APPENDIX 4:

ECONOMIC ANALYSIS CONDUCTED FOR KEY PROJECTS

4 ECONOMIC ANALYSIS CONDUCTED FOR KEY PROJECTS

An important element of the freight plan is an understanding of what the potential economic benefits may be for priority projects. Because data for all of the priority projects were limited, and some projects were in the very early planning stages with no clear solution defined, only a selection of priority projects were analyzed. To the extent possible, a cross-section of projects was selected to ensure that at least one project for each mode of transportation was assessed. Economic analysis was conducted for the following priority projects:

- Interstate 95 Northbound Viaduct
- 6/10, Interstate 95 Southbound Connection
- Allens Ave, Interstate 95 Southbound Connection
- Route 4, Interstate 95 Connection
- Davisville Yard Track Improvements
- T.F. Green Airport Ramp Expansion

For each priority project analyzed, both an economic impact analysis (EIA) and a benefit-cost analysis (BCA) were conducted. It should be noted that these methodologies measure some benefits associated with a potential transportation investment; for example, short-term jobs associated with construction and transportation benefits, such as reduced travel time or accident reduction. There are some benefits, however, that EIA and BCA do not reflect. For example, economic development that may be generated when T.F. Green is able to expand their cargo operations are not included. This section contains a general overview of the methodology used for each type of analysis.

4.1 Economic Impact Analysis

Traditionally, economic impact analysis involves the estimation of three types of effects, commonly referred to as direct effects, indirect effects and induced effects. These are defined below:

- Direct effect: Refers to the economic activity occurring as a result of direct spending by agencies or business located in the study area (e.g., expenses related to construction activities for RIDOT and other transportation projects);
- Indirect effect: Refers to the economic activity resulting from purchases by local firms who are suppliers to the directly affected agencies or businesses (e.g., spending by suppliers of the contractors responsible for construction activities); and
- Induced effect: Represents the increase/decrease in economic activity, over and above the direct and indirect effects, associated with increased/decreased labor income that accrues to workers (of the contractor and all suppliers, in our

example) and is spent on household goods and services purchased from businesses within the study area.

The indirect and induced effects are referred to as multiplier effects because they can make the total economic impact substantially larger than the direct effect alone. In theory, the larger the multiplier, the larger the overall response (total economic impact) to the initial expenditure (direct effect). The total economic impact is the sum of these direct, indirect and induced effects for the project being evaluated.

Typically, economic impacts are measured in terms of employment, industry output, and value added. The employment impact estimates the number of jobs created for a full year. Our analysis presents results in terms of job-years, which is defined as one person employed for one year, whether part-time or full time. Output refers to the total volume of sales. In comparison, value added refers to the value a company adds to a product or service. It is measured as the difference between the amount a company (or State government) spends to acquire it and its value at the time it is sold to other users. Thus, value added can be thought of as a measure of the contribution to the gross domestic product (GDP) made by an establishment or an industry. The total value added within a region is equivalent to the gross regional product and includes employee compensation, proprietary income, other property type income (e.g., rents) and indirect business taxes (e.g., excise taxes).

The IMPLAN® system is used in this study for estimating economic impacts. The event year of the economic impact is determined by the year of construction for each project, but all impacts are expressed in 2016 US dollars. The system is an input-output based regional economic assessment modeling system developed and maintained by MIG, Inc.[1] The IMPLAN® system consists of a software package[2] and data files that are updated every year. The IMPLAN data files include transaction information (intra-regional and import/export) on 440 distinct industrial sectors (corresponding to four- and five-digit North American Industry Classification System [NAICS] codes) and data on over 20 economic variables, including employment, output and value added.

4.2 Benefit-Cost Analysis

Benefit-cost analysis for transportation projects involve a comprehensive assessment of impacts across all benefit and cost categories. Costs and benefits are measured using a "baseline" scenario where the status quo remains and an "alternative" scenario, where the project is completed, is compared. The difference between the two

[1] For more information on the IMPLAN® system, visit http://www.implan.com/.
[2] The newly released IMPLAN Version 3.0 is used for this study.

scenarios is considered the impact of the project. The benefits are translated to equivalent monetary levels in order to compare the public benefits of the project to the project's life-cycle costs. Several criteria are used by decision-makers to determine whether investment projects are economically reasonable to undertake. The most widely used of these decision criteria are:

- **Net Present Value (NPV) –** The net present value is the discounted present value of benefits minus the discounted present value of costs. The net present value is measured over the life-cycle of the project under consideration. A net present value greater than zero indicates that the investment returns benefits proportionally in excess of costs.
- **Benefit-Cost Ratio (BCR) –** A benefit-cost ratio is the ratio of a project's discounted stream of benefits to the project's discounted stream of costs. A benefit-cost ratio greater than 1.0 indicates that a project generates more discounted benefits over the analysis time frame than costs generated in undertaking a project. A benefit-cost ratio greater than 1.0 is considered economically worthwhile. In contrast, projects with a benefit-cost ratio less than 1.0 indicate that the project's costs exceed its benefits and may not be considered economically worthwhile.

A dollar today is worth more than a dollar five years from now, even if there is no inflation. This is because today's dollar can be used productively in the ensuing five years, yielding a value greater than the initial dollar. Future benefits and costs are discounted to reflect this reality, and the analyses conducted for the freight plan utilize the USDOT-recommended discount rate of seven percent. A three percent discount rate is also used as a sensitivity analysis.

In the BCAs conducted for the freight plan, there are several types of transportation public benefits measured. Some of the benefits anticipated for the freight plan priority projects analyzed include:

- **Travel Time Savings:** The most prominent component of travel time costs is the delay due to high levels of roadway congestion, start-and-stop traffic flows, and in extreme cases, gridlock. These delays represent an opportunity cost of time – time that could be spent both at work and for leisure. Travel time includes access time, waiting time, in-vehicle time, transfer time as well as egress time.
- **Congestion Cost Savings:** In cases where travel time savings cannot be measured (due to lack of data on remaining highway users) congestion benefits can be measured. Congestion benefits measure the marginal cost to congestion that an additional vehicle will have on each roadway. A reduction in vehicles will leave a marginal benefit of equal measure.
- **Vehicle Operation Cost Savings:** Traffic congestion leads to higher vehicle operating costs, primarily as a result of increased fuel use due to idling or start-

and-stop traffic flows, both of which consume more fuel than driving at steady speeds.

- **State of Good Repair:** Pavement receives wear and tear from frequent vehicle use, leading to high maintenance costs. As traffic (particularly truck traffic) is reduced, the wear and tear decreases as does the cost of maintenance.
- **Safety Improvements:** Crashes embody major social costs. Vehicle crashes not only impose costs on people who are involved, but also on the rest of the traffic using the roadway and adjoining roadways because they too become congested.
- **Reduced Emission Costs:** A major impact of vehicle use is exhaust emissions – an externality that imposes wide-ranging social costs on people and the environment. The negative effects of pollution depend not only on the quantity of pollution produced, but on the types of pollutants emitted and the conditions into which pollution is released.

The values and methodology used to monetize these benefits are consistent with USDOT guidelines using 2016 dollars. As per USDOT guidelines, seven percent and three percent discount rates were applied to the costs and benefits. Several other assumptions were made to determine outcomes. For example, average daily traffic counts were used in conjunction with annual growth rates to determine annual traffic counts for each year of analysis. The length of the corridor was estimated, along with estimates of speed increases, based on increased capacity to determine time savings.

4.3 Interstate 95 Northbound Viaduct

The I-95 Northbound Viaduct Bridge is in critical need of replacement. Replacing the functionally obsolete bridge will allow for better capability to handle increased traffic volumes in a safer, more time efficient manner.

Average daily traffic counts for 2016 were estimated at 332,179 with an annual growth rate of 0.5 percent bringing average daily traffic counts to 365,198 by 2035.[3] It was estimated that the trip length of 0.9284 miles would not change but that higher speeds would lead to reduced trip times. In addition, the analysis assumes that crashes along the corridor would decrease 35 percent based on previous analyses conducted for similar projects.[4]

[3] AADT data and growth rate were obtained from RIDOT.
[4] Safety reduction factor based on previous work done by VHB on TIGER Grant Application.

4.3.1 Construction Impacts

With the investment of $51 million,[5] economic activity is anticipated in the form of direct, indirect, and induced impacts. In the short term, 718 total job years will be created through the $51 million dollar investment with 441 of those direct impacts. Labor income is expected to increase by $37.8 million and total output is anticipated to eclipse $85.5 million. These short term construction impacts are displayed below in Table 1.

Table 1: Economic Impact, in 2016 Dollars

Impact Type	Employment	Labor Income	Total Value Added	Output
Direct Effect	441	$25,151,086	$26,917,468	$50,999,999
Indirect Effect	97	$5,130,022	$6,945,987	$12,072,259
Induced Effect	180	$7,475,218	$13,270,911	$22,448,296
Total Effect	718	$37,756,326	$47,134,365	$85,520,554

Note: Employment estimates are defined as job years and not FTEs; a job year is one job over a 12 month period

4.3.2 Transportation Benefits

In addition to the jobs generated by the construction activity, it is anticipated that other economic benefits will occur as a result of the improved connectivity between the corridors. Trucks that now have direct access to Interstate 95 will experience time savings and more efficient vehicle performance. Using a seven percent discount rate over a 20-year period of analysis results in $59.6 million of travel time savings. An additional $3.2 million in safety benefits is expected when using the same seven percent discount. In total, $61.6 million of benefits will have accrued over that same time frame.

[5] Costs associated with the project were obtained from RIDOT.

Table 2: Interstate 95 Northbound Viaduct Benefits

Benefit Category	Undiscounted	7% Discount	3% Discount
Vehicle Operating Costs	-$4,528,451	-$2,538,703	-$3,452,758
Travel Time Savings	$108,688,286	$59,605,948	$82,064,304
Safety	$6,160,345	$3,227,683	$4,560,211
Environmental Emissions	$1,989,711	$1,268,826	$1,606,025
Total	$112,309,891	$61,563,754	$84,777,782

4.4 6/10, Interstate 95 Southbound Connection

The 6/10 Interchange with I-95 is currently in poor condition. Repairs and upgrades are planned for the interchange bridges and ramps that will increase capacity and improve safety and reliability standards. Increasing capacity will decrease congestion within the interchange leading to decreased travel times and improved safety.

Average daily traffic counts for 2016 were estimated at 111,167 with an annual growth rate of 0.5 percent bringing average daily traffic counts to 122,217 by 2035.[6] It was estimated that the trip length of 0.6 miles would not change but that higher speeds would lead to reduced trip times. In addition, the analysis assumes that accidents along the corridor would decrease 35 percent based on previous analyses conducted for similar projects.[7]

4.4.1 Construction Impacts

With the investment of $400 million[8], economic activity is anticipated in the form of direct, indirect, and induced impacts. In the short term, more than 5,600 total job years will be created through the $400 million dollar investment with labor income anticipated to increase by $296.1 million and total output reaching $670.8 million. These short term construction impacts are displayed below in Table 3.

[6] AADT data and growth rate were obtained from RIDOT.
[7] Safety reduction factor based on previous work done by VHB on TIGER Grant Application.
[8] Costs associated with the project were obtained from RIDOT.

Table 3: Economic Impact, in 2016 Dollars

Impact Type	Employment	Labor Income	Total Value Added	Output
Direct Effect	3,457	$197,263,416	$211,117,394	$399,999,996
Indirect Effect	761	$40,235,470	$54,478,329	$94,684,381
Induced Effect	1,410	$58,629,160	$104,085,575	$176,065,065
Total Effect	5,628	$296,128,046	$369,681,298	$670,749,442

Note: Employment estimates are defined as job years and not FTEs; a job year is one job over a 12 month period.

4.4.2 Transportation Benefits

In addition to the jobs generated by the construction activity, it is anticipated that other economic benefits will occur as a result of the upgraded interchange. Increasing capacity will allow for improved traffic flow and speeds thus decreasing travel times. $43.1 million in time savings is anticipated over the 20 year benefit analysis period, when discounted at seven percent. An additional $6.1 million in vehicle operating cost savings and safety benefits of $1.3 million are generated when using the same seven percent discount. In total, $51.3 million of benefits will have accrued over that same time frame. At a discount rate of three percent, total benefits are estimated to be $71 million, as presented in Table 4.

Table 4: 6/10, Interstate 95 Benefits

Benefit Category	Undiscounted	7% Discount	3% Discount
Vehicle Operating Costs	$10,798,505	$6,053,764	$8,233,414
Travel Time Savings	$78,653,868	$43,131,662	$59,385,177
Safety	$3,714,058	$1,296,677	$2,302,530
Environmental Emissions	$1,365,204	$848,268	$1,089,159
Total	$94,531,635	$51,330,371	$71,010,280

4.5 Allens Ave, Interstate 95 Southbound Connection

Allens Avenue is a main thoroughfare for traffic coming to and from the Port of Providence. It currently services over 13,300 vehicles per day[9], making their way south along Interstate 95. There currently is no direct connection between the two corridors but with current trends suggesting traffic growth of 6.4 percent[10] annually, direct access to I-95 South could help relieve congestion from pouring onto local roads.

4.5.1 Construction Impacts

With the investment of $25 million,[11] economic activity is anticipated in the form of direct, indirect, and induced impacts. In the short term, 352 total job years will be created through the $25 million dollar investment with labor income anticipated to increase by $18.5 million and total output reaching $41.9 million. These short term construction impacts are displayed below in Table 5.

Table 5: Economic Impact, in 2016 Dollars

Impact Type	Employment	Labor Income	Total Value Added	Output
Direct Effect	216	$12,328,963	$13,194,837	$25,000,000
Indirect Effect	48	$2,514,717	$3,404,896	$5,917,774
Induced Effect	88	$3,664,322	$6,505,348	$11,004,066
Total Effect	352	$18,508,003	$23,105,081	$41,921,840

Note: Employment estimates are defined as job years and not FTEs; a job year is one job over a 12 month period

4.5.2 Transportation Benefits

In addition to the jobs generated by the construction activity, it is anticipated that other economic benefits will occur as a result of the improved connectivity between the corridors. Having direct access to Interstate 95 will allow for time savings and more efficient vehicle performance. $25.9 million in time saving is anticipated over the 20 year benefit analysis period, when discounted at seven percent. An additional $3.4

[9] AADT data obtained from RIDOT.
[10] Projected growth rate obtained from RIDOT.
[11] Costs associated with the project were obtained from RIDOT.

million in vehicle operating cost savings when using the same seven percent discount. In total, $30.4 million of benefits will have accrued over that same time frame.

Table 6: Allens Ave, Interstate 95 Southbound Connection Benefits

Benefit Category	Undiscounted	7% Discount	3% Discount
Vehicle Operating Costs	$6,901,469	$3,435,593	$4,999,890
Travel Time Savings	$53,095,590	$25,888,653	$38,126,225
Safety	$1,442,581	$665,889	$1,010,418
Environmental Emissions	$686,468	$370,336	$514,088
Total	$62,126,108	$30,360,471	$44,650,621

4.6 Route 4, Interstate 95 Connection

Route 4 is the main route leading from Quonset Business Park and the Port of Davisville, carrying freight and other traffic to connecting networks. There is currently no direct access between Route 4 and I-95 South, forcing traffic onto local streets as they transition between the two corridors. This project seeks to establish a direct connection between Route 4 and I-95 South in order to stabilize traffic flow and remove 41,033 vehicles from local roads daily. With an annual growth rate of 2.84 percent, average daily traffic counts are expected to increase to 139,715 by 2035.[12]

4.6.1 Construction Impacts

With the investment of $80 million,[13] economic activity is anticipated in the form of direct, indirect, and induced impacts. In the short term, 691 direct job years will be created through the $80 million dollar investment, with an additional 434 job years through indirect and induced impacts. Labor income is anticipated to increase in the region by $59.2 million with total output climbing to $134.2 million added to the regional economy. Short term construction impacts are displayed below in Table 7.

[12] AADT data and growth rate were obtained from RIDOT.
[13] Costs associated with the project were obtained from RIDOT.

Table 7: Economic Impact, in 2016 Dollars

Impact Type	Employment	Labor Income	Total Value Added	Output
Direct Effect	691	$39,452,683	$42,223,479	$79,999,999
Indirect Effect	152	$8,047,094	$10,895,666	$18,936,876
Induced Effect	282	$11,725,832	$20,817,115	$35,213,013
Total Effect	1,125	$59,225,609	$73,936,260	$134,149,888

Note: Employment estimates are defined as job years and not FTEs; a job year is one job over a 12 month period.

4.6.2 Transportation Benefits

In addition to the jobs generated by the construction activity, it is anticipated that other economic benefits will occur as a result of the improved connectivity provided by the investment. Not having to exit Route 4 onto local roads in order to access Interstate 95 will allow traffic to flow smoother, saving time and reducing fuel consumption and emissions through decreased idling and more efficient speeds. Over the 20 year analysis period, nearly $67 million in time savings will be realized as well as $8.6 million in vehicle operating cost savings when discounted at seven percent. In total, $78.8 million of benefits will have accrued over that same time frame.

Table 8: Route 4/I-95 Connection Benefits

Benefit Category	Undiscounted	7% Discount	3% Discount
Vehicle Operating Costs	$16,217,212	$8,642,410	$12,093,265
Travel Time Savings	$128,357,794	$66,914,083	$94,800,888
Safety	$4,327,744	$1,997,667	$3,031,253
Environmental Emissions	$2,114,983	$1,238,860	$1,642,404
Total	$151,017,733	$78,793,020	$111,567,810

4.7 Davisville Yard Track Improvements

The Davisville Port track realignment is being undertaken in order to extend the interchange and track capacity of the rail yard. This will also open up an additional 12.6 acres of land for the potential creation of a 36 acre industrial park. Total construction costs associated with the realignment are $7.6 million.[14] Benefits are generated through construction jobs, potential development, and transportation benefits generated through changes in rail activity. All are highlighted below.

4.7.1 Construction Impacts

With the investment of $7.6 million, economic activity is anticipated in the form of direct, indirect, and induced impacts. In the short term, 65 direct job years will be created through the $7.6 million dollar investment, with an additional 41 job years through indirect and induced impacts. Labor income is anticipated to increase in the region by $5.6 million with total output climbing to $12.7 million added to the regional economy. These short term construction impacts are displayed below in Table 9.

Table 9: Economic Impact, in 2016 Dollars

Impact Type	Employment	Labor Income	Total Value Added	Output
Direct Effect	65	$3,727,177	$3,988,940	$7,557,767
Indirect Effect	14	$760,226	$1,029,336	$1,789,006
Induced Effect	27	$1,107,764	$1,966,636	$3,326,647
Total Effect	106	$5,595,167	$6,984,913	$12,673,420

Note: Employment estimates are defined as job years and not FTEs; a job year is one job over a 12 month period

4.7.2 Industrial Park

The creation of the 36-acre developable parcel will generate additional benefits, not reflected in the construct impacts detailed above. To estimate the impacts associated with development, the analysis uses a 20-year time frame beginning in 2016 and assumes an average of 1.1 acres of land absorbed per year.

[14] Costs associated with the project were obtained from RIDOT.

Over the 20 year analysis period there is an estimated 21.5 acres of land developed, creating 198 direct job years along with 158 indirect and induced job years for a total of 357 job years. Some of these newly created jobs can be expected to be filled by out-of-the-region hires, thus increasing the region's population, workforce and tax base. Employment numbers are not equivalent to FTEs but rather the number of job years based on the average output per worker in a given industry. The development impacts are presented below.

Table 10: Davisville Commerce Park Employment

Employment Type	Job Years
Direct Employment	198
Indirect Employment	80
Induced Employment	79
Total Employment	357

4.7.3 Rail Yard Expansion

In addition to the jobs generated by the development itself, it is anticipated that other economic benefits will occur as a result of the improved operations provided by the investment. Once the rail yard is expanded, it is expected that capacity will increase for the firms already operating in the yard. This increase in capacity will allow the yard to service more freight by rail, thus reducing the number of trucks on the highway. Some of the assumptions used in this analysis include: an increase in capacity from 20 railcars per train to 28[15] (with a 4 year ramp up period), 2 freight handling firms using the yard, 1 train being serviced by each firm (total of 2 trains per day). Additionally, all increases in operations and maintenance (O&M) costs from additional hires needed to handle the increased load are assumed to be offset by the decrease in O&M from current inefficiencies. The table below presents the transportation benefits generated by the rail improvements.

[15] Estimated increase in capacity obtained from Seaview.

Table 11: Davisville Yard Expansion Benefits

Benefit Category	Undiscounted	7% Discount	3% Discount
Noise Pollution	$204,373	$102,380	$148,674
Congestion	$2,659,775	$1,332,398	$1,934,888
Safety	$5,953,650	$2,925,276	$4,294,094
State of Good Repair	$1,670,112	$836,633	$1,214,945
Environmental Emissions	$1,479,787	$783,607	$1,102,110
Total	$11,967,697	$5,980,293	$8,694,711

It is anticipated the expanded rail yard will decrease truck traffic by nearly 104,000 trucks over the 20 year analysis period, saving over 21 million miles in travel. The average length per trip is assumed to be 204 miles split evenly across the ports of Baltimore, Boston and New York. This decrease in traffic will result in roughly $6 million worth of benefits when discounted at seven percent, with nearly $3 million of that coming from increased safety and an additional $1.3 million from decreased congestion levels on highways.

4.8 T.F. Green Airport Ramp Expansion

In recent years, ramp size has become a determining factor in freight operations as airport planners have recognized the space needed by air carriers. T.F. Green's ramp capacity has remained unchanged during a time when many other airports have significantly increased their ramp sizes. In addition, warehousing space has also become an important factor for carriers determining which airports to use for shipping freight. The T.F. Green expansion seeks to increase space for both warehousing and ramp capacity to address these market changes.

The potential T.F. Green Airport expansion of ramp capacity is expected to increase demand for freight and mail movements to and from the airport. The increased air freight flows should decrease the number of trucks needed to deliver freight from the Boston Logan Airport to the region, decreasing total truck miles traveled.

4.8.1 Construction Impacts

With the investment of an estimated $6 million in the T.F. Green project, economic activity is anticipated in the form of direct, indirect, and induced impacts. Direct impacts are those directly associated with the development. Indirect impacts are those generated when goods and materials are purchased to support the direct jobs. Induced impacts occur when an employee spends his or her wages on goods and services; for example, going to the grocery store or taking the family out to dinner.

Economic impacts associated with construction are presented in the table below. Employment estimates are not equivalent to FTEs but rather the number of job years based on the average output per worker in a given industry. A job year is defined as one job over a 12 month period.

As shown below, $6 million in construction investment will lead to 52 direct job years along with an additional 32 job years from indirect and induced effects. Overall, the spending is expected to have a total impact of more than $10 million dollars on the regional economy.

Table 12: Economic Impact

Impact Type	Employment	Labor Income	Total Value Added	Output
Direct Effect	52	$2,958,951	$3,166,761	$6,000,000
Indirect Effect	11	$603,532	$817,175	$1,420,266
Induced Effect	21	$879,437	$1,561,283	$2,640,976
Total Effect	84	$4,441,921	$5,545,219	$10,061,241

**Costs associated with project obtained from RIDOT.*

4.8.2 T.F. Green Ramp Expansion

In recent years, air freight has declined at T.F. Green as well as across the nation. The decrease in freight at T.F. Green has been higher than average, however, partly attributable to insufficient ramp capacity at the airport in relation to its competitors. For the economic analysis, potential demand was estimated, assuming there are no ramp capacity issues. This was accomplished by assuming a decrease in T.F. Green freight volumes at the national average (over the past ten years) rather than the actual decrease experienced at the airport. This reflects the "current" market demand if the airport had competitive ramp capacity. The differences between actual usage and estimated market demand are highlighted below in Table 13.

Table 13: Cargo Demand Estimates, in Tons

Year	Cargo (Actual)	Cargo (Market Demand)	Difference	National Average % Change
2006	22,864	22,864	0	-2.43%
2007	22,093	22,537	444	-1.43%
2008	15,222	20,459	5,236	-9.22%
2009	10,509	17,900	7,391	-12.51%
2010	10,930	18,664	7,734	4.27%
2011	11,428	18,059	6,631	-3.24%
2012	12,102	18,406	6,304	1.92%
2013	13,145	18,496	5,351	0.49%
2014	13,667	19,118	5,450	3.36%
2015	13,520	19,594	6,073	2.49%

**Actual cargo values obtained from T.F. Green website*[16]

Freight demand at T.F. Green was then forecast for two scenarios to facilitate an estimation of transportation benefits. The baseline scenario assumes that no increase in ramp capacity will continue to limit freight demand (using the 10 year average annual rate of -5.67 percent for T.F. Green) at the airport as carriers continue to use Boston Logan and other competitors instead. After a 10 year period, it is assumed the airport will grow at anticipated national levels as the market for limited ramp capacity is stabilized. The alternative scenario assumes T.F. Green increases their ramp capacity, allowing demand to swell to its actual market levels at an increased annual growth rate of 5.41 percent before growth slows to the anticipated national growth rate of 2.6 percent estimated by Boeing in the World Air Cargo Forecast.[17] Construction is assumed to happen in 2018 with ramp capacity expanded in 2019. The cargo forecasts can be found below in Table 14.

[16] http://www.pvdairport.com/corporate/ri-airport-corporation/passenger-numbers
[17] http://www.boeing.com/resources/boeingdotcom/commercial/about-our-market/cargo-market-detail-wacf/download-report/assets/pdfs/wacf.pdf

It is estimated that the actual cargo in the alternative scenario would not reach market demand levels by the end of the analysis period in 2038. The cargo is anticipated to increase to 33,905 tons during that period. During this same timeframe, it is anticipated that the baseline cargo will fall to a minimum of 8.6 thousand tons in 2025 before rebounding and growing to over 12 thousand tons in 2038. Forecasts for the baseline and alternative scenario are presented in the table below.

Table 14: Cargo Demand Forecast, in Tons

Year	Baseline	Alternative	Market Demand
2016	12,928	12,928	20,103
2017	12,361	12,361	20,626
2018	11,819	11,819	21,162
2019	11,301	12,458	21,712
2020	10,805	13,132	22,277
2021	10,332	13,843	22,856
2022	9,879	14,592	23,450
2023	9,446	15,381	24,060
2024	9,031	16,214	24,685
2025	8,635	17,091	25,327
2026	8,860	18,016	25,986
2027	9,090	18,990	26,661
2028	9,327	20,018	27,355
2029	9,569	21,101	28,066
2030	9,818	22,243	28,795
2031	10,073	23,446	29,544
2032	10,335	24,715	30,312
2033	10,604	26,052	31,100
2034	10,880	27,462	31,909

Year	Baseline	Alternative	Market Demand
2035	11,162	28,947	32,739
2036	11,453	30,514	33,590
2037	11,750	32,165	34,463
2038	12,056	33,905	35,359

4.8.3 Benefits

Allowing freight to flow through its most efficient air route is anticipated to lessen the need to transport freight by truck. This is expected to lead to a decrease in truck traffic of 22.4 thousand trucks and 1.5 million truck miles traveled in the alternative scenario. The average distance saved per trip is anticipated to be 68.4 miles, equal to the distance between T.F. Green and Boston Logan Airport. The benefits associated with the completion of the increased ramp capacity over a 20 year analysis period (2019-2038) are shown below in Table 15.

Table 15: Total Benefits, in 2016 Dollars

Benefit Category	Undiscounted	7% Discount	3% Discount
Noise Pollution	$34,020	$12,648	$21,761
Congestion	$185,525	$68,976	$118,671
Safety	$254,174	$94,498	$162,582
State of Good Repair	$161,195	$59,930	$103,108
Environmental Emissions	$97,974	$36,790	$62,888
Total	$732,888	$272,842	$469,009

It is estimated that $733 thousand in total benefits will accrue over the analysis period. Roughly a third of these benefits will be realized through increased highway safety and another 25 percent from a reduction in congestion. Using a seven percent discount rate to reflect the time value of money, this equals nearly $273 thousand in anticipated benefits.