University Transportation Research Center - Region 2

Final Report

Impact Analysis of Recreational Transit Services on Local Community Economic Development, Employment and Spending

Performing Organization: Rutgers Unviersity

October 2014

Sponsor(s):
New Jersey Department of Transportation (NJDOT)
University Transportation Research Center - Region 2

University Transportation Research Center - Region 2

The Region 2 University Transportation Research Center (UTRC) is one of ten original University Transportation Centers established in 1987 by the U.S. Congress. These Centers were established with the recognition that transportation plays a key role in the nation's economy and the quality of life of its citizens. University faculty members provide a critical link in resolving our national and regional transportation problems while training the professionals who address our transportation systems and their customers on a daily basis.

The UTRC was established in order to support research, education and the transfer of technology in the field of transportation. The theme of the Center is "Planning and Managing Regional Transportation Systems in a Changing World." Presently, under the direction of Dr. Camille Kamga, the UTRC represents USDOT Region II, including New York, New Jersey, Puerto Rico and the U.S. Virgin Islands. Functioning as a consortium of twelve major Universities throughout the region, UTRC is located at the CUNY Institute for Transportation Systems at The City College of New York, the lead institution of the consortium. The Center, through its consortium, an Agency-Industry Council and its Director and Staff, supports research, education, and technology transfer under its theme. UTRC's three main goals are:

Research

The research program objectives are (1) to develop a theme based transportation research program that is responsive to the needs of regional transportation organizations and stakeholders, and (2) to conduct that program in cooperation with the partners. The program includes both studies that are identified with research partners of projects targeted to the theme, and targeted, short-term projects. The program develops competitive proposals, which are evaluated to insure the mostresponsive UTRC team conducts the work. The research program is responsive to the UTRC theme: "Planning and Managing Regional Transportation Systems in a Changing World." The complex transportation system of transit and infrastructure, and the rapidly changing environment impacts the nation's largest city and metropolitan area. The New York/New Jersey Metropolitan has over 19 million people, 600,000 businesses and 9 million workers. The Region's intermodal and multimodal systems must serve all customers and stakeholders within the region and globally.Under the current grant, the new research projects and the ongoing research projects concentrate the program efforts on the categories of Transportation Systems Performance and Information Infrastructure to provide needed services to the New Jersey Department of Transportation, New York City Department of Transportation, New York Metropolitan Transportation Council , New York State Department of Transportation, and the New York State Energy and Research Development Authorityand others, all while enhancing the center's theme.

Education and Workforce Development

The modern professional must combine the technical skills of engineering and planning with knowledge of economics, environmental science, management, finance, and law as well as negotiation skills, psychology and sociology. And, she/he must be computer literate, wired to the web, and knowledgeable about advances in information technology. UTRC's education and training efforts provide a multidisciplinary program of course work and experiential learning to train students and provide advanced training or retraining of practitioners to plan and manage regional transportation systems. UTRC must meet the need to educate the undergraduate and graduate student with a foundation of transportation fundamentals that allows for solving complex problems in a world much more dynamic than even a decade ago. Simultaneously, the demand for continuing education is growing – either because of professional license requirements or because the workplace demands it – and provides the opportunity to combine State of Practice education with tailored ways of delivering content.

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FINAL REPORT
October 2014

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In cooperation with
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and
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16. Abstract

Public transit service provided by NJ TRANSIT is used throughout the state of New Jersey by a large number of persons to visit recreational activities. Such activities include beach-related recreation and amusement, sporting events, concerts, and various types of shows and other events. By focusing on three separate transit markets related to recreational activities in New Jersey, this study quantifies the local economic benefits generated by the expenditures of public transit users as well as the environmental and congestion-reduction benefits due to the avoidance of automobile use by the same. The three transit markets considered are: (a) the North Jersey Coast Line (NJCL) summer weekend service to the shore areas of Monmouth and Ocean Counties, (b) transit service to professional hockey games and concerts at the Prudential Center in the City of Newark, and (c) the Express Bus #316 summer weekend service provided by NJ TRANSIT between Philadelphia and the Wildwood/Cape May area in Cape May County.

This research involved a review of literature; interviews with stakeholders; focus groups; and surveys of NJCL riders, hockey spectators, concert goers, and bus riders. The focus groups pertained only to the NJCL, whereas the interviews and surveys pertained to all three markets. While local economic benefits from the transit users' expenditures were estimated for all three transit markets, the environmental and congestion-reduction benefits were estimated for the NJCL service and the transit service to the Prudential Center, but not for the Wildwood/Cape May express bus service because of the modest number of bus riders. The R/ECON™ Input-Output model developed by Rutgers University was used for the estimation of local economic benefits for all three transit markets. The model results showed a significant contribution to the local economies from the transit users' expenditures in all three markets, including the creation of a large number of jobs and the generation of large amounts of earnings, state taxes, and local taxes. Analyses showed a significant contribution of the NJCL and transit services to the Prudential Center in reducing vehicle miles traveled (VMT), greenhouse gas (GHG) emissions, and traffic volumes on regional and local roads.

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EXECUTIVE SUMMARY

Public transit provided by NJ TRANSIT connects many places of New Jersey known for their recreational activities to other parts of the state and places in adjacent states like New York and Pennsylvania. By providing service to New Jersey's recreational communities, the public transit helps to generate local economic benefits such as jobs, earnings, and taxes, and at the same time, generates environmental and congestion-reduction benefits by allowing individuals to avoid using automobiles in places that are already highly congested.

Communities in New Jersey contain diverse types of recreational activities. The Jersey shore areas, extending from Sandy Hook in the north to Cape May in the south, attract visitors from all parts of New Jersey and the surrounding states during the summer months because of beach-related recreational activities. Similar is the case with the state's sports complexes and arenas that attract visitors throughout the year because of professional sporting events, concerts, and other recreational events. Among these complexes, perhaps the most notable is the Prudential Center in downtown Newark, where the New Jersey Devils of the National Hockey League (NHL) play 41 home games each season. Many other recreational events are held there throughout the year, including concerts, family-oriented shows, and college basketball games.

The primary objective of this study was to quantify the economic, environmental, and congestion-reduction benefits from public transit service to communities with extensive recreational activities. The study focuses on three specific transit markets: (a) the North Jersey Coast Line (NJCL) summer weekend service operated by NJ TRANSIT to the Jersey shore, (b) transit services to the Prudential Center for recreational activities, and (c) the Express Bus #316 service operated by NJ TRANSIT between Philadelphia and the Wildwood/Cape May area. The NJCL is a commuter rail line that is extensively used on weekdays by workers from the shore area to commute to New York City and places in northern New Jersey, but is also widely used by visitors from New York City and places in northern New Jersey during the summer weekends to travel to the Jersey shore areas of Monmouth and Ocean Counties for recreational purposes. The Prudential Center is only two blocks away from the Newark Penn Station, which is served by several commuter rail lines and the Newark light rail operated by NJ TRANSIT, the PATH service operated by the Port Authority of New York and New Jersey, and numerous bus routes. The center is also within walking distance of the Newark Broad Street Station, which connects many places of northern New Jersey and Hoboken to the city. Express Bus #316 allows residents of Philadelphia and selected communities in New Jersey to visit the recreational communities of Wildwood and Cape May in Cape May County during the summer months. Although this service is not as extensive as the transit services to the Prudential Center or the NJCL, it was included in the study because it is one of few bus services in the state that specifically cater to recreational visitors.

To estimate the economic, environmental, and congestion-reduction benefits from transit service in the three markets, a number of tasks were undertaken. The tasks

included a literature review, stakeholder interviews, focus groups, surveys, counting of boarding and alighting passengers at stations, and analysis of primary and secondary data. Although stakeholder interviews were conducted to gauge the perceptions of local officials and business leaders about the transit-induced benefits in all three markets, the primary focus was on the stakeholders from the NJCL service area in Monmouth and Ocean Counties. Fewer interviews were conducted with stakeholders from Newark and Wildwood/Cape May area. Two focus groups were conducted involving recreational riders of the NJCL with the twin objectives of gaining in-depth perceptions of the riders and pre-testing the survey instrument. Since the key components of the NJCL and the other two surveys were similar, it was not necessary to conduct focus groups involving transit users in Newark or the Wildwood/Cape May area.

Surveys were conducted in all three markets. For the NJCL service, daylong rider surveys were conducted onboard eastbound (New York bound) trains on two Saturdays, two Sundays, and a Monday morning during the summer of 2013. Although the study specifically focuses on benefits from the NJCL weekend service, the Monday morning survey was necessary to include visitors who spend the weekend in the shore area and return on Monday morning. The Prudential Center surveys were conducted at two New Jersey Devils home games and a concert by music artist PINK in the Fall of 2013. The Express Bus #316 surveys were conducted on two Saturdays and two Sundays during the summer of 2013. Although the most important objective of the surveys in the three markets was to collect information on itemized expenditure of the transit users, the surveys also helped to collect other information, including origin/destination of the riders, satisfaction with transit, reasons for using transit, available travel alternatives, and the riders' demographic and socioeconomic characteristics. The NJCL survey also included questions on satisfaction with express trains and preferred time for such trains.

Daylong counting of boarding and alighting passengers was conducted at 13 NJCL stations between Red Bank and Bay Head on two Saturdays and two Sundays in the summer of 2013. In addition, passengers were counted on a Monday morning at the stations for the sake of consistency with the onboard survey. While the surveys generated the primary data, secondary data were collected for analysis from the New Jersey Turnpike Authority and the City of Newark traffic department. These two sources provided base traffic data for the analysis of congestion-reduction impacts of transit service.

Economic benefits from the spending of transit users in all three markets were estimated by the R/ECON^{TM} input-out model developed by Rutgers University. The model has been widely used in the past for a number of agencies in New Jersey and beyond. The model estimated number of jobs created as well as earnings, business outputs, state taxes, local taxes, and gross domestic product (GDP) generated by the spending of transit users in the three markets.

The surveys showed that the public transit users in all three markets spend a substantial amount of money in the communities with recreational activities and their

expenditures help to create a number of jobs and generate large volumes of earnings and taxes. Table 1 shows the itemized expenditures of transit users in the three markets adjusting for leakage out of the state. The R/ECON™ model used the figures shown in the table as inputs to estimate the economic benefits for local communities.

Table 1 – Expenditure of Transit Users in the Three Markets

Expenditure Category/ Industry Type	NJCL (15 summer weekends)	Prudential Center - Hockey Season (41 hockey games)	Prudential Center - PINK Concert (one event)	Express Bus #316
Hotels and Motels	$3,970,584	$152,457	$7,910	$558,945
Food and Drinking Places	$5,847,861	$5,755,320	$126,090	$252,900
Retail	$1,202,635	$556,722	$21,054	$126,076
Amusement	$1,303,123	$7,047	$13,327	$266,790
Wholesale	$696,767	$372,267	$13,339	$74,857
Transit	$142,004	$400,508	$7,691	$0
Total in NJ	$13,162,974	$7,244,321	$189,411	$1,279,568
Total including out-of-state	$14,749,140	$7,541,592	$201,392	$1,431,015

In Table 1, the expenditure amounts for the NJCL and Express Bus #316 represent the total for all summer weekends, numbering 15 in the year 2013. In contrast, the expenditure amounts for hockey games at the Prudential represent the entire season encompassing 41 home games played by the New Jersey Devils and the expenditure amounts for the PINK concert represent only one event. As evident in Table 1, the NJCL weekend riders spent around $14.8 million in the Jersey shore area during the summer months, hockey spectators who used transit to attend games in the Prudential Center spent around $7.5 million in the Newark area during the hockey season, Express Bus #316 riders spent around $1.4 million in the Wildwood/Cape May areas in the entire summer, and the PINK concert attendees spent a little over $200,000 in the Newark area to attend a single event. Expenditure on food and drinking accounts for a high volume in all three markets, although expenditures on hotels and motels and amusement are also high in the shore areas. A reason for the high expenditure on hotels and motels in the NJCL service area and the Wildwood/Cape May area is that the visitors often spend multiple days at the shore. In contrast, most visiting the Prudential Center for recreational events spend little on hotels and motels because they are typically residents of New York City or New Jersey.

Table 2 – Economic Benefits from Transit Users' Spending in the Three Markets

Benefit	NJCL (All summer weekends)	Hockey Season (41 games)	PINK Concert (One event)	Express Bus #316 (All summer)
Jobs (annualized)	225	135	3	20
Earnings	$9,115,448	$4,734,551	$125,493	$915,475
State Taxes	$1,100,480	$592,083	$16,172	$109,520
Local Taxes	$587,919	$318,964	$8,453	$60,547
Gross Domestic Product	$15,478,042	$8,055,205	$214,118	$1,553,482

The expenditure by the transit users in the three markets generates a substantial amount of economic benefits for the local communities. The number of jobs created as well as the earnings, state taxes, local taxes, and GDP generated by the spending of the transit users in the three markets are shown in Table 2.

As shown in Table 2, the expenditure by the NJCL summer weekend riders help to create a total of 225 jobs in the local communities served. The 225 annualized jobs can be considered equivalent to 700 summer jobs. Like the NJCL riders, the hockey spectators who travel by public transit to the Prudential Center help to generate 135 annualized jobs. Even the Express Bus #316 helps to generate 20 annualized jobs in its service area despite the relatively modest level of service. Although the single concert at the Prudential Center included in this research generated only three annualized jobs, considering that a number of such concerts and other recreational events are held at the Prudential Center throughout the year, transit riders to all those events together are likely to generate far more jobs.

In addition to the creation of jobs, the expenditure by the transit riders in the three markets helps to generate large amounts of earnings and taxes. The expenditure by the NJCL summer weekend riders helps to generate $9.1 million in earnings, whereas the transit-using hockey spectators generate $4.7 million. Even the modest Express Bus #316 helps to generate around 10% of the earnings generated by the NJCL riders. The NJCL summer weekend riders help to generate $1.1 million in sales taxes and almost $600,000 in local taxes. The transit-using hockey spectators visiting the Prudential Center help to generate slightly more than half those amounts. In sum, the transit users in all three markets help to generate substantial amounts of benefits to local communities in terms of jobs, earnings, and taxes.

It is not merely that the transit services considered by this research generate a substantial amount of economic benefits to the local communities, but they do so by generating large proportions of these benefits from the expenditure of out-of-state visitors. For example, the modeling effort for the NJCL clearly showed that more than 81% of the total jobs, earnings, and taxes generated in the shore area are due to the spending of out-of-state visitors. Although similar analysis could not be conducted for the other two markets because of limited data, the distribution of trip origins of the riders to the Prudential Center events and the Bus #316 riders indicated that large proportions of the spending were by out-of-state visitors. For example, the trip origins of 27%, 19%, and 30% transit-using visitors to the Prudential Center for the New York Rangers game, the Detroit Red Wings game, and the PINK concert, respectively, were New York City, whereas 94% of the Bus #316 riders visited the Wildwood/Cape May area from Philadelphia. In the case of the Prudential Center, it can surmised that the out-of-state transit riders help to generate around a quarter of the benefits generated by transit riders, whereas almost all of the benefits from the Bus #316 riders are generated by out-of-state riders.

Additional analysis for the NJCL summer weekend service showed that 20 shore communities together accounted for around 75% of the economic benefits generated by the rider expenditures. Neptune Township and Asbury Park accounted for the most because of their extensive beaches/boardwalks and proximity to rail stations, but communities as far as Brick Township and Toms River Township also benefited substantially.

While the economic benefits from transit services were estimated for all three markets, the environmental and congestion-reduction benefits from transit were not estimated for Express Bus #316 because of modest ridership volumes. Those benefits were not estimated for the PINK concert also because of the difficulties in generalizing the results from a single concert. The environmental benefits, including the avoidance of vehicle miles traveled (VMT), gasoline consumption, and greenhouse gas (GHG) emissions, for the NJCL summer weekend service and transit services to hockey games at the Prudential Center are summarized in Table 3. The figures the table reflect the outcome of two-way travel as they were estimated based on the assumption that the persons who traveled to recreational activities by using public transit used the same mode for their return trip.

Table 3 – Environmental Benefits from the NJCL Summer Weekend Service and Transit Services to the Prudential Center

Measure	NJCL Summer Weekend Service (All Summer Weekends)	Prudential Center Hockey Games Involving NJ Devils (41 games)
Vehicle miles travel (VMT)	6,791,586	2,766,637
Gasoline consumption (gallons)	314,425	128,085
Gasoline consumption (barrels)*	7,486	3,050
Cost of gasoline used**	$1,100,488	$448,298
Crude oil barrels used	16,549	6,741
Cost of crude oil used***	$1,688,131	$687,682
CO_2 emissions (metric tons)	2,794	1,138

* One barrel = 42 gallons
** At $3.50/gallon (http://www.gasbuddy.com/gb_retail_price_chart.aspx)
*** At $102.01/barrel (http://www.bloomberg.com/energy/

According to the estimates in Table 3, if the current NJCL summer weekend riders diverted to automobile, a total of 6.8 million additional VMT would be generated during the summer weekends and if the transit-using hockey spectators visiting the Prudential Center did the same, a total of 2.8 million additional VMT would be generated on the 41 game days combined. Such diversions would necessitate a consumption of large amounts of gasoline, which in turn would generate large amounts of GHG emissions. According to the estimates, diversion of the NJCL summer weekend riders would generate 2,794 metric tons of CO_2, whereas the diversion of the transit riders attending hockey games would generate 1,138 metric tons of CO_2. Although the NJCL and the transit services used by the hockey spectators also generate CO_2, based on past

studies, such emissions are likely to be less than 50% per passenger trip compared to an automobile trip.

Finally, this research showed that the NJCL summer weekend service to the Jersey shore area and the transit services to the Prudential Center also help to contain traffic congestion in critical locations by providing an opportunity to individuals to avoid using an automobile. This is an important contribution of transit because the shore areas served by the NJCL and the areas around the Prudential Center in downtown Newark can be extremely congested at certain times. The regional highways connecting the Jersey shore area to New York City and cities in northern New Jersey, such as the Garden State Parkway (GSP) and US-9, are extremely congested in the summer months due to recreational visitors to the shore area from around the region. Similarly, the regional highways, such as the McCarter Highway, and other roads in downtown Newark experience extreme congestion in the morning and evening peak periods throughout the year because of commuter trips. The traffic generated by hockey spectators using automobiles to attend games adds to the problem because most arrive in the area during the regular evening peak period.

The traffic analysis pertaining to the NJCL riders showed that the daily traffic volumes at certain locations of the GSP (e.g., Exit 105) would increase by as much as 7% if the NJCL weekend service were not available. When one considers only the northbound traffic in the evening period (4 PM – 8 PM), when many recreational visitors return from the shore area to areas up north, traffic volumes on certain exists of the GSP might increase by around 9%. The congestion-reduction impact of the NJCL on regional roads is more significant in the northbound direction in the evening period and more significant in the southbound direction in the morning period.

Similar to the NJCL, the transit services to the Prudential Center also help to contain traffic volumes in nearby areas. Transit users typically constitute a quarter or more of the event attendees at the Prudential Center's 18,500-seat arena. If those individuals used automobiles instead of transit, they would generate a substantial amount of traffic on roads near the arena despite a high carpool rate among event attendees. The analysis in this study showed that hourly traffic volumes on certain major intersections nearby would increase by up to 15% in the period prior to a game if the transit users decided to use automobile. Since those intersections have extremely high base traffic volumes, even a 10-15% increase in volume could cause extensive delays to all road users, including workers returning home from work in downtown Newark.

INTRODUCTION

New Jersey residents and residents from neighboring states use the services provided by NJ TRANSIT for various purposes. While a large proportion of the system's customers use commuter rail, light rail, and buses for commuting purposes, many also take advantage of the system's expanse to participate in recreational activities at beaches, amusement parks, performing arts centers, stadiums, and arenas. The objective of this study is to quantify the local economic benefits as well as the environmental and congestion-reduction benefits from public transit service to recreational activities in New Jersey by focusing on three specific markets served by NJ TRANSIT. These three markets are: (a) the North Jersey Coast Line (NJCL) summer weekend service to shore communities served by the stations between Red Bank and Bay Head, (b) transit services to recreational events at the Prudential Center in downtown Newark, and (c) the Express Bus #316 summer weekend service between Philadelphia and Wildwood/Cape May in Cape May County.

The NJCL serves several communities in Monmouth and Ocean Counties of New Jersey along the Atlantic coast between the Red Bank and Bay Head Stations (see Figure 1). Although people from around the country visit the shore communities served by the NJCL for recreational purposes, the bulk of the visitors come from different parts of the greater New York metropolitan area, including the five boroughs of New York City and parts of northern New Jersey. The NJCL weekend service is popular among New York City residents because they can get a one-seat ride on all trains from New York Penn Station in Manhattan to the Long Branch Station, a few direct trains all the way to the Bay Head Station that use dual-mode engines, and additional trains to the Bay Head Station that require a transfer at the Long Branch Station.

As shown in Figure 1, the segment of the NJCL that serves the shore communities includes 13 stations, including Red Bank and Bay Head. Most trains to Bay Head require a transfer at the Long Branch Station because of change of power from electric to diesel fuel, but a few trains provide direct service by using dual-mode engines.

During the summer quarter (July-September) of 2013, the average weekday ridership of the NJCL was 24,740. During the same time period, the average Saturday ridership was 11,950 and the average Sunday ridership was 10,100. Because of the popularity of the line among persons visiting the Jersey shore for recreational activities, the average weekend ridership on the line is significantly higher in the summer than other seasons. For example, while the average Saturday and Sunday ridership during the summer quarter of 2013 were 48% and 41% of weekday ridership, in the subsequent quarter, Saturday and Sunday ridership were 46% and 33%, respectively. A review of ridership data from the past several years revealed that, relative to average weekday ridership, Sunday ridership increases far more in the summer months than Saturday ridership.

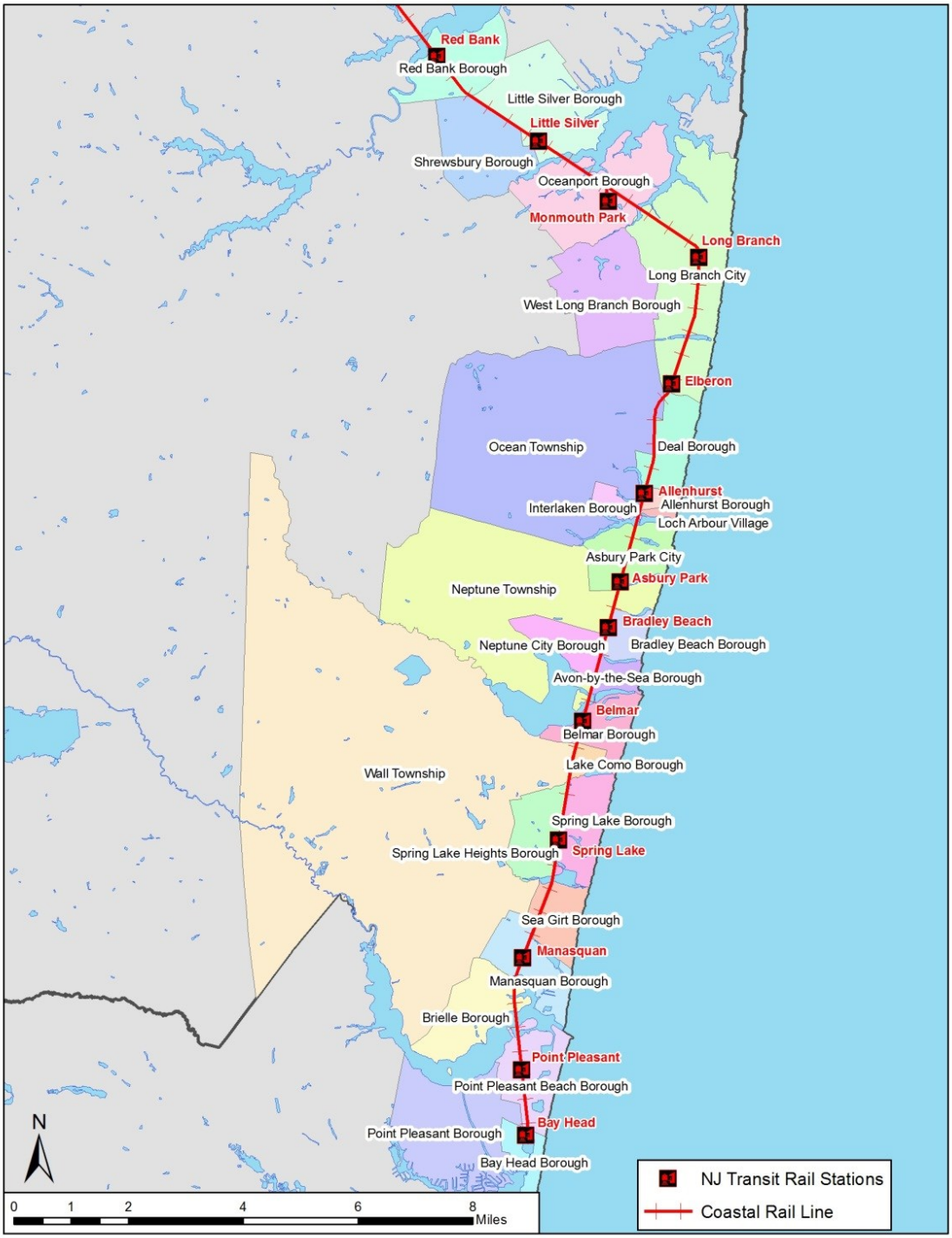

Figure 1 – The North Jersey Coast Line (NJCL) in the Jersey Shore Area

The second transit market this study focuses on is the services to the Prudential Center arena in downtown Newark, where a total of 41 home games are played each season by the New Jersey Devils of the National Hockey League (NHL) and numerous other recreational events are held throughout the year. The 18,500-seat arena was completed in October 2007 at an estimated cost of $375 million, shared between the City of

Newark and the New Jersey Devils of the National Hockey League (NHL), with a 20-year naming-right contribution from the Prudential Financial Incorporated. In addition to the NHL games involving the Devils, the arena hosts NCAA basketball games involving Seton Hall Pirates and various other sporting and cultural events, including concerts and family shows. Several bars/lounges as well as nine concession stands are located in the arena building, in addition to the 350-seat Acela Club restaurant. In addition, the team store for the New Jersey Devils, called the Devil's Den, and other satellite team stores are located inside the Prudential Center.

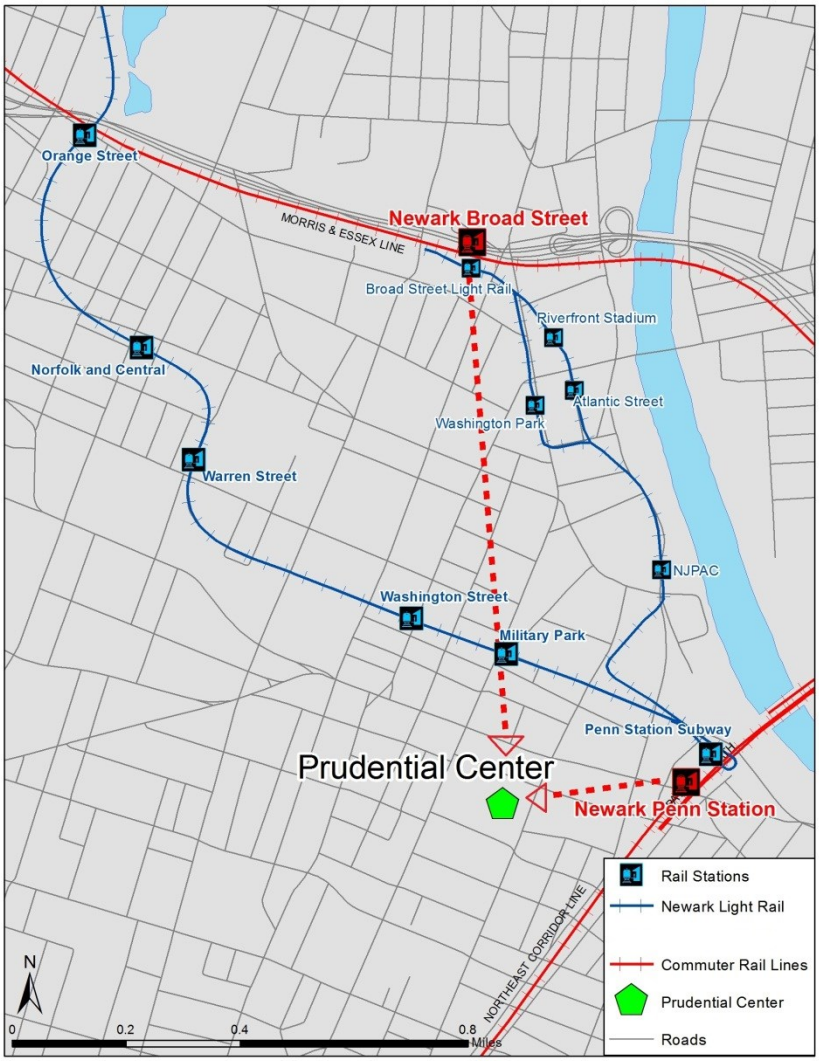

Figure 2 – The Prudential Center and its Surroundings in Newark, New Jersey

The location of the Prudential Center in relation to the surrounding transit system is shown in Figure 2. The Center is easily accessible by multiple public transit modes. Although the arena is surrounded by more than 3,500 parking spaces and connected to New Jersey Turnpike, Interstate-78, Interstate-280, and US-1/9 by Route 21 (McCarter Highway), a large proportion of sports fans and concert goers use public transit to

attend events. The primary reason for the high usage of public transit by the event goers is the close proximity of the arena to Newark Penn Station, a multi-modal transit facility served by NJ TRANSIT trains and buses, PATH trains, Newark light rail, and Amtrak. The station, which directly connects Manhattan and many parts of New Jersey, is only two blocks away from the arena. Furthermore, it takes only about 15-20 minutes to walk to the arena from the Newark Broad Street Station, which is served by a number of commuter trains from northern New Jersey. In contrast to the ease by which one can access the arena by public transit, driving to the arena is difficult due to perpetual congestion on major highways and arterials leading to downtown Newark, including McCarter Highway, Raymond Boulevard, Broad Street, Market Street, and Ferry Street.

The third and final focus of this research is the Philadelphia-Wildwood/Cape May Express Bus #316 service provided by NJ TRANSIT. It predominantly serves people from the Philadelphia area who visit the Wildwood/Cape May area on weekends for recreational purposes. As shown in Figure 3, three NJ TRANSIT bus routes, namely, #313, #315, and #316, serve this travel market. Bus #316 serves both as local and express, the express service operating only during the summer period. The express service includes limited stops between the Philadelphia Greyhound Station and Cape May. The #316 service is supplemented by #510 in the shore area, a bus service that connects Cape May with Wildwood. In August 2013, the average Saturday ridership in the westbound or Philadelphia-bound direction of Express Bus #316 was around 100 and the average Sunday ridership was around 170.

The local economic benefits from the spending of public transit users in all three markets were estimated by using the R/ECON™ Input-Output (I-O) model developed by the Rutgers Economic Advisory Service of Rutgers University. The transit users' expenditure amounts, required as inputs by the R/ECON™ I-O model, were estimated by conducting surveys onboard the NJCL and the Express Bus #316 as well as at the Prudential Center. The NJCL and Express Bus #316 surveys were conducted during the summer of 2013. At the Prudential Center, two surveys involving hockey spectators and one survey involving concert goers were conducted during the Fall of 2013.

The congestion-reduction and environmental benefits from public transit use were estimated only for the NJCL in the shore area and for the transit service to the Prudential Center. Similar estimates were not obtained for the Bus #316 service between Philadelphia and Wildwood/Cape May due to modest ridership volumes. Because of the high base traffic volumes on roads connecting Philadelphia and Cape May and low ridership volume on Bus #316, it was assumed that the service would not have a discernible effect on traffic conditions.

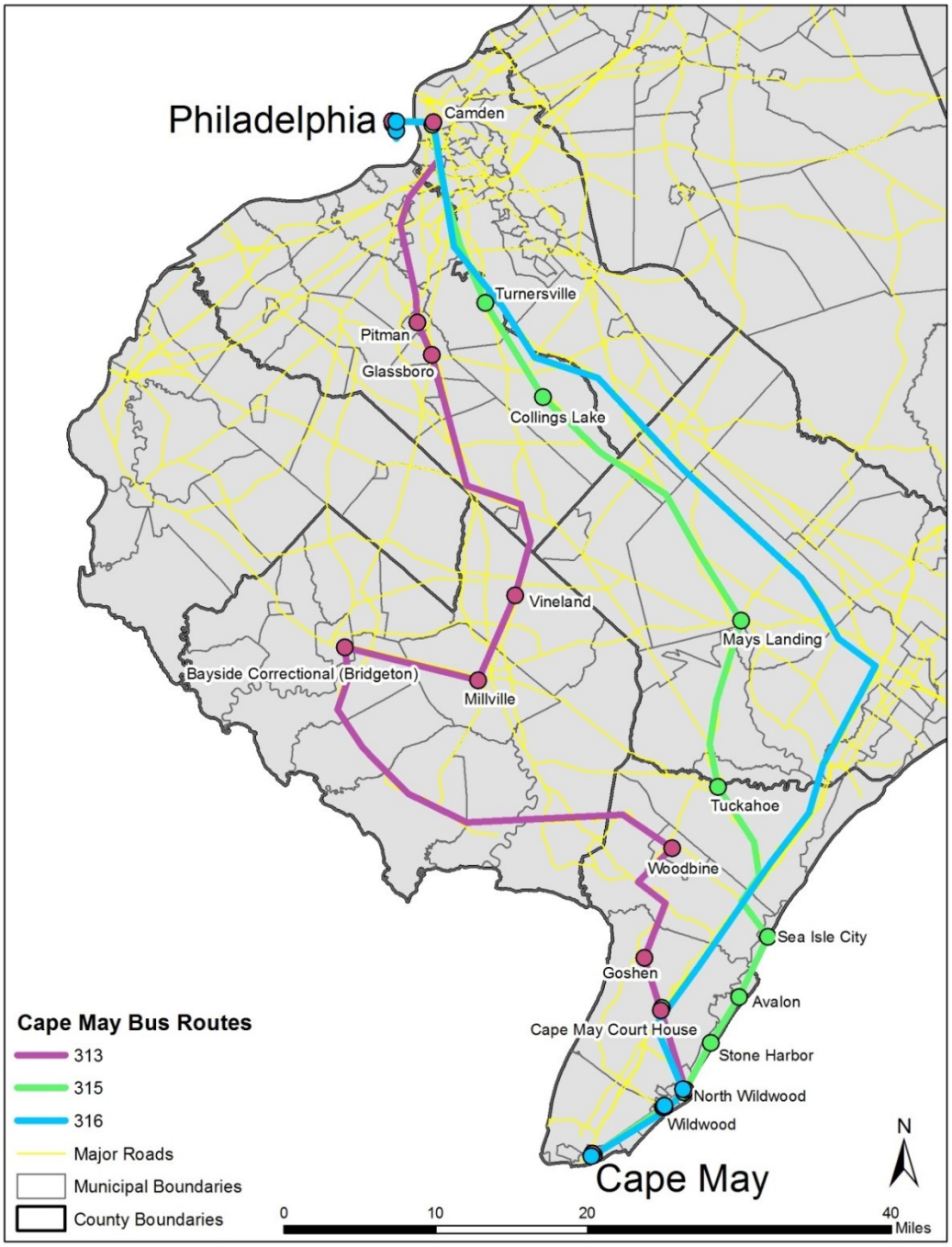

Figure 3 – NJ TRANSIT Bus Route #316 Between Philadelphia and Cape May

While the overall objectives of this research were to estimate the local economic benefits, congestion-reduction benefits, and environmental benefits from public transit use in the three markets by focusing on the users who travel to recreational activities, the specific objectives of this research were to:

- Conduct a review of relevant literature to examine approaches adopted by other researchers, agencies, and practitioners to estimate local economic benefits, congestion-reduction benefits, and environmental benefits from public transit use, with a focus on transit service to recreational destinations.
- Conduct interviews with stakeholders from the three study areas to gain insights of persons involved in promoting recreational activities.
- Conduct focus groups involving NJCL riders to comprehend the utility of the rail service and related issues.
- Conduct onboard surveys of NJCL riders and Bus #316 riders as well as intercept surveys of hockey spectators and concert goers at the Prudential Center to collect a host of information, including itemized expenditures of transit users visiting recreational activities.
- Count boarding and alighting passengers at 13 NJCL stations in the shore area to obtain accurate estimates of riders.
- Analyze station- and stop-specific ridership data for the NJCL and Bus #316 obtained from NJ TRANSIT to convert survey respondents to riders.
- Quantify the local economic benefits, such as the creation of jobs and the generation of earnings, state taxes, and local taxes, from the spending of public transit users who visit recreational activities in the three markets by using the R/ECON^{TM} I-O model.
- Estimate the congestion-reduction benefits, such as reduction of traffic volumes at key locations, and environmental benefits, such as the reduction of vehicle miles traveled (VMT) and greenhouse gas (GHG) emissions from the NJCL service to the shore area and transit services to the Prudential Center.
- Document the local economic benefits, congestion-reduction benefits, and environmental benefits from transit service for the markets studied.
- Generalize the findings to the extent possible and assess how the observed results may affect transit planning, operations, and investment decisions in the future.

LITERATURE REVIEW

The objective of this literature review was to identify studies that are relevant to the current study because of subject matter, data, or methods. Although studies that have specifically focused on the economic, environmental, and congestion-reduction benefits from transit to recreational communities or activities was considered to be the most valuable for this review, studies on related topics, including overall benefits from transit service to communities, economic development in communities due to tourism, and economic development related to sports complexes and sporting events were also reviewed. Identifying appropriate methods for the quantification of transit's contributions to recreational communities was highly important for this review. Since this research addresses two types of recreational activities – those pertaining to activities in shore communities and those pertaining to an arena, studies that connect public transit to any of these two types of recreational activities were considered to be highly relevant.

The remainder of this chapter has been divided into five sections. The first section includes a review of studies that directly addresses transit's contributions to recreational communities. The second section includes a review of studies that do not directly address transit's contribution to recreational communities but nevertheless acknowledge the importance of transit for such communities. The third section includes a review of economic benefits from transit in general. The fourth section includes a review of studies on transit access and its impact on sporting events/arenas, whereas the final section includes a review of studies on the methods for estimating economic benefits from tourism/recreation and sporting events.

Studies on Transit Service to Communities with Recreational Activities

One of the most relevant studies for the current research was conducted by Marchwinski (*1*). The study is particularly relevant for this research because it also estimated the economic benefits from the spending of NJCL riders in the shore communities of New Jersey. In addition to the NJCL, the study estimated the economic benefits from the spending of riders of the Morris and Essex Line (M&E) and the Atlantic City Rail Line (ACRL). The study, published in 1998, is based on surveys conducted in the mid-1990s. The M&E and the ACRL surveys were conducted on weekdays, whereas the NJCL surveys were conducted on summer weekends. The NJCL surveys of the study were conducted on Saturdays and Sundays between 3 PM and 8 PM on trains traveling from the shore communities in the direction of Newark and New York. The study found that about 67% of the recreational visitors using the NJCL came from New York State (mostly NY City), whereas most of the remaining visitors came from Hudson and Essex Counties of New Jersey.

By using employment multiplier data from the NJ Division of Travel and Tourism, Marchwinski's study estimated that the expenditures of recreational visitors using the NJCL summer weekend service helped to create 125 direct and 60 indirect jobs. The study further estimated that $920,000 in state tax revenue and $390,000 in local tax revenue were generated by the spending of the riders. Finally, based on the proportion

of survey respondents who mentioned that they would not visit the shore communities in the absence of the NJCL weekend service, the study determined that there would be a decrease of 15,500 visitors to the shore communities each summer and this decrease in visitors would lead to a decrease of $2.18 million in visitor spending if the service did not exist.

The study by Marchwinski is highly relevant to the current study for several reasons. First, it provided a benchmark for number of visitors to the shore communities using the NJCL and their spending in the shore communities. Second, it provided estimates of jobs created and tax revenues generated from the spending of the NJCL riders. Third, it described the surveys conducted, including the direction of the trains surveyed and the time periods when the surveys were conducted. Fourth, it provided an indication of the response rate for the rider survey. Finally, it described the method used to estimate the jobs and tax revenues generated from the spending of the recreational visitors.

Another study, by Heatwole and West (*2*), also explored public transit service to recreational activities in shore areas by focusing on beaches in Coney Island, Orchard Beach, and Jacob Riis Park. However, instead of estimating benefits from spending by transit users, the study examined factors associated with mode choice of travelers visiting recreational activities.

Two studies, by Kelly and Williams (*3*) and Kelly, Haider, and Williams (*4*), noted the importance of public transit for communities dependent on tourism, but they focused environmental benefits rather than economic benefits. These studies emphasized that public transit can promote tourism by allowing visitors to travel to recreational areas, and at the same time, also help to prevent the negative environmental impacts (e.g., greenhouse gas emissions) that would be generated if the travelers drove to those communities. Some other studies (*5,6*) also examined the actual and perceived impacts of public transit on recreational communities without actually estimating economic benefits from the spending of visitors.

A recent study by Becker and George (*7*) explored the potential for tourism development in the context of rapid rail transit. The study, conducted for the US Gulf Coast region, provided a highly favorable view of rapid rail transit for tourism development. Another study, by Albalate and Bel (*8*), highlighted the importance of public transit and expounded on the relationship between tourism growth and public transit in a European context.

Studies on the Economic Benefits from Transit Service

While the studies mentioned in the previous section dealt with public transit service in the specific context of tourism or recreational communities, many other studies have alluded to economic development benefits from transit in a more general context. A number of reports by the Transit Cooperative Research Program (TCRP) touches upon the economic benefits from transit, some specifically mentioning transit's role in promoting recreational activities and tourism. TCRP Report 20 (*9*) and TCRP Report 35

(*10*) maintain that public transit generates economic benefits to communities by improving access to businesses, increasing demand for regional goods and services, and by promoting tourism. TCRP Report 78 (*11*) highly emphasizes the role of public transit for tourism development. It notes that transit's contribution to tourism development is special because tourism serves like an export industry by bringing in revenues from other regions.

In addition to the TCRP reports mentioned above, several other studies noted the economic benefits from public transportation. For example, a study by Sanchez (*12*) found a positive association between transit level of service and labor force participation in two metropolitan areas of the US. Johnson (*13*) argued that public transit contributes to local economies by providing access to employment as well as recreational activities. Although Weisbrod and Reno (*14*) did not specifically focus on tourism or recreational activities, they identified a number of economic benefits from transit in a broader context. Like some of the TCRP reports, Litman (*15*) emphasized the contributions of public transit to recreational activities. Overall, a number of studies highlighted transit's economic development impacts in the general context of transportation, while other studies specifically highlighted the importance of transit for tourism development or access to recreational activities. However, studies that measured the economic benefits accruing from transit service have been rare.

Studies on Transit's Role in Providing Assess to Sporting Arenas/Events

Because of the component of this study dealing with public transit to hockey games and concerts at the Prudential Center, literature was searched on public transit to sports arenas and recreational facilities. The search revealed that studies that directly focus on contributions of public transit to arenas, sporting events, and other special events like concerts are extremely rare. However, a few studies mention public transit in the context of developing sport arenas and sporting events. For example, Cebula et al.(*16*) examined how professional sports franchises in the US benefited from mass transit. The study concluded that professional football franchises benefited more from mass transit than baseball and basketball franchises. Other studies (*17,18*) focused on the design aspects of mass transit in the context of service to sporting events, but did not consider any type of benefits from transit service to the events.

Although studies that directly associate transit service or transit users' expenditures at sporting events to the benefits of local communities are rare, a number of studies have concluded that sporting events can be beneficial to local communities (*19,20,21*). Since most sporting complexes in American cities are connected by public transit, it can be inferred that such service generates at least some amount of economic development benefits to the communities where the complexes are located. However, efforts to measure those benefits are difficult to find.

In the context of sports complexes and special events, literature was also reviewed on carpooling. It was necessary to identify studies on carpooling because of this study's objective to estimate how many vehicle trips would be generated if existing public transit

services did not exist. Two studies, by Henao and Marshall (*22*) and Kuppam et al. (*23*) were found to be highly relevant. The first study found that carpooling rate varied by type of sporting complex/event in Denver, Colorado. It found that the carpool rate for spectators attending home games of the NHL hockey team Colorado Avalanche was 2.2 persons per vehicle. The second study, for the Phoenix area, did not provide a rate for hockey games, but from the data provided for different types of recreational events, the rate for all types of events combined can be estimated to be around 2.5 persons per vehicle.

Studies on Methods to Estimate Economic Benefits

Researchers have used a number of methods for estimating benefits from transportation projects. Two studies were identified that estimated economic benefits from transportation service or projects. For estimating economic benefits from public transit service to the shore communities of New Jersey, Marchwinski (*1*) used a method utilizing data from the NJ Division of Travel and Tourism. Lynch (*24*) used Regional Input-Output Modeling System (RIMS), the Minnesota IMPLAN Input-Output model, and the integrated input-output-econometric model known as REMI to estimate economic benefits from transportation projects.

The review of literature on methods to quantify benefits from sports events and tourism shows an overwhelming popularity of the Input-Output (I-O) model developed by Leontief (*25*). For example, Daniels, Norman, and Henry (*26*) used an extension of the I-O model to estimate economic benefits from a road race event. The authors estimated and distributed county-level economic impacts of the event by using aggregated occupational and wage data. In another study, Daniels (*27*) used a similar model for the estimation of benefits from a softball tournament. Both studies provided detailed discussions on the merits of different types of models for the estimation of economic impacts of tourism and sporting events.

In the context of tourism also, the I-O model has often been used by researchers. For example, Andrew (*28*) used this approach to estimate economic development benefits from tourism in Cornwall, UK; Frechtling and Horváth (*29*) used it for estimating benefits from tourist expenditure in Washington, DC; West and Gamage (*30*) used a variation of the model to estimate benefits from tourism in Victoria, Australia; Zhou et al. (*31*) used it to estimate benefits from tourism in Hawaii; and Akkemik (*32*) used it for estimating economic benefits from tourism for Turkey. Another study that is highly relevant to the current study was conducted by Frechtling (*33*), who provided several guidelines for collecting and analyzing data from tourists and visitors. The review of methods to quantify benefits from tourism and sporting events indicates that all studies recognize that the benefits from such activities can be direct and indirect. The studies recognize that the benefits may spread to other industries through a multiplier effect. Finally, two studies by Lahr (*34*) and Stevens, Treyz, and Lahr (*35*) are highly relevant to this study because they provide detailed description of the R/ECON^{TM} model used in this study to estimate local economic benefits from the spending of public transit users.

Conclusions

The literature review showed that very little has been written to directly address the main subject matter of this research, namely, the quantification of economic benefits from public transit to communities that are recreational in nature or communities that contain sports/recreational facilities like arenas and stadiums. However, a number of studies have been published that relate to the subject matter indirectly. For example, several studies have argued about the benefits from transit to tourism-oriented communities. Other studies have mentioned transit's role in providing access to sporting events/stadiums. Unfortunately, many of these were alluding to, rather than measuring or quantifying the benefits from transit to recreational communities.

The literature review showed that the most methodological studies have acknowledged that economic impacts from transportation projects of sporting events could be both direct and indirect. Most of these studies have used sophisticated methods to quantify the benefits. The literature review showed that the Input-Output approach to measuring economic benefits has been the most popular to estimate economic benefits from tourism, sporting events, and other recreational activities.

BENEFITS FROM THE NORTH JERSEY COAST LINE

The NJCL and the Study Area

The NJCL runs approximately 70 miles from New York's Penn Station through Hudson County, Essex County, Union County, Middlesex County, Monmouth County, and Ocean County of New Jersey to the Bay Head Station, located in Ocean County. Between New York and the Long Branch Station, trains operate with electric engines, whereas trains between Long Branch and Bay Head run on diesel fuel. As of the summer of 2014, 33 trains operate from New York to Long Branch and 20 trains operate from New York to Bay Head on weekdays. Of the 20 trains operating to Bay Head, all but five require transfers at the Long Branch Station. The trains that do not require transfers use dual-mode engines. In the reverse direction, 34 trains operate from Long Brach to New York, whereas 19 operate from Bay Head to New York. Of the 19 trains from Bay Head to New York, all but five require transfers at the Long Branch Station. On Saturdays, Sundays, and holidays, the number of trains operating from New York to both Long Branch and Bay Head is 21, although only four trains run to Bay Head without requiring a transfer. In the reverse direction, 24 trains operate from Long Branch to New York and 21 operate from Bay Head to New York, all but four requiring transfers at the Long Branch Station.

Although the NJCL serves a large number of communities between New York City and Bay Head, the primary focus of this study is the impact of the riders who visit the region served by the 13 stations between the Red Bank and Bay Head Stations (See Figure 1). The two stations in the southernmost section of the line, namely, Point Pleasant Beach and Bay Head, are located in Ocean County, whereas the other 11 stations are located in Monmouth County. Although Bay Head is the southernmost station of the line, places that are 15-20 miles south of the station can also be considered to be within the line's catchment area because residents of those places regularly use the line to commute to New York City and northern New Jersey.

Many communities served by the southern section of the NJCL depend heavily on beaches and other tourist attractions during the summer months. According to Census Transportation Planning Products (CTPP) data derived from the 2006-2010 American Community Survey (ACS), the study area contains 229,290 total jobs, accounting for 5.9% of all jobs in New Jersey (*36*). However, because of its extensive recreational activities, the study area contains 7.7% of the State's jobs for the industry type defined as "Arts, entertainment, recreation, accommodation and food services." Jobs in this particular industry type constitute 10.3% of all jobs in the study area, whereas such jobs constitute only 7.7% of all jobs in the rest of New Jersey. It is likely that the proportion of jobs in this particular industry type would be even higher in the study area if the employment data pertained only to the summer months.

Since the shore communities served by the NJCL are only 60-70 miles away from New York City and the densely populated parts of northern New Jersey, many visitors from those areas come to the shore area on weekend trips. The line is particularly attractive

to Manhattan residents because they can take a one-seat ride from the New York Penn Station to the Long Branch Station on all trains and continue further south to Bay Head after a transfer. The few direct trains to Bay Head provide added convenience.

Two major highways, the Garden State Parkway (GSP) and US-9, also provide access to the shore area from New York City and the dense urban areas in northern New Jersey. However, since these highways are highly congested during the summer weekends, the NJCL is often favored by visitors. Low automobile ownership rate among the residents of New York City and the dense urban areas of northern New Jersey, such as Newark and Jersey City, also contributes to the popularity of the NJCL.

To fulfill the study's objectives of estimating local economic impacts from the spending by the NJCL riders and the congestion-reduction impacts of the NJCL on the shore area, both primary and secondary data were collected and compiled. The primary data collection efforts included interviews with stakeholders from the study area, two focus groups involving NJCL riders from the shore area, counting of boarding and alighting passengers at the 13 stations in the study area, and an onboard survey of NJCL riders between the Red Bank and the Bay Head Stations. Collected secondary data pertained to highway traffic counts in the study area. The following sections describe the tasks related to the collection of primary data.

Stakeholder Interviews

A total of six interviews were conducted with stakeholders from the shore area served by the NJCL. The interviewees included mayors and other high-ranking officials from municipalities and counties who were also interested in the promotion of recreational activities. The objective of the interviews was to gain insights about the perception of local government officials about the impact of the NJCL on the local economies. As expected, all interviewees provided highly favorable views about the role of the NJCL in providing access to the summer recreational activities in the shore area. In addition, they provided useful insight about recreational activities in their communities and the characteristics of the typical visitors who come to the area from other regions. Some of the interviewees also mentioned that the NJCL plays a critical role in keeping traffic volumes low in areas where the current traffic volumes in the summer months are extremely high. One interviewee also mentioned that the NJCL contributes to roadway safety by providing opportunity to recreational visitors who consume alcohol in the shore area. An interviewee mentioned that local businesses had a much higher preference for locations close to the NJCL stations than other areas, potentially indicating the economic development impact of the line. Due to the significant benefits from the line, some interviewees suggested additional trains that provided one-seat rides to the stations south of Long Branch. Some also suggested improvement of local transit service, especially shuttles, to complement the NJCL service.

Focus Groups Involving NJCL Riders

Two focus groups involving NJCL riders were conducted at the NJ TRANSIT Headquarters in Newark. The first focus group was conducted in July 2013, whereas the second was conducted in November 2013. The focus groups were included as a part of this research so that in-depth discussions could be had with the NJCL users about the line's importance to the shore communities. The first focus group had the additional objective of pre-testing the rider survey instrument subsequently used during the onboard survey in July and August of 2013. The second focus group, on the other hand, sought to comprehend the participants' perceptions on specific issues related to the NJCL, including satisfaction with the new express trains and the use of dual-mode engines.

A topic guide was prepared prior to the focus groups. Approval of the topic guide was received from the Institutional Review Board of the Office of Research and Sponsored Programs of Rutgers University. The topic guide included general questions, the participants' activities in the shore communities, transportation to the shore communities, and the effects of Hurricane Sandy on the shore area. The topic guide also included questions about the participants' awareness/perceptions of dual-mode locomotive, express train service, beach packages, and discounted train fare offered by NJ TRANSIT.

Participants for the first focus group were recruited from a list of NJCL users who completed a past survey conducted by NJ TRANSIT and volunteered to be contacted for further questions concerning the service. An email inquiry was sent out to a small group of these persons requesting information on their usage of the NJCL and subsequently an invitation to participate in the focus group was sent out to a smaller group of persons based on their NJCL usage pattern and demographic characteristics. A total of nine persons were eventually selected and all of them participated in the focus group.

Participants for the second focus group were recruited from a list of NJCL passengers who completed an onboard survey conducted by this research team during the summer of 2013 and consented to be contacted for additional questions. Similar to the first focus group, an invitation to participate was sent to a small group of persons selected on the basis of their NJCL usage pattern and demographic characteristics. A total of ten persons eventually participated in the focus group.

Participants of both focus groups were highly appreciative of the weekend NJCL service to the shore area. They generally agreed that taking the NJCL is more relaxing than driving. It was evident from the discussions that the focus group participants preferred to use the NJCL in the summer months primarily because of travel time savings and shortage of parking space in the shore communities. High traffic volumes on regional highways connecting the shore areas in the summer months appeared to be a major concern. Participants also mentioned that having the opportunity to take the NJCL prevents people from driving while intoxicated. Participants appreciated the service

provided by train conductors and other NJ TRANSIT staff. They also appreciated senior discount and free rides for children.

A number of focus group participants mentioned that they traveled to the shore area to participate in beach-related recreation and for dining out. They mostly traveled for the day, but sometimes stayed overnight. It appeared from the focus groups that visitors often travel to more than one beach community and therefore travel between the shore communities is an issue. Some mentioned occasionally driving to the shore areas instead of taking the NJCL because of the difficulties in traveling between the shore communities. They were mostly unaware of shuttle services between train stations and boardwalks/beaches. It appeared from the focus groups that additional shuttle services between communities and marketing those services to train riders may make the NJCL even more attractive.

Although the participants were highly appreciative of the NJCL service overall, some had minor issues about the service. These issues were mainly about lack of communication during delays, cleanliness of station restrooms, lack of luggage space on double-decker trains, and non-enforcement of no-smoking regulations on station platforms. Having to transfer at the Long Branch Station did not appear to be a major issue. While some participants mentioned the need for additional direct trains to Bay Head in the first focus group, participants in the second focus group did not find transfers at the Long Branch Station to be arduous.

Counting of Passengers at NJCL Stations

Due the study's objective of estimating the economic benefits generated from the spending of the NJCL riders in the shore communities, it was important to obtain an accurate count of riders using the stations in the shore area. A task involving counting of boarding and alighting passengers was undertaken by trained researchers at all 13 stations in the shore area during the summer of 2013. The station counts were needed to convert the survey respondents to station-specific riders with the development of a weight variable. Since the NJCL onboard surveys were conducted on two Saturdays, two Sundays, and a Monday morning, the counts were also conducted on those days and times. The specific dates for the counts were: July 20 (Saturday), July 21 (Sunday), July 22 (Monday), August 3 (Saturday) and August 4 (Sunday). The Saturday and Sunday counting took place all day, while the Monday counting took place in the morning only.

The NJCL Onboard Survey

To fulfill the study's objectives, an onboard rider survey was required. The survey was conducted in the summer of 2013. It was conducted by trained researchers on July 27 (Saturday), July 28 (Sunday), July 29 (Monday), August 10 (Saturday), and August 11 (Sunday). The Saturday and Sunday surveys were conducted throughout the day, whereas the Monday survey was conducted only in the morning hours. Although the study's primary focus is on the NJCL weekend service, the Monday morning survey was

considered essential. The reason for conducting the Monday morning survey was that many visitors to the shore communities return by Monday morning trains after spending the weekend in the shore area.

Although the NJCL serves many places between New York City and Bay Head, the survey was conducted only between the Red Bank and Bay Head Stations (See Figure 1). The survey was distributed to riders between the two stations on eastbound (New York bound) trains only. It was distributed only on the eastbound trains because the respondents would have more accurate estimates of their spending in the shore areas on their return trips than their trips to the shore area. The riders traveling to the shore area would have to speculate how much they would spend during their visit, whereas the returning riders had the actual estimates of the expenditures they incurred.

During the survey period, a total of 13 trains operated from Bay Head Station to New York City on Saturdays and Sundays via the Long Branch Station. Six additional trains operated from Long Branch to New York City. In the westbound direction also, 13 trains operated from New York City to Bay Head. Seven additional trains operated from New York City to the Long Branch station. Riders onboard a total of 46 trains were surveyed during the five days. Only six of the 46 trains were Monday morning trains, while the rest were Saturday and Sunday trains. A few trains were surveyed on multiple days, but all respondents completing the survey were unique in that no individual completed the survey more than once.

A total 2,241 NJCL riders completed the onboard survey. Table 4 shows the number of respondents by survey date. The response rate was approximately 26%. By using the station counts of boarding and alighting passengers and additional ridership information from NJ TRANSIT, first a weight variable was created to make the respondents equivalent to average summer weekend riders traveling in the eastbound direction. Subsequently, a second weight variable was created by using NJ TRANSIT's ridership data to make the respondents equivalent to all-summer weekend riders. Application of the weekend weight converted the 2,241 survey respondents to 8,569 average weekend riders. Application of the all-summer weight converted the respondents to 131,122 riders. This number is representative of the riders who used NJCL to travel in the eastbound direction on Saturdays, Sundays, and Monday mornings in 15 weekends between Memorial Day and Labor Day of 2013.

Table 4 – Number of NJCL Survey Respondents by Survey Date

Survey date	Respondents	Percent
Saturday, 7/27/2013	408	18.2
Sunday, 7/28/2013	729	32.5
Monday, 7/29/2013	290	12.9
Saturday, 8/10/2013	237	10.6
Sunday, 8/11/2013	577	25.7
Total	2,241	100

Description of the NJCL Summer Weekend Riders

The core group of NJCL riders this study focuses on are those who traveled on eastbound trains on Saturdays and Sundays from the shore area irrespective of the purpose of their trip to the area, and the Monday morning riders who specifically mentioned that they visited the shore area for recreational purposes. Thus, some of the Saturday and Sunday riders included in the core group might have been returning from the shore area after work or visiting friends or family, but all Monday morning riders were returning from the area after a recreational trip. It was decided to include all Saturday and Sunday riders in the core group because, even if some of them did not visit the shore area for recreational purposes, they contributed to the local economies on weekends through work, services, or expenditure. The Monday morning riders were restricted to only recreational visitors to exclude riders who lived in the shore area and were going to work or traveling for some other purposes when the onboard survey was conducted.

The core group for the 15-week summer period consisted of 107,719 riders. The description of the riders provided in the subsequent sections pertains to this group. Although the group contains Monday morning recreational riders, they have been termed weekend riders for the sake of simplicity.

Demographic and Socioeconomic Characteristics

Some of the important demographic and socioeconomic characteristics of the NJCL summer weekend riders have been provided in Table 5. It is evident from the table that females constitute a slightly larger proportion of the riders than men. The age distribution of the riders clearly indicates that younger riders constitute a larger proportion than older riders. While proportion of riders below age 35 is 55%, the proportion of riders 55 and above is only 20%. The distribution of household income shows that the riders come from all income groups – high, medium, and low. No income group is over- or under-represented among the riders. Educational attainment of the riders appears to be exceptionally high as 24% have a graduate or professional degree and another 45% have a bachelor's degree. White riders constitute 80% of the total riders, whereas African American and Asian riders constitute only a modest 9% and 4%, respectively. It may also be noted that Hispanic riders constitute a slightly larger proportion of the riders (11%) than African American riders.

In addition to the information presented in Table 5, the survey provided some additional information about the NJCL summer weekend riders. It revealed that vehicle ownership among the riders is very low compared to the region's overall population. Forty seven percent (47%) of the riders belonged to households with no vehicle, while 23% belonged to households with only one vehicle. A reason for the low vehicle ownership rate among the riders could be that many visited the area from New York City and urban areas of northern New Jersey, where public transit is readily available and automobile ownership can be a hardship because of scarcity of parking space.

Table 5 – Demographic and Socioeconomic Characteristics of the NJCL Riders

Rider Characteristics	Summer Weekend Riders	Percent
Gender		
Female	58,957	57%
Male	44,775	43%
Total	103,732	100%
Age		
18-24	20,183	19%
25-34	37,025	36%
35-44	12,728	12%
45-54	13,311	13%
55-61	7,316	7%
62-64	6,355	6%
65 or over	6,908	7%
Total	103,826	100%
Annual household income		
Under $25,000	13,540	15%
$25,000 to $49,999	15,862	18%
$50,000 to $74,999	16,657	18%
$75,000 to $99,999	11,957	13%
$100,000 to $149,999	13,725	15%
$150,000 to $199,999	7,011	8%
$200,000 or over	11,373	13%
Total	90,125	100%
Level of education		
Less than high school	841	1%
High school graduate or GED	12,978	13%
Some college but no degree	12,596	13%
Two-year college degree	4,856	5%
Four-year college degree	44,720	45%
Graduate or professional degree	24,500	24%
Total	100,491	100%
Race		
White	79,902	80%
Black or African American	9,497	9%
Asian or Pacific Islander	4,069	4%
American Indian or Alaska Native	198	0%
Other (Please specify)	6,464	6%
Total	100,130	100%

Note: The totals do not add to 107,719 because of non-response to questions by some respondents

Origin and Destination Stations and Places

From responses to the survey questions, it could be determined which NJ TRANSIT rail stations the riders used for boarding and alighting from the NJCL trains. This information is useful to understand which stations are most commonly used by the summer weekend riders. Table 6 shows the number of riders boarding at the 13 stations in the shore area, whereas Table 7 shows the number of riders alighting at stations in different parts of the region.

Table 6 – Number of Riders Boarding at the Shore Area Stations

Boarding Station	Number of Riders Boarding	Percent of riders
Bay Head	6,116	6%
Point Pleasant Beach	12,156	12%
Manasquan	6,754	6%
Spring Lake	5,743	5%
Belmar	7,000	7%
Bradley Beach	4,908	5%
Asbury Park	13,032	12%
Allenhurst	2,768	3%
Elberon	2,362	2%
Long Branch	26,927	26%
Monmouth Park	1,246	1%
Little Silver	4,550	4%
Red Bank	11,554	11%
Total	105,116	100%

Table 7 – Number of Riders Alighting at Different Stations in the Region

Alighting Station	Number of Riders Boarding	Percent of riders
New York Penn Station	59,935	60%
Newark Penn Station	15,663	16%
Secaucus Junction	2,416	2%
Hoboken	1,618	2%
Other stations	20,442	20%
Total	100,074	100%

It is evident from Table 6 that the most commonly used station for boarding trains in the shore area is Long Branch, which is not surprising because riders from most stations further south require a transfer at the Long Branch Station. Asbury Park, Point Pleasant Beach, and Red Bank also account for a large number of boardings compared to the other stations in the area.

Table 7 shows the stations where the weekend NJCL riders got off the train. New York Penn Station accounts for 60% of the riders, whereas stations in New Jersey account for the other 40%. Among the New Jersey stations, Newark accounts for the largest number of riders. Further scrutiny of the riders alighting at “other stations” showed that a modest number of them got off at stations within the shore area, mostly at Long Branch, Monmouth Park, Red Bank, and Asbury Park stations. Among the stations outside the shore area, Newark Airport, Rahway, Elizabeth, Woodbridge, and Middletown Stations accounted for large numbers of alighting riders.

Trip origins are the places from where the NJCL riders came to the shore area stations to board trains. Thus those are the places the riders visited during their trip, although they might also have gone to other places in the vicinity. Table 8 shows the 20 places (municipalities) within the shore area with the highest trip origins of NJCL weekend riders. Once again, the reason for the large number of riders from Long Branch is that most trains traveling from further south require transfers at the Long Branch Station. The two adjacent municipalities of Asbury Park and Neptune together account for more than 16,000 of the trip origins. While most places in Table 8 are located in Monmouth County, Brick Township and Toms River Townships are located in Ocean County.

Table 8 – Origin Places of the NJCL Weekend Riders

	Origin Places	Total Riders	Percent
1	Long Branch	11,252	14%
2	Asbury Park	9,913	12%
3	Neptune Township	6,472	8%
4	Point Pleasant Borough	5,445	7%
5	Red Bank Borough	4,971	6%
6	Manasquan Borough	4,247	5%
7	Belmar Borough	3,972	5%
8	Ocean Township	3,783	5%
9	Spring Lake Borough	3,044	4%
10	Bradley Beach Borough	2,651	3%
11	Point Pleasant Beach Borough	2,074	3%
12	Brick Township	2,028	2%
13	Wall Township	1,978	2%
14	Bay Head Borough	1,449	2%
15	Tinton Falls Borough	1,379	2%
16	West Long Branch Borough	1,275	2%
17	Sea Girt Borough	1,106	1%
18	Toms River Township	1,101	1%
19	Shrewsbury Borough	983	1%
20	Oceanport Borough	834	1%
	Other places	12,728	15%
	Total	82,685	100%

Table 9 shows the top 10 destination counties of the NJCL weekend riders. They provide a good indication about the areas from where the visitors to the shore area come from. It was decided to show the destination counties instead of the destination places or municipalities in Table 9 because each place except New York City accounted for only a small number of riders. Table 9 shows that Manhattan accounts for most of the riders, followed by Monmouth County. When the riders from Brooklyn, Queens, and Bronx are combined with the riders from Manhattan, they account for approximately 58% of the riders. When visitors from areas surrounding New York City, such as Long Island, Orange County, and Westchester County, are added, visitors from the general area account for approximately 60% of the riders. The New Jersey counties together account for around 37% of the riders. Among the New Jersey Counties, Monmouth, Essex, and Hudson County account for the most riders. The number of riders from Monmouth County is high because people from communities within the shore area often visit other communities within the area. Furthermore, because of the high level of proximity, many people from the northern part of the county visit the shore area communities by the NJCL.

Table 9 – Destination Counties of the NJCL Weekend Riders

	Destination Counties	Riders	Percent
1	New York County (Manhattan Borough), NY	37,343	45%
2	Monmouth County, NJ	16,573	20%
3	Kings County (Brooklyn Borough), NY	6,528	8%
4	Essex County, NJ	5,310	6%
5	Hudson County, NJ	4,695	6%
6	Queens County/Borough, NY	3,313	4%
7	Union County, NY	1,819	2%
8	Middlesex County, NJ	1,542	2%
9	Bergen County, NJ	1,064	1%
10	Bronx County/Borough, NY	637	1%
	Others	4,770	6%
	Total	83,594	100%

Although Table 9 shows only the top-10 destination counties for the NJCL summer weekend riders, the trip destinations mentioned in the survey revealed that people from 18 states other than New York and New Jersey visited the area and used the NJCL. Among those states, Texas, Connecticut, Indiana, Florida, and Pennsylvania accounted for the most riders.

Days Spent in the Shore Area and Group Size

Since the length of stay and number of accompanying persons can affect the expenditures of visitors, the NJCL riders were asked through the survey how many nights they spent in the shore area and how many people accompanied them on their trip. The survey results showed that 34% of the riders visited the area on a day trip, 20% spent one night, 31% spent two nights, 6% spent three or four nights, and 9%

spent five or more nights, indicating that a vast majority of the riders visit the shore area for a weekend only. Responses to another question revealed that 41% of the NJCL riders visited the shore area alone, 30% visited in company of another person, 10% visited with two other companions, and 19% visited with three or more companions. Thus single-person and two-person trips to the shore area are the most common, although a fairly large proportion also visits the shore area as members of very large groups.

Travel Options of the Riders

The NJCL onboard survey inquired about the travel options available to the riders. Sixty one percent (61%) of the respondents revealed that they had no viable alternative other than taking the train, while the remaining 39% indicated that they could have traveled by automobile but decided to take the train. It is not surprising that such a large proportion of the riders did not have an alterative other than taking the train because a large number of riders are from New York City and the dense urban places of northern New Jersey, where automobile ownership is very low. As discussed previously, 47% of the riders were from households with no vehicles.

The riders who took the NJCL despite having the option to drive to the shore area were asked the reasons for their choice. Forty one percent (41%) reported convenience as the primary reason, whereas 23% reported traffic congestion, 22% reported cost of driving (gasoline, parking, and toll), and the remaining 14% cited other reasons.

All riders were asked how they would have traveled to the shore area in the absence of the NJCL trains. Twenty two percent (22%) reported that they would have traveled by bus, 21% stated that they would have driven a car, 20% reported that they would have traveled as a passenger of someone's car, 8% reported that they would have rented a car, 21% reported that they would not have made the trip at all, and the remaining stated that they would have come by some other mode. It is particularly noteworthy that 21% of the riders would not have traveled to the shore area at all in the absence of the NJCL, indicating that the benefits from their expenditures in the shore area would have been totally lost if the NJCL weekend service did not exist.

Trip Distance

Estimating the distance of the trips made by the riders traveling to the shore area is important for determining how the NJCL summer weekend service saves vehicle miles traveled (VMT) and greenhouse gas emissions. An effort was therefore made to estimate the travel distances of the NJCL riders by using GIS.

Since most visitors to the shore area using the NJCL summer weekend trains travel from New York City and northern New Jersey, their trip distances are fairly long. To estimate the trip distances of the NJCL riders, their origin and destination places were geocoded and the ArcGIS network analyst was used to estimate the network distances between the trip origins and destinations. The results showed that the average trip

distance for the riders who visited the shore area from New York City was a little over 66 miles, whereas the average trip distance for the riders visiting from New Jersey was 49 miles. When the data were restricted to only those riders who stated that they would drive to the shore area in the absence of the NJCL, the average distance for the New York riders was 65 miles, whereas for the New Jersey riders the average distance was 47 miles.

Rider Expenditure in the Shore Area

The most critical piece of information collected through the NJCL onboard survey was the amount of money spent by the riders in the shore area during their visit. This information is critical because the R/ECON™ I-O model requires these amounts as inputs in order to estimate the economic impacts such as the creation of jobs and the generation of earnings and taxes from the NJCL riders.

To collect the required information, a question was included in the onboard survey inquiring about the itemized expenditures of the riders during their entire visit. The respondents were also allowed to write in other types of expenditures that were not included in the itemized list. The collected data were thoroughly reviewed, cleaned, and aggregated as necessary so that they could be used as inputs to the R/ECON™ I-O model.

The itemized expenditure of the NJCL riders are summarized in Table 10. The expenditure estimates in the table are the total for all summer weekends of 2013. Table 10 includes two columns on total expenditure: *Total* and *Total in NJ*. While the *Total* column reflects the actual total expenditure of the NJCL summer weekend riders, the *Total in NJ* column reflects the total expenditure after leakage out of the state. It was necessary to estimate the expenditure after leakage because a portion of the expenditure made by the NJCL riders are bound to leak out of the state because some commodities they consumed are manufactured in other states. Thus the itemized expenditure amounts shown in Table 10 are the adjusted amounts after leakage. It may be noted that the out-of-state leakage for the total was approximately 10%, meaning that around 90% of the expenditure by the NJCL riders remains within the state.

The first row of Table 10 shows the expenditure by the core group, consisting of all riders who used the NJCL weekend trains to travel from the shore area on eastbound (New York bound) trains on Saturdays and Sundays and those who traveled from the area on Monday mornings after a recreational trip to the shore area. As shown, this core group of riders spent a total of approximately $14.8 million in the shore are during the summer, of which, $13.2 million stay within the state after leakage. It should be noted that these amounts do not include the expenditure of those NJCL users who visited the shore area during weekdays (e.g., visitors arriving in the area on a Monday or Tuesday and leaving on Wednesday or Thursday) because the survey was restricted to Saturdays, Sundays, and Monday mornings only.

Table 10 – Itemized Expenditure of NJCL Weekend Riders in the Shore Area (All Summer)

Visitor Classification	Hotels and Motels	Food and Drinking Places	Retail	Amusement	Wholesale	Transit	Total in NJ	Total
All Saturday and Sunday visitors and Monday recreational visitors combined (core group)	$3,970,584	$5,847,861	$1,202,635	$1,303,123	$696,767	$142,004	$13,162,974	$14,749,140
Share of expenditure in NJ	*30%*	*44%*	*9%*	*10%*	*5%*	*1%*	*100%*	*NA*
Out-of state visitors	$3,105,478	$4,838,724	$1,058,109	$942,466	$614,896	$114,523	$10,674,197	$12,054,512
Share of out-of-state visitors	*78%*	*83%*	*88%*	*72%*	*88%*	*81%*	*81%*	*82%*
Visitors who would not have made trip in the absence of NJCL	$740,927	$972,161	$117,559	$188,738	$66,237	$17,529	$2,103,151	$2,273,531
Share of those who not have made trip in the absence of NJCL	*19%*	*17%*	*10%*	*14%*	*10%*	*12%*	*16%*	*15%*
Visitors whose trip purpose was strictly recreational	$3,516,316	$3,875,500	$721,170	$844,592	$415,210	$42,329	$9,415,117	$10,387,654
Share of those whose trip purpose was strictly recreational	*89%*	*66%*	*60%*	*65%*	*60%*	*30%*	*72%*	*70%*

Note: The total amount spent by the NJCL riders is shown in the *Total* column. However, since the R/ECON™ model estimates economic impacts after accounting for leakage out of the state, the expenditure amounts under the six categories have been adjusted to reflect leakage out of the state. The *Total in NJ* column is the sum of the adjusted expenditure under the six categories.

Table 10 shows the six categories of expenditures for the NJCL weekend riders. These categories were created from the survey responses so that they matched the input categories of the R/ECON™ I-O model. The estimates for the *Hotel and Motel*, *Food and Drinking Places*, *Amusement*, and *Transit* were directly obtained from the survey data. The *Transit* category includes all transportation-related expenditures. The two categories, *Retail* and *Wholesale*, had to be derived from the expenditure estimates on miscellaneous consumption of goods and services that are not included in the other four categories. For separating those expenditures into the *Retail* and *Wholesale* categories, the latest *Annual Retail Trade Report*[1] and the *Annual Wholesale Trade Report*[2] by the US Census were used.

It may be noted from Table 10 that expenditures pertaining to *Food and Drinking Places* account for the largest share of the riders' expenditure (44%), followed by *Hotels and Motels* (30%). In contrast to these two categories, the other categories account for a substantially lower proportion of the riders' expenditures.

In addition to the core group, Table 10 also shows the expenditures of the riders who visited from out-of-state, those who mentioned that they would not have visited the shore area in the absence of the NJCL, and those who mentioned that they were strictly traveling to the shore area for recreational purposes. As noted previously, out-of-state visitors comprised 63% of all riders and mostly consisted of people from the New York City area. The second category – those who would not have visited the area in the absence of the NJCL included 21% of all riders. The last category – those who visited the shore area strictly for recreational purposes – do not include the Saturday and Sunday riders who visited the shore area to work or for other non-recreational purposes.

Compared to the in-state visitors, the out-of-state visitors spent substantially more in the shore area. While out-of-state visitors comprised only 63% of the visitors, they accounted for 81% of the total expenditure. The riders who mentioned that they would not have made the trip in the absence of the NJCL accounted for 21% of the riders but only 16% of the total expenditure. Finally, the expenditure of those riders who were strictly traveling for recreational purposes constituted 37% of the core group but they accounted for 72% of the expenditure. The greater share of expenditure by this group compared to others is understandable because their visits were for longer duration, they came in larger groups, and they spent substantially more on *Hotels and Motels* and *Food and Drinking Places* than those who visited for non-recreational purposes.

Estimation of Economic Benefits from the NJCL Summer Weekend Service

The itemized expenditure amounts shown in Table 10 were the inputs for the R/ECON™ I-O model for estimating economic benefits from the spending of the NJCL summer weekend riders. The R/ECON™ I-O model estimates economic outcomes in terms of employment (jobs), earnings, state taxes, local taxes, and GDP. Employment is

[1] http://www.census.gov/retail/

[2] https://www.census.gov/wholesale/

the count of annualized jobs, a measure of employment at the place of work. The value of this measure depends on the prevailing mix of full- and part-time employment for the industry affected by investment. Earnings include wages, salaries, and supplements to wages and salaries earned by employees in return for contributing to production. State taxes are revenues collected by state governments through personal and corporate income, state property, excise, sales, and other state taxes generated by changes in output or wages or by purchases by visitors to the region. Local taxes are revenues collected by sub-state governments, occurring mainly through property taxes on new worker households and businesses, but can include income, sales, and other major local taxes in applicable areas. In New Jersey, local taxes include only property taxes. GDP measures regional production in the same way as it measures national output. It is the difference between the value of goods and services purchased as production inputs and the value of goods and services produced.

The R/ECON^{TM} I-O model estimates of the economic benefits from the spending by the NJCL summer weekend riders are presented in Table 11. These estimates are directly based on the expenditure amounts presented in Table 10. Table 11 shows the estimates of jobs, earnings, state taxes, local taxes, and GDP generated by the spending. It is evident from the table that a total of 225 annualized jobs were created in the shore area from the spending of the NJCL summer weekend riders or the core group. If the annualized jobs are converted to summer jobs, they would be equivalent to 700 summer jobs. Table 11 also shows that a over $9 million in earnings, more than $1 million in state taxes, and almost $600,000 in local taxes are generated from the spending of the NJCL summer weekend riders.

Table 11 shows that the bulk of the economic benefits are generated from the spending of the out-of-state riders as their share is above 80% by all measures. The riders who would not have made the trip in the absence of the NJCL contribute around 16% the benefits, indicating that there would have been loss of around 16% of the benefits if the NJCL weekend service did not exist. The benefits generated by whose trip purpose was strictly recreational contribute more than 72% of the economic benefits to the shore area. The remaining 28% are from the riders who visited the area for some other purpose, such as work and visiting friends and family.

The R/ECON^{TM} I-O model estimates both direct and indirect/induced effects for jobs, earnings, and GDP. The estimates shown in Table 11 are the sum of the direct and indirect benefits. The proportion of direct and indirect benefit varies by measure. Ninety one percent (91%) of the jobs created was due to the direct effect, whereas only 9% was due to the indirect effect. The direct/indirect split for earnings was 55%/45%, whereas for GDP, the split was 51%/49%. The return-on-investment multipliers can be obtained from the estimates provided in Tables 10 and 11. For example, the return-on-investment multiplier for jobs is 15 jobs per million dollars (i.e., 225/$14,749,140 X $1,000,000), whereas for earnings, it is $618,033 per million dollars (i.e., $9,115,448 /$14,749,140 X $1,000,000). Additional analysis showed that the return-on-investment multipliers are almost similar for different groups of riders considered because their patterns of expenditure on different categories are similar.

Table 11 – Summary of Economic Benefits from the Expenditure of NJCL Weekend Riders (All Summer)

Visitor Classification	Jobs (Annual)	Earnings	State Taxes	Local Taxes	Gross Domestic Product
All Saturday and Sunday visitors and Monday recreational visitors combined (core group)	225	$9,115,448	$1,100,480	$587,919	$15,478,042
Out-of state visitors	182	$7,368,664	$901,435	$475,834	$12,527,638
Share of out-of-state visitors	*81%*	*81%*	*82%*	*81%*	*81%*
Visitors who would not have made trip in the absence of NJCL	36	$1,463,436	$170,366	$96,955	$2,472,147
Share of those who not have made trip in the absence of NJCL	*16%*	*16%*	*15%*	*16%*	*16%*
Visitors whose trip purpose was strictly recreational	160	$6,567,037	$784,090	$434,617	$11,125,620
Share of those whose trip purpose was strictly recreational	*71%*	*72%*	*71%*	*74%*	*72%*

Note 1: The total amount spent by the NJCL riders is shown in the *Total* column. However, since the R/ECON™ model estimates economic impacts after accounting for leakage out of the state, the expenditure amounts under the six categories have been adjusted to reflect leakage out of the state. The *Total in NJ* column is the sum of the adjusted expenditure under the six categories.
Note 2: The benefit estimates are total effects (sum of direct and indirect/induced effects)

The economic benefits from the spending of the NJCL summer weekend riders can be compared to NJ TRANSIT's additional or marginal spending during the summer weekends on service delivery. Between mid-June and the Labor Day weekend of 2013, NJ TRANSIT operated two additional round trip express trains between New York and Long Branch on Saturdays, Sundays and Holidays. NJ TRANSIT also ran six additional shuttle trains round trip between Long Branch and Bay Head during the same time period. According to information obtained from NJ TRANSIT, the marginal cost of providing the two express trains through the summer was approximately $360,000, including labor cost, electric propulsion, materials, and access fees. The cost for providing the additional shuttle trains between Long Branch and Bay Head was approximately $155,000. Thus the cost of providing the additional summer weekend service was around $515,000. This amount is substantially lower than the amount of state tax revenue generated from the spending of the NJ TRANSIT summer weekend riders in the shore area.

The Municipalities with the Highest Economic Benefits

As the R/ECON^{TM} I-O model uses regional data for the estimation of economic benefits, the model cannot be directly used to estimate economic benefits for small areas like municipalities. However, because of the variations in the amount and type of recreational activities in the shore area municipalities, as well as the variations in their proximity to the NJCL stations, all municipalities are not likely to benefit equally from the spending of the NJCL weekend riders.

Due to the inability of the R/ECON^{TM} I-O model to estimate economic benefits for small areas, an effort was made to distribute the benefits accrued to the entire shore area served by the NJCL among the area's municipalities on the basis of the expenditures made by the riders in specific municipalities. The simplifying assumption made for this distribution is that the share of expenditure on the six categories shown in Table 10 are the same for all municipalities, which in reality may not always be the case. The distributed benefits for the 20 municipalities with the highest rider expenditure are shown in Table 12. The figures shown in the table are for the core group of riders – riders who took the NJCL on Saturday or Sunday for any trip purpose and Monday morning riders who were returning from recreational trips in the shore area.

Table 12 shows that rider expenditures in the top-20 municipalities account for 75% of the total expenditure by the NJCL summer weekend riders. Because of the assumption that benefits accrue in the same proportion as total expenditure, the benefits accrued to the to-20 municipalities is also 75%. Neptune Township accounts for most of the benefits (27%), followed by neighboring Asbury Park (9%). The boardwalk and the beaches of Neptune Township are within walking distance of both Bradley Beach and Asbury Park Stations. Because of the contiguity of the boardwalk and beaches in the two municipalities, most recreational visitors presumably visit both. The significantly higher spending in Neptune Township is presumably because it attracts a greater number of high-income visitors than Asbury Park and they stay in the area for a longer duration of time.

Table 12 – Likely Economic Benefits to Municipalities with the Highest Rider Expenditure (All Summer)

	Total Expenditure	Percent Expenditure	Annual Jobs	Earnings	State Taxes	Local Taxes	Gross Domestic Product
1. Neptune Township	$3,961,926	27%	60	$2,448,599	$295,612	$157,927	$4,157,724
2. Asbury Park	$1,304,747	9%	20	$806,376	$97,351	$52,009	$1,369,228
3. Long Branch	$795,561	5%	12	$491,683	$59,359	$31,712	$834,878
4. Point Pleasant Borough	$562,403	4%	9	$347,584	$41,963	$22,418	$590,197
5. Bradley Beach Borough	$551,650	4%	8	$340,938	$41,160	$21,989	$578,913
6. Spring Lake Borough	$542,395	4%	8	$335,218	$40,470	$21,621	$569,200
7. Manasquan Borough	$527,102	4%	8	$325,766	$39,329	$21,011	$553,151
8. Tinton Falls Borough	$381,415	3%	6	$235,727	$28,459	$15,204	$400,265
9. Ocean Township	$369,270	3%	6	$228,221	$27,552	$14,720	$387,520
10. Point Pleasant Beach Borough	$321,563	2%	5	$198,737	$23,993	$12,818	$337,455
11. Belmar Borough	$311,326	2%	5	$192,410	$23,229	$12,410	$326,712
12. Bay Head Borough	$206,504	1%	3	$127,626	$15,408	$8,231	$216,709
13. Mantoloking Borough	$198,883	1%	3	$122,916	$14,839	$7,928	$208,711
14. Spring Lake Heights Borough	$192,483	1%	3	$118,961	$14,362	$7,673	$201,996
15. Sea Girt Borough	$166,696	1%	3	$103,024	$12,438	$6,645	$174,934
16. Red Bank Borough	$158,770	1%	2	$98,125	$11,846	$6,329	$166,617
17. Toms River Township	$132,642	1%	2	$81,977	$9,897	$5,287	$139,197
18. West Long Branch Borough	$128,471	1%	2	$79,399	$9,586	$5,121	$134,820
19. Brick Township	$118,932	1%	2	$73,504	$8,874	$4,741	$124,810
20. Wall Township	$87,798	1%	1	$54,262	$6,551	$3,500	$92,137
Total for the highest 20	**$11,020,539**	**75%**	**168**	**$6,811,051**	**$822,277**	**$439,292**	**$11,565,173**
Total for entire service area*	**$14,749,140**	**100%**	**225**	**$9,115,448**	**$1,100,480**	**$587,919**	**$15,478,042**

Since most of the NJCL in the shore area serves Monmouth County whereas only the southernmost segment serves Ocean County, it is not surprising that most of the top-20 municipalities are in Monmouth County. However, several municipalities from Ocean County, including Point Pleasant Beach Borough, Point Pleasant Borough, Toms River Township, and Brick Township are also among the top-20 municipalities, together accounting for about 8% of the expenditures and estimated benefits.

Environmental and Congestion-Reduction Benefits from NJCL Weekend Service

In addition to the economic benefits generated by the expenditure of the NJCL weekend riders in the shore area, the service also generates a substantial amount of environmental and congestion-reduction benefits. This section includes results of analysis pertaining to these benefits.

Environmental Benefits from the NJCL Weekend Service

There has been a growing concern in recent years about the high proportion of greenhouse gas emissions from the transportation sector. By providing an opportunity to the shore area visitors to avoid driving, the NJCL weekend service helps to reduce automobile use, and thus helps to reduce vehicle miles traveled (VMT) and greenhouse gas (GHG) emissions. Since most weekend visitors to the shore area come from distant places like New York City and cities in northern New Jersey, if the NJCL weekend riders used automobiles instead of taking the train, a substantial amount of additional VMT and GHG would have been generated. Although commuter trains like the NJCL also generate GHG, past studies have shown that the emissions from a train trip is 28-49% lower than an automobile trip even for trains operated by diesel fuel (*37*). Since the NJCL operates with electric power between New York's Penn Station and the Long Branch Station, the GHG savings from the service are likely to be even higher.

To estimate how much GHG would have been generated if the NJCL summer weekend riders used automobile to travel to the shore area, a method developed by the US Environmental Protection Agency (EPA) was used. According to the EPA, with the average annual vehicle miles of 11,400, an automobile generates 4.7 metric ton of carbon dioxide (CO_2).[3] Although GHG, expressed as CO_2e, includes carbon dioxide (CO_2), methane (CH4), nitrous oxide (N_2O), and water vapor (H_2O), CO_2 is the most prevalent component and reason for concern. The EPA provides a method to estimate CO_2 and maintains that the other components of GHG are difficult to estimate from transportation sources.

According to the EPA method, CO_2 emission is measured as follows:

$$CO_2 \text{ emission (in grams)} = \frac{CO_2 \text{ per gallon}}{\text{Miles per gallon}} \times \text{miles traveled}$$

[3] http://www.epa.gov/otaq/climate/documents/420f14040.pdf

Where, CO_2 per gallon is 8,887 grams and miles of travel per gallon (mpg) of gasoline is assumed to be 21.6. Thus for an automobile that travels 11,400 miles in a year, the annual CO_2 emission estimate is given by:

CO_2 emission = $\frac{8,887}{21.6} \times 11{,}460$ = 4.7 metric ton

To estimate how much additional CO_2 would have been emitted if the NJCL riders were to travel by automobile, data from the NJCL survey was used. The estimation involved several steps. First, the network distance between trip origins and destinations of the NJCL riders were obtained by using the ArcGIS network analyst. Second, trip distances were adjusted with the assumption that some travelers would carpool. Based on group size of the survey respondents, it was estimated that an average of 1.6 persons would travel per automobile. Third, using the EPA estimate of 8,887 grams of CO_2 per gallon of fuel consumed, assuming 21.6 miles of travel per gallon consumed by an average automobile, and using the adjusted trip distances of the riders, the CO_2 emissions for all riders were estimated. Finally, since the survey was conducted on only northbound trains, the estimates for the northbound trips were multiplied by two to obtain the total emissions for round trips between the shore area trip origins and the trip destinations of the riders. As the primary focus of the study is the traffic and environmental impacts of weekend travel to the shore area, CO_2 estimates were obtained for only weekend NJCL trips (Saturday and Sunday combined). Inclusion of the Monday morning recreational trips in the estimation would increase the environmental benefits by approximately 2.5%. The findings from this analysis are presented in Table 13. The estimates shown in the table are for all summer weekends combined.

In addition to gallons of gasoline that would be consumed, Table 13 also shows the number of crude oil barrels that would be required to produce the consumed gasoline. According to the US Energy Information Administration (EIA), 19 gallons of motor gasoline are produced from one barrel (42 gallons) of crude oil.[4] The estimate of crude oil barrels in Table 13 is based on this information.

Table 13 – Environmental Benefits from the NJCL Summer Weekend Service (All Summer Weekends)

Measure	Total (Two-Way) Effect
Vehicle miles travel (VMT)	6,791,586
Gasoline consumption (gallons)	314,425
Gasoline consumption (barrels)*	7,486
Cost of gasoline used**	$1,100,488
Crude oil barrels used	16,549
Cost of crude oil used***	$1,688,131
CO_2 emissions (metric tons)	2,794

* One barrel = 42 gallons
** At $3.50/gallon (http://www.gasbuddy.com/gb_retail_price_chart.aspx)
*** At $102.01/barrel (http://www.bloomberg.com/energy/)

[4] http://www.eia.gov/tools/faqs/faq.cfm?id=24&t=10

Since the study period included 15 weekends in the summer of 2013, an approximate estimate of average emissions per summer weekend can be obtained by dividing the figures in Table 13 by 15. However, the figures cannot be used to estimate the average emissions per weekend for the whole year because the number NJCL weekend riders is significantly higher in the summer months than in other seasons.

Congestion-Reduction Benefits from NJCL Weekend Service

One of the most serious concerns for transportation planners in the Jersey shore area served by the NJCL is the high traffic volume on regional and local roads generated by the large number of recreational visitors. These visitors congregate in the shore area during the summer months from New Jersey, New York, and other surrounding states. As a result of the high volume of recreational travelers, the only major freeway connecting the shore area to the areas further north, namely, the Garden State Parkway (GSP), is highly congested on summer weekends. Traffic volume on the GSP is generally higher in the southbound direction in the morning hours as travelers head to the shore, whereas the volume is higher in the northbound direction in the evening hours as the travelers return home.

The GSP is shown in relation to the NJCL is Figure 4. Because of the importance of the GSP in providing access to the shore area to a large number of summer weekend visitors from northern New Jersey and New York City, the analysis in this section examines the impact the highway would have if the NJCL weekend service ceased to exist. The analysis uses data from two sources: the NJCL onboard survey conducted by this research team and hourly traffic counts from GSP toll plazas obtained from the New Jersey Turnpike Authority.

On the basis of the information provided by the survey respondents about their boarding station and trip destination, the number of riders that would travel northbound and southbound from each boarding station in the study area was determined. For the respondents whose destinations were in states other than New Jersey, New York, Pennsylvania, Delaware, or Maryland, it was assumed that they would travel north because all the inter-regional travel nodes, such as airports and AMTRAK stations, are located north of the study area. For the respondents with destinations in Pennsylvania, Delaware, and Maryland, it was assumed that they take Interstate-195 to the New Jersey Turnpike if they were to drive. Accordingly, those riders who boarded at Belmar Station or a station further north were assumed to travel in the southbound direction to Interstate-195, whereas those who boarded at a station south of Belmar were assumed to travel northbound. All riders traveling to New York City were assumed to be traveling in the northbound direction. The riders with destinations in New Jersey were distributed on the basis of the location of their destinations relative to the station where they boarded.

The number of NJCL riders that would travel in the northbound and southbound directions if they were to travel by automobile from their trip origins to their destinations

is summarized in Table 14. The figures shown are for an average weekend. Since many riders would carpool if they were to use a car instead of taking the train, it was necessary to obtain an estimate of persons per vehicle. The estimate was obtained from the response to a survey question on group size, i.e., the number of persons accompanying the rider on the trip to the shore. The analysis of group size revealed that the number of persons per automobile would be 1.6 if the NJCL riders were to use automobile instead of taking the train.

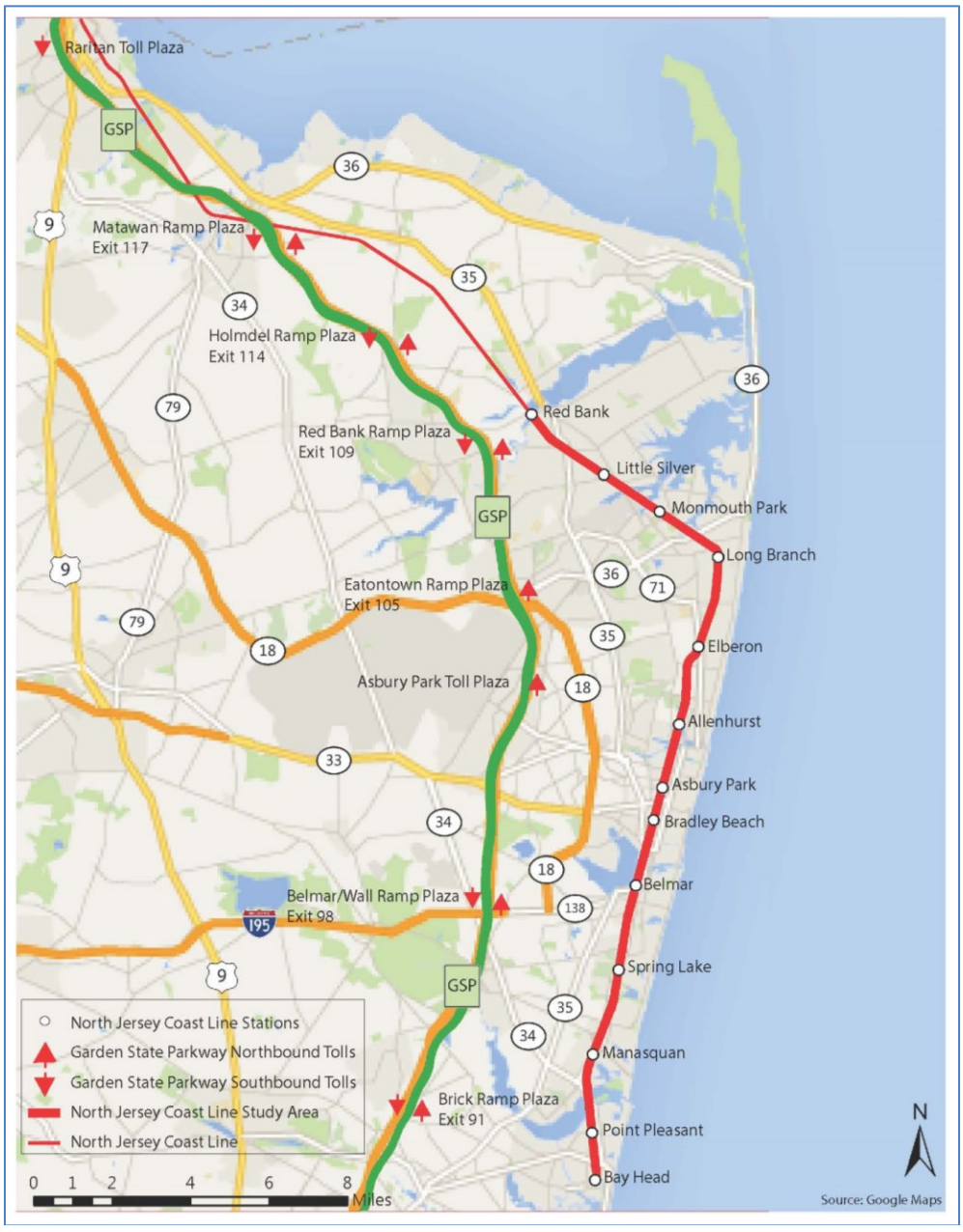

Figure 4 – The Garden State Parkway in Relation to the NJCL in the Study Area

Table 14 – Estimated Direction-Specific Number of NJCL Weekend Riders that would Travel by Road

Boarding station	Saturday North	Saturday South	Sunday North	Sunday South	Saturday Total	Sunday Total
Bay Head	89	4	253	10	93	263
Point Pleasant Beach	263	2	451	3	265	454
Manasquan	138	2	282	5	140	287
Spring Lake	90	1	317	2	90	319
Belmar	144	4	242	6	148	248
Bradley Beach	78	0	198	0	78	198
Asbury Park	303	8	528	15	311	543
Allenhurst	88	0	101	0	88	101
Elberon	92	0	67	0	92	67
Long Branch	601	7	1183	13	608	1196
Monmouth Park	46	0	33	0	46	33
Little Silver	109	0	171	0	109	171
Red Bank	292	0	385	0	292	385
Unspecified	63	0	113	0	63	113
Total	2,395	27	4,326	52	2,422	4,378

The traffic generated by the NJCL riders, estimated with the assumption of 1.6 riders per automobile, was assigned to the GSP exits on the basis of (a) the location of their boarding station, (b) the nearest entrance point to the GSP from the boarding station, and (c) the direction of travel. The traffic volumes obtained in this manner for Saturdays and Sundays were subsequently aggregated for each GSP Exit.

Base traffic volumes for the GSP were available only from toll plazas but no other locations. The locations of the toll plazas in the study area are shown in Figure 4. Although the traffic generated by the NJCL riders were assigned to a number of GSP exits, a direct comparison of base traffic volumes on the GSP and traffic generated by the NJCL riders could be made only at three locations because toll plazas do not exist at the other locations.

The *daily* traffic volumes from the NJCL riders that would be generated in the absence of the weekend service are shown schematically in Figure 5 and Figure 6. Figure 5 shows the daily traffic volumes that would be generated if the Saturday NJCL riders diverted to automobile, whereas Figure 6 shows the daily traffic volumes that would be generated if the Sunday riders diverted to automobile.

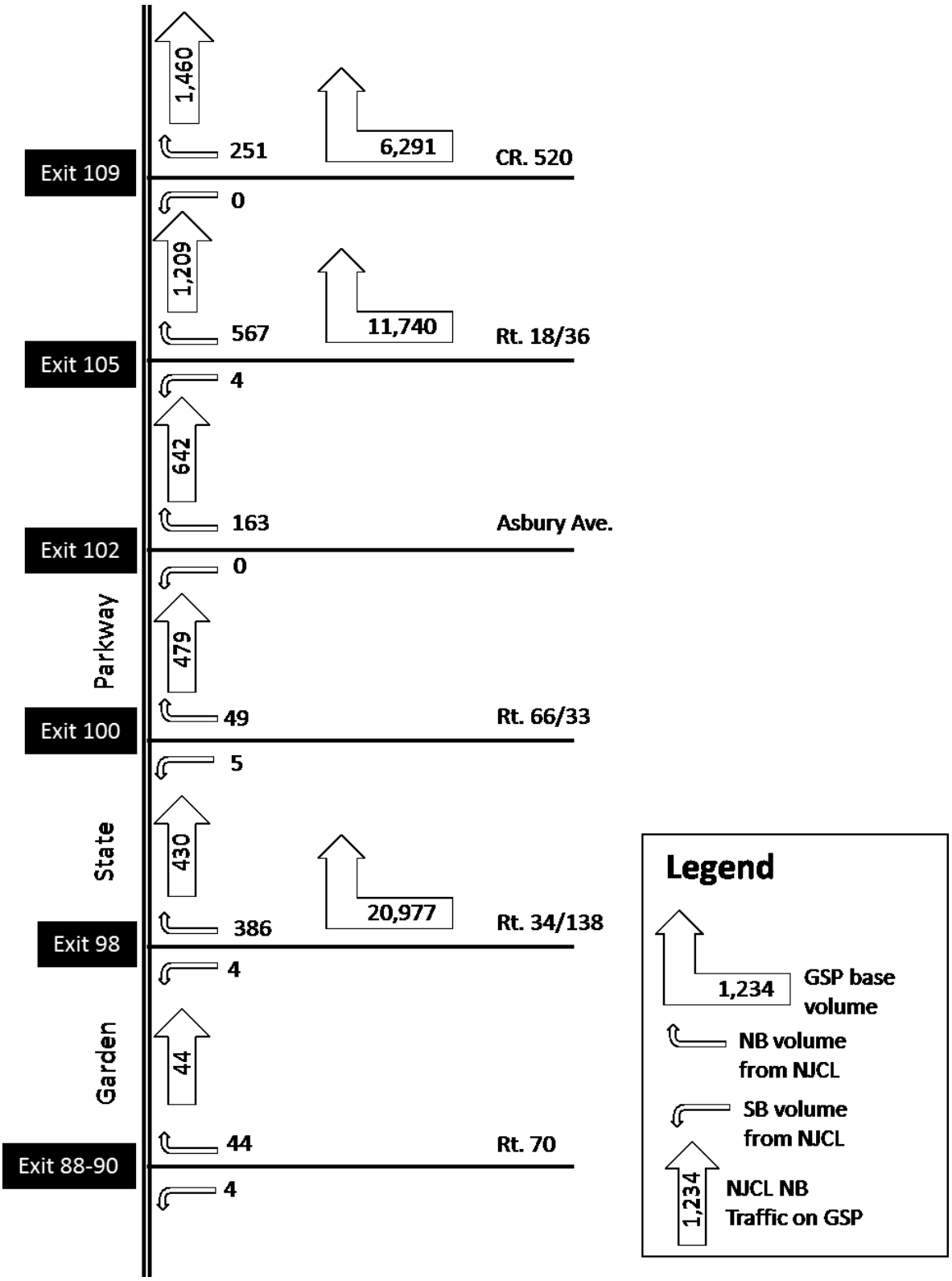

Figure 5 – Additional Traffic Volume that would be Generated if the Current NJCL Riders used Automobile – Summer Saturday, 10AM - 10PM

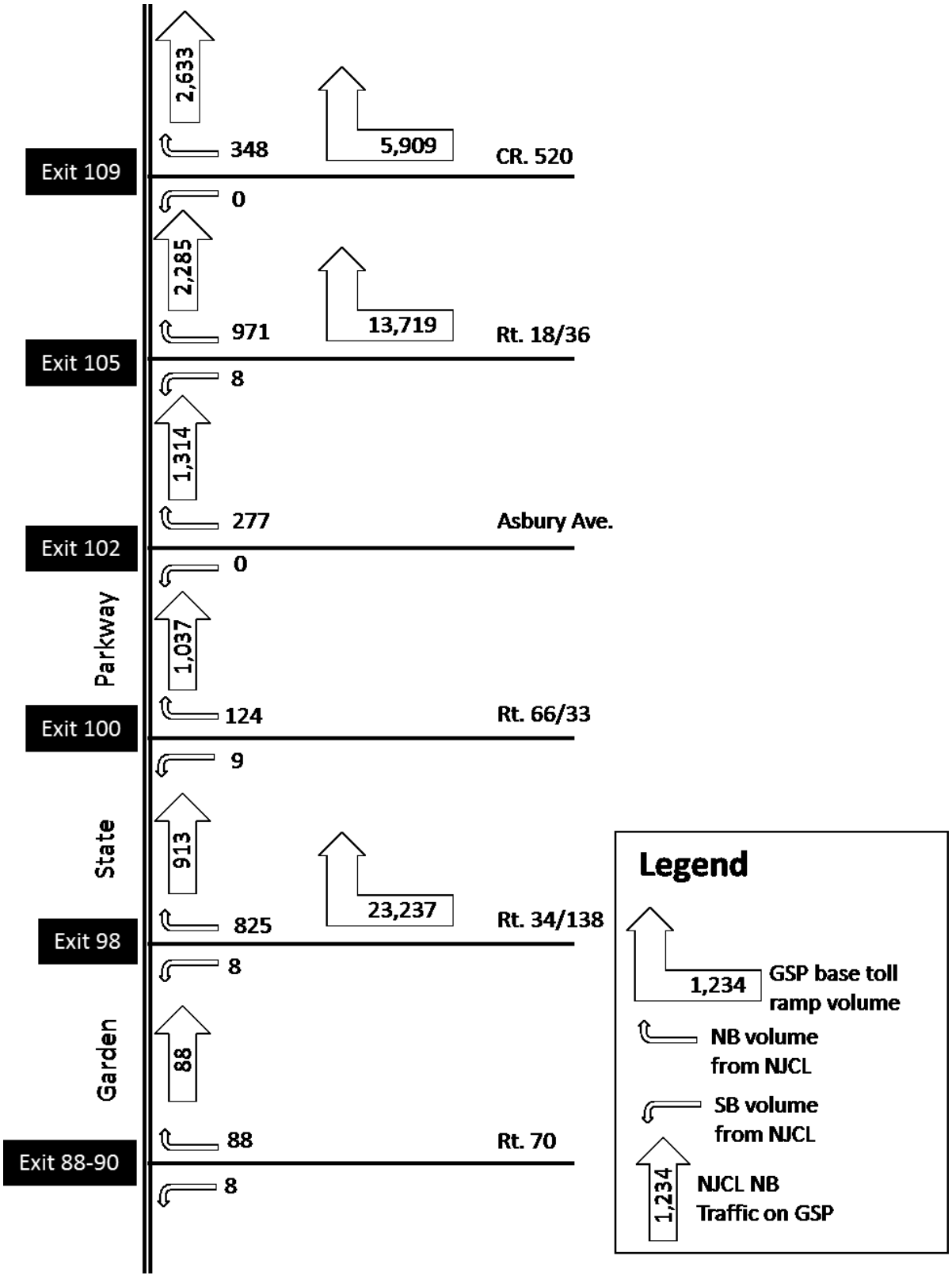

Figure 6 – Additional Traffic Volume that would be Generated if the Current NJCL Riders used Automobiles – Summer Sunday, 10AM - 10PM

Although traffic data from the toll plazas on the GSP are available for all days during the summer of 2013, the data for Saturday, August 10, and Sunday, August 11, were used in this illustration because that was one of the two weekends when the NJCL onboard survey was conducted. Figure 5 and Figure 6, respectively, show the base GSP traffic volumes at the northbound entrances to Exit 98, Exit 105, and Exit 109 for Saturday, August 10, and Sunday, August 11. Data from only the northbound entrances are shown because the southbound volumes cannot be compared with NJCL data as the survey was conducted only on the northbound trains. It should be noted that the GSP traffic volumes shown in Figure 5 and Figure 6 are for the period 10 AM to 10 PM because the NJCL weekend service mostly operates between those time periods.

Figures 5 and 6 show that the vehicles carrying the NJCL riders would converge on GSP Exits 88, 89, 90, 98, 100, 102, 105, and 109. Although a few riders may use other exists, the traffic generated by the NJCL riders would primarily affect the aforementioned exits. Among the exits, Exit 105 and Exit 98 are likely to be affected the most if the NJCL riders were to travel by automobile to their destinations instead of taking the train. For example, a total of 567 northbound vehicles would converge on Exit 105 on a summer Saturday and a total of 971 northbound vehicles would converge on the exist on a summer Sunday. Similarly, a total of 386 northbound vehicles would converge on Exit 98 on a Saturday and 825 vehicles would converge on a Sunday. The traffic volumes at Exits 102 and 109 would be smaller but still significant, whereas the volumes at the other exists would be still smaller.

For comparison purposes, the base traffic volumes on three entrances to the GSP are also shown in Figure 5 and Figure 6. The volumes are for the period 10 AM – 10 PM on August 10 and August 11, respectively. Only the northbound volumes are shown because the southbound volumes cannot be compared with the traffic volumes that would be generated by the surveyed NJCL riders who were traveling on northbound trains. It can be observed from the two figures that the base traffic volume is the highest on the northbound entrance to the GSP at Exit 98. On August 10 (Saturday), 20,977 vehicles were counted at the toll plaza on the northbound approach to the GSP, whereas 23,237 vehicles were counted at that location on August 11 (Sunday).

A comparison of the traffic generated by NJCL riders with the base traffic at the three GSP toll plazas provides valuable insights about the role of NJCL in reducing traffic on regional road network (See Table 15). The comparison shows that the effect of NJCL riders on all three GSP locations would be higher on Sundays than Saturdays. Among the three locations, Exit 105 would have the most diverted traffic on both Saturday and Sunday, followed by Exit 98 and Exit 109, respectively. The comparison also shows that traffic volumes in the three locations will increase by 1.8% to 7.1% at the three locations if the NJCL riders were to use automobiles instead of taking trains. The effect would be the highest at Exit 105 on Sundays, where traffic volume would increase by 7.1%. At Exit 109, traffic volume would increase by 5.9%, whereas at Exit 98, traffic would increase by 3.6%.

Table 15 – Potential Increase in GSP Traffic Volume if NJCL Riders Diverted to Automobile (10 AM – 10 PM)

Day	Location of Toll Plaza	Northbound base traffic volume at toll plaza (10 AM- 10 PM)	NJCL rider traffic	Increase in traffic from NJCL riders
Saturday, 8/10/13	Exit 98	20,977	386	1.8%
Saturday, 8/10/13	Exit 105	11,740	567	4.8%
Saturday, 8/10/13	Exit 109	6,291	251	4.0%
Sunday, 8/11/13	Exit 98	23,237	825	3.6%
Sunday, 8/11/13	Exit 105	13,719	971	7.1%
Sunday, 8/11/13	Exit 109	5,909	348	5.9%

Since a large proportion of the NJCL weekend riders traveling on northbound trains leave the shore area between 4 PM and 8 PM, another set of analysis was undertaken to estimate the amount of additional traffic that would be generated by the NJCL riders travelling by automobile during that period. According to station passenger counts, 52% the Saturday boardings at the 13 shore area stations occur between 4 PM and 8 PM. On Sundays, boardings during that 4-hour period constitute 55% of the daily boardings. By applying these proportions on the NJCL-generated daily traffic volumes shown in Figures 5 and 6, diverted traffic volumes for the 4 PM – 8 PM period were obtained. Figures 7 and 8 show the traffic generated by diverted NJCL riders for 4 PM – 8 PM period. They are also summarized in Table 16.

Table 16 – Potential Increase in GSP Traffic Volume if NJCL Riders Diverted to Automobile (4 PM – 8 PM)

Day	Location of Toll Plaza	Northbound base traffic volume at toll plaza (4 PM- 8 PM)	NJCL rider traffic	Increase in traffic from NJCL riders
Saturday, 8/10/13	Exit 98	8,236	201	2.4%
Saturday, 8/10/13	Exit 105	4,889	295	6.0%
Saturday, 8/10/13	Exit 109	2,527	131	5.2%
Sunday, 8/11/13	Exit 98	8,329	454	5.4%
Sunday, 8/11/13	Exit 105	5,837	534	9.1%
Sunday, 8/11/13	Exit 109	2,465	191	7.8%

A comparison of the last column of Table 16 with the last column of Table 15 reveals that the percent increase in traffic during the 4 PM – 8 PM period would be higher than the percent increase for the whole day if the NJCL riders diverted to automobile. For example at GSP Exit 105, traffic volume would increase by 9.1% in the 4 PM – 8 PM period, but would increase by only 7.1% during the 10 AM – 10 PM period. Similar differences can be observed at Exits 109 and 98 as well. These differences indicate that the effectiveness of the NJCL eastbound trains in reducing traffic is higher during the 4 PM – 8 PM period than the rest of the day.

It may be noted that the NJCL also has a modest effect on traffic at the Asbury Park Toll Plaza. If the NJCL riders diverted to automobile, traffic volume in the northbound direction at that location would increase by 1.2% on Saturdays and 2.4% on Sundays between 4 PM and 8 PM.

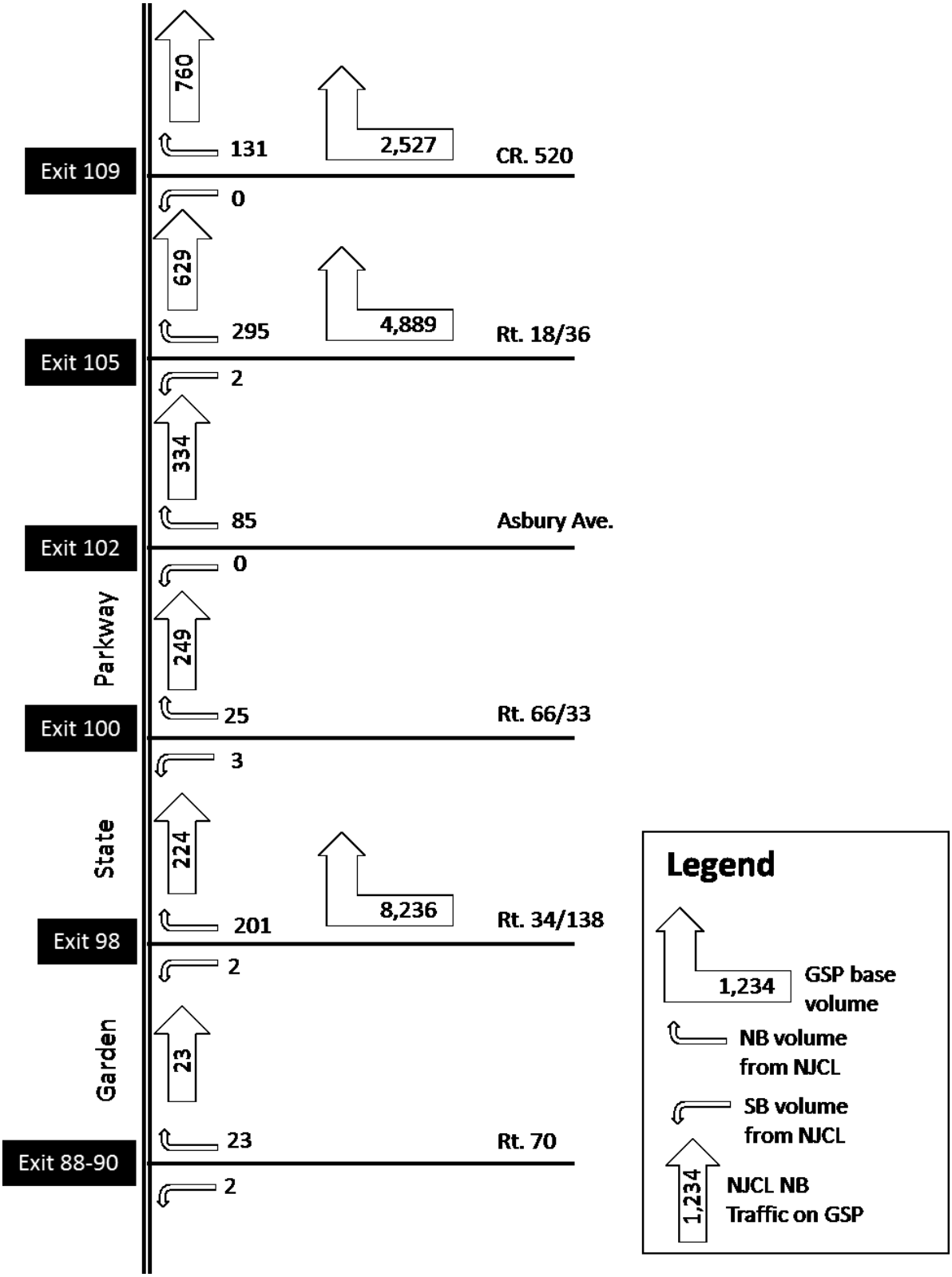

Figure 7 – Additional Traffic Volume that would be Generated if the Current NJCL Riders used Automobiles – Summer Saturday, 4AM - 8PM

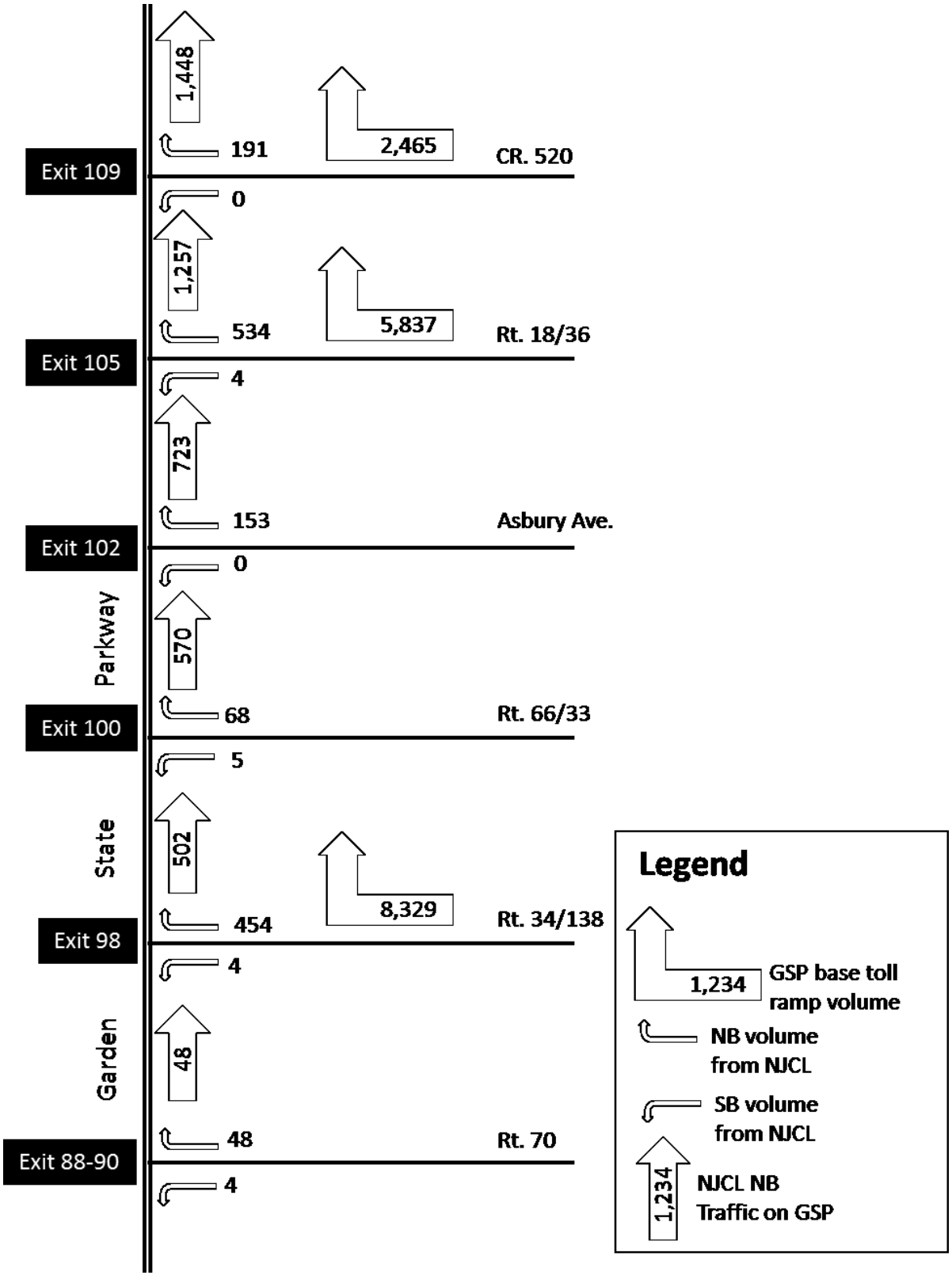

Figure 8 – Additional Traffic Volume that would be Generated if the Current NJCL Riders used Automobiles – Summer Sunday, 4AM - 8PM

Conclusions

The analysis pertaining to the NJCL summer weekend service showed that the service generates substantial benefits to the communities served in the shore area as well as the state of New Jersey and the region as a whole. By generating economic benefits such as jobs, earnings, and local taxes from the spending of the riders, the service helps the local economies of the shore area tremendously. By generating state taxes and bringing in revenue from outside the state, it helps the state of New Jersey as a whole. By allowing riders from New York City and northern New Jersey to avoid extreme congestion on the regional road network, it helps the riders. Furthermore, visitors who travel to the shore area by automobile get certain amount of reprieve from traffic congestion because of the NJCL riders. Had they been using automobile to travel to the shore area, the traffic conditions in and to the shore area would have been even worse.

The following are some of the highlights of the benefits from the NJCL summer weekend service:

- The spending of approximately $14.8 million by the NJCL summer weekend riders generate 225 annualized jobs (or 700 summer jobs), $9.1 million in earnings, $1.1 million in state taxes, almost $600,000 in local taxes, and $15.5 million in GDP.
- Among the shore area communities, Neptune Township and Asbury Park account for most of the rider spending and economic benefits, but the benefits are also spread to communities far from the NJCL stations, such as Toms River, which is 17 miles away from Bay Head, the closest NJCL station.
- Although 63% of the weekend NJCL riders visiting the shore community are from out of state, because of their higher spending than the in-state visitors, they contribute approximately 81% of the economic benefits.
- A large proportion of the NJCL summer weekend riders are from households without vehicles. As a result, 21% of the riders would not visit the shore area in the absence of the NJCL. These riders contribute 16% of the economic benefits generated by all NJCL summer weekend riders.
- Eating and drinking places, such as bars and restaurants, and hotels and motels account for the highest share of the shore area spending by the NJCL weekend riders, the former accounting for 44% and the latter accounting for 30%. Other activities, such as amusement and shopping, also contribute substantially.
- Due to the long distance between the shore area and the places from where the NJCL weekend riders visit, the NJCL helps to reduce a substantial amount of VMT and GHG. If the current NJCL riders traveled to the shore area by automobile, an additional VMT of 6.8 million and CO_2 emission of 2,794 metric tons would have been generated during the summer weekends alone.
- If the current NJCL riders used automobile to travel to the shore area, there would have been a discernible increase in traffic volumes on the shore area roads. Some GSP exits would experience around 7% increase in daily traffic volume and 9% increase in traffic volume between 4 PM and 8 PM.

BENEFITS FROM TRANSIT SERVICE TO THE PRUDENTIAL CENTER

The 18,500-seat Prudential Center arena in downtown Newark hosts 41 home games of the National Hockey League (NHL) team New Jersey Devils and numerous other events including concerts and shows throughout the year. Due to its location only two blocks away from the Newark Penn Station, one of the busiest train stations in New Jersey, many visitors to the arena use public transit to attend events. This chapter of the report summarizes the economic benefits, the environmental benefits, and the congestion-reduction benefits from transit service to the Prudential Center arena by focusing on the New Jersey Devils hockey games during the 2013-14 season and a concert by pop music artist PINK held in November, 2013.

The Prudential Center was selected for this study because most events held there are recreational in nature. The tasks involved for the estimation of economic, environmental, and congestion-reduction benefits from the public transit service to the Prudential Center involved surveys of event goers and analysis of both primary and secondary data. Unlike the research pertaining to the NJCL, no focus groups were conducted involving the Prudential Center visitors. Since the key components of the survey instrument for the Prudential Center was vastly similar to the NJCL survey, there was no need to pretest the survey once again. The following sections describe the major tasks involved for the estimation of benefits from public transit to the Prudential Center.

The Prudential Center Surveys

In order to estimate the economic, environmental, and congestion-reduction benefits from public transit to recreational events at the Prudential Center, it was essential to conduct surveys of event attendees at the center. Since NHL hockey games involving the New Jersey Devils attract far more visitors to the center than other events because as many as 41 hockey games are played at the center per season, the primary focus of the surveys was surveys at hockey events. Two surveys were conducted at hockey events, one involving a game against the New York Rangers and another involving a game against the Detroit Red Wings. Although concerts held at the Prudential Center are less generalizable than hockey games because they are of different types, considering that a number of concerts are held at the center throughout the year, a survey was also conducted at a concert by PINK. However, the primary focus of the analysis presented in this chapter are hockey games. Although surveys were conducted at only two hockey games, the survey results were expanded to estimate the benefits from public transit for the entire hockey season. Table 17 shows the dates of the surveys at the Prudential Center and the number of completed surveys at each event.

The Prudential Center surveys were distributed at several locations inside the building but outside the seating area. Two types of surveys were distributed – a short survey and a long survey. The short survey included only one question pertaining to travel mode to the arena, whereas the long survey included a large number of questions, including expenditures incurred for various purposes during the trip to the event. The long survey

included many other questions pertaining to trip origin, number of accompanying persons, reasons for using specific travel modes, and demographic and socioeconomic characteristics. The response rate for the surveys is difficult to obtain because it was impossible to track the number of intercepted visitors in an extremely crowded environment.

Table 17 – Completed Surveys Received at the Prudential Center Events

Event	Date	Short Survey	Long Survey	Total Survey
NJ Devils vs. NY Rangers	Saturday, 10/19/13	226	324	550
NJ Devils vs. Detroit Red Wings	Friday, 12/06/13	211	451	662
PINK Concert	Wednesday, 12/11/13	176	225	401
Total		613	1,000	1,613

According to the NHL, the New York Rangers hockey game on 10/19/13 was attended by16,592 spectators, while the Detroit Red Wings game on 12/06/13 was attended by 13,223 spectators.[5] It was estimated from data provided by the same source that the average number of spectators at Devils home games at the Prudential Center during the entire season was 15,012. The average number of spectators was calculated by including 40 games held at the Prudential Center and excluding one game held at an outdoor venue. Based on stage configuration, it was determined that the PINK concert was attended by approximately 14,500 persons.

The Share of Public Transit Trips for the Prudential Center Visitors

Since the surveys at the three events were given to all persons irrespective of what travel mode they used to travel to the Prudential Center, it was essential to estimate the proportion of visitors who came by public transit. This proportion was estimated by combining data from the short survey and the long survey. Minor adjustments had to me made to the base estimates because it was discovered that the propensity to use transit varied by survey locations within the building. The locations in close proximity to the Newark Penn Station generated a greater number of transit users, whereas the locations close to the car parking areas generated greater number of automobile users. After the adjustments, it was evident that approximately 25% of the visitors to the hockey games came by public transit, whereas 26.3% of the visitors to the concert came by that mode. The estimated number of public transit users to the surveyed events are shown in Table 18. The table also shows the average and total number of persons using public transit to attend hockey games in an entire hockey season involving 41 games.

[5] http://www.nhl.com/ice/gamestats.htm?fetchKey=20142ALLSATAll&viewName=summary&sort=homeTeam.teamName&pg=19

Table 18 – Estimated Number of Visitors using Public Transit to Events

Event	Percent using transit	Persons attending event	Persons using public transportation
NY Rangers game	25%	16,592	4,148
Detroit Red Wings game	25%	13,223	3,306
Average NJ Devils home game	25%	15,012	3,753
Total NJ Devils home game (41 games)	25%	615,492	153,873
PINK concert	26.3%	14,500	3,814

Expenditure by Public Transit Users

Like the NJCL survey, the survey respondents attending events at the Prudential Center also provided estimates of their expenditures. The estimates included all expenditures made between the time of arrival in Newark for the event and the time of departure from the city after the event ended. The expenditure estimates did not include the cost of tickets or entry fee to the event. The estimates of the expenditures by the public transit users are presented in Table 19. It should be noted that the figures presented in the first column of the table pertain to all 41 hockey games of the season, whereas figures in the second column pertain to a single concert by PINK.

Table 19 – Expenditure by Visitors using Public Transportation to Events

Industry	Hockey Season (41 Games)	PINK Concert
Hotels and Motels	$152,457	$7,910
Food Services and Drinking Places	$5,755,320	$126,090
Retail	$556,722	$21,054
Amusement	$7,047	$13,327
Wholesale	$372,267	$13,339
Transit	$400,508	$7,691
Total spent in NJ	$7,244,321	$189,411
Total	$7,541,592	$201,392

The expenditure categories for the Prudential surveys were similar to those for the NJCL survey. Like the NJCL survey, the actual expenditures on the consumption of miscellaneous goods and services were divided into the *Retail* and *Wholesale* categories because of the requirements of the R/ECON^{TM} I-O model. The adjusted figures shown in Table 19 were used as the inputs for the model. Like the model with NJCL survey data, the figures shown in Table 19 were adjusted to account for leakages due to the consumption of goods and services produced out of state.

The estimated economic benefits from the spending of the persons who used public transit to attend hockey games in the entire 2013-2014 season and transit users who attended the PINK concert in November 2013 at the Prudential Center are shown in

Table 20. The vast discrepancy between the two sets of number is because of the fact that the figures for hockey games represent 41 games played by the NJ Devils, whereas the figures for the concert pertain to only one event. Since concerts are of vastly different types and they attract different types of audiences, it is not possible to generalize the economic benefits from only one concert to all concerts held in a year.

Table 20 – Economic Benefits from the Expenditure of the Public Transit Users Attending Hockey Games and Concert

Benefits	Total Effects - Hockey Season (41 games)	Total Effects - PINK Concert (one event)
Employment / Jobs	135	3
Earnings	$4,734,551	$125,493
State Taxes	$592,083	$16,172
Local Taxes	$318,964	$8,453
GDP	$8,055,205	$214,118

It is evident from the table that the spending by the public transit users to hockey games help to create 135 annualized jobs and generate $4.7 million in earnings, almost $600,000 in state taxes, more than $300,000 in local taxes, and $8 million in GDP. While the economic benefits shown in Table 20 reflect the total effect of spending by the transit users, the R/ECON^{TM} I-O model also estimated the direct and indirect/induced effects. According to the model results, the direct/indirect split for employment was 73%/23%, whereas the splits for earnings and GDP were 52%/48% and 47%/53%, respectively.

By using the estimates of spending in Table 19 and the benefits in Table 20, it is possible to estimate the return-on-investment multipliers. For example, return-on-investment for employment for the hockey season was 17.9 jobs per million dollars (i.e., 135/ $7,541,592 X $1000,000=17.9) whereas the return-on-investment for earnings was $627,792 (i.e., $4,734,551/$7,541,592 X $1000,000=$627,792).

Environmental and Congestion-Reduction Benefits from Transit to Prudential Center

Like the NJCL providing access to the Jersey shore area, public transit services to the Prudential Center also provide an opportunity to persons attending recreational activities at the Prudential Center to avoid using an automobile. Transit service to the Prudential Center is of high quality because of its proximity to the Newark Penn Station. NJ TRANSIT trains from New York City and various parts of New Jersey pass through the station. Furthermore, the Newark Broad Street Station, which connects various parts of northern New Jersey and Hoboken to Newark is only about a mile from the Prudential Center.

The Newark downtown area, where the Prudential Center is located, is highly congested in the evening peak period because of a large number of workers leaving the area and a high volume of through traffic on major highways. Under such circumstances, transit services to evening events, especially hockey games, becomes highly attractive to event goers because they provide an opportunity to avoid traffic congestion. Transit service for visitors from New York City is particularly attractive because travelers can avoid tolls and congestion at the trans-Hudson crossings.

Because of the large number of visitors using public transit to attend hockey games and other recreational events at the Prudential Center, transit services are bound to provide environmental and congestion-reduction benefits. The following sections summarize the results from analysis pertaining to the estimation and environmental and congestion-reduction benefits from public transit services to the Prudential Center. The analysis pertains to only hockey games because they are far more common than other events at the center.

Environmental Benefits from Public Transit to Prudential Center

As shown in Table 18, an average of 3,753 spectators can be expected to use public transit to attend a hockey game at the Prudential Center, meaning that the total number of spectators for the full season consisting of 41 games would be approximately 153,873. If these spectators were to use automobile instead of public transit, a substantial amount of additional VMT and GHG would have been generated.

In order to estimate how much additional VMT would have been generated if the transit-using hockey spectators decided to come to the arena by automobile, it was necessary to estimate (a) the distance between their trip origins and the Prudential Center, and (b) the carpool rate that would need to be applied. To obtain the trip distances, the spectators' trip origins from the survey data were geocoded and subsequently the network distances from the trip origins to the Prudential Center were estimated by using the ArcGIS network analyst. The analysis revealed that the average network distance for the transit-using hockey spectators was 18.6 miles. It was further estimated that the total one-way VMT generated by their trips would be 2,862,038, or approximately 2.9 million, if all riders came to the games by single-occupancy vehicles. However, since many of those spectators would carpool with other spectators, the actual VMT generated by those persons would be smaller.

From the analysis of number of persons in group for the survey respondents who came to the hockey games by automobile, it was determined that the average number of persons per automobile would be 2.1 if the transit users came to the games by automobile.[6] Application of this carpool rate revealed that the total one-way VMT generated by the transit-using hockey spectators would be 1,383,318, or approximately 1.4 million, for the season if all current transit users came to games by automobile.

[6] This rate is close to 2.2 per automobile found in a study for the Colorado Avalanche hockey games in Denver (See Henao and Marshall, 2013, in reference list #22)

Since this VMT amount was estimated on the basis of one-way travel, by assuming that the hockey spectators would return from the Prudential Center to their trip origins after the game, it was estimated that the total VMT for the hockey spectators for the entire season would be 2,766,637, or, approximately 2.8 million.

By applying the volume of VMT generated by the diverted transit users to the EPA method described earlier in this report, it was possible to estimate the amount of GHG that would be generated due to the diversion of transit riders to automobile. Using the EPA assumption of 21.6 miles of travel per gallon of gasoline, it was estimated that the VMT of 2,766,637 generated by hockey spectators in the entire 41-game season would lead to the consumption of 128,085 gallons of gasoline. By using the EPA method, it was further estimated that the transit-using spectators would generate a total CO_2 of 1,138 metric tons if they used automobile to come to and return from the Prudential Center by automobile. The effects of transit-using hockey spectators diverting to automobile for all 41 games of a hockey season are shown Table 21.

Table 21 – Environmental Benefits from the Transit Service to Prudential Center Hockey Games (Entire Hockey Season)

Measure	Total (Two-Way) Effect
Vehicle miles travel (VMT)	2,766,637
Gasoline consumption (gallons)	128,085
Gasoline consumption (barrels)*	3,050
Cost of gasoline used**	$448,298
Crude oil barrels used	6,741
Cost of crude oil used***	$687,682
CO_2 emissions (metric tons)	1,138

* One barrel = 42 gallons
** At $3.50/gallon (http://www.gasbuddy.com/gb_retail_price_chart.aspx)
*** At $102.01/barrel from Bloomberg (http://www.bloomberg.com/energy/

This volume of VMT and GHG generated by the hockey spectators is substantially smaller than the volumes for the NJCL riders even though the NJCL estimates were based on 15 weekends and the Prudential Center estimates were based on 41 games. A reason for the lower estimate for the Prudential Center spectators is that the average trip distance for the hockey spectators is less than a third of the average trip length of the NJCL riders. Furthermore, their carpooling rate was also considerably higher than the NJCL riders (2.1 persons per car versus 1.6 persons per car for the NJCL riders).

Congestion-Reduction Benefits from Public Transit to Prudential Center

In addition to the economic and environmental benefits, public transit service to the Prudential Center also helps to reduce traffic congestion in the areas surrounding the center in downtown Newark. As mentioned in the previous section, around 25% of the hockey spectators visiting the Prudential Center for New Jersey Devils home games use public transit. If those spectators were to use automobiles instead of transit, there would have been additional traffic on Newark roads before and after hockey games.

Since most hockey games begin at 7 PM or 7:30 PM and spectators often arrive in Newark 2-3 hours before game time, there is an overlap of traffic generated by hockey spectators and traffic generated by workers leaving work in Newark and the surrounding areas. The roads that are most affected by the traffic generated by the automobile-using hockey spectators are near the Prudential Center, including McCarter Highway (Rt. 21), Raymond Blvd., Market Street, and Lafayette Street. As such, if the current transit-using spectators diverted to automobile, the same roads would be affected the most.

An effort was made to examine how the roads surrounding the Prudential Center would be affected if the hockey spectators who currently come to games by public transit diverted to automobiles for their trips to the center. The purpose of this effort is to show the effect of the diversion on selected intersections rather than to provide results from a full-fledged traffic-impact analysis.

Two specific tasks were undertaken as a part of this effort. First, traffic was counted on selected intersections near the arena on two separate days. Since the New York Rangers game and the Detroit Red Wings game were held on Saturday and Friday evenings, respectively, traffic was also counted on a Friday evening and a Saturday evening on game days. The two specific days were Saturday, March 8, and Friday, April 4, 2014. Traffic was counted on both days in the pre-game period only.

Second, traffic count data were collected from the City of Newark traffic department. This data pertained to a base period (when the Prudential Center opened) and to 2010. Although the data collected from this source were not directly comparable to the data collected through the traffic counts conducted on game days because of a time lapse and reconfiguration of certain intersections in the intervening period, the data were useful in certain other regards. For example, it was found from the data that arena traffic was considered to be approximately 75% of total PM peak period hourly traffic at certain intersection turn movements near the arena in the base period and between 50% and 80% in 2010.

To obtain estimates of the additional traffic volume that would be generated by transit users, a procedure involving several steps was undertaken. First, the direction- and movement-specific counted traffic at intersections was converted to arena traffic with location- and movement-specific assumptions. Since the 2010 proportion of traffic attributed to the arena in the Newark City data varied widely, simplifying assumptions were made for the conversion. For each intersection, it was assumed that 60% of the traffic moving in the direction of the arena was arena traffic. For traffic moving in the opposite direction, it was assumed that only 20% was generated by the arena. For the traffic that was moving neither towards nor away from the arena, it was assumed that 40% of the traffic was generated by the arena. Second, additional traffic volume for each movement due to a diversion from transit to automobile was estimated by assuming that all of the 25% spectators who currently use transit will use automobile. Third, on the basis of the Prudential Center survey data, it was assumed that the carpool rate for these spectators would be 2.1 persons per automobile. Fourth, the traffic volume generated from the spectators was assigned to different intersection turn

movements based on their trip origins. Finally, the estimated additional traffic volume for each movement was divided by the counted traffic for the movement to obtain percent increase for the movement. The analysis showed that the hourly traffic volume at the intersections in close proximity to the arena would increase between 5% and 15% if all current transit users decided to come to hockey games by automobile. Because of the assumptions made, the increase in traffic would be high – around 15% – for the intersection movements leading towards the arena, and low – around 5% – for the intersection movements leading away from the arena.

Figures 9 through 12 show the additional traffic volumes that could be expected if the current transit users came to hockey games by automobile. The estimates are shown for a one-hour period before a hockey game. Figure 9 and Figure 10 are based on traffic counts on a Friday evening, whereas Figure 10 and Figure 11 are based on traffic counts on a Saturday evening.

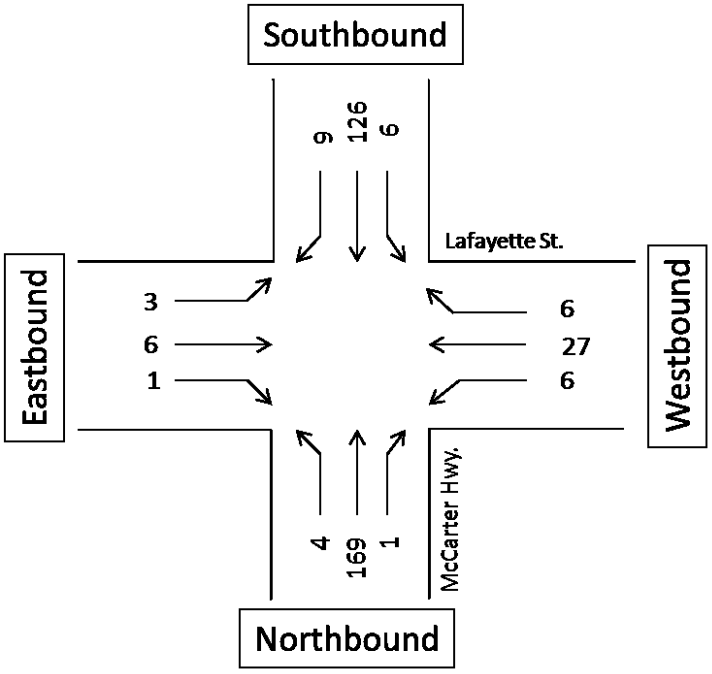

Figure 9 – Additional Hourly Traffic that would be Generated at McCarter Highway and Lafayette Street if Current Transit Riders used Automobile (Friday evening)

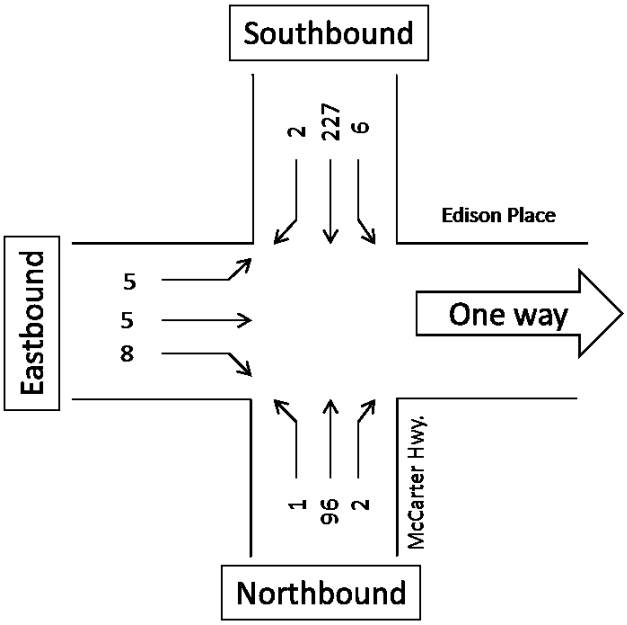

Figure 10 – Additional Hourly Traffic that would be Generated at McCarter Highway and Edison Place if Current Transit Riders used Automobile (Friday evening)

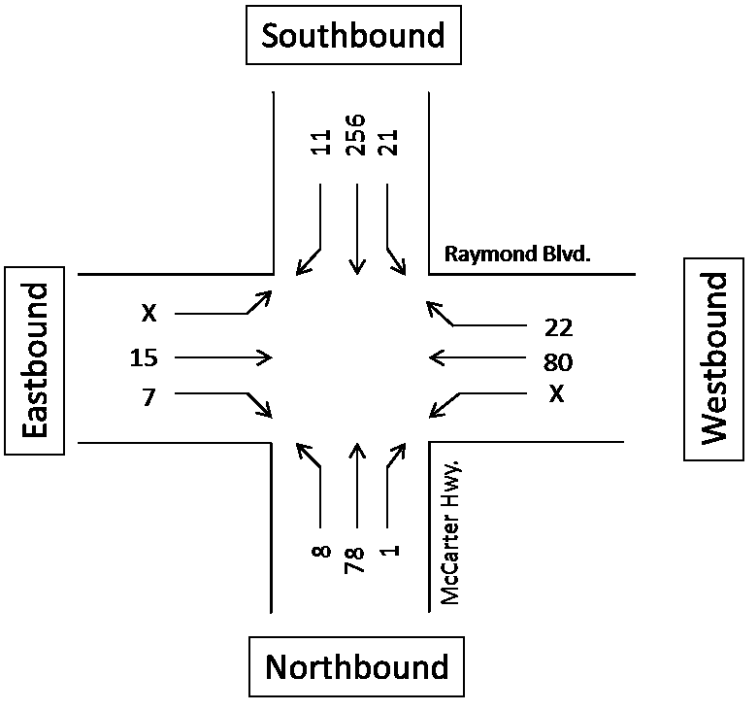

Figure 11 – Additional Hourly Traffic that would be Generated at McCarter Highway and Raymond Blvd. if Current Transit Riders used Automobile (Saturday evening)

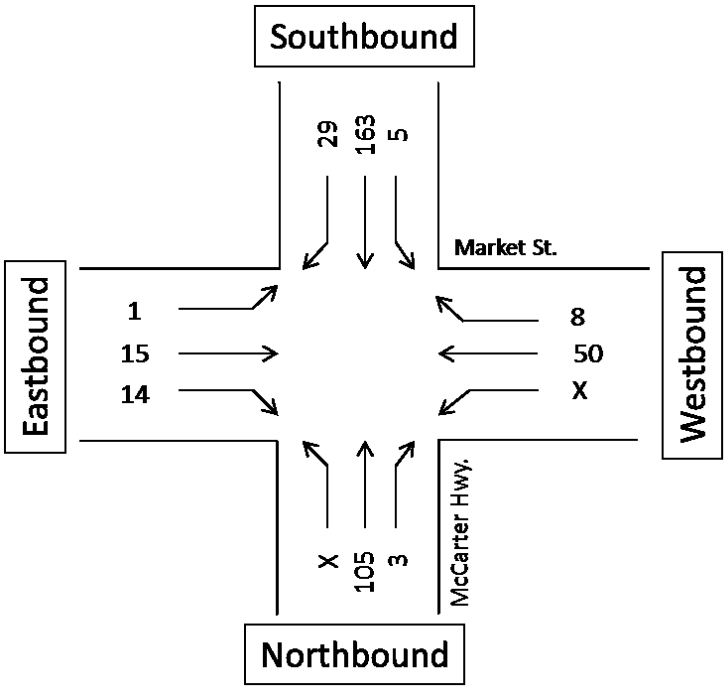

Figure 12 – Additional Hourly Traffic that would be Generated at McCarter Highway and Market Street if Current Transit Riders used Automobile (Saturday evening)

Conclusions

The analysis in this chapter revealed that the transit services to the Prudential Center generate a substantial amount of economic benefits, environmental benefits, and congestion-reduction benefits. The contributions to the benefits are most significant from the hockey spectators who travel to and from the arena by public transit because as many as 41 games involving the New Jersey Devils are played in a season. Significant contributions are also made by persons attending other types of events, although no single type of event is as common as hockey games.

This research showed that approximately 25% of the hockey spectators travel to the Prudential Center to attend hockey games by public transit. For the single concert that was surveyed, more than 26% arrived by transit. Given that the area can seat 18,500 persons for certain events, 25% of 26% transit users means a large a number of transit riders. Their spending as well as avoidance of automobiles to travel to events at the center helps to generate the economic, environmental, and congestion-reduction benefits.

The analysis showed that the transit-using hockey spectators spend approximately $7.5 million in the Newark area during an entire hockey season through their consumption of goods and services. That amount does not even include ticket prices for the events. Their expenditures result in the creation of 135 annualized jobs and the generation of $4.7 million in earnings, almost $600,000 in state taxes, approximately $320,000 in local taxes, and more than $8 million in GDP. The analysis of survey data pertaining to the

PINK concert also showed that a substantial amount of economic benefits are generated from the spending of the persons who travel to concerts by public transit. A comparison of return-on-investment multipliers showed that hockey games generate slightly higher jobs and earnings than concerts on a per-million dollar basis, although they generate similar amounts of taxes.

By traveling to hockey games and concerts by public transit, visitors to the Prudential Center also help to avoid the generation of additional VMT and GHG. If the hockey fans who currently travel to the Prudential Center by public transit were to travel by automobile, they would have generated 2.8 million in VMT in a single hockey season, which would have generated 1,138 metric tons of CO_2.

Finally, the decision to use public transit by the hockey spectators also helps to avoid additional traffic congestion in the areas surrounding the Prudential Center. In the period before evening hockey games, traffic volumes in some major road intersections near the center would have increased by up to 15% per hour if the transit-using hockey spectators decided to use automobiles.

BENEFITS FROM THE PHILADELPHIA-CAPE MAY EXPRESS BUS SERVICE

The estimation of benefits from the NJ TRANSIT Express Bus #316 between Philadelphia and Wildwood/Cape May consisted of only economic benefits through the R/ECON™ model. Unlike the NJCL and the transit services to the Prudential Center, environmental and congestion-reduction benefits from the bus service were not estimated because of the modest number of bus riders. The estimation of the economic benefits from the service was based on data collected through an onboard survey of riders. Since the survey was conducted on summer weekends (Saturdays and Sundays) only, the benefits estimated in this chapter pertain to summer weekend service.

The Bus Survey

The primary objective of the Express Bus #316 rider survey was to collect information on the expenditure of the bus riders in the Cape May/Wildwood area so that the economic benefits to the local economies from their expenditures could be estimated. Therefore, the key questions in the survey pertained to the bus users' spending on various goods and services. However, a number of other questions were also included in the survey so that the trip patterns and other characteristics of the bus users could be comprehended.

The survey of the bus riders was conducted on July 27 (Saturday), July 28 (Sunday), August 17 (Saturday), and August 18 (Sunday) of 2013. Riders were intercepted on buses traveling from the shore areas (Cape May and Wildwood) towards Philadelphia. A total of 76 passengers completed the survey in the four days. By using actual ridership data from NJ TRANSIT on the four days, a weight variable was created, by which the survey respondents were converted to riders. Upon conversion, the 76 respondents became 546 riders. Considering that there were 15 weekends between Memorial Day and Labor day of 2013, the 546 riders were converted to 8190 riders for the entire summer.

Characteristics of the Bus Riders

Sixty-two percent (62%) of the riders on the bus were found to be female, while 38% were male. Approximately 36% of the passengers were below age 35, 29% were between ages 35-54, 16% were between ages 55-61, and 19% were of age 61 or older. Sixty-one percent (61%) were White, 36% were African American, and the remaining 3% of other races. Ninety-five percent (95%) were non-Hispanic, while only 5% were Hispanic. The income distribution of the riders showed that their income was far lower than the surveyed NJCL riders. About 25% of the riders were from households with less than $15,000 annual income, whereas only 5% were from household with more than $100,000 income.

The bus riders were found to be highly dependent on the service. Seventy-eight percent (78%) of the riders mentioned in the survey that they made the bus trip because they

had no other alternative to travel. Almost half (49%) of them mentioned that they would not have made the trip in the absence of the bus service. Perhaps because of low income and low automobile ownership rate, 29% of the riders mentioned that they would ride as passenger of other persons' cars and only 13% mentioned that they would drive their own car if the bus service were not available.

Although a small proportion of the bus riders visit the Wildwood/Cape May area from within New Jersey (e.g., Camden, Avandale), the bulk of the visitors travel from Philadelphia. According to the survey results, 94% of the riders were returning to Philadelphia, whereas only 6% were returning to places within New Jersey. A vast majority of the bus riders (84%) boarded the bus at Wildwood, whereas only 9% boarded at Cape May, indicating that the bus service is more attractive to persons visiting Wildwood than Cape May. Compared to the NJCL riders, the bus riders stayed in the shore area for a longer duration of time. Only 20% of the riders mentioned that they were in the shore area on a day trip, whereas almost 30% mentioned staying at the shore area for one or two nights, and the remaining 50% mentioned staying in the area for three or more nights. The group sizes of the bus riders were also fairly large. Nineteen percent (19%) of them traveled alone, 26% traveled with one companion, 14% traveled with two companions, and the remaining 41% traveled with three or more companions.

Expenditure by the Bus # 316 riders

The itemized expenditures by the Express Bus #316 riders in the Cape May/Wildwood area during their visit are shown in Table 22. The figures represent all summer weekends. As in the case of the NJCL and the transit services to the Prudential Center, the figures were adjusted for leakage out of the state because of the consumption of goods produced outside New Jersey. The figures presented in the table were used as inputs for the R/ECON^{TM} I-O model to estimate the economic benefits.

Table 22 – Expenditures in the Wildwood/Cape May Area by Bus #316 Riders (All Summer Weekends)

Industry	Expenditure (15 summer weekends)
Hotels and Motels	$558,945
Food Services and Drinking Places	$252,900
Retail	$126,076
Amusement	$266,790
Wholesale	$74,857
Total Spent in NJ	$1,279,568
Total	$1,431,015

Estimation of Economic Benefits from Bus #316

The local economic benefits in the Wildwood/Cape May area from the spending of the Bus #316 riders are shown in Table 23. The figures shown in the table are the outcomes of spending in all 15 summer weekends together. As shown, the spending by the bus riders help to create 20 annualized jobs in the area. The 20 annualized jobs are equivalent to 56 summer jobs. The spending by the bus riders also help to generate more than $900,000 in earnings, almost $110,000 in state taxes, and more than $60,000 in local taxes.

Table 23 – Economic Benefits from the Expenditure of Bus #316 Riders (All Summer Weekends)

Benefits	Total Effects
Employment / Jobs	20
Earnings	$915,475
State Taxes	$109,520
Local Taxes	$60,547
GDP	$1,553,482

The benefit estimates shown in Table 23 are the total effects. The direct/indirect split for employment, earnings, and GDP were 90%/10%, 56%/44%, and 52%/48%, respectively. As in the case of the estimates for the NJCL and transit services to the Prudential Center, by using the benefits in Table 23 and the expenditures in Table 22, the return-on-investment multipliers can be estimated for the bus service. For example, the return-on-investment multiplier for employment is 14 annualized jobs per million dollars (i.e.,20/ $1,431,015 X$1000,000=14), whereas the return-on-investment for earnings is $639,738 per million dollars (i.e., $915,475/$1,431,015 X $1000,000 = $639,738).

Conclusions

Although the Philadelphia-Wildwood/Cape May Express Bus #316 is used by far fewer individuals than the NJCL to visit the shore areas of New Jersey, the analysis showed that the economic benefits from their expenditures is not negligible. Their expenditures in the shore area generate 20 annualized jobs and almost $1 million in earnings. Considering the relatively small number of bus riders, these estimates are substantial. A reason for the relatively high economic impact of the bus service is that the riders visit the shore area for a longer period of time than the NJCL riders and their group sizes are also larger.

The bus service also helps to bring in revenue from out-of-state residents. Considering that 94% of the riders visited the shore area from Philadelphia, whereas only 6% visited from other parts of New Jersey, the contributions to jobs, earnings and taxes from their

spending are almost entirely due to out-of-state visitors. Since more than 80% of the riders visited Wildwood whereas only 9% visited Cape May, the Wildwood area benefits from the bus service more than Cape May.

CONCLUSIONS AND IMPLICATIONS

By focusing on three distinct transit markets – the NJCL, the transit services to the Prudential Center, and the Express Bus #316 service between Philadelphia and Wildwood/Cape May – this study showed that public transit to communities with recreational activities can generate a significant amount of benefits to local communities as well as the state of New Jersey. The study showed that such transit services can generate economic benefits as well as environmental benefits and congestion-reduction benefits. The economic benefits accrue from the spending of the transit-riding visitors to the recreational areas, whereas the environmental and congestion-reduction benefits accrue due to the avoidance of automobile use by the transit riders.

The economic benefits from the spending of transit riders include the creation of jobs and the generation of earnings, state taxes, local taxes, and GDP. The R/ECON^{TM} I-O model results in this study showed that the NJCL summer weekend riders help to create 225 annualized jobs (or 700 summer jobs), whereas the riders attending the 41 home games played by the New Jersey Devils at the Prudential Center generate 135 jobs, and the Bus #316 summer weekend riders help to create 20 jobs. At a time when job growth in the state of New Jersey has at best been stagnant, transit's contribution to the creation of jobs in the state is highly commendable. The same can be said about the generation of earnings and taxes. The R/ECON^{TM} I-O model results showed that the NJCL summer weekend riders help to generate $9.1 million in earnings, $1.1 million in state taxes, and almost $600,000 in local taxes. Although certain communities like Neptune Township and Asbury Park benefit the most from the NJCL riders' spending, many communities located far from the NJCL stations also receive a share of the economic benefits.

Like the NJCL summer weekend riders, the transit riders attending hockey games and other recreational events at the Prudential Center also contribute substantially to the generation of earnings and taxes. The riders attending hockey games generate $4.7 million in earnings, almost $600,000 in state taxes, and more than $300,000 in local taxes in the entire season. Similarly, despite its modest ridership, the Bus #316 summer weekend riders help to generate almost $1 million in earnings, more than $100,000 in state taxes, and more than $60,000 in local taxes.

It is not merely that the transit services in the three markets included in this study generate a substantial amount of economic benefits; they generate a large proportion of the benefits from individuals visiting from other states. The R/ECON^{TM} I-O model results for the NJCL summer weekend service clearly showed that more than 80% of the benefits from the rider expenditures accrue due to out-of-state visitors. Although separate model runs could not be undertaken for the Prudential Center transit riders and Bus #316 riders because of limited data, the origins of the visitors seem to indicate that around a quarter of the benefits from the Prudential Center transit riders accrue due to out-of-state visitors and more than 90% of the benefits from Bus #316 accrue due to out-of-state visitors. The generation of large amounts of revenue from out-of-state visitors is an added benefit from the transit services studied.

In addition to the economic benefits, the transit services included in this study also generate substantial environmental and congestion-reduction benefits. If the NJCL summer weekend riders decided to use automobile instead of the train for their visits to the shore area, an additional 6.8 million VMT would be generated, resulting in the consumption of more than 300,000 gallons of gasoline and the emission of almost 2,800 metric tons of CO_2. Similarly, if the transit-riding hockey spectators decided to use automobile instead of transit to attend the 41 professional hockey games of the season at the Prudential Center, an additional VMT of 2.8 million would be generated, resulting in the consumption of almost 130,000 gallons of gasoline and the emission of more than 1,100 metric tons of CO_2. By providing an opportunity to avoid using automobiles for trips to recreational activities, public transit helps to contain both VMT and GHG.

In addition, public transit to recreational activities helps to reduce or contain traffic congestion. By nature, recreational activities generate very high volumes of traffic in particular seasons and times of day. For example, the beach-related attractions in the Jersey shore cause extreme traffic congestion on roads leading to and from the shore areas every summer. Similarly, professional football games at the Metlife Stadium and hockey games at the Prudential Center generate high traffic volumes before and after each game. When mass transit is available, visitors to events in such places can avoid using automobile and thus help to reduce traffic volume. The traffic analysis pertaining to the NJCL summer weekend service in this study showed that the traffic volumes at several Garden State Parkway locations would increase noticeably if the NJCL riders were to use automobile. In some locations, such as the Exit 105 ramp, traffic volume could increase by as much as 9% at certain periods. The traffic analysis pertaining to hockey games at the Prudential Center showed that hourly traffic volumes in some turn movements of major roads surrounding the Prudential Center could increase by up to 15% if the transit-using hockey spectators used automobile to travel to the hockey games.

The significant economic, environmental, and congestion-reduction benefits from transit services to recreational activities in the three study areas seem to suggest that promotion or expansion of such services may generate additional benefits. Making the NJCL even more attractive to New York City riders would help to generate even more revenue from out-of-state riders. Some improvements to the NJCL service have already been made in recent years by adding new direct trains to Bay Head with dual-mode engines. Continuation of such improvements is likely to attract additional riders from New York City and beyond.

Although the NJCL summer weekend riders are highly satisfied with the line's level of service, many survey respondents and focus group participants mentioned the need for local transit services so that the riders could conveniently travel between the shore communities. It appears from the survey and the focus groups that the NJCL summer riders often visit multiple communities in the shore area instead of visiting only one community. Some focus group participants mentioned that they occasionally drive to the shore communities instead of taking the train because of their need to travel to multiple shore communities. Promotion of local buses or shuttles connecting rail stations and

beaches/boardwalks of multiple communities may make the NJCL even more attractive to visitors. Promotion of the NJCL through reduced-cost beach passes may also benefit the service by attracting additional riders.

Transit service to the Prudential Center is already extensive and the survey respondents using transit to events at the center are highly satisfied with the service they used. Many of these riders use transit because of convenience rather than necessity. In order to assess the need for additional service or adjustment of current service to Prudential Center events, NJ TRANSIT will need more detailed data than was collected through this effort. A comparison of trip origins of visitors who use automobile with those who use transit could help to identify places that may require better transit service to the center.

Like the NJCL riders and the transit riders attending events at the Prudential Center, the Bus #316 riders are also highly satisfied with the service they use. However, many of these riders use the service out of necessity because of low income and vehicle ownership. The survey of Bus #316 riders did not provide any indication about the need for additional transit services.

It is worth remembering at the conclusion that the benefits estimated from the NJCL riders in this study pertain to only those who traveled from the shore area on a weekend. Although vacationers often travel to the shore area by the NJCL during weekdays to avoid weekend crowding, their contributions to the local economies are not included in the benefit estimates of this study. Similarly, the ticket prices paid by the transit-using hockey spectators attending games at the Prudential Center are not included in the estimates of economic benefits in this study. Considering the high price of tickets to hockey games, inclusion of ticket prices would have shown far larger amounts of economic benefits than shown in this report.

Finally, the findings of this study indicate that there is a need for the general public to recognize that transit services to recreational activities is important in the state of New Jersey. In addition to providing access to recreational activities throughout the state, they help to generate economic, environmental, and congestion-reduction benefits. Most notably, they help to create jobs and generate earnings and taxes in substantial amounts. In view of the overall economic stagnation experienced by the state over the past few years, it is important to appreciate the contributions of such services to the local economies as well as the state’s economy.

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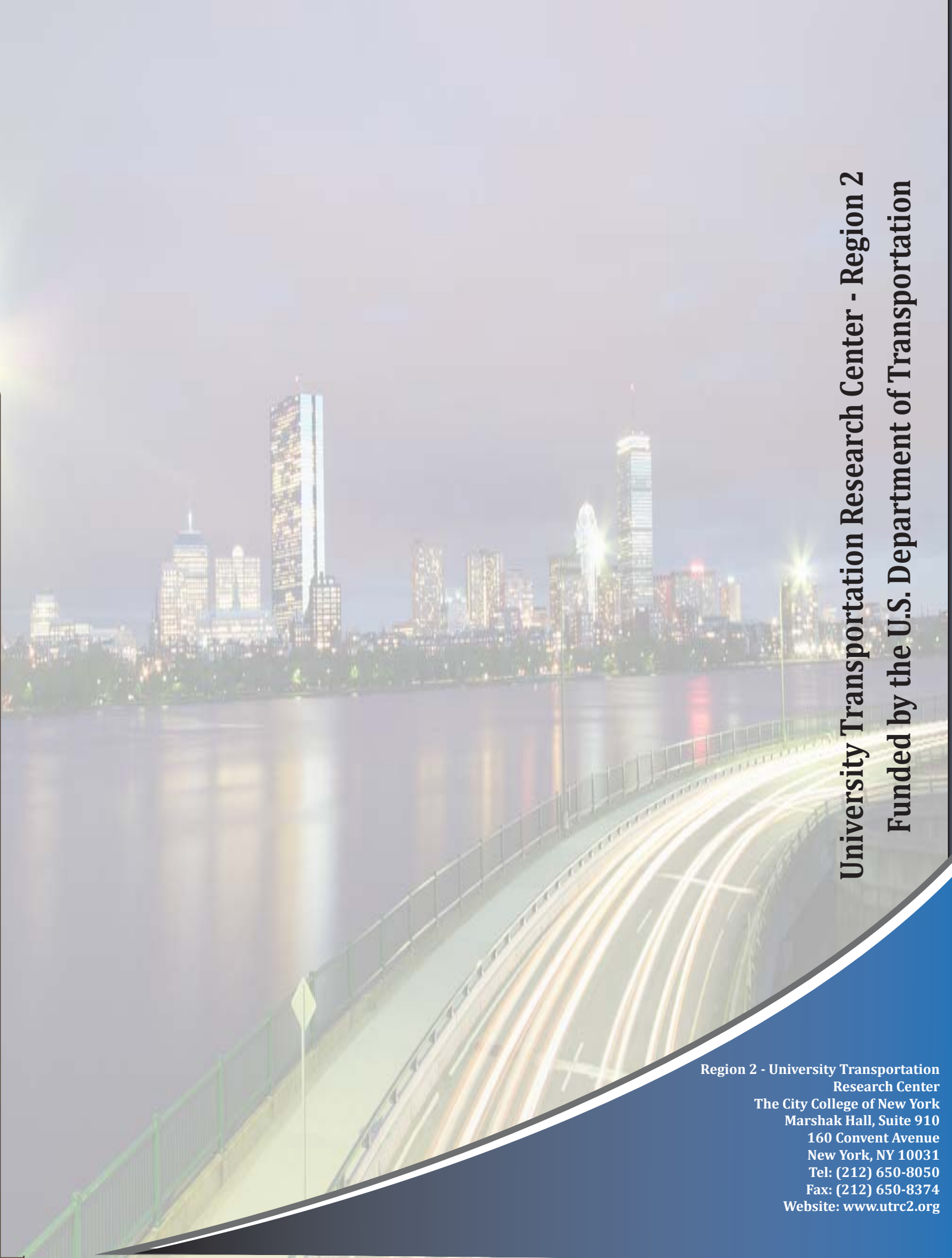

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