	**748,000**	**839,000**
Auto	385,000	415,000	466,000
Transit	29,000	31,000	35,000
Charter Bus	280,000	302,000	339,000

3.4 LOCAL RECREATIONAL VISITORS

From available data, it was estimated that there were approximately three and a half million recreational visitors to Liberty State Park in 2011[1]. Recreation includes exercise, nature walk, leisure, picnic, playground, fishing, crabbing, etc. Visitors to the Liberty Landing Marina or restaurants were also considered recreational trips.

The geographic and modal distribution of recreational visitors was estimated primarily using the visitor survey conducted on Wednesday, July 11, 2012 and Sunday, July 15, 2012. A total of 464 survey records were identified. As part of the survey, the home municipality was obtained for each respondent. For Jersey City residents, the closest intersection to the respondent's home and/or neighborhood was also obtained. The home origin distribution of recreational trips by purpose is shown in Figure 3-5 with one map feature plotted for each survey. The majority of these visitors live within five miles of the park. From the survey data, 89 percent of local recreational visitors were from Hudson County and the City of Newark. This corresponds to approximately 3.1 million annual local recreational visitors. The NJRTM-E was used to estimate auto and transit travel times to Liberty State Park. Each survey record was assigned to an NJRTM-E TAZ. The TAZ data was then aggregated to one of ten neighborhoods within Jersey City or to municipality in the remainder of the local market area. The local area municipalities and the Jersey City neighborhoods are shown in Figures 3-6 and 3-7, respectively.

Visitation to Liberty State Park for local recreation could be classified as either frequent or infrequent. The group size for park visitors was identified by the number of people who traveled together. Surveys were generally limited to one survey per visiting group. To account for both trip frequency and party size, each survey was assigned a weight corresponding to the number of persons in the party multiplied by the respondents' estimate of their average number of visits to Liberty State Park per year. It was estimated that 81 percent of annual local recreational park visitors are Jersey City residents, nine percent Bayonne residents, and seven percent Newark residents. The survey found that only 0.4 percent of local recreational park visitors are Hoboken residents and less than one percent of all recreational visitors come from Manhattan and Brooklyn. The estimated home distribution of local recreational park visitors is shown in Table 3-3.

[1] There were approximately 5 million visitors to Liberty State Park in 2011 including approximately 700,000 to the Liberty Science Center and 700,000 to the Statue of Liberty/Ellis Island Ferry. This leaves approximately 3.5 million to 4.0 million visitors that came to the park primarily for its non-regional attractions. All of these trip purposes were considered recreational for this analysis. The more conservative 3.5 million recreational visitors was used to guard against over-estimating trip making,

Figure 3-5
Liberty State Park Visitors - Geographic Distribution by Purpose

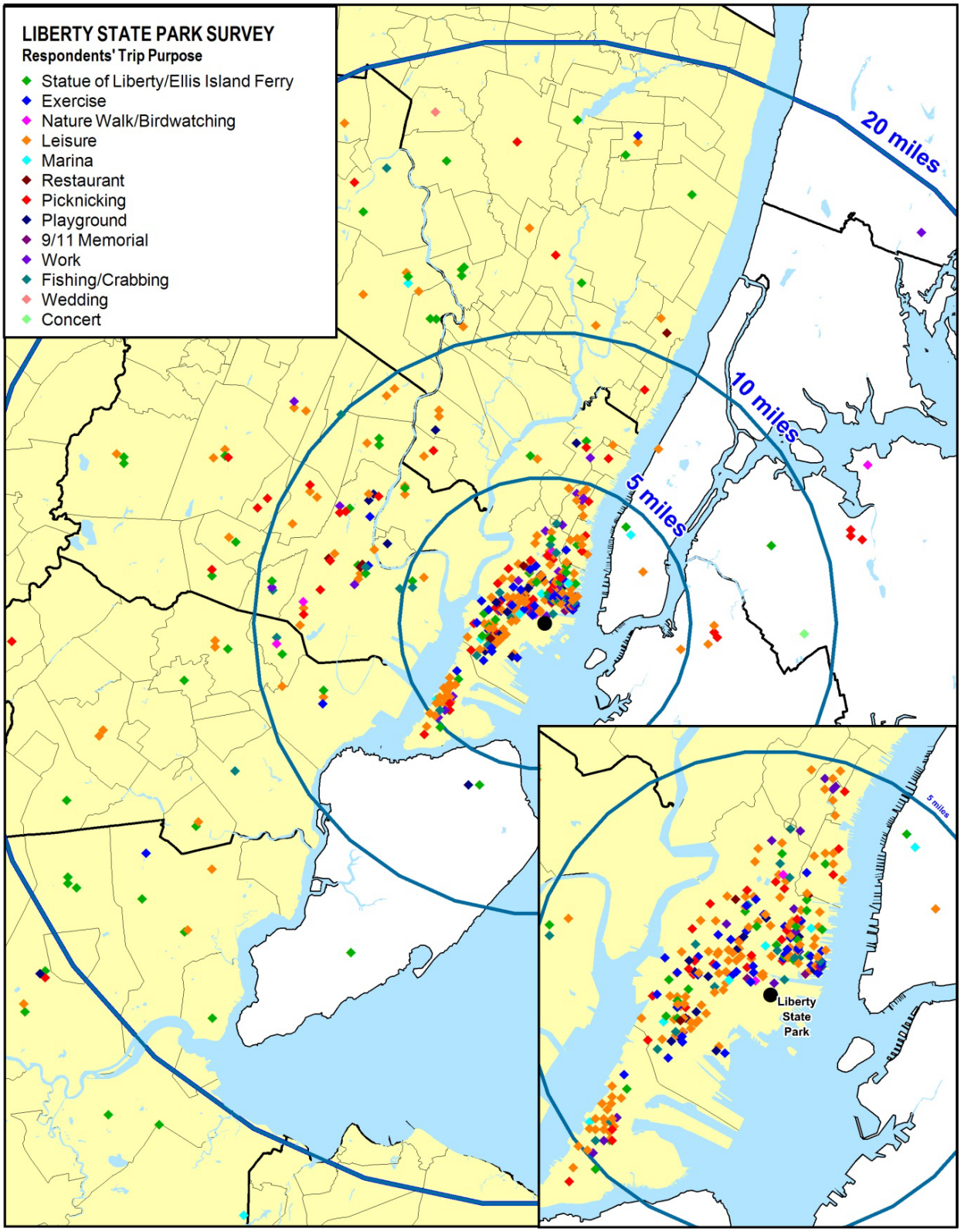
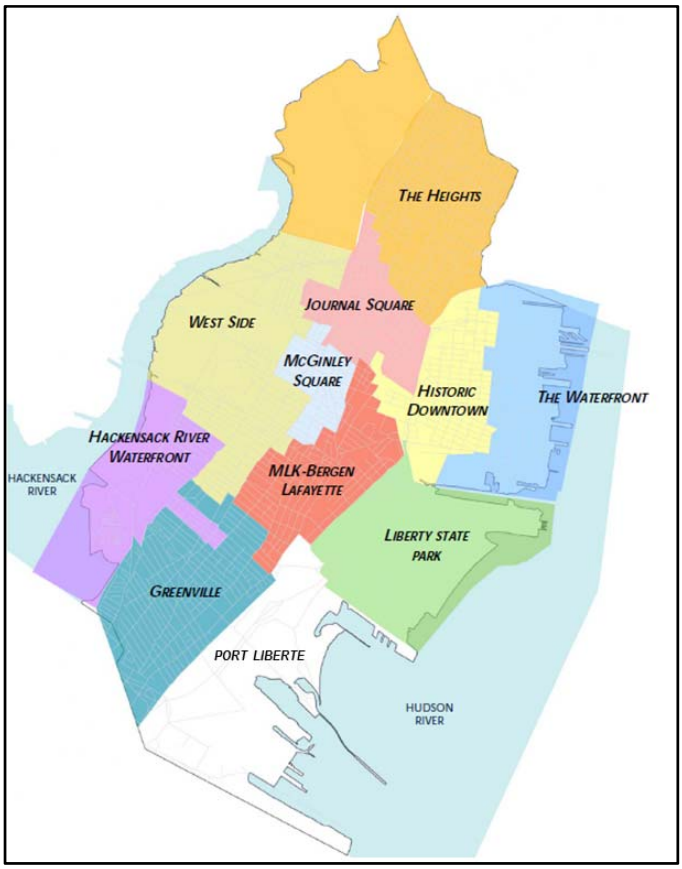


Figure 3-6
Local Area Municipalities

Figure 3-7
Jersey City Neighborhoods



Source: Urban Enterprise Zone Five Year Strategic Plan 2005, Jersey City Economic Development Corporation

Table 3-3
Liberty State Park – Annual Estimated Local Recreational Visitors

Municipality / Neighborhood		Number of Local Recreational Visitors	Percent of Local Recreational Visitors
Jersey City	*The Heights*	113,355	3.7%
	The Waterfront	319,454	10.3%
	MLK – Bergen – Lafayette	656,696	21.2%
	Hackensack River Waterfront	183,521	5.9%
	West Side	191,659	6.2%
	Historic Downtown	338,358	10.9%
	Journal Square	149,258	4.8%
	McGinley Square	133,177	4.3%
	Greenville	418,763	13.5%
	Port Liberté	7,220	0.2%
Jersey City Subtotal		**2,511,461**	**81.0%**
Bayonne		271,671	8.8%
Hoboken		13,127	0.4%
Union City		77,189	2.5%
West New York		328	0.0%
Guttenberg		66	0.0%
Secaucus		1,969	0.1%
Kearny		11,027	0.4%
Harrison		1,575	0.1%
East Newark		66	0.0%
North Bergen		7,089	0.2%
Weehawken		3,282	0.1%
Newark		201,768	6.5%
Local Area Total		**3,100,617**	**100.0%**

The survey data was coupled with household and income data from the Census to develop the regression-based local visitor model. The local visitor model estimates the average annual number of Liberty State Park trips that an individual household makes as a function of travel time and income. To estimate auto trips, the number of 3+ person households with a vehicle available is used. This household size indicates children are likely to be part of the household. To estimate transit trips, the total number of households without a vehicle available is used. The model is shown below.

Annual Trips Per Household:

$$\exp\left(a * \mathrm{I} + b * \mathrm{TT\text{^}0.5} + c * \mathrm{HH\text{^}1.2} + d\right)$$

Where (transit variables shown in parentheses):

I = annual household income [dollars]

TT = auto (or transit) travel time [minutes]

HH = number of households with 3+ persons and a vehicle available (or no vehicle available)

a = -8.22E-06 (trip rate decreases at higher income levels)

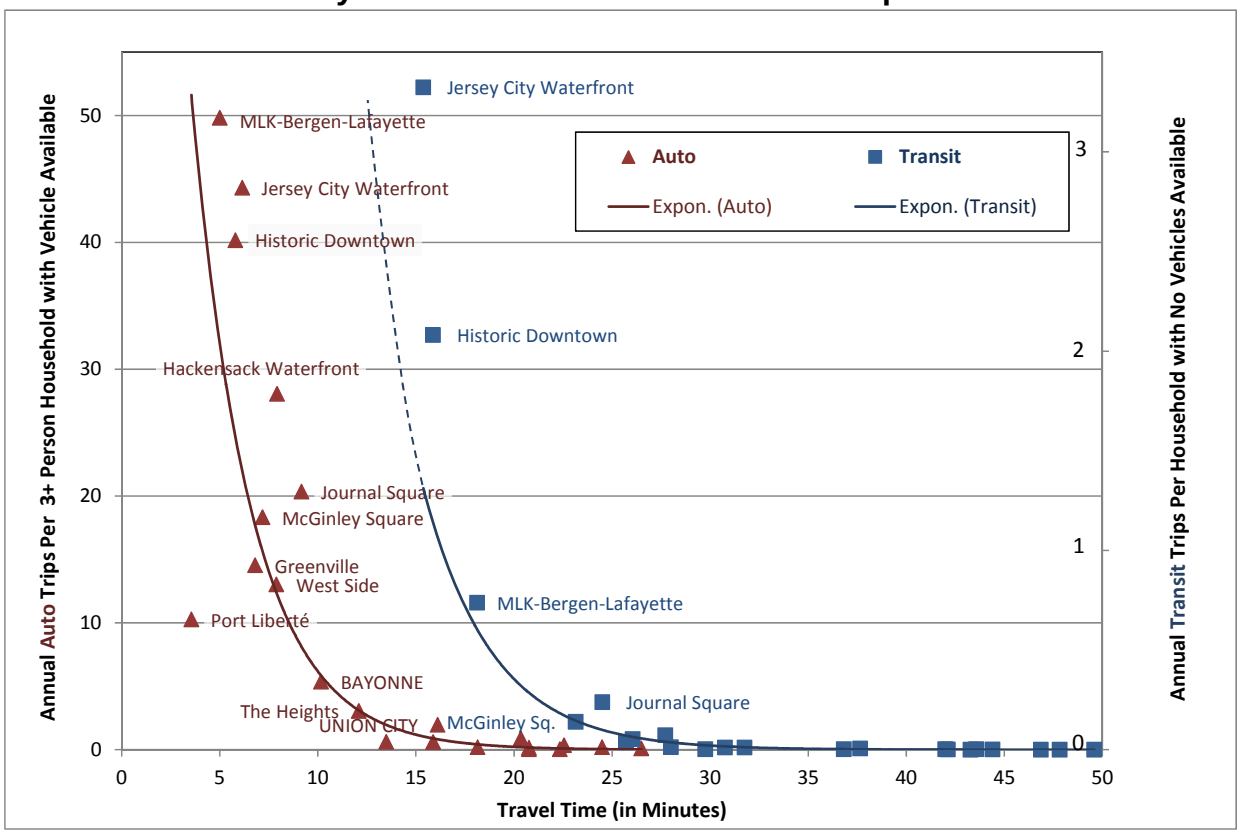
b = -2.96 (trip rate decreases with longer travel times)

c = 7.22E-06 (trip rate increases at higher population)

d = 1.34E+01

The model provided an excellent estimate of the current total number of local visitors as well as the current percentage of local visitors by home location, indicating that the model accurately reflects current conditions and will produce reliable results. Overall, the R^2 for the model was 0.86. This indicates that 86 percent of the visitation likelihood can be correlated to the variables of household income, travel time, and number of households with 3+ persons and a vehicle available. A display of the relationship between the most correlated variable - travel time - and the park visitation rate by household is shown graphically in Figure 3-8.

Figure 3-8
Liberty State Park - Local Recreational Trip Model



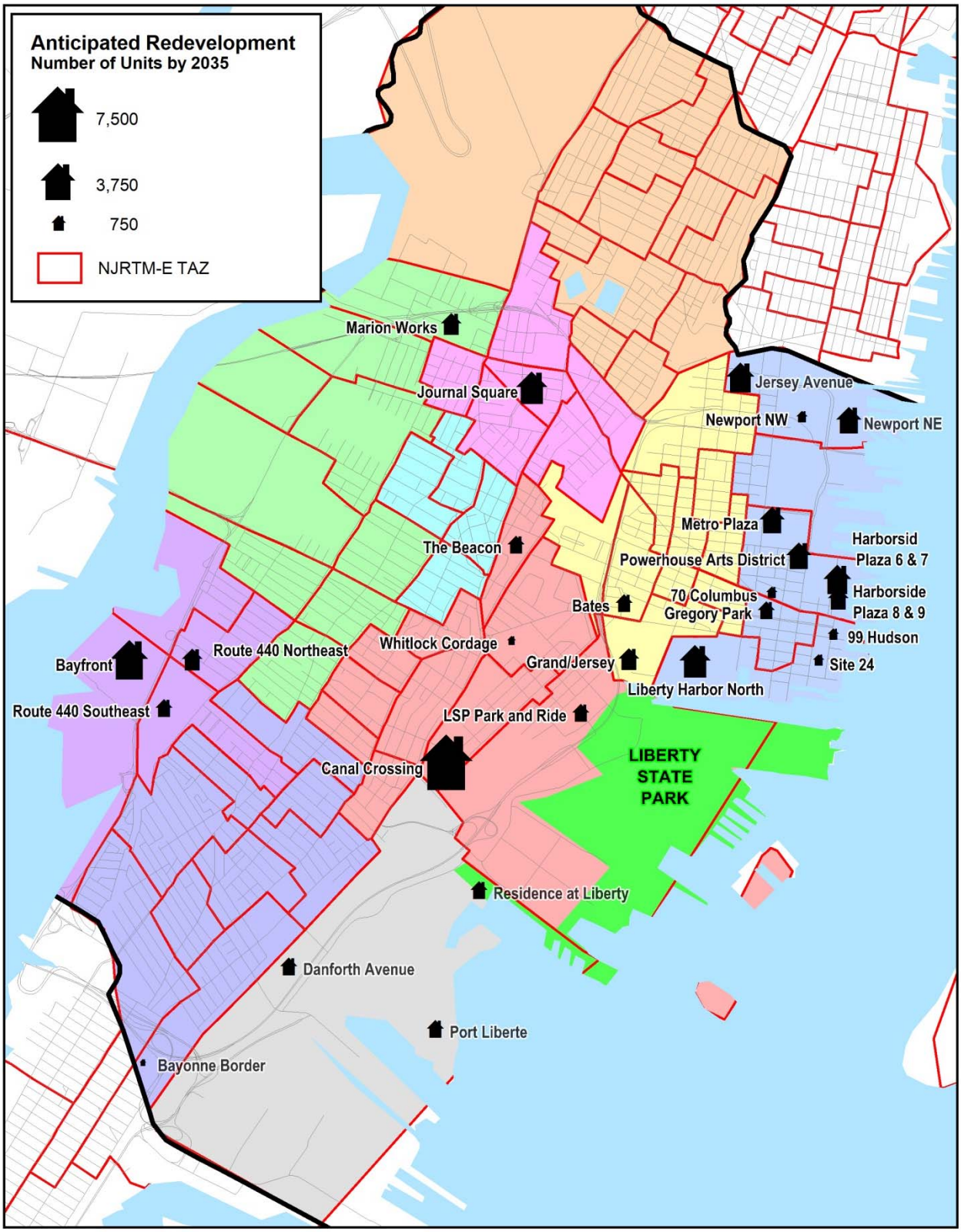
Future year growth in population was estimated using NJRTM-E for all areas of the region except Jersey City. For Jersey City, a list of anticipated residential developments was provided by the Division of City Planning and is shown in Table 3-4. The number of new housing units included on the list, 44,930 by 2035, closely matched the total of 47,178 housing units projected for Jersey City by 2035 in the NJRTM-E. To properly locate the anticipated new households, each residential development was assigned to its respective TAZ. The location of the new developments is shown in Figure 3-9. Future residential development is anticipated to be greatest in the Waterfront neighborhood and areas near Liberty State Park. It was assumed that local transit users would be limited to households that did not have a vehicle available. The Census data was the source of current estimates of households with and without vehicle availability.

Table 3-4
Jersey City Developments and Transit Usage Rates

Project Name	**Residential Units by 2020**	**Residential Units by 2035**	**Office/ Retail Space KSF by 2035**	**Transit Usage** (see Note 1)
Bayfront	1,000	4,000		Very High (VH)
Route 440 Northeast	0	1,500		Very High (VH)
Route 440 Southeast	0	1,000		High (H)
Port Liberté	0	1,000		Low (L)
Residence at Liberty	500	1,000		Low (L)
Canal Crossing	1,500	7,500	93 Retail, 766.9 Office	High (H)
Liberty State Park Park and Ride	0	1,000		High (H)
Danforth Avenue	0	1,000		Medium (M)
Whitlock Cordage	330	330		High (H)
The Beacon	1,000	1,000		Medium (M)
Grand/Jersey	0	1,500		High (H)
Liberty Harbor North	1,500	3,000		Very High (VH)
Newport NE	2,000	2,000	100 Retail	Very High (VH)
Newport NW (Target, Modell today)	500	500		Very High (VH)
Jersey Avenue	1,000	2,500		Medium (M)
Metro Plaza (Shop Rite today)	1,000	2,000		Very High (VH)
Powerhouse Arts District	2,000	2,000		Very High (VH)
Harborside Plaza 6 and 7	0	2,400		Very High (VH)
Harborside Plaza 8 and 9	0	1,500		Very High (VH)
Journal Square	1,500	3,000	150 Retail	Very High (VH)
Gregory Park	0	1,000		Very High (VH)
Marion Works	0	1,500		Medium (M)
Bates (Pathmark today)	0	1,000		Medium (M)
Bayonne Border (HC zone today)	0	200		Low (L)
Site 24 on Downtown Development map	0	500		Very High (VH)
99 Hudson	500	500		Very High (VH)
70 Columbus	500	500		Very High (VH)
Total Residential Units	**14,830**	**44,930**		

Notes:
1. 2020/2035 Future Transit Utilization expressed as Percent Automobile Usage – VH=26%/23%; H=36%/33%; M=46%/43%; L=56%/53%; VL=66%/63% (*Route 440 / Routes 1&9T Multi-Use Urban Boulevard and Through Truck Diversion Concept Development Study*, May 2011. Tables 5.14 and 5.15).

Figure 3-9
Anticipated Redevelopment Projects in Jersey City



To estimate future households with and without vehicle availability, data from the *Route 440 / Routes 1&9T Multi-Use Urban Boulevard and Through Truck Diversion Concept Development Study* was utilized. This study estimated future transit utilization for 2020 and 2035 for most of the proposed residential developments based on their location in Jersey City. For three developments not included in that study data, Site 24, 99 Hudson, and 70 Columbus, an adjacent development was used. Transit usage varied from developments with very high (VH) transit usage (26% or 23% auto availability) to very low (VL) transit usage (66% or 63% auto availability).

The total number of households and households without auto availability for 2011, 2020 and 2035 are summarized in Table 3-5. As stated above, both the population growth and the auto ownership for each Jersey City neighborhood is determined based on the list of anticipated developments. For other municipalities, the vehicle ownership percentages were left unchanged from 2011 to 2020 and 2035. As shown, households without auto availability are projected to grow substantially by 2035. In particular, households in Jersey City without an auto available are projected to increase by 87 percent as compared to a growth rate of 24 percent for households with a vehicle available.[2] The impact is that most Jersey City neighborhoods will become increasingly more transit-dependent in the future.

Using the 2020 and 2035 NJRTM-E auto and transit times coupled with the household data shown in Table 3-5, the number of future local auto and transit visitors and circulator shuttle riders can be estimated. The NJRTM-E included the following Hudson-Bergen Light Rail transit improvement for 2020 and 2035: Extension of the Hudson-Bergen Light Rail from the Westside Avenue station across Route 440 to the Bayfront redevelopment plan area in Jersey City. This station would provide greatly improved access from the Hackensack Waterfront area of Jersey City to Liberty State Park.

The proposed HBLR stations at Caven Point and Jersey Avenue / 18th Street are not included in the NJRTM-E. The future year transit travel times from the transportation model were adjusted for the TAZs that would utilize these two new HBLR stations to access Liberty State Park. Jersey Avenue / 18th Street Station was included in the 2020 and 2035 transit travel time calculation and Caven Point was included in the 2035 analysis only.

The estimated visitor and circulator ridership totals are shown in Table 3-6. Total visitation is projected to grow by two-thirds above current level by 2035. Jersey City residents would continue to make up more than three-quarters of local recreational trips to Liberty State Park because of the relatively high household growth rate. The largest portions of that growth would be generated by the MLK-Bergen-Lafayette and Waterfront neighborhoods. The MLK-Bergen-Lafayette area residents currently make up the largest share of visitors at 21 percent of the total. This figure is expected to increase to 32 percent by 2035 due to significant residential building plans in this neighborhood directly to the west of Liberty State Park.

Park visitors interested in using a circulator are projected to grow at a faster rate than total visitation. The demand would increase by 3.6 times the current level by 2035. This is due to high growth in the nearby, transit-accessible neighborhoods and low vehicle-availability rates anticipated with new Jersey City developments. The park is easily reached from the Waterfront by light rail and is the primary neighborhood expected to increase the circulator demand in the future. Improved transit at Caven Point

[2] Estimated from number of units identified in the *List of Anticipated Developments* (July 2012) and auto availability rates identified in the *Route 440 / Routes 1&9T Multi-Use Urban Boulevard and Through Truck Diversion Concept Development Study* (May 2011)

associated with the Canal Crossing development will make the park more accessible for transit users from the MLK-Bergen-Lafayette neighborhood as shown with a spike in circulator demand in 2035 when the new light rail station could commence service.

Table 3-5
Hudson County and Jersey City Neighborhood – Population Growth

Municipality / Jersey City Neighborhood		Total Households			Households without Auto Available		
		2010[1]	2020[2]	2035[2]	2010[1]	2020[3]	2035[3]
Jersey City	*The Heights*	19,301	19,301	19,301	6,820	6,820	6,820
	The Waterfront	10,830	19,830	29,230	4,761	11,221	18,429
	MLK – Bergen – Lafayette	9,313	12,143	19,143	3,892	5,603	10,378
	Hackensack River Waterfront	3,588	4,588	10,088	536	1,276	5,441
	West Side	9,675	9,675	11,175	3,885	3,885	4,740
	Historic Downtown	9,532	9,532	12,032	3,674	3,674	5,249
	Journal Square	9,518	11,018	12,518	5,083	6,193	7,393
	McGinley Square	6,003	6,003	6,003	2,775	2,775	2,775
	Greenville	14,400	14,400	14,600	4,726	4,726	4,820
	Port Liberté	866	1,366	3,866	60	280	1,570
Jersey City Subtotal		**93,026**	**107,856**	**137,956**	**36,212**	**46,453**	**67,615**
Bayonne		25,148	29,919	37,161	6,395	7,608	9,450
East Newark		746	906	983	252	306	332
Guttenberg		4,755	5,526	5,514	1,868	2,171	2,166
Harrison		4,582	5,556	6,231	1,098	1,331	1,493
Hoboken		23,145	28,025	28,660	8,448	10,229	10,461
Kearny		13,518	14,717	15,640	2,181	2,374	2,523
North Bergen		21,347	24,279	26,888	5,068	5,764	6,383
Secaucus		6,015	7,552	10,338	497	624	854
Union City		22,071	24,619	25,367	9,868	11,007	11,342
Weehawken		5,702	6,621	7,495	1,606	1,865	2,111
West New York		17,671	20,204	20,907	6,971	7,970	8,248
Newark		92,618	106,865	118,565	35,613	41,091	45,590
Local Area Total		**330,344**	**382,645**	**441,705**	**116,077**	**138,793**	**168,568**

Notes:
1. Census American Community Survey, 2006-2010
2. Anticipated developments added to 2010 base values for Jersey City neighborhoods; NJRTM-E growth rate applied to Census 2010 base values for other locations
3. Anticipated developments added to 2010 base values for Jersey City neighborhoods; Auto Available rates held at 2010 levels for other locations.

Table 3-6
Liberty State Park Local Recreational Visitors and Circulator Riders

Municipality / Jersey City Neighborhood		Local Recreational Trips			Estimated Circulator Demand		
		2011	**2020**	**2035**	**2011**	**2020**	**2035**
Jersey City	*The Heights*	113,355	113,355	113,355	75	82	82
	The Waterfront	319,454	406,657	562,490	15,824	32,931	53,710
	MLK – Bergen – Lafayette	656,696	860,969	1,643,616	2,872	5,497	22,811
	Hackensack River Waterfront	183,521	191,654	288,699	39	204	1,077
	West Side	191,659	191,659	189,546	204	204	291
	Historic Downtown	338,358	338,358	436,822	7,644	8,694	15,284
	Journal Square	149,258	156,156	161,029	1,212	1,612	2,061
	McGinley Square	133,177	133,177	133,177	388	388	388
	Greenville	418,763	418,763	426,319	174	174	212
	Port Liberté	7,220	10,348	25,675	0	2	14
Jersey City Subtotal		**2,511,461**	**2,821,096**	**3,980,728**	**28,432**	**49,788**	**95,930**
Bayonne		271,671	363,654	537,877	71	98	137
East Newark		66	83	92	1	1	1
Guttenberg		66	79	79	0	0	0
Harrison		1,575	2,019	2,346	2	3	3
Hoboken		13,127	17,184	17,745	100	131	133
Kearny		11,027	12,528	13,750	1	1	1
North Bergen		7,089	8,778	10,472	3	4	4
Secaucus		1,969	2,654	4,063	0	0	0
Union City		77,189	91,527	95,994	62	69	74
Weehawken		3,282	3,957	4,626	4	5	5
West New York		328	399	420	1	1	1
Newark		201,768	325,154	476,307	24	30	36
Local Area Total		**3,100,618**	**3,649,112**	**5,144,499**	**28,701**	**50,131**	**96,324**

A summary of the data sources used in developing the visitor estimation models is shown in Table 3-7.

Table 3-7
Data Sources for Liberty State Park Visitor Estimation Models

Data	Source	Circulator Market		
		Liberty Science Center	Ferry	Local Rec.
Liberty Science Center Visitor Survey	2012 Survey	✓		
Liberty State Park Visitor Survey	2012 Survey		✓	✓
Regional Household Growth	NJRTM-E	✓	✓	
Municipal Household Growth	NJRTM-E			✓
Local Household Growth	Jersey City Division of City Planning			✓
Auto Availability Rates	Census American Community Survey			✓
Future Jersey City Auto Availability Rates	Route 440 Study			✓
Household Income	Census American Community Survey			✓
Regional Roadway Improvements	NJRTM-E			✓
Regional Transit Improvements	NJRTM-E			✓
Local Transit Improvements	Jersey City Division of City Planning			✓

3.5 OTHER POTENTIAL MARKETS

3.5.1 NEW YORK VISITORS

As stated earlier, it was not surprising that the surveys found that the Liberty Science Center draws some visitors from Manhattan and Brooklyn but the Statue of Liberty / Ellis Island Ferry, because of the competing Battery Park ferry, does not. However, it was surprising that the Local Recreational Market drew so few visitors from Manhattan and Brooklyn despite the proximity of Liberty State Park. Using the local recreational visitor model developed for the Hudson County area, a separate analysis was performed to determine if there was a substantial population across the Hudson River with latent potential to visit Liberty State Park for recreation.

Manhattan and Downtown Brooklyn were divided into 16 neighborhoods based on the NJRTM-E zone structure. For each zone, the NJRTM-E and Census data were used to determine the number of households with and without a vehicle available, the auto and transit travel time to Liberty State Park, and the average household income. The NJRTM-E does not include the Liberty Landing Ferry. Consequently, transit travel times from Battery Park City and the Financial District were adjusted to

account for the ferry service. The results of this initial analysis indicated that the minimal number of New York residents identified by the survey was consistent with the estimates produced by the Local Recreational Visitor model and was not due to any "New York bias" (increased reluctance by New Yorkers to visit the park due to its location across the river).

As seen in the model results, at travel times greater than 30 minutes, transit travel rates to Liberty State Park approach zero. This leaves only two neighborhoods in New York City that are convenient to Liberty State Park using this criterion – Battery Park City and the Financial District. The very high average incomes in these communities further reduce the Liberty State Park visitor rates, since income is inversely correlated with a park visitor trip. Similar issues were found for Hoboken, where high incomes resulted in low visitor rates, compared to Union City, where lower incomes resulted in more park visitors despite longer travel times.

3.5.2 LIBERTY LANDING FERRY COMMUTERS AND VISITORS

As part of the Liberty State Park survey, 12 respondents indicated that the Liberty Landing Ferry Marina was the primary purpose of their visit to Liberty State Park. Given the small number of Commuter / Visitor responses, it is difficult to draw conclusions about the potential circulator ridership. Since about half of the commuters / visitors indicated a home address in Jersey City, the commuters / visitors were grouped with the local recreational market for estimating future year circulator ridership. Commuters would likely require weekday circulator service from 5:00 AM to 10:00 AM, which does not match a service oriented toward recreational trips. If such a circulator service was provided, additional analysis to determine the size of this market would be needed.

3.5.3 LOCAL INDUSTRIAL WORKERS

As part of the Liberty State Park survey, 23 respondents indicated that the primary purpose of their visit to Liberty State Park was for work. Most of these workers were likely bound for the marina or restaurants although a few of the workers indicated that they worked in other areas of the park. Since almost all of the workers indicated a home address in Bayonne or Jersey City, these workers were grouped with the local recreational market for estimating future year circulator ridership. Given the small number of worker responses, it is again difficult to draw conclusions about the potential circulator ridership. Workers in the industrial area would also likely require weekday circulator service from 5:00 AM to 10:00 AM, which does not match a service oriented toward recreational trips. If such a circulator service was provided, additional analysis to determine the size of this market would be needed.

3.6 FUTURE YEAR CIRCULATOR RIDERSHIP

The elimination of the NJ TRANSIT #305 circulator bus service in mid-year 2010 may have reduced the number of visitors who use transit to access Liberty State Park due to the loss of reliable transportation from the light rail station to attractions located more than one mile away. For the model development, it was necessary to estimate the trip purpose of the #305 shuttle users in the last full year of service in 2009. In 2009, the circulator bus served approximately 60,000 annual riders. This ridership level was used as a benchmark for establishing the existing demand for such a circulator with similar service features.

The Liberty Science Center is located within a short walk of the Liberty State Park HBLR Station so local residents or visitors who arrive by transit would likely walk to their final destination. However, these visitors would potentially use the circulator service to visit other destinations within Liberty State Park. From the Liberty Science Center survey, 28 percent of respondents indicated that they would visit other destinations within the park, and 69 percent of respondents indicated that they would use a

circulator service. Applying these percentages to the 25,000 annual non-auto Liberty Science Center visitors provided an estimate of 4,800 potential circulator riders. Liberty Science Center visitors who take the ferry from New York would also be potential circulator riders. The survey indicated that six percent of Liberty Science Center visitors who arrived by transit live in Manhattan or Brooklyn. However, it is not known from the survey how many of these residents live in neighborhoods where it would be more convenient to use the ferry and circulator service rather than PATH and light rail. Based on this, it was determined that relatively few New York residents live in areas where taking the Liberty Landing Ferry to the park would be most convenient. Therefore, the potential number of such visitors was very small and was not explicitly included in the future ridership calculation.

The remaining circulator shuttle riders were divided primarily between Ferry visitors and local recreational visitors. The responses of the survey administered near the HBLR station just east of the park entrance were specifically reviewed to determine the trip purpose of current non-auto users entering Liberty State Park. A total of 58 persons were surveyed. Of these surveys, six surveys were discounted because the respondent indicated that they were unlikely to use a shuttle service if available. Of the remaining surveys, 25 (48%) indicated that they were bound for the Statue of Liberty / Ellis Island Ferry and 27 (52%) indicated that they were bound for local recreational activities. These survey results were then used to estimate the circulator market distribution.

As discussed earlier, future year ridership for visitors of regional attractions was based on regional population growth. Local recreational ridership growth was based on specific residential developments within Jersey City, as well as municipal population growth for the remainder of Hudson County and Newark. Overall, potential circulator ridership is forecast to increase by approximately 40 percent by 2020 and more than double by 2035 based on the model output. Because the population of Jersey City in the vicinity of Liberty State Park is anticipated to grow at a much faster rate than the region as a whole, the local recreational visitor market is expected to grow much more rapidly than the regional visitor market in the future. Table 3-8 shows the existing demand and forecast shuttle ridership by market assuming a circulator service similar to the NJ TRANSIT #305 bus route with daily service from April to December and weekend and holiday service from January through March. Of course, ridership would vary depending on the specific type, routing, frequency of service, and span of service that would be provided.

Table 3-8
Liberty State Park Circulator Projected Shuttle Ridership

Market	2011		2020		2035	
Local Recreational	28,700	48%	50,900	60%	79,900	68%
Ferry Visitor	26,500	44%	28,300	34%	31,800	27%
Liberty Science Center Visitor	4,800	8%	5,100	6%	5,800	5%
Total	**60,000**	**100%**	**84,300**	**100%**	**117,500**	**100%**

4 PURPOSE AND NEED STATEMENT

4.1 PURPOSE OF LIBERTY STATE PARK CIRCULATOR

The purpose of the Liberty State Park Circulator is to provide a reliable transit service to, from and within the park that:

- Provides an alternative to reliance on the automobile for access to and within the park;
- Serves the current and estimated future transit demand to the park for recreational and tourist markets;
- Provides Jersey City residents who do not have access to a car with a means to visit the park.

4.2 NEED FOR LIBERTY STATE PARK CIRCULATOR

The need for the Liberty State Park Circulator is summarized below. The need supports the assertion made in the purpose statement and provides the factual foundation for the project purpose by describing the problems to be addressed and their causes.

1. Provide an Alternative to Auto Access to/from Liberty State Park and reliance on the automobile for circulation within the park:

Currently, nearly 80 percent of the approximately 6 million annual visitors to Liberty State Park arrive by automobile, (and nearly 85 percent of visitors are car owners). A large portion of the remaining visitors arrive by tour or charter bus. Furthermore, travel within the 1,200 acre park is primarily limited to auto use. Public transportation provides access to the edges of the park but does not serve the attractions and amenities within Liberty State Park. The Liberty State Park station stop on the HBLR is located just northwest of the park's northern entrance. The NJ TRANSIT #6 bus, the only scheduled bus service in the vicinity of the park, stops at the Liberty State Park HBLR station at the edge of the park. The #6 does not operate on weekends and has limited service during the week. The distance from the HBLR station and bus stop to major attractions in the park is further than the average visitor could be expected to walk. The tourist-based Statue Cruises ferry dock at the historic CRRNJ Terminal is over one mile away and the South Lawn picnic area is over three miles away from the HBLR station. Similarly, Liberty Landing Ferry's modest commuter and recreational ferry service is provided to the northern edge of the park with no means of access to the park's attractions. The location of transit at the park's edges and the current lack of circulator service create an accessibility gap between the transit system and park attractions and amenities for anyone who does not own or have access to an automobile.

Liberty State Park visitation is expected to increase in the future due to the growth of the local population, improvements to park attractions, and the opening of more parkland area to the public. Furthermore, the park's policy is to not develop more areas devoted to parking or auto use, and fewer vehicles are desired through the park. Therefore, a viable non-auto transportation option is needed now and in the future to access the park and its attractions and amenities.

2. Serve the Current and Future Park Transit Circulator Demand:

There is an existing and growing demand for transit service to Liberty State Park from the tourist and local recreational markets. The NJ TRANSIT #305 bus provided transit service to/from and within the park from January 2001 until May 2010 when it was cancelled. This route provided "circulator"-type

service as it served the Liberty State Park HBLR station and major attractions within the park including the Liberty Science Center, CRRNJ Terminal and Statue of Liberty/Ellis Island ferry slips, Liberty Landing Marina, and the park office and South Lawn at the southern end of the park. In 2009, ridership on this route exceeded 58,000 passengers per year. Since the service was cancelled, transit access within the park and to its attractions is no longer provided. The Liberty State Park travel demand model estimates that by the year 2020, circulator ridership demand would increase to approximately 83,000 annual passengers and, by 2035, to nearly 134,000 annual passengers.

3. Provide Access for Local Recreational Visitors Without Vehicles:

According to the Liberty State Park travel survey, 81 percent of the park's recreational visitors come from Jersey City, and nearly one-quarter of these visitors are from the Martin Luther-King/Bergen-Lafayette neighborhood located just to the west of the park. Jersey City, as a whole, has a high transit-dependent population, as nearly 40% of its households are without access to a vehicle, compared to less than 12 percent statewide. Forty-two percent of the Martin Luther King/Bergen-Lafayette neighborhood households are without a vehicle, with some Census tracts as high as 55 percent. A transit connection to destinations within Liberty State Park from existing transit facilities at the edge of the park is needed to afford transit-dependent visitors with the same opportunity to visit the park as auto owners. Failure to do so would represent a deficiency in the transportation system serving this community. It is anticipated that auto ownership rates will remain lower than the state average in the foreseeable future, due to the expected continuation of current City policies, such as location of higher density development near mass transit.

4.3 GOALS AND OBJECTIVES

A number of goals were identified at the outset of the study by the project team, and additional goals and objectives were identified by stakeholders. A transit circulator would achieve many of the goals and objectives which are listed below.

4.3.1 STUDY GOALS

These study goals were presented at the first TAC meeting on April 4, 2012:

- Reduce auto travel to the park
- Capitalize on the multi-modal mass transit network to make the park more accessible
- Consider transportation needs of underserved communities
- Develop connectivity within Liberty State Park and consider destinations near the park
- Recognize Liberty State Park as a local and regional destination
- Support tourism
- Improve linkages to national monuments

4.3.2 STAKEHOLDERS GOALS

A questionnaire was submitted to the TAC to solicit input on stakeholder goals and objectives, including the mission statement for each organization.

Purpose and Need Questionnaire for Technical Advisory Committee

The Purpose and Need Statement will establish the basis for the development of the range of options for the circulator service. The Purpose and Need Statement will be informed by socio-economic data of Jersey City; the data collected by the survey; and anticipated redevelopment and the outputs of the travel demand model.

We would also like to collect input from the member agencies of the TAC to help us with the evaluation of the Purpose and Need for a transit circulator serving Liberty State Park. We would like to gain a better understanding of the purpose of your organization, particularly if your organization's purpose mainly concerns Liberty State Park (or facilities in/near the park). Please submit one response per organization based on the following questions:

1. *What is your organization's mission?*
2. *What are your organization's plans for the next 20 years? Please include planned investments, changes to operations, long-term goals, etc.*
3. *Provide any other comments you wish to add related to the need for transit service to and within the park.*

A number of responses were submitted by key stakeholders. The goals provided relevant to the transit circulator study have been underlined as appropriate for each stakeholder. Responses for each stakeholder have been summarized as follows:

- **Liberty State Park (NJDEP Division of Parks and Forestry):** Liberty State Park is a state park operated and maintained by NJDEP's Division of Parks and Forestry. Liberty State Park management stated that their mission is to provide the public with access to the harbor's resources. Liberty State Park will continue to grow over the next 20 years in accessible open space and services and amenities provided to the public. In the near future, 300 acres of previously inaccessible urban forest will be opened to the public with trails and bird blinds. In addition, the historic ferry slips will be restored at the CRRNJ Terminal.

- **Friends of Liberty State Park:** The Friends of Liberty State Park (FOLSP) is an all volunteer, officially-recognized "Friends Organization" of the NJ Division of Parks and Forestry dedicated to Liberty State Park open space. FOLSP stated that their mission is "to preserve, protect, conserve and promote Liberty State Park" and to support the mission, goals and objectives of Liberty State Park and the New Jersey Division of Parks and Forestry.

- **National Park Service**: The National Park Service, which operates, maintains and provides access to the national monuments of Ellis Island and the Statue of Liberty through their concession with Statue Cruises, encourages greater public transportation access to Liberty State Park. One objective of this goal would be to relieve congestion and long lines experienced at the Battery Park Statue Cruises ferry slips in lower Manhattan by shifting more ferry access to Liberty State Park.

- **Liberty Science Center:** Liberty Science Center is an interactive science museum located in the northwest portion of the park. Their mission is to "expose learners of all ages to the excitement, power, and promise of science and technology. Liberty Science Center stated a

goal of increasing attendance by 5% per year. A transit connection from the Statue Cruises and/or Liberty Landing ferry would help with their marketing to the New York City lower Manhattan/Battery Park City area, where ferry service is available to and from the park. In cold or rainy weather, when the Liberty Science Center is most visited, parents with small children cannot easily walk from the ferry to the center. That makes attracting this NYC market more difficult since their only other transit option is to take PATH and transfer to the HBLR, both of which do not run as frequently on weekends, making transfers time consuming.

- **Camp Liberty:** Camp Liberty is a summer arts camp for children located at the southwestern part of the Liberty State Park. It is operated by the Educational Arts Team, a private not-for-profit organization. They noted that Jersey City families do not have transportation options to get to the camp and camp buses have limited bus pick up sites.

- **Liberty Historic Railway:** Liberty Historic Railway was established in 2010 as a non-profit, public benefit corporation to provide rail shuttle connections within Liberty State Park; to allow appropriate historic transportation equipment to be displayed and interpreted; and to jump-start the restoration of the deteriorating CRRNJ Terminal Train Shed. In response to the questionnaire, they stated they believe a goal of Liberty State Park should be to move people, not autos, in, out and around the park as an environmentally friendly solution.

- **North Jersey Transportation Planning Authority (NJTPA):** The NJTPA is the regional transportation planning leader and technical and informational resource for the people of northern New Jersey that:

    - Creates a vision to meet the mobility needs for people and goods;
    - Develops a plan for transportation improvement and management to fulfill the vision;
    - Partners with citizens, counties, cities, state, and federal entities to develop and promote the transportation plan;
    - Prioritizes federal funding assistance to make the plan a reality; and
    - Links transportation planning with safety and security, economic growth, environmental protection, growth management, and quality of life goals for the region.

The Purpose and Need Statement and Study Goals and Objectives defined herein were used to inform subsequent tasks of the Liberty State Park Circulator Cost-Benefit Analysis, including development and evaluation of options and implementation strategy.

5 OPTIONS FOR CIRCULATOR SERVICE

This chapter evaluates options for transit service in Liberty State Park. It builds on previous work completed for this study that detailed existing conditions, ridership projections, and the purpose and need for a potential circulator service through Liberty State Park. Potential modes and corridors for service were considered based on analyses of activity centers within the park, ridership on the previous park circulator service, and other considerations that pertain to operating the service in a park environment.

Initial screening and analysis outlined in this chapter led to the elimination of modes of transit that are inappropriate for the park setting and scale of service being considered. Modes of transit retained for further study, in combination with selected corridors for service, are described in this chapter as four options for further study in the cost-benefit analysis phase of this project.

5.1 PREVIOUS BUS SERVICE

5.1.1 OPERATIONS

As discussed in the Existing Conditions chapter, there have been several attempts at operating bus service within Liberty State Park. The NJ TRANSIT #305 served Liberty State Park from January 2001 through May 2010 when it was cancelled. The route served the Liberty State Park HBLR station and destinations throughout the park including the Liberty Science Center, Ferry Terminal, Liberty Landing marina, historic CRRNJ Terminal, and the park office.

The NJ TRANSIT #305 was branded under the NJ TRANSIT WHEELS program and operated every day for the first two years of service in 2001 and 2002. The WHEELS program is a system of non-traditional transit routes owned by NJ TRANSIT and operated mostly under contract by private companies. Starting in 2003, service was reduced to weekends from January through March and was operated every day from April through December. This service was operated on 30-minute headways on all days between 2001 and 2005 and was increased to 40 minutes on weekdays in 2006. A cash fare of $1.00 per passenger was paid to the driver for unlimited daily rides.

In June 2010, the Hudson Transportation Management Association (TMA) took over the service to replace the cancelled NJ TRANSIT #305 with the routing shown in Figure 5-1. It operated free of charge on weekends through Labor Day 2010 with a headway of 35 minutes. This service was also operated on weekends in 2011 during the summer months with a headway of 30 minutes. In 2011, the cost to ride was a $1.00 cash fare per passenger paid to the driver for unlimited daily rides.

Figure 5-1
Hudson TMA Bus Stop Locations

5.1.2 RIDERSHIP

In order to determine which areas of the park could be expected to experience the highest demand for transit service, stop-level ridership for the Hudson TMA operated circulator service was obtained for weekends from May through August of 2011, the period of highest visitation. All bus boarding and alighting (exiting) activity was aggregated for each stop and averaged for this four-month period. The resulting stop-level ridership numbers are shown below in Table 5-1.

Based on this boarding and alighting data, the highest demand for transit service is along the corridor between the HBLR station and the historic CRRNJ Terminal. This represents 265 of the 296 average daily boardings and alightings (89 percent). The Park Office/Visitor's Center bus stop represents most of the activity in the park outside of this corridor with 23 daily boardings and alightings. Also, there are 127 daily boardings and alightings at the HBLR station, which is outside of the park, compared to 169 daily boardings and alightings that occur at bus stop locations within the park. Based on this, it can be inferred that there were 127 daily passenger trips between the HBLR station and another bus stop within the park. As 169 total boardings and alightings occurred within the park, there are 42 remaining boardings and alightings (approximately 25 percent of the total) that cannot be linked to the HBLR station and that represent trips that occurred wholly within the park. Average daily ridership data (boarding and alighting activity) by corridor is shown in Figure 5-2.

Table 5-1
Hudson TMA Bus
Average Daily Boardings and Alightings
(May through August 2011)

BUS STOP	AVERAGE DAILY BOARDINGS AND ALIGHTINGS
HBLR	127 (43%)
Liberty Science Center	20 (7%)
Restaurants	9 (3%)
Historic Terminals/Ferry	109 (37%)
Playground/Green Park	5 (2%)
Interpretive Center	1 (<1%)
Park Office Visitor's Center	23 (8%)
Liberty Park Café	2 (<1%)
Total	296 (100%)

Figure 5-2
Hudson TMA Bus Ridership by Corridor (May through August 2011)

5.2 PRIMARY ATTRACTIONS FOR POTENTIAL LIBERTY STATE PARK CIRCULATOR RIDERSHIP

The summary of ridership at Hudson TMA bus stops in Table 5-1 provides an indication of which attractions in the park could be expected to draw potential transit riders. Based on the travel surveys conducted for this study, stop-level ridership data, on-site observations, and park programming plans, the primary attractions for potential Liberty State Park circulator riders are shown in Figure 5-3. Further detail on each primary attraction is also provided.

Figure 5-3
Existing and Future Primary Park Attractions

5.2.1 LIBERTY SCIENCE CENTER

Liberty Science Center, pictured in Figure 5-4, attracts approximately 700,000 visitors per year. The Liberty Science Center stop on the Hudson TMA bus accounted for seven percent of boardings and alightings. This low percentage may be due to the fact that Liberty Science Center is within walking distance of the HBLR station for most visitors. According to the travel survey conducted for Liberty State Park, 77 percent of visitors arrived by private vehicle on weekdays and 89 percent arrived by private vehicle on weekends. The lower percentage arriving by private vehicle on weekdays may be a reflection of the high number of school groups visiting during the week.

According to the travel survey, 23 and 25 percent of visitors to the Liberty Science Center came from New York State on weekdays and weekends, respectively. The previous circulator service was not actively marketed as a travel mode for New Yorkers to visit Liberty Science Center in conjunction with the ferry to Liberty Landing. However, Liberty Science Center is interested in targeting their advertising to New York visitors to promote this option. In addition, if the potential circulator service is more convenient for intra-park trips, more visitors to Liberty Science Center may use it to visit the remainder of Liberty State Park during their visit. As Liberty Science Center is located along the main spine of activity within the park and is a major area attraction, it should be served with the potential circulator service.

Figure 5-4
Liberty Science Center

5.2.2 CENTRAL RAILROAD OF NEW JERSEY TERMINAL/FERRY LANDING

This area is the main hub of activity within the park and is home to the historic CRRNJ Terminal (Figure 5-5), historic train shed, Statue Cruises ferry to Ellis Island and the Statue of Liberty, and the Liberty State Park 9/11 Memorial. The stop on the Hudson TMA bus serving this area of Liberty State Park accounted for 37 percent of all boardings and alightings. It is located along Zapp Drive, the main axis of activity that stretches from the HBLR station to the CRRNJ Terminal and ferry landing. As such, this location should be a priority for inclusion in the potential transit service.

Figure 5-5
Historic CRRNJ Terminal

5.2.3 PLAYGROUND/GREEN PARK

The playground in the Green Park (Figure 5-6) was the primary purpose for visiting Liberty State Park among two to four percent of those surveyed, and the secondary purpose for visiting the park among four to five percent of those surveyed. Picnicking is another significant activity, some of which takes place in this area. Picnicking was the primary purpose for four to 10 percent of survey responses and the secondary purpose for three to six percent of survey responses. Nonetheless, the Hudson TMA bus stop in this area accounted for only two percent of boardings and alightings. As a result, it is not of primary importance for inclusion in the potential transit service but would be a viable stop on a corridor that otherwise justifies transit service.

Figure 5-6
Playground in the Green Park

5.2.4 PARK OFFICE/SOUTH LAWN

This area, located in the southeast corner of the park, experiences a lot of activity in the picnic and playground area (Figure 5-7). The Hudson TMA bus stop at this location accounted for eight percent of boardings and alightings. This area is not located along the main spine of activity on Zapp Drive. However, outside of the heavily used corridor between the HBLR station and the historic CRRNJ Terminal, this is the area of the park with the greatest historic transit ridership. Ridership and visitation activity dictate that this area should be served by a future circulator service if possible.

Figure 5-7
South Lawn Picnic and Playground Area

5.2.5 HABITAT RESTORATION AREA

Currently, a large interior section of Liberty State Park is undergoing habitat restoration and is inaccessible to the general public. However, public trails are being constructed as part of the restoration effort and will allow the public to hike throughout the interior of the park, among the restored/newly created wetlands and uplands. As currently devised, the trails will be accessible via entry points adjacent to the Liberty Science Center, the industrial park, and along Audrey Zapp Drive and Freedom Way, as shown in Figure 5-8.

As this area is not yet open to the public, its ridership potential cannot be precisely determined. However, as a new park attraction that has been many years in the making, it is expected to be a major draw for hikers, birders, nature enthusiasts, and other interested visitors. For this reason, at least some access points to the habitat restoration area trail system should be easily accessible from the circulator stops.

Figure 5-8
Habitat Restoration Area

Source: Friends of Liberty State Park – Park Interior presentation

5.2.6 LIBERTY INDUSTRIAL PARK

Liberty Industrial Park is a 135-acre industrial area located on the southwestern edge of Liberty State Park. It is bordered on three sides by Liberty State Park and shares some of the park's main access roads. Even though the industrial park is surrounded by Liberty State Park, there is little synergy between the areas. Some major tenants within this area include Suzette Manufacturing, Palermo Manufacturing, Wilman Paper, Streichler Trucking, Diversified Global Graphics Group, and the New York Daily News. A typical business in Liberty Industrial Park is shown in Figure 5-9. The industrial park employed more than 2,000 workers as of October 2012. Many of the large tenants conduct business 24 hours per day, seven days per week.

Employees of the industrial park are potential users of a park transit circulator. However, while the hours and days of operation for the potential circulator service have not been determined, the schedule for a service that primarily serves recreational users will not likely serve the needs of industrial park workers. Ridership activity at the Liberty Café stop for the Hudson TMA bus, adjacent to the industrial park, accounted for less than one percent of total bus boardings and alightings (an average of two per day). This service was only in operation on weekends from 9:00 AM until 10:00 PM on Saturdays and 9:00 PM on Sundays, the prime recreational hours/days, but did not serve the needs of full-time employees working at the industrial park.

Nonetheless, according to the 2009 Jersey City Bus Study, demand for transit at the industrial park was underserved. In response, the NJ TRANSIT #981 bus was extended by NJ TRANSIT to serve the industrial park. However, the route was subsequently eliminated in the 2010 service cuts. Since the northwest corner of the industrial park is located approximately one mile from the nearest transit (the combined HBLR Liberty State Park station and the NJ TRANSIT #6 bus stop), the industrial park is not adequately served by transit to meet the current demand. Transit that would directly serve the industrial park is needed. This would include a route or route extension with hours/days that accommodates worker schedules and connects with areas outside of Liberty State Park to generate commuters to the industrial park. The Liberty State Park circulator service should be optimized to serve the travel patterns and peak demand of recreational park users, which does not match the industrial park workers that require service early in the morning and year round. Therefore, the proposed Liberty State Park circulator service would be insufficient to meet the needs of full-time industrial park workers, especially at facilities that operate 24 hours per day, seven days per week.

Figure 5-9
Typical Business in Liberty Industrial Park

5.3 SERVICE CORRIDORS

5.3.1 PRIORITY OF ACTIVITY CENTERS

The activity centers within the park were analyzed and subsequently categorized into three tiers of priority for inclusion in the circulator routing. Tier 1 considered the highest-priority destinations to be served by a potential circulator service and Tier 3 considered the lowest-priority destinations. On this basis, the stops with the highest number of boardings and alightings on the Hudson TMA bus service would be the most obvious candidates to be served in the future by transit. Although the process of tiering activity centers was primarily based on the Hudson TMA bus service transit demand, it also considered clusters of activity along the same corridor and potential future ridership. Based upon the criteria, many of the activity centers along the Audrey Zapp Drive corridor would be classified in the Tier 1 category.

As stated previously, Hudson TMA bus ridership for the Liberty Science Center was low in comparison to the more than 700,000 visitors per year it receives. However, the Liberty Science Center plans to market any potential circulator to its visitors from New York as a means to transport them to their facility from the Liberty Landing Ferry. This coupled with the fact that it is located along the corridor of heaviest ridership justifies classification as a Tier 1 activity center. As a new and high-profile feature of the park, the entrances to planned trails within the Habitat Restoration Area are also included in the Tier 1 category.

Tier 2 activity centers were identified based upon mid-level ridership numbers on the previous Hudson TMA bus service and were not primary origins/destinations within the park. If resources allow, serving these locations with a future circulator service would be desirable. The Park Office/South Lawn area is the most notable location in this category. Based upon the criteria, many of the activity centers along the Freedom Way corridor would be classified in the Tier 2 category.

Tier 3 consists of activity centers with historically low Hudson TMA bus service ridership and no anticipation of growth projections in the future. At this time, it is not recommended that Tier 3 locations be served initially by a future circulator service. However, if new entertainment attractions are developed within the industrial park area or if conditions at an existing activity center change significantly, circulator service to these areas should be re-evaluated. While service to attractions outside of Liberty State Park is not proposed at this time due to resource limitations, outside attractions such as Pole Position Recreational Raceway could be added to the routing in the future as resources allow.

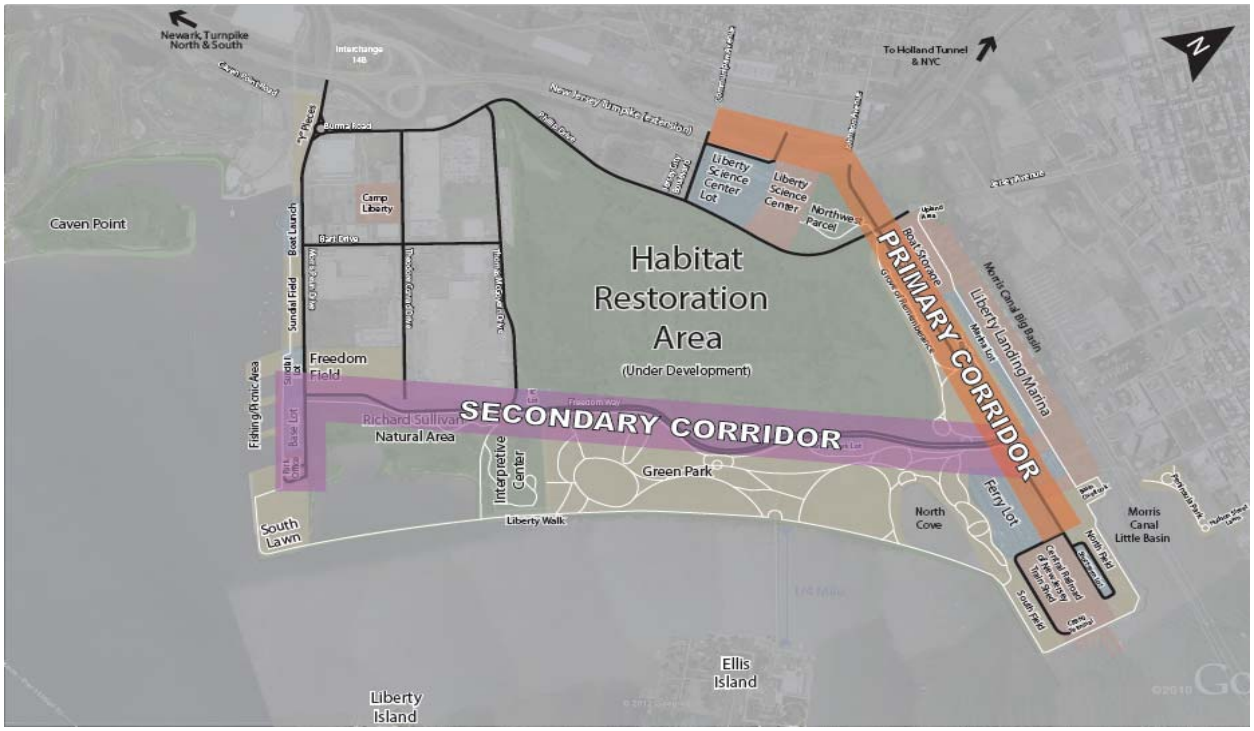
The activity centers were categorized into the following three tiers.

- Tier 1 – must be served:
    - HBLR Liberty State Park Station
    - Liberty Science Center
    - CRRNJ Terminal/Ferry Landing
    - Future Habitat Restoration Area Trails
- Tier 2 – should be served:
    - Liberty Landing/Restaurants
    - Park Office/South Lawn
    - Green Park/Playground
- Tier 3 – service not justified at this time:
    - Industrial Park/Camp Liberty
    - Interpretive Center

5.3.2 POTENTIAL SERVICE CORRIDORS

Based on the identified tiers of service priority for individual activity centers, two service corridors were identified as shown in Figure 5-10. The “primary corridor” between the HBLR station and the historic CRRNJ Terminal includes the activity centers with the highest transit demand based upon previous Hudson TMA bus service and some intermediate destinations along Audrey Zapp Drive including at least one of the Habitat Restoration Area trail entrances. The “secondary corridor” connects the historic CRRNJ Terminal with the Park Office/South Lawn area including activity centers along Freedom Way such as the Green Park/playground area, Interpretive Center, and two Habitat Restoration Area trail entrances.

Figure 5-10
Transit Service Corridors within Liberty State Park



The “Primary” corridor is the highest priority and should be the priority transit service route. However, the “Secondary” corridor along Freedom Way between the CRRNJ Terminal and the Park Office/South Lawn area should be served with the potential transit circulator as funding allows.

A full loop of the entire park, as was previously operated, was not considered to be a viable option. In order to provide a service with convenient access to all destinations, the loop would have to run bi-directionally. The previous Hudson TMA bus service operated only clockwise through the park. This meant that a person traveling from the South Lawn to the CRRNJ Terminal would need to ride the bus to the terminus at the HBLR station, wait during the bus layover period, and continue on the next scheduled run of the bus to the CRRNJ Terminal. This type of service design is not capable of attracting a significant number of passengers. To operate the loop bi-directionally, the additional mileage would require another vehicle to achieve the same headways as service on the primary and secondary corridors identified above. This results in a considerable additional annual cost. This considerable additional cost is not considered to be prudent in light of the fact that there was an average of two passengers per day on the previous Hudson TMA bus service outside of the primary and secondary corridors. While increasing headways and improving service characteristics may increase transit demand on the route, it is not expected that the distribution of passengers throughout the park would change significantly.

5.4 POTENTIAL SERVICE VEHICLES

5.4.1 LONG LIST OF VEHICLES/MODES

A long list of transit modes/vehicles was compiled for consideration for the Liberty State Park circulator service. This list includes all vehicles that could potentially be used for a circulator service, including both bus and rail vehicles. The long list for bus vehicles (Figure 5-11) is as follows:

- **Replica trolley (bus)** – Replica trolley bus is a rubber-tired bus designed to resemble a historic streetcar. They are generally shorter than typical buses and are mostly used for historic district and tourist-oriented circulator or shuttle services.
- **Bus guideway** – Bus guideways may be physical or remote guidance systems that steer buses along part or all of a route by external means on dedicated right-of-way. Guideways often parallel existing roads and allow buses to travel freely without obstruction.
- **Bus** – A bus is a transit vehicle with front and center doors, a rear-mounted engine, and low-back seating. Buses are powered by gasoline, battery, or alternative fuel engines contained within the vehicle.
- **Minibus/jitney** – Minibus/jitney is a smaller bus or van that may carry passenger loads between eight and 24 persons.

Figure 5-11
Long List of Bus Vehicles/Modes for Screening

Bus Guideway

Bus(Standard or Electric)

Replica Trolley (Bus)

Mini Bus/Jitney

The long list for rail (Figure 5-12) is as follows:

- **Light rail** – Light rail operates on right-of-way that may be largely grade-separated but also may have portions on which the vehicles share right-of-way with general traffic. A light rail system typically can accommodate passenger loads that are smaller than those of a heavy rail system. Light rail vehicles can operate as single units or as short multi-unit trains.

- **Automated Guideway Transit (AGT)** – AGT systems are fully grade-separated and fully automated. They do not require drivers. They are generally capable of accommodating smaller passenger loads than those of a light rail system. However, there are examples of larger AGT systems in operation throughout the world. AGT systems are common forms of transportation in airports.

- **Battery/ground level power supply modern streetcar** – Modern streetcars operate at low speeds and can share the road with vehicular traffic as they travel on rails embedded in streets. They are typically larger than buses with modern features such as low floors and multiple doors for convenient passenger loading/unloading. Modern streetcars are designed for local transportation and may be powered by battery or ground level power, a modern method of third-rail electrification that does not pose a danger to pedestrians.

- **Battery-powered historic streetcar** – Historic streetcars are refurbished vintage streetcars that were originally manufactured in the early 1900s. They are typically not air-conditioned and lack modern amenities such as low floors. However, they may serve as a historic attraction within the park that may draw additional visitors to ride the streetcar as an experience and not solely for transportation.

- **Battery-powered historic replica streetcar** – Historic replica streetcars are designed to resemble historic streetcars, but are built new, are likely air-conditioned, and have modern amenities such as low-floors.

Heavy rail was briefly considered but eliminated early on. Heavy rail's extreme high cost and intensity of associated infrastructure would not be justified by the projected ridership.

Figure 5-12
Long List of Rail Vehicles/Modes for Screening

Light Rail

Automated Guideway Transit

Battery/Ground Level Power Supply Modern Streetcar

Battery-Powered Historic Streetcar

New Battery-Powered Historic Replica Streetcar

5.4.2 VEHICLE/MODE FATAL FLAW SCREENING

In order to reduce the long list of mode options to those most appropriate for further study for the circulator service within Liberty State Park, fatal flaw screening criteria was developed as follows:

- **Must not require grade separation or barrier** – A physical barrier, such as a separated guideway or elevated monorail, would inhibit park circulation and be visually inappropriate in the natural park setting.

- **Must not require excessive infrastructure that does not benefit ridership or running time** – Modes of transportation that are primarily designed for longer distance travel often include infrastructure meant to help speed service through congestion or gain efficiency over a significant distance. Given the relatively smaller scale of a potential service within Liberty State Park and lack of significant traffic congestion, this type of infrastructure is not necessary. It would unnecessarily add to the capital and operational cost of the potential circulator service.

- **Must not be prohibitively expensive** – There is an order of magnitude difference among those modes included on the long list. The most expensive modes of transportation included on the list include AGT and the least expensive are the various bus alternatives. Given the small scale of service and modest potential ridership at this time, the most expensive modes of transportation are inappropriate for further consideration in this study.

- **Must have sufficient capacity** – Minibus or jitney vehicles may not have sufficient capacity to accommodate projected ridership for the "primary corridor". However, these vehicles may be better suited for lower potential ridership corridors. This will need to be definitively determined

in further detail in a subsequent phase of the study. Due to the projected ridership on the potential circulator service, capacity is not thought to be an issue with any other mode under consideration.

All of the modes under consideration were evaluated based upon the identified fatal flaw criteria. Modes with one or more of the identified fatal flaws were eliminated from further study. As a result of the evaluation process, light rail, AGT, and bus guideway were each eliminated from further consideration for circulator service within Liberty State Park. The detailed results of the screening analysis for the modes eliminated from further consideration can be found in Figure 5-13.

Figure 5-13
Vehicle/Mode Fatal Flaw Screening Results

	Requires barrier or grade separation	Requires excessive Infrastructure	Prohibitively expensive	Insufficient capacity
Light Rail 		X		
Automated Guideway Transit 	X	X	X	
Bus Guideway 		X		

In addition, a golf cart or electric tram vehicle, as shown in Figure 5-14, was considered as an inexpensive option. However, this type of vehicle presents safety issues in the event of a crash due to the open sides of the vehicles. These vehicles are not meant to operate on streets with significant numbers of other standard automobiles and trucks. In addition, these vehicles may not be considered legal to operate on Jersey City streets, there would be issues with exposure to the elements, and they would present challenges with fare collection. Therefore, these vehicles were eliminated from further consideration.

Figure 5-14
Golf Cart/Electric Tram

5.4.3 POTENTIAL SERVICE VEHICLES

Modes retained for further study after the fatal flaw screening include: minibus/jitney, bus, replica trolley (bus)—all potentially powered by battery, hybrid-electric, or compressed natural gas—as well as battery/ground level power supply modern streetcar, battery-powered historic streetcar, and battery-powered historic replica streetcar. For these retained modes, a preliminary review (shown in Figure 5-15,) has been compiled of vehicle specifications, positives, and negatives of each as they relate to a potential Liberty State Park circulator service. The ballpark costs provided are for the cost of the vehicle only and do not include the costs for operations and maintenance or additional infrastructure (i.e. track) that may be necessary to operate the service.

As expected, the bus alternatives are the least expensive of the retained options and modern streetcar would likely be the most expensive. Buses also make use of existing infrastructure, do not require any additional right-of-way, and have the flexibility to adjust routing as necessary. They can be ultra-low or zero emissions for an additional cost. The streetcar alternatives range in price but also carry the additional cost of track, charging mechanisms or power supply, carbarn, and other required infrastructure. However, electric streetcars inherently have no local emissions. Historic or replica streetcars may have the added benefit of being an attraction to draw additional visitors to the park to ride the service beyond those purely interested in transportation from one point to another.

Figure 5-15
Potential Service Vehicles

	SPECS	POSITIVES	NEGATIVES
Mini Bus 	• CAPACITY: up to 30 seats • SIZE: less than 40 feet • AVG COST: $90,000	• Least expensive vehicle • Uses existing infrastructure and right of way • Routing flexibility • May be low or zero emission (at additonal cost)	• Some local emissions unless all electric vehicles are used • Serves purely as transportation, not attraction in and of itself Shorter life than standard bus (for least expensive types
Bus 	• CAPACITY: 80 • SIZE: 40 feet • AVG COST: $480,000	• Less expensive than streetcars • Uses existing infrastructure and right-of-way • Routing flexibility • May be low or zero emission (at additional cost)	• Some local emissions unless all electric vehicles are used • Serves purely as transportation, not attraction in and of itself
Replica Trolley (Bus) 	• CAPACITY: approx 80 • SIZE: approx 40 feet (varies) • AVG COST: $280,500	• Less expensive than streetcars • Uses existing infrastructure and right-of-way • Routing flexibility • Creates historic ambiance	• Some local emissions unless all electric vehicles are used • Not likely to be its own attraction
Battery/Ground Level Power Supply Modern Streetcar 	• CAPACITY: avg 157 passengers • SIZE: 66 feet (or up to 148 feet) • AVG COST: $3.5 - $4.5 M	• New vehicles may be easier to maintain (compared to historic streetcars) • New vehicles may be more comfortable for passengers (compared to historic streetcars) • No local emissions • No charging mechanism needed at route termini for ground level power supply	• More expensive than bus service • Serves purely as transportation, not attraction in and of itself • Need charging mechanism at one or both route termini for battery powered vehicles
Battery-Powered Historic Streetcar 	• CAPACITY: approx 70 • SIZE: 46 - 50 feet • AVG COST: est $900 ,000 for renovation	• Historic cars can be attraction in and of themselves – boosting ridership • No local emissions	• More expensive than bus service • Need charging mechanism at one or both route termini • Historic cars may be difficult to maintain and less reliable than new cars
New Battery-Powered Historic Replica Streetcar 	• CAPACITY: 88 passengers • SIZE: ~50 feet • AVG COST: $1.4 M	• Historically accurate cars can be attraction in and of themselves – boosting ridership • New cars may be easier to maintain and more reliable than historic cars • No local emissions	• More expensive than bus service • Need charging mechanism at one or both route termini

5.5 PRELIMINARY SERVICE GUIDELINES

In order to help define the characteristics of options for further study in the cost-benefit analysis, preliminary service guidelines were developed to minimize the effect on the surrounding park environment and to maximize the passenger experience.

- **Grass track beds and no overhead wires could be standard for streetcar options:** In order to respect the park environment and minimize the noise and visual impact of transit operations, overhead wires should not be used. Battery-powered streetcars should be used for propulsion with a charging mechanism to be located at one or both terminals along a potential route. Grass track beds (Figure 5-16) could be used for all rail options so that rail facilities are contextual with the park environment to the extent possible.

Figure 5-16
Grass Track Bed in New Orleans

- **No or ultra-low emissions could be standard for all bus options:** Technology to reduce or eliminate bus emissions has advanced rapidly in recent years, and there are many propulsion options. Hybrid, compressed natural gas, or even battery-powered buses are all commercially available (Figure 5-17). The vehicle selection should minimize local emissions to the extent possible to reduce the impact to air quality.

Figure 5-17
Zero Emissions Bus in Scotland

- **Service design and vehicle selection could promote a scenic tour of the park:** For some, an ideal trip to the park would involve a scenic vehicular tour to the areas of interest in the park without significant exposure to the elements or the need for a personal car. This audience could include those who are mobility-impaired, those who do not have a whole day to spend in the park, or simply those who prefer to access everything in a short amount of time. This is a common way for many to tour larger national parks (Figure 5-18). To this end, service design should focus on a scenic routing with items of visual interest, as well as selection of vehicles

that maximize views of the park with large windows or sun roofs. To further add exposure, the service, vehicles, and all related materials should be branded as a scenic tour of the park.

Figure 5-18
Park Shuttle in Zion National Park

- **Historic streetcar may be an attraction on its own:** The main purpose of the circulator service whether operated using a bus, streetcar, or other vehicle is to allow visitors to take in the scenery and get from one place to another. Historic or replica streetcars could serve as an additional attraction in Liberty State Park. Due to the history of the park site as a rail terminal and the presence of the historic CRRNJ Terminal and train shed, a historic or replica streetcar operation could draw additional riders who come just for the experience of riding the historic vehicles. This would especially be true if historic vehicles were used as opposed to replica vehicles. Research of parks shows that the use of unique vehicles increases park visitation.[3]

5.6 SHORT LIST OF SERVICE OPTIONS

5.6.1 REFINEMENT OF MODES

The modes that emerged from the fatal flaw screening and corridors for potential service were refined into discrete options for further study by applying additional considerations. Bus service (standard, replica trolley or minibus) for one or both corridors has the lowest cost and does not require significant additional infrastructure. It should, therefore, be retained as a viable circulator service option.

Rail service was only considered for the Audrey Zapp Drive corridor serving the corridor between the HBLR Station and the CRRNJ Terminal, since it has the highest ridership potential. Conversely, projected ridership for the remainder of the park does not justify rail infrastructure and associated requirements at this time. In addition, modern streetcar was not included in the short list of options for further study, as it would not likely act as an attraction to draw additional riders and visitors to the park, as compared with historic or replica streetcar in conjunction with historical park programming. More

[3] As referenced in the Existing Conditions chapter, Stone Mountain in Georgia and the historic trolley in Lowell, Massachusetts serve as distinct attractions for park visitors.

detailed study beyond the scope of this project should determine whether rehabilitated historic streetcars or new replica streetcars should be used.

5.6.2 POTENTIAL OPTIONS

Based on the refinement process, the following four transit circulator options were proposed for further cost-benefit analysis in a subsequent task of this project. More details are provided in the Service Option Evaluation chapter.

1. **Single bus service corridor:** Service would operate in the Audrey Zapp Drive corridor between the HBLR station and the historic CRRNJ Terminal (Primary Corridor) only. Bus, replica trolley (bus), or mini-bus/jitney may be used and should be determined during service planning.

2. **Double corridor bus service:** Service would operate along the Primary and Secondary Corridors (Audrey Zapp Drive and Freedom Way). Bus, replica trolley (bus), or mini-bus/jitney may be used, and the specific vehicle should be determined during service planning.

3. **Single historic/replica streetcar corridor:** This would operate in the Audrey Zapp Drive corridor between the HBLR station and the historic CRRNJ Terminal (Primary Corridor) only. Use of historic or replica streetcar should be determined following a more detailed analysis.

4. **Combination historic/replica streetcar and bus service:** This option entails historic/replica streetcar in the Audrey Zapp Drive corridor between the HBLR station and the historic CRRNJ Terminal (Primary Corridor) and bus service in the Freedom Way corridor between the historic CRRNJ Terminal and the Park Office/South Lawn area (Secondary Corridor).

6 SERVICE OPTION EVALUATION

This chapter evaluates the four options for a Liberty State Park Circulator advanced for further study. It builds on the previous analysis conducted for this study that described potential modes and corridors for service based on analyses of activity centers within the park, ridership on the previous park circulator service, and additional considerations that pertain to operating the service in a park environment.

Initial screening and analysis outlined in the Options for Circulator Service chapter led to the elimination of modes of transit that are inappropriate for the park setting and scale of service being considered. Modes of transit retained for further study, in combination with selected corridors for service, are described in this chapter as the four options selected for cost-benefit analysis.

More detailed information for the four service options is provided including proposed service headways, routes/alignments, bus stop/station locations, and number of vehicles in revenue service. For each service option, projected ridership from the travel demand model was adjusted based on proposed service changes and service features that would affect ridership. All four options were qualitatively assessed for their potential to cause impacts within the park environment in which they would operate and for the related benefits that would be derived from their operation. Capital cost estimates were developed for each service option with a 30 percent contingency for design and construction. Annual operating and maintenance costs are represented in 2013 dollars. The estimated costs associated with each service option were compared to associated benefits and potential impacts.

6.1 LIBERTY STATE PARK SERVICE OPTIONS

The New Jersey TRANSIT #305 route served Liberty State Park from January 2001 until May 2010, when it was cancelled. In June 2010, the Hudson TMA took over the service. It operated free of charge on weekends through Labor Day with a headway of 35 minutes. This service was also operated on weekends in 2011 during the summer months with a headway of 30 minutes. In 2011, the cost to ride was a $1.00 cash fare per passenger paid to the driver for unlimited daily rides. The route served the Liberty State Park HBLR station and destinations throughout the park including the Liberty Science Center, Liberty Landing marina, the historic CRRNJ Terminal and ferry to the national monuments, and the park office.

As discussed in the Options for Circulator Service chapter, two distinct service corridors were identified for the purposes of planning for a potential new circulator service. The “Primary Corridor” extends between the HBLR station and the historic CRRNJ Terminal via Audrey Zapp Drive. It is projected to be the corridor that would experience the highest ridership once a transit service is implemented. The “Secondary Corridor” extends from the CRRNJ Terminal to the Park Office/South Lawn area via Freedom Way and would provide connections to several of Liberty State Park’s additional attractions.

The four service options developed during this study are described below. All service options are assumed to operate every day of the week between April 1 and October 31 and on weekends only November 1 through March 31. During the summer months from June through August, the hours of operation would be from 9:00 AM to 9:00 PM Sunday through Friday and from 9:00 AM to 10:00 PM on Saturdays. During the remainder of the year from September through May, the hours of operation would be 9:00 AM to 7:00 PM. All service options would be designed to meet ADA requirements.

6.1.1 OPTION 1: BUS ON PRIMARY CORRIDOR ONLY

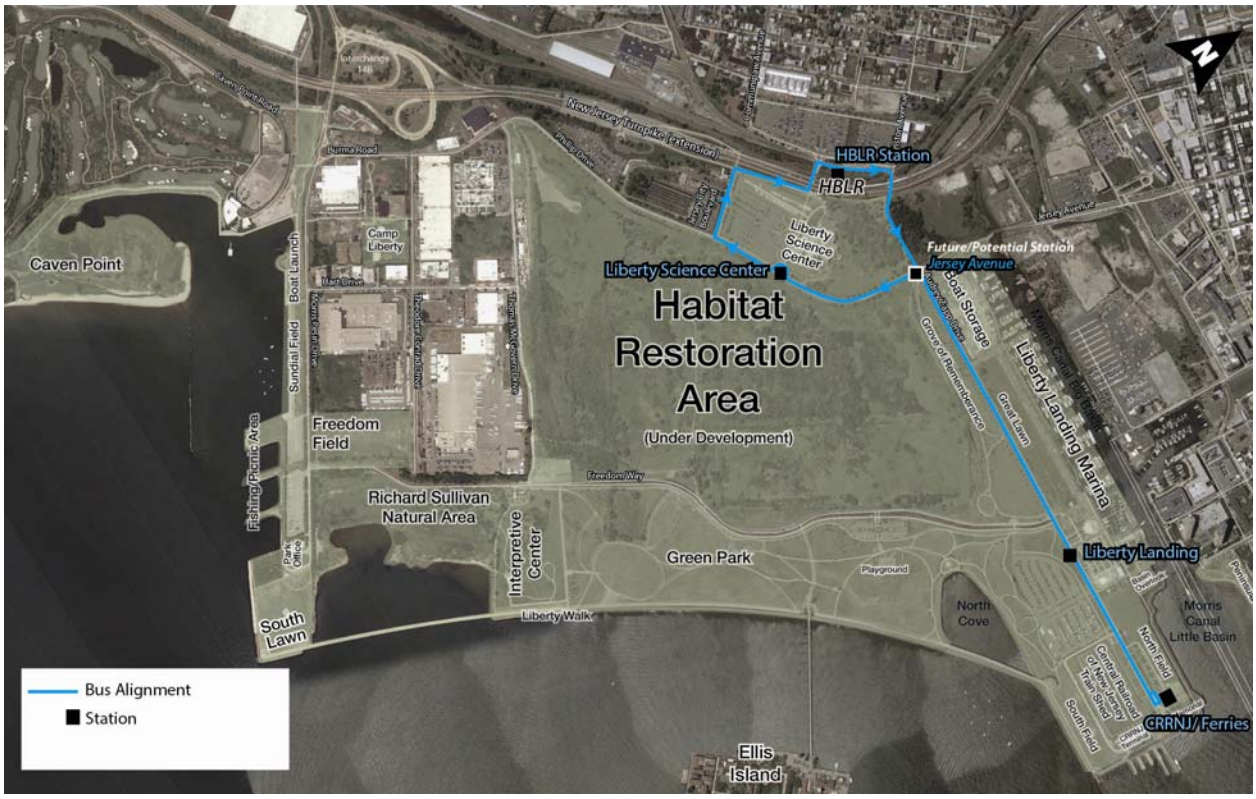
For this option, bus service would be implemented along the Primary Corridor only. Service would operate primarily along Audrey Zapp Drive and serve the Liberty State Park HBLR Station, Liberty Landing Marina, and the CRRNJ Terminal. A future/optional bus stop could be located at the intersection of Phillip Drive/Jersey Avenue and Audrey Zapp Drive, if or when demand from adjacent neighborhoods north of the Jersey Avenue footbridge warrants a stop. Eastbound bus service would begin at the existing NJ TRANSIT #6 bus stop adjacent to the HBLR Station. From there, service would continue along Communipaw Avenue and turn east on Johnston Avenue, which becomes Audrey Zapp Drive in the park. Service would continue east with a stop on Audrey Zapp Drive serving the Liberty Landing Marina, the adjacent restaurants, and Liberty Landing ferry service. Service would terminate at the historic CRRNJ Terminal in the existing bus bay adjacent to the display tracks. Westbound service would begin at the same bus bay at the CRRNJ Terminal and follow the same alignment with the same stops to Jersey Avenue/Phillip Drive where it would make a southbound left turn and continue to a bus stop at the bus turnaround on the east side of the Liberty Science Center on Phillip Drive. Service would then continue southbound on Phillip Drive, westbound on Jersey City Boulevard on the south side of the Liberty Science Center parking lot, northbound on Communipaw Avenue and under the New Jersey Turnpike to terminate at the same northbound NJ TRANSIT #6 bus stop. This option would have a service frequency of 15 minutes during all hours of operation, achievable with one vehicle, and serve the 1.3 mile corridor shown in Figure 6-1. The expected operational speed would be approximately 15 MPH. This operational speed is consistent with observed operating speeds in the park including the stretch of the Audrey Zapp Drive roadway paved with cobblestones. Signs and shelters would be installed at all bus stops. Because of the irregular arrival patterns of northbound and southbound HBLR vehicles, it is not recommended to attempt timed transfers between buses and the HBLR vehicles at the Liberty State Park HBLR Station.

For the purposes of this study, it was assumed that bus service would be contracted to a private company. Vehicles would be owned, operated and maintained by the company, according to terms negotiated as part of the contract and in the event of a breakdown, the contracted service provider would provide a back-up vehicle at no additional cost. Vehicle type may be specified and branded with a vehicle wrap, a plastic coating of the vehicle that would display service branding or a logo. More common vehicle types that could be easily re-used by the company or that may already be part of their fleet would be less expensive than more obscure or custom vehicles. Low or no-emission vehicles are recommended for service in the park.

6.1.2 OPTION 2: BUS ON PRIMARY AND SECONDARY CORRIDORS

Option 2 would expand on Option 1 by extending the bus service approximately 1.9 miles between the CRRNJ Terminal and the Park Office/South Lawn to include the Secondary Corridor (largely along Freedom Way). Bus stops along the Primary Corridor would remain the same with the addition of bus stops at the Playground, Interpretive Center, and the Park Office/South Lawn on the Secondary Corridor. Buses would use the existing vehicle turnaround at the Park Office. This option would provide a service frequency of 15 minutes during all hours of operation along both corridors. This headway is achievable with two vehicles in operation to serve the combined 3.2 mile route along both corridors and an expected operational speed of approximately 15 MPH. This operational speed is consistent with observed operating speeds in the park including the stretch of the Audrey Zapp Drive roadway paved with cobblestones. Both of these vehicles would cover the entire 3.2 mile route in both directions on all runs thus eliminating the need to transfer between buses at the CRRNJ Terminal. The service alignment for Option 2 is shown in Figure 6-2.

Figure 6-1
Service Alignment – Option 1



As with Option 1, it was assumed that bus service would be contracted to a private company. Vehicles would be owned, operated and maintained by the company, according to terms negotiated as part of the contract and in the event of a vehicle breakdown, the contracted operator would provide a back-up at no additional cost. Vehicle type may be specified and branded with a vehicle wrap, a plastic coating of the vehicle that would display service branding or a logo. More common vehicle types that could be easily re-used by the company or that may already be part of their fleet would be less expensive than more obscure or custom vehicles. Low or no-emission vehicles are recommended for service in the park.

Figure 6-2
Service Alignment – Option 2

6.1.3 OPTION 3: STREETCAR ON PRIMARY CORRIDOR ONLY

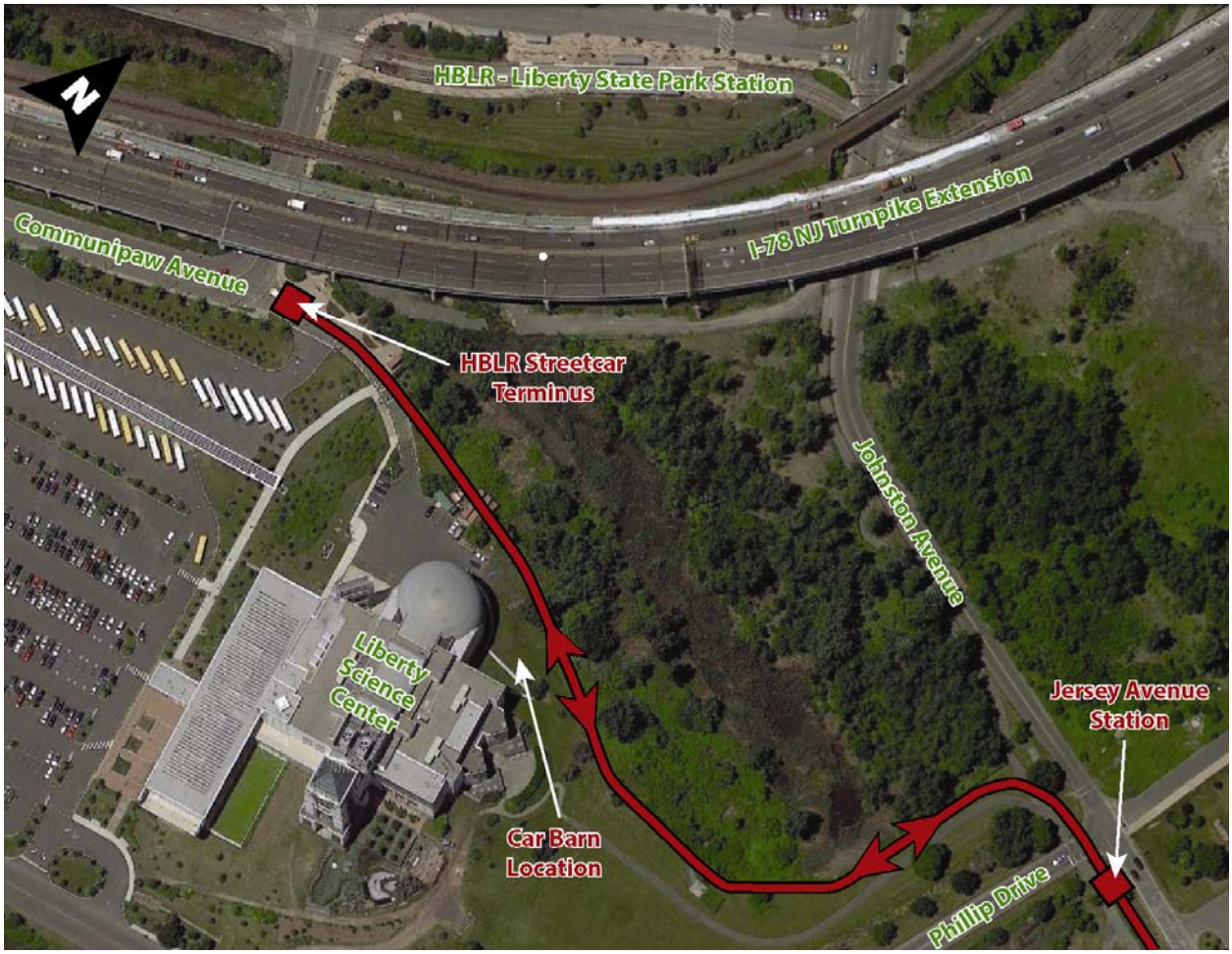
For Option 3, historic or historic replica streetcar service would operate along the Primary Corridor. The western terminus of the alignment would be located adjacent to the New Jersey Turnpike across from the Liberty Science Center (Figure 6-3). In this scheme, the ultimate footprint of this terminus station would not be located on New Jersey Turnpike Authority (NJTA) property or within the easement for the Spectra natural gas pipeline. This terminus location would be a relatively short walk to or from either the Liberty Science Center entrance or the Liberty State Park HBLR station. The portion of the walk between the western terminus station and the HBLR station under the New Jersey Turnpike superstructure along the northern sidewalk of Communipaw Avenue could be beautified to improve the pedestrian experience. However, the cost of implementing these improvements was not included in the overall cost estimate of the streetcar options, since this would be a discretionary expense.

Alternatively, the tracks could be extended further to the west so that the western terminus station could be located under the New Jersey Turnpike superstructure. This location for the western terminus station would provide shelter from the elements for streetcar passengers without the need to construct a separate canopy. It would also be closer to the HBLR station to better serve transfers between the two modes of transportation. However, the NJTA would need to give authorization for the station to be located under their roadway.

Heading east of the western terminus station, the streetcar alignment would be located adjacent to the northern section of the Habitat Restoration Area and behind the Liberty Science Center, as shown in Figure 6-3. There is currently at least 20 feet of horizontal clearance between the Liberty Science Center back–up generator and the boundary of the Habitat Restoration Area. Further to the east, there

is also at least 20 feet of clear space between the radio tower behind the Liberty Science Center and the Habitat Restoration Area, which could accommodate the necessary 12-foot-wide track. A carbarn of approximately 100 feet by 40 feet, including a maintenance pit, would be necessary to store the streetcar when not in operation and to conduct necessary repairs and maintenance. It would be located behind the Liberty Science Center above the visible flood line associated with Hurricane Sandy in late 2012. Streetcar access to the carbarn would be provided with a separate track branching off from the mainline.

Figure 6-3
Western Terminus of Alignment – Option 3



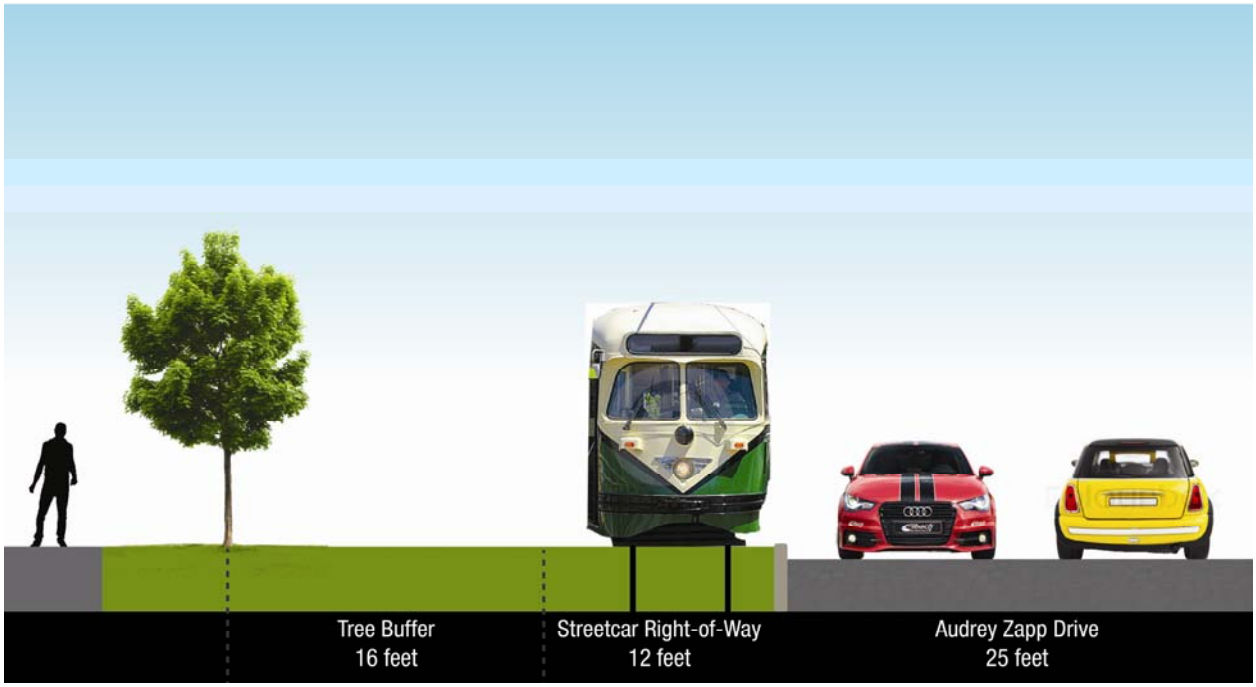
The streetcar alignment would continue between the Habitat Restoration Area and the existing walking path toward the intersection of Phillip Drive/Jersey Avenue and Audrey Zapp Drive. The alignment would then cross this intersection and continue on the south side of Audrey Zapp Drive between the south curbline of the roadway and the adjacent trees. A new signal and other grade crossing treatments are assumed at this location for cost-estimating purposes and the walking path on the west side of this intersection would need to be slightly relocated. On the east side of this intersection, up to four trees may be affected by the streetcar alignment and may need to be relocated. A “Jersey Avenue Station” could be located on the east side of this intersection in the future if warranted due to projected demand from adjacent neighborhoods to the north.

The streetcar alignment to the east of Phillip Drive/Jersey Avenue would be located directly adjacent to south side of Audrey Zapp Drive between Phillip Drive/Jersey Avenue and Freedom Way (Figure 6-4). The measured distance between the south curbline of Audrey Zapp Drive and the walking path to the south is generally a consistent 37 feet. Also, the measured distance between the center of the tree line and the southern curbline of Audrey Zapp Drive is generally a consistent 28 feet. One notable exception is the small cobblestone turnout from Audrey Zapp Drive for people visiting the Grove of Remembrance. This cobblestone may also be of the same historic quality as the remainder of Audrey Zapp Drive. In addition, if the streetcar tracks traversed the turnout, it would make it unusable for general traffic. Therefore, it is proposed that the streetcar alignment be located just south of this turnout. This could affect approximately four trees at this location that may be able to be relocated.

Figure 6-4
Photo of Option 3 Alignment
Audrey Zapp Drive Corridor (Looking East)

The 28-foot-wide swath along Audrey Zapp Drive just south of the travel lanes is expected to be of a sufficient width to allow for a single streetcar track and tree growth over time. Twelve feet would be allotted for the streetcar alignment, including buffer, and the remainder for tree growth clearance. However, if Option 3 is to be implemented, a detailed analysis should take into account the specific tree species and expected canopy development over time. Some tree trimming may be necessary over time to maintain a clear path for the streetcar. A cross section of the Audrey Zapp Drive corridor streetcar alignment is shown in Figure 6-5.

Figure 6-5
Cross Section of Option 3 Alignment
Audrey Zapp Drive Corridor (Looking West)



Further to the east along the alignment, a station would be located in the vicinity of Freedom Way to serve the Liberty Landing Marina and the adjacent restaurants and Liberty Landing Ferry service. The alignment could operate just to the south to avoid the asphalt southbound right turn bay at this location. The streetcar would cross Freedom Way where a new signal and other grade crossing treatments would be needed. Further east, the streetcar would avoid affecting any trees and would cross the main entrance/exit to the ferry parking lot and the secondary exit of the ferry lot just west of the historic train shed behind the CRRNJ Terminal. These crossings could be stop-controlled for vehicles and not require the streetcar to stop. The exact treatment used at these crossings would need to be further evaluated through a signal warrant study if a detailed streetcar alignment study is performed.

The alignment would continue to the east on the existing display tracks adjacent to the historic train shed. An eastern terminus station would be located along the display track to serve the CRRNJ Terminal, 9/11 Memorial, and the Statue Cruises ferry terminal. The train cars currently occupying the display tracks would need to be relocated or the alignment would need to stop short of their location at the east end of the track.

At a minimum, stations would involve a platform for level boarding and ADA accessibility, likely made of poured concrete or similar construction, as well as a shelter and passenger information. Station design could be similar to HBLR stations or could be more basic. Stations would likely be at least 50 feet long and at least 10 feet wide.

Service would be provided with a frequency of 15 minutes during all hours of operation, achievable with a single double-ended vehicle and an operating speed of approximately 15 MPH. The vehicle would be either a historic or historic-replica streetcar with hybrid-electric, hydrogen fuel cell power or would be battery operated with an electric charging station. As a result, no overhead wires or catenary poles would be necessary. For the purpose of this study, it was assumed that vehicles and associated infrastructure would be owned by the operating entity. However, service would be operated and maintained by a private company according to a negotiated contract. A second streetcar vehicle was not assumed to be necessary as a spare. Due to the high cost of buying/refurbishing and maintaining a second vehicle, it was assumed that an on-call relationship could be established with a private bus operator that could dispatch a bus to provide service on the corridor when the streetcar is out of service. An approximate cost for this has been included in the cost estimates for the streetcar options, detailed later in this report. Because of the irregular arrival patterns of northbound and southbound HBLR vehicles, it is not recommended to attempt time transfers between streetcars and the HBLR vehicles at the western terminus station. The alignment for Option 3 is shown in Figure 6-6. Grass tracks could be used along the length of the alignment.

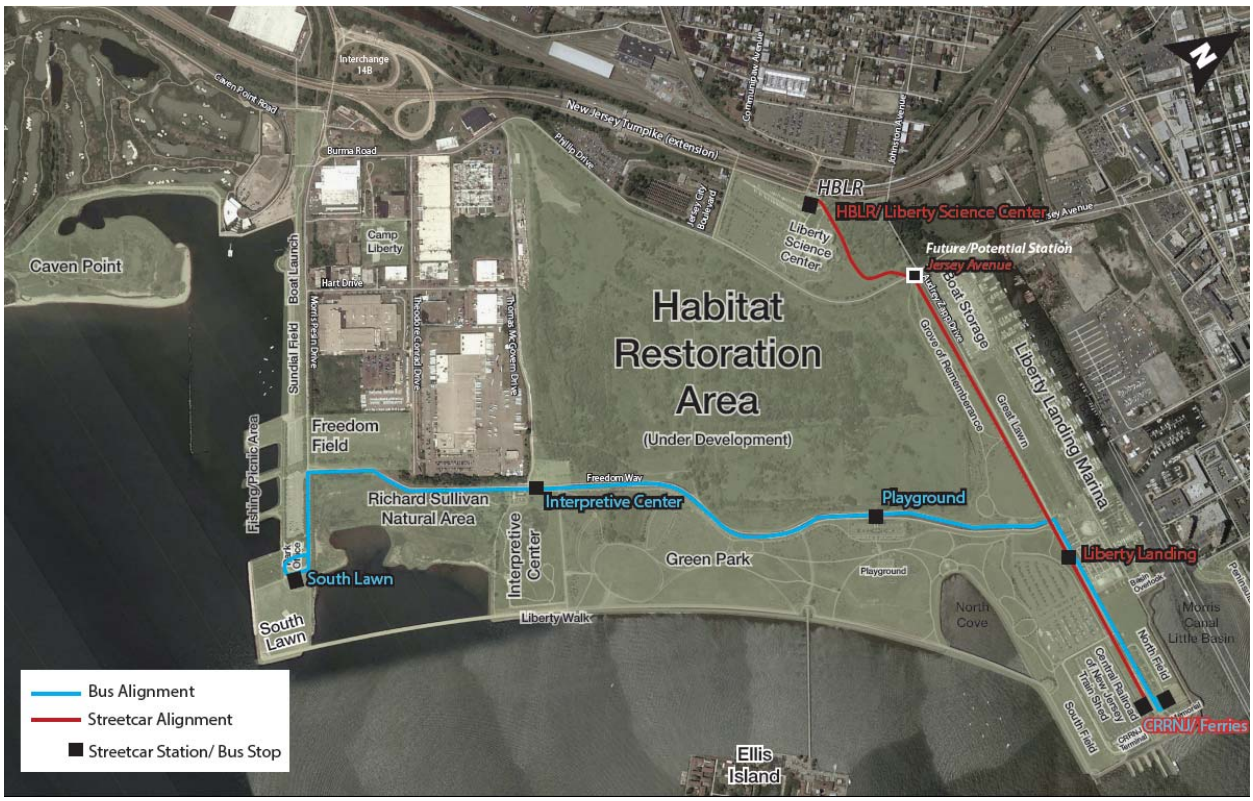
Figure 6-6
Service Alignment – Option 3

6.1.4 OPTION 4: STREETCAR ON PRIMARY AND BUS ON SECONDARY CORRIDOR

The final service option would combine the historic or replica streetcar service on the Primary Corridor described in Option 3 with bus service on the Secondary Corridor described in Option 2. To travel the entire length of the route, a timed transfer would be required at the CRRNJ Terminal between the streetcar and the bus, meaning that the connecting bus service would be held waiting for passengers disembarking from the streetcar service. As the display tracks where the streetcar service would terminate are located parallel to the existing bus bays, approximately 80 feet north, the transfer would be easy and straightforward for passengers. Service would be provided along the Primary Corridor with a frequency of 15 minutes and a frequency of 30 minutes along the Secondary Corridor during all hours of operation. This would be achievable with one streetcar vehicle and one bus vehicle. This means that every other streetcar would be met by a timed transfer for passengers traveling on the Secondary Corridor. All passengers traveling northbound on the Secondary Corridor would always have a streetcar connection while passengers in half of the streetcars wishing to travel southbound on the Secondary Corridor would need to wait 15 minutes for connecting service. Achieving a frequency of 15 minutes on the Secondary Corridor with no wait for any connecting streetcar passengers would require a second vehicle that would essentially double the cost of bus service for this option. If warranted due to high ridership, a second vehicle could be added. Approximate operational speed for both corridors is assumed to be 15 MPH. The alignment for Option 4 is shown in Figure 6-7.

As with the above options, streetcar vehicles and associated infrastructure would be owned by the operating entity but operated and maintained by a private company according to a negotiated contract. For bus service, vehicles would be owned, operated and maintained by the contracted company, according to terms negotiated as part of a contract. It is possible that the same company could operate both the streetcar and bus services. Streetcar vehicles could be double-ended, hybrid-electric, hydrogen fuel cell-powered historic or replica cars. As such, no overhead wires or catenary poles would be needed and grass tracks could be used along the length of the alignment. Buses should be low or no-emission vehicles.

Figure 6-7
Service Alignment – Option 4



6.2 RIDERSHIP ESTIMATES

Ridership projections were developed for each of the four service options using the results of the travel demand modeling conducted for this study, quantitative methods outlined in various Transit Cooperative Research Program (TCRP) reports, and professional engineering judgment. The travel demand model output for the years 2011, 2020, and 2035 were used as baseline ridership. The travel demand model assumed a circulator service similar to the discontinued NJ TRANSIT #305 route and the subsequent Hudson TMA bus service. The transit service that was modeled included daily service from April through December and weekend and holiday service from January through March. Frequency on this service was every 40 minutes with a fare of $1.00. While the Hudson TMA bus route included a service segment between the South Lawn, west through the industrial park, and returning to the HBLR Station, that was not included in any of the four service options advanced for detailed analysis of costs and benefits. Ridership along this segment was extremely low and can therefore be considered negligible. The full methodology of how baseline ridership projections were calculated is detailed in the Future Conditions chapter.

Baseline ridership projections calculated for the 2011, 2020, and 2035 model years are shown in Table 6-1.

Table 6-1
Liberty State Park Circulator Baseline Projected Circulator Ridership

Market	2011		2020		2035	
Local	28,700	48%	50,900	60%	79,900	68%
Ferry Visitor	26,500	44%	28,300	34%	31,800	27%
Liberty Science Center Visitor	4,800	8%	5,100	6%	5,800	5%
Total	**60,000**	**100%**	**84,300**	**100%**	**117,500**	**100%**

Based on historical data provided by the Hudson TMA, 90 percent of the service's projected ridership would occur on the Primary Corridor with the remaining 10 percent occurring on the Secondary Corridor. As such, ridership estimates for service options that only include service along the Primary Corridor began with a baseline of 90 percent of the total ridership in Table 6-1. The additional 10 percent was added back into the total for options that provide service on the Secondary Corridor as well. All of the four options would serve at least the Primary Corridor but with higher service frequency, coordinated schedules, and other premium features and passenger amenities. It was assumed that these improved amenities and service features would attract riders beyond the baseline ridership projections in Table 6-1.

The first and most substantial contributor to projected ridership increases above the baseline projections is the improved service frequency of the circulator options over the previous bus service and resulting reduced average wait times. The discontinued NJ TRANSIT #305 route had a service frequency of 40 minutes, resulting in an average wait time of 20 minutes. Service frequencies of 15 minutes would be provided for Options 1 and 3 on the Primary Corridor and for both corridors with Option 2, resulting in an average wait time of 7.5 minutes. A service frequency of 15 minutes would be provided for Option 4 on the Primary Corridor and 30 minutes on the Secondary Corridor. This would result in average wait times of 7.5 minutes and 15 minutes, respectively.

TCRP Synthesis 66 – Fixed-Route Transit Ridership and Service Planning Methods proposes that a direct relationship exists between average passenger wait times and average service ridership. As detailed in the report, for every minute reduction in average waiting time, ridership is anticipated to increase by 2.5 percent. Following this logic, where average wait times have been reduced from 20 minutes to seven and a half minutes, a 31.3 percent ridership increase could be expected. For the Secondary Corridor in Option 4 where average wait times are reduced from 20 minutes to 15 minutes, a ridership increase of 12.5 percent could be expected.

TCRP Report 118 – Bus Rapid Transit Practitioner's Guide contains a methodology for projecting ridership increases on a route that is upgraded from a standard bus route to a premium bus route. The report posits that the maximum ridership increase that can be obtained by adding priority features to an existing transit route to upgrade it to a premium service is 25 percent. Each premium service element is responsible for a percentage of that maximum 25 percent ridership gain. As an example, implementation of grade-separated busways would provide 20 percent of the maximum ridership gain (20 percent of the maximum 25 percent), which is equal to a 5 percent ridership gain over existing service.

The case can be made that the upgrades, features, and improvements to the service being proposed over what existed previously is comparable to upgrading an existing standard transit route to a premium service. As such, Table 6-2 provides the premium features proposed in each of the four service options, the ridership gain that can be expected from each feature, and the total ridership percentage gained from all proposed features in each service option.

Table 6-2
Estimated Ridership Increases Resulting From Premium Service Features

Premium Service Feature	Option 1	Option 2	Option 3	Option 4	
				Primary Corridor	*Secondary Corridor*
Separated Right-of-Way	--	--	3.75%	3.75%	--
Level Boarding	--	--	1.25%	1.25%	--
Uniquely Designed Vehicles	1.25%	1.25%	1.25%	1.25%	1.25%
Clear Simple Service Plan	1.00%	1.00%	1.00%	1.00%	1.00%
Uniquely Designed Shelters	0.50%	0.50%	0.50%	0.50%	0.50%
Service Branding (Vehicles. Brochures)	2.50%	2.50%	2.50%	2.50%	2.50%
Total Ridership Percentage Gained from Premium Service Features	**5.25%**	**5.25%**	**10.25%**	**10.25%**	**5.25%**

Source: TCRP Report 118

The final factor contributing to projected ridership increases is a novelty factor associated with the streetcar service options. This factor is projected to provide an additional 10 percent increase in service ridership to the streetcar-based service options and is applied on top of the gains from service improvements and added premium features. This factor is applied to account for additional visitors that would either come to the park with the specific intention of riding the historic streetcar service or that would ride the streetcar as an attraction, as part of a visit that would not have otherwise involved transit. Applying a 10 percent increase would equate to approximately 32 riders per day (7,700 riders over 242 service days).

Supporting literature on ridership increases associated with unique transit experiences is limited. This is especially true for finding a comparable scenario in a park setting. Conversations with Ed Tennyson, streetcar expert from the American Public Transit Association, and reports on the conversion of the F Line in San Francisco from a bus route to a historic streetcar line suggest that an increase of 40 percent over bus service has been observed due to the draw of a historic streetcar. In addition, the historic streetcar in Lowell, Massachusetts, which provides access to the Lowell National Historical Park and Streetcar Museum, is a comparable example of visitors attracted to the experience of riding a historic streetcar.

Given this information, a conservative estimate was made regarding the number of people that would be drawn to Liberty State Park solely for the experience of riding a historic streetcar. If the historic train shed is rehabilitated at some point in the future, this number may increase due to the synergy of historic attractions.

Applying all of these factors provides an estimation of increased ridership over the baseline demand as a result of significantly improved service and premium features proposed as part of the four options. Tables 6-3 through 6-6 provide a summary for each of the four service options identifying the base ridership from the travel demand model and the projected total ridership taking into account the improved ridership factors for each of the model years.

Table 6-3
Ridership Projections - Option 1

Option 1: Bus on Primary Corridor Only			
	2011	**2020**	**2035**
Base Ridership	54,000	75,870	105,750
Ridership Increase from Decreased Waiting Times	31.25%	31.25%	31.25%
Ridership from Service Features	5.25%	5.25%	5.25%
Uniquely Designed Vehicles	*1.25%*	*1.25%*	*1.25%*
Clear Simple Service Plan	*1.00%*	*1.00%*	*1.00%*
Uniquely Designed Shelters	*0.50%*	*0.50%*	*0.50%*
Service Branding (Vehicles. Brochures)	*2.50%*	*2.50%*	*2.50%*
Projected Ridership	**73,710**	**103,563**	**144,349**

Table 6-4
Ridership Projections - Option 2

Option 2: Bus Primary and Secondary Corridors			
	2011	**2020**	**2035**
Base Ridership	60,000	84,300	117,500
Ridership Increase from Decreased Waiting Times	31.25%	31.25%	31.25%
Ridership from Service Features	5.25%	5.25%	5.25%
Uniquely Designed Vehicles	*1.25%*	*1.25%*	*1.25%*
Clear Simple Service Plan	*1.00%*	*1.00%*	*1.00%*
Uniquely Designed Shelters	*0.50%*	*0.50%*	*0.50%*
Service Branding (Vehicles. Brochures)	*2.50%*	*2.50%*	*2.50%*
Projected Ridership	**81,900**	**115,070**	**160,388**

Table 6-5
Ridership Projections - Option 3

Option 3: Streetcar on Primary Corridor Only			
	2011	**2020**	**2035**
Base Ridership	54,000	75,870	105,750
Ridership Increase from Decreased Waiting Times	31.25%	31.25%	31.25%
Ridership from Service Features	10.25%	10.25%	10.25%
Separated Right-of-Way	*3.75%*	*3.75%*	*3.75%*
Level Boarding	*1.25%*	*1.25%*	*1.25%*
Uniquely Designed Vehicles	*1.25%*	*1.25%*	*1.25%*
Clear Simple Service Plan	*1.00%*	*1.00%*	*1.00%*
Uniquely Designed Shelters	*0.50%*	*0.50%*	*0.50%*
Service Branding (Vehicles. Brochures)	*2.50%*	*2.50%*	*2.50%*
Streetcar Novelty Factor	10.00%	10.00%	10.00%
Projected Ridership	**84,051**	**118,092**	**164,600**

NOTE: The 10% streetcar novelty factor was applied to estimated ridership on top of the increase from premium service features.

Table 6-6
Ridership Projections - Option 4

Option 4: Streetcar on Primary Corridor, Bus on Secondary Corridor						
	2011		**2020**		**2035**	
Base Ridership	60,000		84,300		117,500	
Corridor Portion	*Primary*	*Secondary*	*Primary*	*Secondary*	*Primary*	*Secondary*
Ridership Increase from Decreased Waiting Times	31.25%	12.50%	31.25%	12.50%	31.25%	12.50%
Ridership from Service Features	10.25%	5.30%	10.25%	5.30%	10.25%	5.30%
Separated Right-of-Way	*3.75%*	--	*3.75%*	--	*3.75%*	--
Level Boarding	*1.25%*	--	*1.25%*	--	*1.25%*	--
Uniquely Designed Vehicles	*1.25%*	*1.30%*	*1.25%*	*1.30%*	*1.25%*	*1.30%*
Clear Simple Service Plan	*1.00%*	*1.00%*	*1.00%*	*1.00%*	*1.00%*	*1.00%*
Uniquely Designed Shelters	*0.50%*	*0.50%*	*0.50%*	*0.50%*	*0.50%*	*0.50%*
Service Branding (Vehicles. Brochures)	*2.50%*	*2.50%*	*2.50%*	*2.50%*	*2.50%*	*2.50%*
Streetcar Novelty Factor	10.00%	--	10.00%	--	10.00%	--
Projected Ridership	**90,991**		**127,842**		**178,191**	

6.3 POTENTIAL IMPACTS AND BENEFITS

All four options were qualitatively assessed to determine if there was potential for causing impacts to the park environment in which they would operate and the related benefits that would be derived from their implementation. The areas considered for potential impacts include air/emissions, noise, wetlands, visual, historic resources, contaminated soil, vegetation/open space, and pedestrians/vehicles. The impact assessment was conducted separately for streetcars and buses as they would affect the park differently. The implementation of transit service in Liberty State Park would provide benefits that uniquely apply to each option.

6.3.1 POTENTIAL IMPACTS

6.3.1.1 AIR/EMISSIONS

Streetcar
Historic or historic-replica streetcars could be hybrid electric hydrogen fuel cell-powered vehicles or battery-operated vehicles with an electric charging station. Therefore, it is not anticipated that the use of this technology for streetcars would produce local emissions in the park or surrounding areas.

Bus
For options that would use bus service, local emissions would largely depend on the vehicle selected. At this point, the vehicle type selected could vary greatly considering the many vehicle types available on the market. An alternative-fuel or electric vehicle is recommended as it would produce little to no emissions compared with a traditional gasoline- or diesel-powered bus.

The streetcar options would produce no local emissions and the bus options would produce little to no emissions, depending on the selected vehicle. However, due to the low number of trips per day compared to existing background vehicle volumes in the vicinity of the park, local air quality is not expected to be appreciably adversely affected by any option.

6.3.1.2 NOISE

Streetcar
Because of the lighter vehicle used (as compared to heavy rail), the lower travel speeds (likely 15 MPH maximum), and a minimal number of grade crossings, the streetcar options would generally produce low levels of track noise and bell chiming. In addition, a battery-powered streetcar would produce very little associated engine noise.

Bus
An alternative-fuel or electric-powered vehicle would result in very low levels of noise. One other source of noise for buses would be travel on the cobblestones along Audrey Zapp Drive. The amount of noise produced would vary depending on the size of the bus used.

On the Primary Corridor, low levels of noise are anticipated for streetcars and buses because of the slow travel speeds proposed during service operation. In addition, the amount of noise emanating from buses would be further minimized if an alternative-fuel or electric vehicle is used.

6.3.1.3 WETLANDS

Streetcar
The streetcar option is not expected to have an impact on the park's wetlands. The potential streetcar alignment is proposed to operate adjacent to but outside the established boundary of the Habitat Restoration Area at the western end of the alignment to the north of the Liberty Science Center.

Bus
Since the bus is proposed to operate along existing streets in the park in all options, there should be no impact on the park's wetlands. Bus shelters may be placed in grassy areas adjacent to the roadway. However, none of the grassy areas adjacent to the roadway are thought to be classified as wetlands.

6.3.1.4 VISUAL

Streetcar
The streetcars would be battery-powered and would not require the use of poles or overhead wires. In addition, grass tracks could be used to minimize the presence of the associated guideway infrastructure including rails, ties, and ballast. The only visual changes would be the vehicles and the stations (potentially with signs and shelters). Stations and vehicles could be branded to be consistent with the overall look and feel of the park setting to minimize visual impacts.

Bus
As was the case with streetcars, the bus stops and vehicles could be branded to be consistent with the overall look and feel of the park setting to minimize visual impacts.

6.3.1.5 HISTORIC RESOURCES

Liberty State Park is built over a historic rail yard, and the CRRNJ Terminal building and associated elements are on the National Register of Historic Places. In addition, the cobblestone lined Audrey Zapp Drive is a contributing element to the historic terminal building. Therefore, any circulator option should be evaluated for potential impacts to historic resources. While not a definitive determination of whether any historic resources could be impacted by a bus or streetcar service, the following evaluation summarizes any known potential impacts identified by Michael Timpanaro (Liberty State Park Historian) in an interview on February 25, 2013.

Streetcar
The streetcar alignment along Zapp Drive would be located largely on existing parkland and would cross two park roadways and two parking lot entrances/exits. The potential station location at the HBLR station would be on park property adjacent to the New Jersey Turnpike Extension. As the streetcar options would not operate within the roadway of Audrey Zapp Drive, no impact to the historic cobblestone is expected and none of the planned crossings would traverse historic cobblestone. The streetcar tracks would largely be located on remediated parkland that is topped with one to two feet of clean fill. If ballast and track installation does not penetrate below the clean fill, no impact to historic resources below or hazardous materials would be expected. One area for further investigation, however, is the cobblestone turnout located on the south side of Audrey Zapp Drive. This may also be historic cobblestone, and the alignment proposed in Option 3 would avoid the cobblestone.

Use of the display tracks adjacent to the historic train shed for the terminus of the streetcar alignment is not expected to be a cause of concern, as these tracks were added later and are not historic. However, display cars are currently stored there and would either need to be moved to the historic train shed or elsewhere, or the streetcar service would need to stop short of their location.

Bus
All bus options under consideration would use existing roadways without modification and bus shelters would be placed in the public right-of-way (as would be the case at the HBLR station) or at bus stops for the previous Hudson TMA bus service with the likely addition of bus shelters on the parkland adjacent to the roadway. Therefore, no impact to historic resources is expected for any of the potential options involving bus service.

6.3.1.6 CONTAMINATED SOIL

Streetcar
A soil cover of one to two feet of clean fill was added to contain contamination caused by the earlier rail yard use as a means to transform the property into parkland. While existing ballast is thought to still be in place beneath the fill, this ballast is likely inadequate for potential streetcar service due to its age and resulting compacted condition. In addition, disturbing any soil below the existing fill may raise potential contamination issues of unknown cost and complexity. As such, it is advisable to add new ballast to the alignment without penetrating below the one to two feet of clean fill. This should avoid any potential issues with contaminated soil.

Bus
As every bus option features an alignment that operates only on existing streets in the park, there is no expected impact to any areas with contaminated soil. The installation of bus stops/shelters would not penetrate below clean fill.

6.3.1.7 VEGETATION/OPEN SPACE

Streetcar
The potential streetcar alignment would operate mostly on grass-covered parkland. The western end of the alignment would traverse the area between the Liberty Science Center and the fence line of the Habitat Restoration Area. Since this area is slightly uneven, some earthwork would be needed to level the track bed. Further east, the alignment would be located on grass parallel to and south of Audrey Zapp Drive between the roadway and a row of widely-spaced trees. Up to eight trees could be affected by the alignment at two locations including the area in the vicinity of the Phillip Drive/Jersey Avenue and Audrey Zapp Drive intersection and adjacent to the cobblestone turnout on Audrey Zapp Drive. These trees are young and may be able to be relocated to accommodate the streetcar alignment. As the alignment could make use of grass tracks, vegetative cover would be largely maintained. While the streetcar alignment would make use of what is currently parkland, no programmed open space would be affected.

Bus
The bus alignment for all relevant options would operate on existing streets in the park. As such, there is no expected effect to the park's vegetation or open space, except for the potential placement of bus stops or shelters on grassy areas adjacent to the roadway.

6.3.1.8 PEDESTRIANS/VEHICLES

Streetcar
Streetcars would not affect other vehicles within the park for the majority of the alignment since it would predominantly operate on an exclusive right-of-way parallel to the Habitat Restoration Area and Audrey Zapp Drive. However, two grade-crossings would be required at Phillip Drive/Jersey Avenue and Freedom Way and another two may be needed at the entrances/exits to the ferry parking lot just west

of the train shed. With a maximum expected frequency of four streetcars per direction per hour, the effect on general traffic is not expected to be significant. Actuated signals could be used at the two street crossings so that cross automobile traffic would not be disrupted when a streetcar is not crossing the roadway. Traffic signal warrant studies would be needed to determine the exact design of the signals at the two intersections with roadways and the need for signals at the two entrances/exits of the ferry lot.

The streetcar options are not expected to have a significant effect on pedestrian facilities in the park. Small portions of the adjacent pedestrian path may need to be relocated or reconfigured. Intersection crossing times at relevant intersections are not expected to be significantly affected. Due to the slow anticipated operating speeds of the streetcars (likely a maximum of 15 MPH), and in accordance with common practice, pedestrians' crossing of the streetcar tracks would not need to be restricted. Since the right-of way is essentially straight in the sections of the park where a streetcar would most likely encounter pedestrians, there should be adequate sight distance to stop in advance of any encroaching pedestrian.

Bus

Traffic congestion is not a typical occurrence on the park's roads. All bus options would add a maximum of only four buses per direction per hour and would not affect the flow of traffic in the park. If bus stops are proposed without a pull-off area and in a travel lane, there could be some temporary delays in traffic flow as buses stop to pick up and drop off passengers. The bus options are not expected to significantly affect the overall pedestrian experience. No pedestrian walkways or paths would need to be relocated as a result of the bus options.

6.3.2 SERVICE BENEFITS

All options offer improved access to destinations in Liberty State Park. Serving both the Primary and Secondary Corridors would provide greater access to park visitors than the options that only service on the Primary Corridor but would cost more money to implement.

6.3.2.1 OPTION 1 (BUS SERVICE ON THE PRIMARY CORRIDOR ONLY)

This option offers the lowest initial start-up cost, because no significant infrastructure is needed as only new bus shelters and wayfinding signage would be installed. As a result, Option 1 could be implemented more quickly than the other three options. All bus options offer flexibility and growth potential, since it would be relatively easy to change the vehicle size based on actual demand. Through coordination with the private operator, bus vehicles could be substituted from their general fleet through negotiation of the contract. Option 1 is expected to capture a large portion of the previous transit ridership since it would serve the Primary Corridor. Additional riders are projected as a result of other service enhancements proposed.

6.3.2.2 OPTION 2 (BUS SERVICE ON BOTH THE PRIMARY CORRIDOR AND SECONDARY CORRIDOR)

While twice as costly as Option 1, this option offers the second lowest cost, because it does not require significant infrastructure. As with Option 1, only new bus shelters and wayfinding signage would be required. It also offers flexibility and room for growth in that vehicle size of the bus would be relatively easy to change depending on the actual demand. Option 2 would serve both the Primary and Secondary Corridors and would be expected to capture most or all of the previous transit ridership. Additional riders are also projected as a result of other service enhancements proposed.

6.3.2.3 OPTION 3 (STREETCAR SERVICE ON THE PRIMARY CORRIDOR)

Since track infrastructure and stations would have to be installed, streetcar service achieves a sense of permanence that is thought to benefit ridership as riders have more confidence (justified or not) that service would be operating as planned when they travel to the park. This option could additionally capture ridership from people interested in the experience of riding a historic streetcar. Infrastructure installation would take more time than simply placing bus shelters within the park. As a result, any streetcar option would take longer to be operational as compared with options that only use buses. However, this option could begin as a bus service while the streetcar infrastructure is constructed. Because the streetcar could be powered by hydrogen fuel cell (hydrogen derived from water would be produced on-site) to supplement its battery charge, this presents an additional opportunity for collaboration with Liberty Science Center on the science of hydrogen fuel cell technology and could potentially be the topic of a Liberty Science Center exhibit. This opportunity can be further explored as plans are developed. Hydrogen fuel cells are in use throughout the United States in cars, buses and light duty vehicles, and a hydrogen fuel cell streetcar is currently operating in Oranjestad, Aruba. Additional study and engineering would be required before implementation of streetcar or any rail service.

6.3.2.4 OPTION 4 (STREETCAR ON THE PRIMARY CORRIDOR AND BUS SERVICE ON THE SECONDARY CORRIDOR)

This option has the benefit of serving both park corridors and the benefit of capturing the additional ridership interested in a historic streetcar. It would achieve the aforementioned sense of permanence on the Primary Corridor, while maintaining vehicle size flexibility to match demand on the Secondary Corridor. This option features 15-minute headways on the Primary Corridor and 30-minute headways on the Secondary Corridor, which would be a small but significant reduction in headways for passengers along the Secondary Corridor and a very substantial reduction in headways for passengers on the Primary Corridor. As with Option 3, Option 4 could begin operating as a bus service while the streetcar infrastructure is implemented. Additional study and engineering would be required before implementation of streetcar or any rail service. Similarly to Option 3, Option 4 presents an opportunity for collaboration with Liberty Science Center on an exhibit featuring hydrogen fuel cell technology.

6.4 CAPITAL AND OPERATING COSTS

The estimated costs associated with each service option were determined based on research of best practices and current services operated throughout the country and the world. Each cost estimate details initial capital costs and annual operating and maintenance costs represented in 2013 dollars. A contingency of 30 percent for design and construction was applied to the initial capital costs for all options.

6.4.1 BUS

Since it is recommended that bus service would be contracted to a private company, vehicles would not need to be purchased. An annual contract for a private entity to operate the service and provide and maintain the vehicle could range from between $425,000 and $475,000 per vehicle in revenue service, including the driver, fuel, insurance, maintenance and back-up vehicles in the event of a breakdown. This price would be negotiated based on a number of factors including daily operating hours, days of operation per year, and length of the route. An average of $450,000 was used for estimating purposes. All costs associated with the operation and maintenance of the buses would be included in the contract cost. Options 1 and 4 would require one bus, while Option 2 would require two buses.

Another capital cost for the bus would be the fabrication and installation of shelters at each bus stop. The unit cost for each shelter is estimated at $15,000. Options 1, 2, and 4 would require three, six, and five shelters, respectively (with one optional additional/future bus stop not included in the cost estimates).

6.4.2 STREETCAR

There are two options for a streetcar vehicle. The vehicle could be newly built as a replica of a historic streetcar or a historic streetcar could be retrofitted. Both vehicle choices would make use of hydrogen fuel-cell and battery-powered propulsion technology. Without a hydrogen fuel cell, the battery-powered streetcar would not be able to operate continuously for up to 13 hours as proposed. A brand new replica historic streetcar would cost approximately $1.4 million. Full restoration and retrofit of a donated historic streetcar would cost approximately $875,000. Options 3 and 4 would each require one vehicle.

According to Liberty Historic Railway, the group is in possession of a number of streetcar items that would be donated to the service, including an original historic streetcar that has not been rehabilitated, sufficient track for the length of the alignment (including heavier rail for grade crossings), and all necessary maintenance equipment. Liberty Historic Railway performed a cursory visual inspection of their used rail inventory and found that nearly all pieces had less than 1/16-inch battered ends and was deemed appropriate for use for trolley service. As a result, the amount of usable rail in their inventory far exceeds what is needed for trolley use within Liberty State Park. However, the rail will need to undergo more sophisticated testing prior to implementation for identifying internal and external flaws. Nondestructive testing methods would be administered as a preventative measure against potential track failure. Liberty Historic Railway would also donate the necessary joint bars, track bolts, tie plates and spikes for track installation. The estimates for the streetcar capital costs assumed that these items would be donated and there would be no additional costs. However, the high estimate for the streetcar capital cost assumed that a replica streetcar would need to be purchased.

Other capital costs associated with the rail mode include the following: track installation, site preparation, a vehicle storage/maintenance facility (carbarn), hydrogen fuel production plant installation, fueling equipment, grade crossings (hardware and pavement markings), and stations. The use of donated track involves an installation fee of approximately $52 per foot, as well as an estimated $122,400 for welding of track pieces. Site preparation would consist of earthwork, ballast/sub-ballast work, relocation of trees, and relocation of the pedestrian path to the west of the Phillip Drive/Jersey Avenue and Audrey Zapp Drive intersection. Construction of a carbarn and maintenance pit could cost an estimated $200,000.

The streetcar would be propelled primarily by electric battery and charged overnight in the carbarn. A fully charged battery would allow streetcar operation for six to eight hours. To allow for a span of service of up to 13 hours, the streetcar could additionally be equipped with a hydrogen fuel-cell generator, which would generate power on-board the vehicle to keep the battery charged as necessary. The on-board fuel-cell generator would need to be refueled each day with hydrogen. As commercial-grade hydrogen fuel is not available locally, a small production plant could be installed for $200,000, which would produce hydrogen from water using electricity. The cost of fueling equipment ranges from $100,000 to $500,000.

Alternatively, an opportunity charger could be located at the HBLR terminus of the streetcar alignment, which would allow for a few minutes of charging during layovers there at the end of each run. However, this has the comparative disadvantage of leaving the battery neither fully charged nor fully drained for most of the day, which has a detrimental effect on battery life.

An additional method of vehicle procurement is to lease a double-ended streetcar from a trolley museum. However, as the leased streetcars may need to be propelled by an off-board diesel generator, which may generate opposition due to air quality and noise concerns. In addition, it is unclear if the service could comply with ADA regulations. Therefore, this option was not considered in any depth.

Grade crossings would additionally be required for the streetcar. A stop-controlled grade crossing is estimated to cost $5,500 and a signal-controlled grade crossing with a new signal could cost approximately $250,000. Two signal-controlled and two stop-controlled grade crossings were assumed for Options 3 and 4.

A simple streetcar station, including fabrication and installation could cost approximately $30,000, while a more complex station could cost approximately $250,000. The lower cost has been assumed for the low-cost estimate and the higher-cost has been assumed for the high-cost estimate. Options 3 and 4 would require the installation of three stations. (A fourth station is optional or may be implemented at some point in the future.)

An operating and maintenance cost of approximately $112 per service hour was determined after researching comparable streetcar systems, including the operator and insurance. Right-of-way maintenance for the streetcar has also been included and would cost an estimated $46 per foot per year. An additional cost for hydrogen fuel production was included in the annual operating and maintenance cost estimate for the options that include the streetcar.

6.4.3 PASSENGER INFORMATION/WAYFINDING

Capital costs for passenger information/wayfinding signage would be incurred for all options. Each sign was estimated to cost $650, including fabrication and installation. A total of 15 signs could be distributed throughout the park regardless of the service option and would cost nearly $10,000.

6.4.4 COST ESTIMATES

Capital and operating cost estimates are provided in Tables 6-7 through 6-10. High and low estimates are provided for streetcar capital cost estimates as it is not known whether some items will be necessary or, in some cases, to account for a range in costs of a particular item. Where applicable, the items included in the high- and low-cost estimates are identified.

Table 6-7
Option 1 (Bus on Primary Corridor) Cost Estimate

Capital Costs	Unit Cost	Units	Total Cost
Bus Shelters[4]	$15,000	3	**$45,000**
Passenger Information/Wayfinding[5]	$650	15	**$9,750**
Estimate			**$54,750**
Contingency - Design and Construction (30 percent)			**$16,425**
Total			**$71,175**
Annual Operating & Maintenance Costs	**Unit Cost**	**Units**	**Total Cost**
Operations & Maintenance per Vehicle[6]	$450,000	1	**$450,000**
Total			**$450,000**

Table 6-8
Option 2 (Bus on Primary and Secondary Corridors) Cost Estimate

Capital Costs	Unit Cost	Units	Total Cost
Bus Shelters[5]	$15,000	6	**$90,000**
Passenger Information/Wayfinding[6]	$650	15	**$9,750**
Estimate			**$99,750**
Contingency - Design and Construction (30 percent)			**$29,925**
Total			**$129,675**
Annual Operating & Maintenance Costs	**Unit Cost**	**Units**	**Total Cost**
Operations & Maintenance per Vehicle[7]	$450,000	2	**$900,000**
Total			**$900,000**

[4] Based on advertised prices and correspondence with New Jersey Transit.
[5] Based on average for various streetscape bids over the past year in New Jersey, plus allowances for installation, lack of economies of scale, and potential design enhancements.
[6] Based on recent bids for shuttle bus service in the New York Metropolitan area.

Table 6-9
Option 3 (Streetcar on Primary Corridor) Cost Estimate

Capital Costs	Unit Cost	Units	Total Cost
Replica Streetcar[7] *- High*	$1,400,000	1	**$1,400,000**
Historic Streetcar (donated) *– Low*	$0	---	**$0**
Retrofit of Historic Car for Battery/Hydrogen Power[8] *– Low*	$875,000	1	**$875,000**
Carbarn, Pit[8]	$200,000	1	**$200,000**
Maintenance Equipment (donated)	$0	---	**$0**
Track (donated)	$0	---	**$0**
Track Installation (per foot, for donated track)[9]	$52	5,340	**$277,680**
Track Welding (for donated track)[10] , per weld point	$450	300	**$135,000**
Earth Work[10]	$25,000	---	**$25,000**
Ballast Work[5], per cubic yard	$36	490	**$17,655**
Sub-ballast Work[5], per cubic yard	$40	100	**$4,044**
Tree Relocation[11]	$2,000	8	**$16,000**
Path Relocation[11]	$50,000	---	**$50,000**
Grade Crossing (with new signal)[6]	$250,000	2	**$500,000**
Grade Crossing (stop-controlled) [6]	$5,500	2	**$11,000**
Quick Connect/Disconnect Charging Station[8] *- Low*	$250,000	1	**$250,000**
Hydrogen Fuel Production Plant[8] *– High*	$200,000	1	**$200,000**
Fueling Equipment/Dispenser (high-end estimate)[8] *- High*	$500,000	1	**$500,000**
Rail Stations[11] *– High*	$250,000	3	**$750,000**
Rail Stations[12] *– Low*	$50,400	3	**$151,200**
Passenger Information/Wayfinding[6]	$650	15	**$9,750**
Estimate (High)			**$4,096,129**
Contingency - Design and Construction (30 percent)			**$1,228,839**
Total (High)			**$5,324,967**
Estimate (Low)			**$2,522,329**
Contingency - Design and Construction (30 percent)			**$756,699**
Total (Low)			**$3,279,027**

[7] Estimate provided through correspondence with TIG/m, LLC.
[8] Based on 2013 advertised prices of pre-fabricated buildings and associated infrastructure.
[9] Estimate provided through quote from Liberty Historic Railway from Track Builders of Mechanicsburg, PA.
[10] Based on 2011 streetscape bids in Newark, NJ.
[11] Based on Newark streetscape bid prices (2010 – 2013) for concrete pads, shelters, ramps, railings, benches and lighting.

Annual Operating & Maintenance Costs	Unit Cost	Units	Total Cost
Operations & Maintenance per Service Hour (Streetcar)[12]	$112	2,880	**$322,560**
Maintenance of ROW (Streetcar, 10% replacement per year), per track foot	$46.437	5,340	**$247,974**
Hydrogen Fuel Production[8], per gallon of gasoline equivalent	$12.50	750	**$9,375**
Replacement Bus Service for Streetcar Breakdowns[7]	$60,000	1	**$60,000**
Total			**$639,909**

Table 6-10
Option 4 (Streetcar on Primary Corridor and Bus on Secondary Corridor)
Cost Estimate

Capital Costs	Unit Cost	Units	Total Cost
Replica Streetcar[8] ***– High***	$1,400,000	1	**$1,400,000**
Historic Streetcar (donated) ***– Low***	$0	---	**$0**
Retrofit of Historic Car for Battery/Hydrogen Power[8] ***– Low***	$875,000	1	**$875,000**
Carbarn, Pit[9]	$200,000	1	**$200,000**
Maintenance Equipment (donated)	$0	---	**$0**
Track (donated)	$0	---	**$0**
Track Installation (per foot, for donated track)[10]	$52	5,340	**$277,680**
Track Welding (for donated track)[10], per weld point	$450	300	**$135,000**
Earth Work[11]	$25,000	---	**$25,000**
Ballast Work[5], per cubic yard	$36	490	**$17,655**
Sub-ballast Work[5], per cubic yard	$40	100	**$4,044**
Tree Relocation[11]	$2,000	8	**$16,000**
Path Relocation[11]	$50,000	---	**$50,000**
Grade Crossing (with new signal) [6]	$250,000	2	**$500,000**
Grade Crossing (stop-controlled) [6]	$5,500	2	**$11,000**
Quick Connect/Disconnect Charging Station[8] ***– Low***	$250,000	1	**$250,000**
Hydrogen Fuel Production Plant[8] ***– High***	$200,000	1	**$200,000**
Fueling Equipment/Dispenser (high-end estimate)[8] ***– High***	$500,000	1	**$500,000**
Bus Shelters[5]	$15,000	5	**$75,000**
Rail Stations[12] ***– High***	$250,000	3	**$750,000**
Rail Stations[12] ***– Low***	$50,400	3	**$151,200**
Passenger Information/Wayfinding[6]	$650	15	**$9,750**
Estimate (High)			**$4,171,129**
Contingency - Design and Construction (30 percent)			**$1,251,339**
Total (High)			**$5,422,467**
Estimate (Low)			**$2,597,329**
Contingency - Design and Construction (30 percent)			**$779,199**
Total (Low)			**$3,376,527**

[12] Based on Lowell historic trolley O&M costs.

Annual Operating & Maintenance Costs	Unit Cost	Units	Total Cost
Operations & Maintenance per Vehicle (Bus)	$450,000	1	**$450,000**
Operations & Maintenance per Service Hour (Streetcar)[13]	$112	2,880	**$322,560**
Maintenance of ROW (Streetcar, 10% replacement per year), per track foot	$46.437	5,340	**$247,974**
Hydrogen Fuel Production[8], per gallon of gasoline equivalent	$12.50	750	**$9,375**
Replacement Bus Service for Streetcar Breakdowns[7]	$60,000	1	**$60,000**
Total			**$1,089,909**

6.4.5 COST COMPARISON

Cost estimates for each service option are summarized and compared in Table 6-11.

Table 6-11
Summary of Cost Estimates (Options 1 through 4)

Service Options	Capital Costs		Annual Operating & Maintenance Costs
	Low	High	
Option 1 – Bus, Primary Corridor	$71,175		$450,000
Option 2 – Bus, Primary and Secondary Corridors	$129,675		$900,000
Option 3 – Streetcar, Primary Corridor	$3,279,027	$5,324,967	$639,909
Option 4 – Streetcar on Primary Corridor, Bus on Secondary Corridor	$3,376,527	$5,422,467	$1,089,909

6.5 EVALUATION MATRIX

The following matrix (Table 6-12) summarizes capital costs, operations and maintenance costs, ridership, and potential impacts and benefits of the four retained options.

Table 6-12
Evaluation Matrix

	Option 1: Bus on Primary Corridor	Option 2: Bus on Primary and Secondary Corridors	Option 3: Streetcar on Primary Corridor	Option 4: Streetcar/Bus Combination
Benefits	• *Small initial capital investment* • *Short implementation timeline* • *Relatively easy service expansion*	• *Small initial capital investment* • *Short implementation timeline* • *Relatively easy service expansion* • *Serves both park corridors*	• *No local emissions* • *Achieves sense of "permanence"* • *Additional ridership from streetcar novelty* • *Hydrogen fuel cell may be basis for Liberty Science Center collaboration*	• *Serves both park corridors* • *Achieves sense of "permanence"* • *Additional ridership from streetcar novelty* • *Hydrogen fuel cell may be the basis for Liberty Science Center collaboration*
Impacts	• *Possible local emissions* • *Possible engine noise*	• *Possible local emissions* • *Possible engine noise*	• *May impact up to 8 trees* • *May involve avoiding contaminated soil* • *2 grade crossings, 2 parking lot crossings*	• *Possible local emissions* • *Possible engine noise* • *May impact up to 8 trees* • *May involve avoiding contaminated soil* • *2 grade crossings, 2 parking lot crossings*
Initial Capital Costs	$71,175	$129,675	$3,279,027 - $5,324,967	$3,376,527- $5,422,467
Annual Operation and Maintenance Costs	$450,000	$900,000	$639,909	$1,089,909
First-Year Ridership Estimate	73,710	81,900	84,051	90,991

7 IMPLEMENTATION

This chapter outlines a strategy for implementing the transit options that have been developed to serve Liberty State Park based on conventional available funding sources as well as creative financing tools. Funding sources that have been used in the past to support previous transit service in the park and potential future funding sources were identified, including federal, state and local agencies, private contributions, and user fees/fares. Due to the current economic climate, traditional transportation funding has become less available and uncertain. As a result, all reasonable potential sources and strategies were investigated.

Since one funding source may not cover all capital and operating costs, funding from different sources could be bundled to meet the financial obligation for implementing transit service for Liberty State Park. In addition, the required funding may not be available to initially implement a full transit option. This would require the phased implementation of a transit option over time as the requisite funding becomes available to cover capital and operating costs.

7.1 FUNDING SOURCES

7.1.1 PAST OPERATING FUNDING

The NJ TRANSIT #305 route served Liberty State Park from January 2001 through May 2010 branded under the WHEELS program. The service was funded by NJ TRANSIT and operated by a private carrier on weekends from January through March and every day from April through December. A $1.00 cash fare per passenger was paid to the driver for unlimited daily rides. Since the farebox recovery for the service was low, the service was heavily subsidized by NJ TRANSIT. In May 2010, the service was cancelled as a cost cutting measure because of operating budget shortfalls at NJ TRANSIT.

In June 2010, the Hudson TMA took over the cancelled #305 service. It operated free of charge using a private carrier on a limited schedule on weekends only between June and Labor Day. This limited service was funded jointly by the Hudson TMA and NJ TRANSIT. The service was also operated by the Hudson TMA using a private carrier on weekends in 2011 during the summer months. In 2011, the cost to ride was a $1.00 cash fare per passenger paid to the driver for unlimited daily rides. The seasonal service was funded by the Hudson TMA, NJ TRANSIT, the Friends of Liberty State Park, and the Liberty Landing Marina.

7.1.2 POTENTIAL FUTURE FUNDING SOURCES

7.1.2.1 FEDERAL

Sarbanes Transit in Parks Program

At the outset of the Liberty State Park Circulator Cost-Benefit Analysis, the Federal Transit Administration's (FTA's) Paul S. Sarbanes Transit in Parks Program (Sarbanes) was a viable funding source for transit options serving Liberty State Park. The program was geared towards National Parks and federal lands and eligible projects included those that served communities and land surrounding these federal lands. The program provided discretionary funding for alternative transportation systems such as shuttle buses and rail connections as a means of improving visitor accessibility and mobility, and enhancing the visitor experience. Conversations with program administrators in the early stages of this study indicated that Liberty State Park circulator options that connect to the National Park Service Monuments at Ellis Island and the Statue of Liberty would be eligible for funding. On July 6, 2012,

President Obama signed into law P.L. 112-141, the Moving Ahead for Progress in the 21st Century Act (MAP-21). Unfortunately, the Sarbanes program was not continued under the new federal transportation initiative and cannot be used as a funding source for the Liberty State Park transit options either for further study or capital expenses.

Result: The program was repealed under MAP-21 and can no longer be used as a potential funding source.

Federal Emergency Management Agency (FEMA)

President Barack Obama has directed FEMA to lead the federal government's effort to provide assistance and support to states affected by Hurricane Sandy, which caused significant damage to Liberty State Park in October 2012. Funding and resources have been made available to support state, local, and tribal communities in affected areas. These funds are provided to agencies and individuals demonstrating a loss due to the storm for recovery and the rebuilding effort.

Result: Since the Liberty State Park circulator was not in operation and subsequently damaged due to the hurricane, this source of funding would not apply.

Congestion Mitigation and Air Quality Improvement (CMAQ) Program

The CMAQ program, jointly administered by Federal Highway Administration (FHWA) and the FTA, was reauthorized under MAP-21 and provides funding to the North Jersey Transportation Planning Authority region of northern and central New Jersey, since the region is in non-attainment or maintenance for ozone, carbon monoxide, and/or particulate matter. According to the FHWA, over $2.2 billion in CMAQ funding will be provided for each year of the MAP-21 authorization in FY 2013 and FY 2014. The new legislation places considerable emphasis on diesel engine retrofits and other efforts that underscore the priority on reducing fine particle pollution (PM 2.5). The general guideline for determining eligibility is whether the project increases capacity and would likely result in an increase in transit ridership and a potential reduction in congestion. This would need to translate into a project's emissions benefits based on the result of a quantified estimate. The amount of air quality benefit will be judged against the total cost of the improvement. The FHWA also stipulates that to be eligible for CMAQ funds, a project must be included in the Metropolitan Planning Organization's (MPO) current Regional Transportation Plan (RTP) and Transportation Improvement Program (TIP) and needs to complete National Environmental Policy Act (NEPA) requirements.

Result: It is estimated that the Liberty State Park circulator options would have a low relative air quality benefit ranking due to the cost of the project and relatively low volume of use on a regional basis when compared to improvement to air quality resulting from commuter services, which have higher ridership. Therefore, it is unlikely that the Liberty State Park circulator would meet the emissions reduction requirements needed to qualify for CMAQ funds.

Federal Transit Administration (FTA) Grant Program

The FTA administers the Section 5309 Capital Investment Grant program, which provides capital funds for major transit investment projects nationwide. Grants are for capital costs associated with new fixed guideway systems, extensions, and bus corridor improvements. Requests must be for under $75 million in New Starts funds and total project costs must be under $250 million. Also known as "New Starts / Small Starts," this program awards grants on a competitive basis for major investments in new and expanded rail, bus rapid transit (BRT), and ferry systems. The program is funded at $1.9 billion dollars for FY 2013 and FY 2014 subject to appropriations by Congress.

The Section 5309 Capital Investment Grants program also includes a project category called "Very Small Starts." According to the program, "These projects are simple, low-risk projects that qualify for a highly simplified project evaluation and rating process by FTA." In order to qualify for the streamlined Very Small Starts evaluation and rating process, a project must be a bus, rail or ferry project and contain certain features outlined in the Very Small Starts Fact Sheet (http://www.fta.dot.gov/documents/Very_Small_Starts_Fact_Sheet.doc). The Liberty State Park transit options were evaluated with these features:

- Transit Stations – **Yes,** all proposed service options would have transit stations.
- Signal Priority/Pre-emption (for Bus/LRT) – **No/Yes,** the proposed bus service options would not have signal priority but streetcar options would have signal priority (at roadway intersections).
- Low Floor / Level Boarding Vehicles – **Yes,** the bus could be equipped as a low-floor vehicle. The stations could be designed to allow level boarding for the streetcar.
- Special Branding of Service – **Yes,** the proposed service options would have specially-developed branding as a marketing tool.
- Frequent Service (10 min peak/15 min off peak) – **No,** the proposed service options would not achieve a headway of less than 15 minutes during any portion of the day.
- Service offered at least 14 hours per day – **No,** the proposed service options would not provide a minimum of 14 hours of service per day.
- Existing corridor ridership exceeding 3,000/day – **No,** the proposed service options are not projected to attain this number of riders per day.
- Less than $50 million total cost – **Yes,** the proposed service options would cost less than this total.
- Less than $3 million per mile (excluding vehicles) – **Yes/No,** the proposed bus service options would cost less than $3 million per mile, while it is estimated that rail options would cost more than $3 million per mile.

Based upon the criteria, the Very Small Starts program is geared towards weekday commuter service that carries high volumes of people at a relatively modest cost. As a result, the criteria do not apply favorably towards a recreationally based transit service like the Liberty State Park circulator.

Result: Based on the prescribed service features, the Liberty State Park circulator would not meet more than half of the criteria needed to qualify for the Very Small Starts program. However, although not a perfect fit, it is advisable to contact the FTA to explore if some monies could be obtained through this funding source due to the potential significance of improving transit access in Liberty State Park and to the national monuments.

National Park Service (NPS)

According to the NPS Transportation Mission, "The National Park Service will preserve and protect resources while providing safe and enjoyable access within the national park system units by using sustainable, appropriate, integrated transportation systems and services." Based on this mission statement, the NPS has identified the following transportation goals to ensure consistency with improvements to transportation systems in the national park system:

- To provide high-quality transportation infrastructure and services;
- To deliver efficient and effective transportation infrastructure projects and services; and

- To serve as a leader and innovator in transportation, as well as in cooperating with local, regional, state, federal, and industry partners.

Funding for transportation projects (including alternative transportation and transit projects) at NPS facilities are allocated annually to the Federal Lands Highway Program using the federal motor vehicle gas tax and certain excise taxes that support the federal Highway Trust Fund. Use of these funds is limited to roads and transportation facilities open to the public and may not be used for routine maintenance activities (i.e. snow plowing, patching, and re-striping). Based on this, the NPS does not fund transportation on its own and is dependent upon allocations from the Federal Lands Highway Program.

Result: There is no funding available directly through the NPS for the Liberty State Park circulator. The NPS could support funding through the Federal Lands Highway Program, since the proposed Liberty State Park circulator would improve connectivity to the national monuments. Also, the NPS staff could be a resource for ideas about how funds might be assembled for the Liberty State Park circulator.

US Department of Energy

Through the Office of Energy Efficiency and Renewable Energy, the US Department of Energy has an alternative-fuel vehicle development program and funding process that allows U.S. companies to produce electric vehicles that are affordable for the average American family. Some programs are tied to private companies, while others are tied to research arms of a university and other entities.

Result: Although the funding is for research and development of alternative-fuel vehicles, transit vehicle technology could be used as a test case for the Liberty State Park circulator that would reduce the cost to operate the service. More information can be found here: http://www1.eere.energy.gov/vehiclesandfuels/financial/solicitations_detail.asp?sol_id=586.

Federal Lands Access Program (FLAP)

The Sarbanes Transit in Parks Program, operating under the auspices of the FTA, was repealed with the adoption of MAP-21. A new program was developed as part of MAP-21 called the Federal Lands Access Program (FLAP). The goal of the FLAP is to improve transportation facilities that provide access to, are adjacent to, or are located within Federal lands. According to the Implementation Guidance found on the FHWA web site, the FLAP "supplements State and local resources for public roads, transit systems, and other transportation facilities, with an emphasis on high-use recreation sites and economic generators." Also according to the Implementation Guidance, "a Programming Decisions Committee (PDC) within each State will make programming decisions and should develop a multi-year program of projects."

The eligibility requirements for funds that will be made available under FLAP are varied including both implementation and study and cover a wide range of uses identified in the Implementation Guidance:

- The eligible uses include transportation planning, research, engineering, preventive maintenance, rehabilitation, restoration, and construction. They also cover the reconstruction of Federal Lands access transportation facilities located on or adjacent to, or that provide access to, Federal land. The Federal Lands access also includes adjacent vehicular parking areas; acquisition of necessary scenic easements and scenic or historic sites; provisions for pedestrians and bicycles; environmental mitigation in or adjacent to Federal land to improve public safety and reduce vehicle-caused wildlife mortality while maintaining habitat connectivity;

construction and reconstruction of roadside rest areas, including sanitary and water facilities; and other appropriate public road facilities, as determined by the Secretary;
- The operation and maintenance of transit facilities (including vehicles); and
- Any transportation project eligible for assistance under title 23 that is within or adjacent to, or that provides access to, Federal land.

The program is designed to provide flexibility for a wide range of transportation projects in the 50 States, the District of Columbia, and Puerto Rico. The eligible funds under this program will be available for the current year plus three additional years. However, FLAP funding is authorized at $250,000,000 annually for each year of MAP-21 and it is distributed to each State, District of Columbia, and Puerto Rico according to a prescribed formula: The majority of FLAP funding totaling 80 percent will be distributed to States that contain at least 1.5 percent of the total public land in the United States. The 12 "preference States," that meet this definition are: Alaska, Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming. The remaining 20 percent of the FLAP funds will be distributed to the other 38 States, District of Columbia, and Puerto Rico. For eastern states like New Jersey that have significantly less public land than most states, their share of the FLAP funding will be relatively small. New Jersey's annual share of FLAP funding will be approximately $200,000. This money would be further subdivided between eligible projects within New Jersey. All FLAP money received in New Jersey would require a 19.86 percent local match.

Within each State, a three-party Programming Decisions Committee (PDC) will be responsible for the rating, ranking, and prioritization of the projects potentially eligible for the receipt of FLAP funds. The PDC must be comprised of the following representatives:

- The Federal Highway Administration (FHWA);
- The State Department of Transportation; and
- An appropriate political subdivision of the State that will be jointly selected by the State DOT and the FHWA

An Eastern Federal Lands website for the program has been established at http://www.efl.fhwa.dot.gov/programs/federal-lands-access.aspx. Specific information provided on the website for each state will be updated as it becomes available. In New Jersey, the PDC is comprised of a State Representative (David Kuhn, Assistant Commissioner, Capital Investments New Jersey Department of Transportation), Local Representative (Frank Scarantino, President, New Jersey County Engineer's Association), and FHWA Representative (David Payne, Access Program Manager). All project proposal applications for FLAP funding in New Jersey will be screened and rated by this PDC. As of spring 2013, all necessary internal and external processes and procedures were in development so that a call for applications in New Jersey could be issued by the fall of 2013. It is anticipated that the application process will be similar to that of the Sarbanes Transit in Parks Program.

Result: Based on the adoption of MAP -21, the FLAP program appears to be the best option to acquire federal funds for further study and implementation of the proposed Liberty State Park circulator.

Unified Planning Work Program (UPWP)

The UPWP is used to schedule the planning and project development to be undertaken for particular initiatives identified in the Regional Transportation Plan (RTP) of the North Jersey Transportation Planning Authority (NJTPA). Projects are selected for inclusion in the Study and Development Program based on a combination of technical evaluations using the Project Prioritization Criteria and consultations with interested parties. Based on the results, a list of prioritized (ranked) projects is

developed by NJTPA and submitted to NJDOT and NJ TRANSIT. This is a step needed so that an initiative could ultimately be ready for implementation as part of the TIP.

Result: Based on the NJTPA project prioritization criteria for transit, it is not likely the Liberty State Park circulator would qualify for the UPWP. However, the UPWP may be a potential funding source for any further federally-required analysis of the rail options.

7.1.2.2 STATE

New Jersey Department of Environmental Protection (NJDEP) Division of Parks and Forestry

In recent years, New Jersey has been cutting the operating budget of the NJDEP Division of Parks and Forestry. As a result, it is more difficult for the agency to maintain the programs and services that are already in place. In terms of the capital budget, the agency uses the corporate business tax to fund its program. However, these funds have been diverted to offset expenses incurred by the agency to fix resources damaged by Hurricane Sandy. Since the agency does not know if they will be reimbursed by FEMA for any of these expenses, new capital expenditures would have a very low priority.

Result: Based on the current economic climate, there does not appear to be an opportunity for the agency to fund new initiatives like the Liberty State Park circulator, either operating or capital expenditures.

7.1.2.3 OTHER

User Fees

Currently, there is no fee collected from visitors when they enter Liberty State Park. However, three of the nine parking lots (Marina lot, Liberty Science Center Lot, and Ferry Lot) are operated by an outside concessionaire that charges a $7.00 daily fee to users. The concessionaire pays a fee to NJDEP to operate in the Park. Visitors are required to pay user fees for certain activities conducted while at Liberty State Park. Group picnicking in the areas at Pavilions A and B require a fee of $175 for New Jersey residents and $225 for non-residents and $125 for New Jersey residents and $175 for non-residents, respectively. Seasonal permits ($170 for New Jersey residents and $220 for non-residents) are required to use the boat launch facilities within the park. The Liberty Landing Marina charges a fee for docking boats for the season. Bicycles can be rented on an hourly and daily basis at the CRRNJ Terminal Building.

Any organized special event for indoor and/or outdoor facilities must be reserved through a Special Use Permit Application that must be completed at least 30 days in advance of the event date. The application also requires a transportation plan and a fee. The cost to travel by ferry between the national monuments (Liberty and Ellis Islands) and Liberty State Park is $24 for adults, $17 for seniors, and $12 for children. For the Liberty Science Center, the cost for daily general admission is $16.75 for adults, $12.50 for seniors, and $12.50 for children.

Result: Currently, park user fees and concession fees go to general revenue and are not dedicated for park use. If permitted by the NJDEP Division of Parks and Forestry, a small transportation fee could be added to the cost of some or all of these user fees or a portion of the concession fees could be used to help pay for the proposed Liberty State Park circulator.

Donation of Materials

The Liberty Historic Railway has pledged to donate a number of streetcar items for the proposed service. These items include an original historic streetcar that has not been rehabilitated, sufficient track for the length of the alignment, and all necessary maintenance equipment.

Result: For the streetcar options, the donation of these items would represent a significant cost savings.

Private Sponsorship/Advertising

Private contributions could be a fruitful means of funding for transportation within Liberty State Park. It could be in the interest of a profitable corporation to donate to a not-for-profit organization to fund transportation initiatives to receive tax benefits. In addition, the sponsoring corporation could be woven into the branding of the transportation service to gain recognition and positive marketing of their organization to Liberty State Park visitors. JeffCo Express buses in Jefferson County, Missouri charges corporate sponsors a term fee to provide their advertisement on the outside of a JeffCo transit vehicle (Figure 7-1). In addition, corporate sponsors can provide their logo and information within the interior of a bus, route maps, newsletters, and website depending on the package that is purchased.

Figure 7-1
JeffCo Express Corporate Sponsorship

Source: http://www.jeffcoexpress.org/sponsorship

On a grander scale, Massachusetts Bay Transportation Authority (MBTA) and Chicago Transit Authority (CTA) are developing plans to sell the naming rights to their rail stations to corporate sponsors.

Result: Corporate sponsorship could be used to raise money needed to support part or all of the proposed Liberty State Park circulator. However, since neither NJDEP nor NPS are allowed to accept corporate sponsorships or donations, a not-for-profit organization would have to spearhead this effort.

Not-For-Profit

Volunteer not-for-profit, 501(c) (3) organizations have the ability to raise money to fund initiatives for the benefit of the general public. An organization of this type could raise some or all of the money needed to implement transit at Liberty State Park. Private money contributed to the Liberty State Park circulator (former NJ TRANSIT #305 route) in the summer of 2011.

Result: Several organizations in the area could participate in a fundraising campaign or donate money to help bring transit service back to Liberty State Park.

7.2 IMPLEMENTATION STRATEGY

It is a reality that traditional transportation funding has become less available and uncertain in today's economic climate. The competition for these limited resources has become extremely competitive. NJ TRANSIT's operating budget has been reduced and the agency faces the challenge of maintaining the services they already operate and are not in a position to add new service. The Sarbanes program would have been a natural avenue to pursue as a potential funding source for the Liberty State Park circulator but was repealed under MAP-21. The Federal Lands Access Program (FLAP) program created under MAP-21 appears to be the best option to acquire federal funds for further study and implementation of the proposed Liberty State Park circulator. Based on the available information, the following steps should be used for developing and implementing a Liberty State Park circulator:

7.2.1.1 LEAD AGENCY

In order to move forward, an agency must take the initiative for overseeing the Liberty State Park circulator. This role is pivotal as the driver for ultimately establishing the service. The lead agency would be responsible for preparing grant applications to secure long-term federal funding and other funding sources (corporate sponsorship, fundraising, etc.) needed for studying, planning, procuring, and implementing the service.

7.2.1.2 TIMEFRAME

Very Short Term - Summer 2013

The rail options have a much higher start-up cost and would require a very robust funding steam. It would also take time and money to further study and design the rail option before it could be built. Conversely, the bus option is "shovel-ready" and much less expensive to implement. Bus service between the HBLR station and the historic CRRNJ Terminal could be implemented without much advanced planning. It is not imperative that shelters be constructed initially to operate the bus service. However, marketing the service through the web sites of the Technical Advisory Committee members, especially NJ TRANSIT and Statue Cruises, would be critical for promoting ridership. A more elaborate marketing campaign with a budget of about $5,000 to $10,000 could include local newspaper ads, flyer distribution to park attendees, ads within the HBLR system, inserts in mailings sent out by Liberty State Park, etc. If a lead agency cannot be immediately identified, perhaps the Hudson TMA could assist with the planning, marketing, and procurement process to hire a private operator, since they have experience with operation of shuttles.

It is recommended that a modest service operate on only nine weekends and two holidays in July, August, and September of 2013. The launch of the service could be synchronized with the reopening of the Statue of Liberty on July 4, 2013. Therefore, the service would operate for 20 days starting on July 4 and ending on September 2 (Labor Day). This service would cost approximately $40,000 for a contractor to operate (based on recent bids for shuttle bus service in the New York Metropolitan area) and some start-up costs. Since there is not enough time to procure federal funding for FY 2013, alternative funding could be pursued. There would also not be enough time to change NJDEP Division of Parks and Forestry policy to use a portion of park user fees to cover all or most of this service. The most likely candidates for procuring funds would be the use of corporate sponsorship to raise the money needed to support the proposed Liberty State Park circulator. Also, a fundraising campaign

targeting private donations could be initiated by local non-profit groups to help bring transit service back to the park.

Short Term – 2014 and 2015

Once a schedule has been established for soliciting eligible projects, the lead agency can submit a formal application for FLAP funding for the operation of bus service or the study of rail options. It is likely that the call for applications will occur by the fall of 2013. However, it is unclear at this point when the call for projects will be made, how long the process will take, and if the Liberty State Park circulator would be selected. Since New Jersey has significantly less public land than most states, their share of the FLAP funding will be relatively small at approximately $200,000 annually for two years. Competition for this funding will most likely be very stiff. It is unlikely that FLAP could by itself fund the capital costs for a rail option that is estimated to be in excess of $3 million. FLAP funding could be a source for further study of Liberty State Park Circulator options. In addition, stakeholders could work with their Congressional delegation on a federal legislative initiative in the federal FY 2015 re-authorization of MAP-21 to add a small discretionary pot for "non-preference" states like New Jersey.

The lead agency could retain the services of a grant consultant to cobble funding from a variety of sources to operate the full bus service option, to study the rail options, and/or to fund start-up and operating funds for the rail option. If a longer-term funding source is available, part of that money should be used to advance the marketing to include branding of the service.

If no FLAP funds can be procured in the short term, the lead agency could re-launch the modest two-month summer bus service to be operated on only weekends and holidays along with the marketing campaign proposed in the Very Short Term plan. Funding for this service could come from the use of corporate sponsorship and a fundraising campaign targeting private donations to continue the bus service. The lead agency could work with NJDOT or NJ TRANSIT to include any further federally-required analysis of the rail options as part of the RTP so that ultimately it could be funded as part of the UPWP.

Long Term – 2016 and Beyond

FLAP funding or other relevant funding sources should be pursued by the lead agency to continue to support limited bus service, operate the full bus service option, study the rail options, and/or fund start-up and operating funds for the rail option. If a rail service option is warranted and funding is secured, the operation of the bus service option should continue in order to meet the purpose and need until implementation of a rail service. If rail funding is never secured, the bus option would serve the purpose and need.

8 PUBLIC INVOLVEMENT

8.1 PROJECT WEBSITE

A project website was developed in both English and Spanish to inform the public of the study. The website (http://www.lsptransitstudy.com) went live in June 2012 and was updated throughout the study. The study-specific website included an overview of the study, key work products, and contact information. The homepage included a section for announcements (Figure 8-1).

Figure 8-1
Project Website Homepage

8.2 TECHNICAL ADVISORY COMMITTEE (TAC)

A TAC comprised of key stakeholders was formed at the outset of the study to guide the study process. The members of the TAC included:

- Central Parking
- Educational Arts Team
- EZ Ride (Meadowlink)
- Friends of Liberty State Park
- Hudson County Division of Engineering
- Hudson County Division of Planning
- Hudson Transportation Management Association (TMA)
- Jersey City Division of City Planning
- Jersey City Division of Engineering
- Jersey City Economic Development Corporation
- Jersey City Mayor's Office
- Liberty Historic Railway
- Liberty National Golf Club
- Liberty Landing Marina
- Liberty Science Center
- Liberty State Park
- NJDEP Division of Parks and Forestry
- NJDOT Bureau of Capital Program Development
- New Jersey Transit
- North Jersey Transportation Planning Authority (NJTPA)
- Pole Position
- Port Authority of New York and New Jersey
- Save Ellis Island
- Statue Cruises
- US National Park Service

The TAC played a pivotal role throughout the course of the study in the following capacities:

- Provided critical data
- Identified previous studies
- Provided input on park operations and specific knowledge on function of park
- Contributed feedback on survey instrument and assisted with survey implementation
- Provided input on options for potential circulator
- Assisted in the development of evaluation criteria
- Reviewed consultant reports and work products
- Assisted with public outreach, including the preparation of public meetings

A total of seven meetings were held with the TAC throughout the study:

- April 4, 2012
- June 19, 2012
- October 16, 2012
- December 13, 2012
- March 12, 2013
- April 11, 2013

- May 22, 2013

The agenda, presentations, and minutes for all seven TAC meetings can be found in Appendix B.

8.3 PUBLIC MEETINGS

Two public meetings were held throughout the course of the study as a means to solicit public input. The meetings were held at Jersey City City Hall - Anna Cucci Memorial Council Chambers, 280 Grove Street, Jersey City, NJ 07302 on:

- January 24, 2013 – The purpose of the first public meeting was to introduce the public to the study and to solicit input of work completed to-date, including the identification of potential corridors and modes for a circulator service.

- May 9, 2013 – The purpose of the second public meeting was to present findings of the study to the public, including the costs and benefits of four, short-listed options for the circulator, potential funding sources, and an implementation strategy.

The meetings were advertised in *The Jersey Journal*. Meeting announcements were posted on the study website, the City of Jersey City website, and websites of TAC agencies and distributed through e-mail blasts to interested parties (mainly respondents of the travel survey who indicated that they would like to receive meeting notices) and the City of Jersey City's social media outlets. Public comment periods followed both public meetings during which written comments could be submitted via e-mail or US mail. The agendas, presentations, public comments, and meeting summaries for both public meetings can be found in Appendix C.

9 CONCLUSIONS AND RECOMMENDATIONS

9.1 CONCLUSIONS

As part of the Liberty State Park Circulator Cost-Benefit Analysis, a Purpose and Need Statement was established that states that the Liberty State Park Circulator would provide a reliable transit service to, from and within the park that provides an alternative to the automobile, adequately serves the current and estimated future transit demand, and provides Jersey City residents without access to a car with a means to visit the park. The travel demand model created for the study determined an increase in park visitation and circulator ridership potential in the coming years. A number of potential modes/vehicles and corridors for service were considered based on an analysis of activity centers within the park, ridership on the previous park circulator service, and other considerations that pertain to operating the service in a park environment. It was important to identify options for a successful circulator service in order to re-establish service in Liberty State Park, which could be expanded if and when necessary. The modes that emerged from the fatal flaw screening and corridors for proposed service were refined into discreet options. The initial screening and analysis led to the selection of four options for further study in the cost-benefit analysis phase of this study:

1. Bus service between the HBLR station and the historic CRRNJ Terminal (Primary Corridor) only

2. Bus service along both the Primary Corridor and Secondary Corridor (Freedom Way)

3. Historic/replica streetcar service between the HBLR station and historic CRRNJ Terminal (Primary Corridor) only

4. Combination historic/replica streetcar and bus: historic/replica streetcar service between the HBLR station and historic CRRNJ Terminal (Primary Corridor) and bus service along Freedom Way (Secondary Corridor).

All four options were qualitatively assessed for potential impacts to the park environment in which they would operate and the related benefits that would be derived from their implementation. All options offer improved access to destinations in Liberty State Park. Serving both the Primary and Secondary Corridors would provide greater access to park visitors than the options that only service on the Primary Corridor but would cost more money to implement. Any of the four feasible options would meet the established Purpose and Need.

Bus service (standard, replica trolley or minibus) for one or both segments has the lowest cost and does not require significant additional infrastructure. This service has a small initial capital investment (approximately $71,000) with a short implementation timeline. This service is scalable and provides relatively easy service expansion as needed. Depending upon the vehicle selected, the emissions and engine noise could vary. Service on the Primary Corridor would initially generate approximately 73,700 annual riders and would cost approximately $450,000 annually to operate.

Rail service should only be considered for the Audrey Zapp Drive corridor serving the segment between the HBLR Station and the CRRNJ Terminal, since it has the highest ridership potential. Conversely, projected ridership for the remainder of the park does not justify rail infrastructure and associated requirements at this time. The rail service would not produce local emissions, it would achieve a sense of "permanence", and the hydrogen fuel-cell technology could be the basis for Liberty Science Center collaboration. Rail service would require two grade crossings and two parking lot crossings, may impact up to eight trees, and may require avoiding contaminated soil when the tracks are installed. Additional study and engineering would be needed before implementation of any of the rail options.

Unlike the bus service, rail service has a very large initial capital investment (ranging from approximately $3 million to over $5 million depending upon the amount of donated equipment that could be used) with a longer implementation timeline. Because of the infrastructure costs, this service would not be easy to expand to other parts of the park. Rail service on the Primary Corridor would initially generate approximately 84,000 annual riders. This would be higher than bus service since additional ridership would be captured from people interested in the experience of riding a historic streetcar. The cost to operate the streetcar on an annual basis would be approximately $640,000.

In the current economic climate, funding for implementation and/or additional study of any of the four options is scarce. The implementation of a circulator will most likely require the efforts of many agencies and funding from multiple sources.

9.2 RECOMMENDATIONS

Based on the conclusions derived from the study, the following action items are recommended:

1. Selection of a Lead Agency – A single agency (or group of agencies) must take ownership of the Liberty State Park circulator to maintain the momentum of the study. The lead agency would be responsible for preparing grant applications to secure long-term federal funding and other funding sources (corporate sponsorship, fundraising, etc.) needed for studying, planning, procuring, and implementing the service. Without the leadership of a lead agency, the effort to establish a transit circulator for Liberty State Park would be fractured and uncoordinated.

2. Very Short Term Implementation (2013) - A modest service could be operated on only nine weekends and two holidays in July, August, and September of 2013 for 20 days starting on July 4 and ending on September 2 (Labor Day). The launch of the service could be synchronized with the reopening of the Statue of Liberty on July 4, 2013. This service would cost approximately $40,000 for a contractor to operate (based on recent bids for shuttle bus service in the New York Metropolitan area) and some start-up costs. Depending on the negotiated operating cost, there could be money within the $40,000 budget for an elaborate marketing campaign (an estimated $5,000 to $10,000) that could include local newspaper ads, flyer distribution to park attendees, ads within the HBLR system, inserts in mailings sent out by Liberty State Park, etc. Short–term funding could come from corporate sponsorship or a fundraising campaign targeting private donations that could be initiated by local non-profit groups to help bring transit service back to the park.

3. Apply for Federal Lands Access Program (FLAP) Funding - This appears to be the best option to acquire federal funds for further study and/or implementation of the proposed Liberty State Park circulator. The lead agency could submit a formal application for FLAP funding once there is a call for applications (most likely by the fall of 2013).

4. Apply for FTA Very Small Starts Funding - Although not a perfect fit, it is advisable for the lead agency to contact the FTA to explore if some monies could be obtained through this funding source.

5. Retain Grant Consultant - The lead agency could retain the services of a grant consultant to cobble funding from a variety of sources to operate the full bus service option, study the rail options, and/or fund start-up and operating funds for the rail option. If a longer term funding source is available, part of that money should be used to advance the marketing to include branding of the service.

6. Short Term Implementation (2014 - 2015) - In terms of FLAP funding, it is unclear at this point exactly how long the process will take and if the Liberty State Park circulator would be selected. New Jersey's share of the FLAP funding at approximately $200,000 per year is relatively small due to allocation formula. Competition within the state to receive this money will most likely be very stiff. It is unlikely that FLAP could by itself fund the capital costs for a rail option that is estimated to be in excess of $3 million. However, FLAP could fund bus service or a study of rail options. If no FLAP funds can be procured in the short term, the lead agency could re-launch the modest two-month summer bus service to be operated on only weekends and holidays along with the marketing campaign proposed in the Very Short Term plan. Funding for this service could come from the use of corporate sponsorship and a fundraising campaign targeting private donations to continue the bus service. The lead agency could work with NJDOT or NJ TRANSIT to include any further federally-required analysis of the rail options as part of the RTP so that ultimately it could be funded as part of the UPWP.

7. Re-authorization of MAP-21 - Stakeholders could work with their Congressional delegation on a federal legislative initiative in the federal FY 2015 re-authorization of MAP-21 to add a small discretionary pot of funding for "non-preference" states like New Jersey.

8. Long Term Implementation (2016 and Beyond) - FLAP funding or other relevant funding sources should be pursued by the lead agency to continue support of limited bus service, operate the full bus service option, study the rail options, and/or fund start-up and operating funds for the rail option. Bus service could operate while rail options are studied and, if warranted, implemented/constructed. If rail funding is never secured, the bus option would serve the purpose and need for a circulator determined by this study.

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