Final Report

March 2022

Puerto Rico Tolling Analysis

Authority
Our ref: 24038401

steer

Final Report
March 2022

Puerto Rico Tolling Analysis

Prepared by:

Steer

+1 (617) 391 2300
www.steergroup.com

Prepared for:

Authority
Puerto Rico Highway and Transportation Authority (PRHTA)

Our ref: 24038401

Disclaimer

STEER DAVIES & GLEAVE LIMITED ("STEER") HAS NO LIABILITY TO RECIPIENTS OF THIS DOCUMENT OTHER THAN THE CLIENT, THE PUERTO RICO HIGHWAY AND TRANSPORTATION AUTHORITY (PRHTA) SUBJECT TO THE TERMS AND CONDITIONS OF OUR ENGAGEMENT.

ANY RECIPIENT OF THIS DOCUMENT OTHER THAN THE CLIENT, RELEASES STEER FROM LIABILITY FOR ANY LOSS OR DAMAGE WHETHER ARISING IN CONTRACT, WARRANTY, EXPRESS OR IMPLIED, TORT OR OTHERWISE. UNLESS YOU ARE THE CLIENT, STEER: (A) MAKES NO WARRANTY, EXPRESSED OR IMPLIED, WITH RESPECT TO THE USE OF ANY INFORMATION OR METHODS DISCLOSED IN THIS DOCUMENT; AND (B) ASSUMES NO LIABILITY WITH RESPECT TO THE USE OF ANY INFORMATION OR METHODS DISCLOSED IN THIS DOCUMENT**.**

This traffic and revenue report (the Report) has been prepared for the Puerto Rico Highway and Transportation Authority (PRHTA) (the "Client"). This Report is based on standard professional efforts, and information available to us at the time of the Report, and is subject to time and budget constraints of the Report's scope of work.

This Report, information and statements contained herein, are all based on third party data provided to us, or sourced by us, and Steer has not sought to establish the reliability of the data, except as specifically stated in the Report. Steer bears no responsibility for the results of any actions taken on the basis of third-party data.

Certain forward-looking statements in the Report are estimates based on interpretations or assessments of information available at the time of writing. The Report is thus to be viewed as an assessment that is time-relevant, specifically referring to conditions at the time of the review. Steer undertakes no obligation to update the Report for any reason.

While the estimates contained in the Report are not precise forecasts, they do represent, in our view a reasonable expectation of the future, based on information we have been provided with or sourced. However, the estimates necessarily rely on numerous assumptions and judgements, and circumstances may occur over the timeframe of the project that go counter to these assumptions and judgements and that affect the project's realized revenue. Actual events may differ from those assumed, and events are subject to change. Therefore, Steer makes or provides no warranty, whether implied or otherwise, as to the accuracy of forward-looking information presented.

In particular, readers of this Report must note that Steer developed the relationships in the models used to produce the forecasts for this Project based on data through August 2021 and earlier. Subsequently, the outbreak of the viral illness known as COVID-19 has spread throughout the world and has been defined by the World Health Organization as a pandemic. As of the date of distribution of this Report, the COVID-19 outbreak is materially impacting global economic and political affairs, and significantly impacting all transportation industries. Toll road traffic in particular has been impacted, where vehicle volumes have fallen in response to quarantine, shelter in place and related measures that governments, including state and local governments in the United States, have imposed and continue to impose. The situation remains dynamic and rapidly evolving and is subject to significant change. In this context, Steer has revised our forecasts with a Base Case post COVID-19 possible scenario with assumptions of a delayed economic recovery and decreased travel demand. However, it is important to note that Steer's post-COVID-

19 analysis is only one view, and there continues to remain uncertainty as to the short-term, intermediate or prolonged effects of and responses to the COVID-19 pandemic on the Project.

All of these effects could impact the COVID-19-related update to the Report. While the COVID-19-related update to the Report was prepared in good faith, no assurance can be provided by Steer that the scenario and assumptions Steer has identified in such update will prove to be accurate. Given the uncertainty described here and inherent in this unprecedented pandemic, Steer advises that all readers of this Report consider this Report in the context of their own assessment of the COVID-19 outbreak and current and potential impacts before making final decisions related to this Project.

Contents

Figures

Tables

Appendices

A Detailed Forecasting Results

1 Introduction

Overview

1.1 The Puerto Rico Highway and Transportation Authority (PRHTA) engaged Steer to perform tolling analysis of the PRHTA toll facilities. Specifically, the study had three key elements:

- Prepare revenue forecasts for all PRHTA toll facilities considering different toll rate scenarios.
- Analyze the impact of modifying the current one-way tolling to two-way tolling structure for some toll plazas.
- Analyze the impact of re-locating some toll plazas to reduce the amount of toll evasion/leakage from traffic that exits the toll facilities prior to passing the toll plaza.

1.2 The first element builds upon the work that Steer performed in 2018 as part of the Puerto Rico Tolling Potential Analysis. In that project, we developed traffic and revenue forecasts for PR-20, PR-52, and PR-53 toll plazas under different toll rate assumptions. For this new assignment, we have used the models we built before along with new models we built for new corridors, to first update our baseline traffic and revenue forecasts and then analyze the traffic and revenue associated with different toll rates.

1.3 The second and third points are new analyses that use the forecasting tools from the first element and that, along with new data collected for the study, provides revenue impact for different tolling alternatives.

1.4 The analysis presented in this report is intended to support the decision-making process of PRHTA, as the transportation policy maker locally, understanding both the revenue potential and the potential socioeconomic/environmental effects of tolling changes for Puerto Rico.

Toll Plazas

1.5 Table 1.1 summarizes the tolled facilities included in this study and the analyses we carried out for each one.

Table 1.1: PRHTA Toll Plazas

ID	Toll Plaza	Road	1way / 2way	Forecasts	New Location	2Way Analysis
1	Rio Grande (including ramps)	PR-66	2	X		
2	Carolinas (including ramps)	PR-66	2	X		
3	Guaynabo	PR-20	1 – NB	X	X	X
4	Montehiedra	PR-52	1 – NB	X		
5	Ceiba	PR-53	1 – SB	X		X
6	Humacao Norte	PR-53	1 – NB	X		X
7	Humacao Sur	PR-52	1 – SB	X		X
8	Caguas Norte	PR-52	1 – NB	X		X
9	Caguas Sur	PR-52	1 – SB	X		
10	Salinas (including ramps)	PR-52	1 - NB	X		
11	Ponce	PR-52	2	X	X	
12	Juana Diaz EB/WB	PR-52	2	X		
13	Guayama	PR-53	2	X		
14	Hucar	PR-53	1 – EB	X		X

Source: Steer

1.6 Toll plazas currently charging in one direction but with no real alternative roads are not included as part of the two-way analysis.

1.7 Figure 1.1 shows the location of the toll plazas we analyzed in this study. The map shows in red the plazas operated by PRHTA, in blue by Metropistas and in yellow by Autopistas de Puerto Rico (APR).

Figure 1.1: Puerto Rico Toll Plazas

Source: Steer

Our Scope of Work

1.8 The scope of our work includes the development of traffic and revenue forecasts for all the PRHTA toll plazas under different tolling assumptions. For the two-way scenarios, we carried out financial and social evaluations of each toll plaza.

1.9 To prepare the traffic and revenue forecasts we have:

- Reviewed the available information and collected new data to understand the existing conditions of the different study areas and to estimate the in-scope demand for each toll plaza considered. In particular, we have focused on understating how traffic has recovered from the restrictions related to COVID-19 and what could be considered as the new normal.
- Updated and developed our own network highway assignment models using inputs from the Long Term Puerto Rico Long Range Transportation Plan (PR LRTP) network model. For all the models we have calibrated the base year to represent 2019 traffic conditions.
- Prepared forecasts scenarios for all toll plazas for 2024 and 2030.
- Used the base year to estimate the impact of the two-way tolling and the re-location of toll plazas. We also prepared financial and cost benefit analysis for the plazas considered for two-way tolling.

1.10 All our analysis was based on traffic data, through August 2021 and earlier, including the period heavily impacted by COVID-19. We complemented the transaction data and traffic counts from PRHTA with original traffic counts collected in July 2021, specifically to support the two-way analysis and the evaluation of the new toll locations.

1.11 We have assumed in our forecasts no further impacts on traffic from lockdowns or related measures in response to COVID-19.

1.12 The methodology presented here was agreed with PRHTA based on the best approach for a feasibility study considering the time limitations for the assignment.

About Steer

1.13 Steer is one of world's largest independent specialist transportation consultancies, with more than 400 professional staff and a worldwide client base. Steer's head office is in London and the company has U.S. offices in Boston, Los Angeles, New York, San Juan and Washington D.C. Steer is an employee-owned company that was founded in 1978. Our independence means that we offer truly unbiased and objective advice.

1.14 Having worked on over 500 toll and shadow toll road projects around the world, Steer has developed a recognized specialty in the appraisal of toll-financed facilities, especially in the preparation of robust Investment Grade Traffic and Revenue Forecasts. In recent years, we have been involved in perhaps most of the major high profile P3 projects in the US. From our office in San Juan we have advised PRHTA, sponsors and lenders in multiple projects on the island.

Next Chapters

1.15 This report presents our traffic and revenue analysis structured around the tasks defined for this study as follows:

- **Chapter 2:** summarizes the existing conditions in the study area.
- **Chapter 3:** describes our forecasting methodology.
- **Chapter 4:** presents our forecasts for toll rate increases at the PRHTA toll plazas.
- **Chapter 5:** presents our analysis of the two-way tolling conversation.
- **Chapter 6:** presents our analysis of re-locating toll plazas.
- **Chapter 7:** summarizing the results of the study

2 Review of Existing Conditions

Overview

2.1 This chapter describes the historical and existing traffic conditions of the PRHTA toll plazas, as well as the general demographic and economic conditions of the island. This review informs the tolling analysis and provides a better understanding of the potential impact of increasing or introducing new toll rates.

Data Sources

2.2 To have a thorough understanding of the current traffic conditions, and to inform the model development and the forecasting analysis, we reviewed information from the client or from public sources as detailed below:

- Historical Transaction data: from 2013 to Aug 2021 provided by PRHTA for all the toll plazas included in the study.
- Travel time data: using information from the 2019 National Performance Management Research Data Set (NPMRDS) and extracted by Traffic Message Channel (TMC) code, which is a unique coding system used to differentiate every segment on the roadway system.
- Population: from the U.S. Census Bureau. Population is measured on a decennial basis (2010, 2020), with intermediate figures being estimated. The population figure for 2020 remains an estimate and all estimates are based on the 2010 Census.
- Employment: from the Bureau of Labor Statistics. Total employment is measured monthly and annual figures are averages. Data was unavailable for March and April 2020.
- Household Income: from the American Community Survey. Five-year and 1-year estimates of households and proportion by income group Five-year estimates have a sample overlap with adjacent years and are not intended to be compared over time.
- Gross Domestic Product (GDP) and GDP per Capita: from the World Bank national accounts data, and OECD National Accounts data files. The annual figures are estimates and are in US$ at current prices.
- Traffic Counts: collected in September 2021, in all the plazas considered for two-way analysis and some additional points near Ponce and Guaynabo to support the re-locations analysis.

2.3 Additionally, we carried out a site visit in October 2021 to evaluate competing roads as well as to establish ongoing observations by our local staff.

Toll Plazas

Overview

2.4 The following table summarizes the characteristics of each of the PRHTA toll plazas considered in this study.

Table 2.1: Toll Plazas Characteristics

Plaza	Road	1way / 2way	Description
Rio Grande	PR66	2	Rio Grande is the easternmost toll plaza of PR-66. It captures traffic coming from or going to the Municipality of Rio Grande or any location further east. The alternative route is PR-3 which is toll free.
Carolinas Main	PR66	2	Carolina is the westernmost toll plaza of PR-66, in the outskirts of San Juan, and includes a plaza on the main road west of PR-853, as well as on the ramps with PR-853. The alternative route is PR-3 which is toll free.
Guaynabo (main and ramps)	PR20	1 – NB	Guaynabo captures the traffic in the northbound direction on PR-20 coming either from Guaynabo or Caguas. The surrounding communities can access the road via a by-pass and avoid paying tolls. The alternative road is PR-1 or PR-52 (which is also tolled in the northbound direction).
Montehiedra	PR52	1 – NB	Montehiedra is located in the entrance ramp to access PR-52 northbound. This ramp connects the urbanized area of Cupey directly with PR-52, specifically the residentials developments near the toll plaza. The Alternative route is PR-20, which is also tolled in Guaynabo in the northbound direction.
Ceiba	PR53	1 – SB	Ceiba captures the traffic in southbound direction in the PR-53 from Fajardo. It competes with PR-3 which goes across the urban center of the Municipality of Ceiba.
Humacao Norte	PR53	1 – NB	Humacao Norte captures the traffic in the northbound direction on PR-53 coming from the urban areas of the Municipality of Humacao or further south. The alternative route is PR-3 that runs along the cost.
Humacao Sur	PR52	1 – SB	Humacao Sur has a symmetrical role to its north counterpart capturing the trips in the southbound direction on PR52 leaving the Humacao area, and also competing with the PR-3.
Caguas Norte	PR-52	1 – NB	Caguas Norte captures traffic from both Caguas and from the PR-30 going north to San Juan. The alternative is route is PR-1.
Caguas Sur	PR52	1 – SB	Caguas sur captures traffic from Caguas going south. The alternative is route is PR-1.
Salinas	PR52	1 – NB	Salinas captures the traffic going to Caguas on the PR-52 coming from both sides of the south coast, from PR-52 on the west side and from PR-53 on the east. There is not a real alternative.
Ponce	PR52	2	Ponce is the westernmost toll plaza of PR-52. It captures the traffic coming and going to the south-western side of the island using the PR-2. The alternative route is PR-2.

Plaza	Road	1way / 2way	Description
Juana Diaz	PR52	2	Juana Diaz has two toll plazas separated about 5.1 miles from each other, Juana Diaz Oeste tolls the eastbound direction while Juana Diaz Este tolls the westbound direction. They capture the traffic moving on the PR-52 between towns in the south-central part of the Island and along the south coast corridor. The alternative route is PR-1.
Guayama	PR53	2	Guayama is the easternmost toll plaza of PR-52. It captures the traffic coming and going to the south-eastern side of the island using the PR-3. The alternative route is PR-3.
Hucar	PR53	1 – EB	Hucar is the toll plaza on the western end of the PR-53. It captures the traffic taking the PR-53 on eastbound direction coming both from both the north and west sections of the PR-52. The alternative route is PR-3.

Source: Steer

Toll Rates

2.5 Tolls vary by vehicle type according to the number of axles and are the same throughout the day and year.

- Class 1: motorcycles and vehicle with 2 axles under 7 feet and 6 inches in height.
- Class 2: vehicles with 2 axles
- Class 3 to 7: Heavy Vehicles with 3 to 7 axles.

2.6 Tolls can be paid by transponder (AutoExpreso) with a positive balance or, in some but not all the toll plazas, with pre-charged toll card called MovilCash.

2.7 Table 2.2 shows the toll rates for all the plazas we are analyzing. We note that, while toll rates on other facilities not analyzed in this study like PR-22 (operated by Metropistas) and Teodoro Moscoso (operated by APR) are adjusted annually, PRHTA has not adjusted any of the toll rates on their toll plazas since 2005.

Table 2.2: Toll Rates (in 2021 $)

		Vehicle Class						
Plaza	Road	1	2	3	4	5	6	7
Rio Grande	PR-66	$1.00	$2.00	$2.500	$3.00	$3.50	$4.00	$4.50
Carolinas	PR-66	$1.50	$3.00	$3.25	$3.50	$3.75	$4.00	$4.25
Guaynabo	PR-20	$0.75	$1.50	$1.75	$2.00	$2.25	$2.50	$2.75
Montehiedra	PR-52	$0.35	$0.70	$0.95	$1.20	$1.45	$1.70	$1.95
Ceiba	PR-53	$1.00	$2.00	$2.50	$3.00	$3.50	$4.00	$4.50
Humacao Norte	PR-53	$1.00	$2.00	$2.50	$3.00	$3.50	$4.00	$4.50
Humacao Sur	PR-52	$1.00	$2.00	$2.50	$3.00	$3.50	$4.00	$4.50
Caguas Norte	PR-52	$1.50	$3.00	$3.70	$4.40	$5.10	$5.80	$5.50
Caguas Sur	PR-52	$1.00	$2.00	$2.50	$3.00	$3.50	$4.00	$4.50

Plaza	Road	Vehicle Class						
		1	2	3	4	5	6	7
Salinas	PR-52	$1.75	$3.50	$4.25	$5.00	$5.75	$6.50	$7.25
Ponce	PR-52	$0.75	$1.5	$1.75	$2.00	$2.25	$2.5	$2.75
Juana Diaz	PR-52	$0.50	$1.00	$1.25	$1.50	$1.75	$2.00	$2.25
Guayama	PR-53	$0.50	$1.00	$1.25	$1.50	$1.75	$2.00	$2.25
Hucar	PR-53	$1.00	$2.00	$2.50	$3.00	$3.50	$4.00	$4.50

Source: PRHTA

Traffic and Revenue

Historical

2.8 We obtained transaction and revenue information from the PRHTA for all their toll plazas. Table 2.3 summarizes this information showing the historical transactions in form of Annual Average Daily Traffic (AADT) from 2013 to 2020 and Table 2.4 provides the corresponding year on year growth.

Table 2.3: Historical AADT for PRHTA Toll Plazas

	2013	2014	2015	2016	2017	2018	2019	2020
Rio Grande	21,316	21,152	21,764	22,283	17,652	17,310	25,840	20,109
Carolinas	42,080	41,508	42,422	44,117	43,424	46,653	48,427	38,889
Guaynabo	10,782	10,547	10,716	10,869	10,656	10,980	11,589	9,390
Montehiedra	11,265	11,194	11,094	11,487	10,831	11,884	11,645	8,643
Ceiba	8,814	8,616	8,750	8,876	9,016	9,128	9,283	7,565
Humacao Norte	12,833	8,693	8,813	9,125	6,630	N/A	3,795	7,481
Humacao Sur	9,014	12,535	12,843	12,574	8,815	N/A	4,803	10,452
Caguas Norte	55,036	54,720	55,211	55,808	50,121	55,269	52,622	39,763
Caguas Sur	31,456	31,157	31,933	32,347	28,955	30,504	30,955	24,097
Salinas	26,654	26,454	27,145	27,780	25,548	27,922	27,178	21,269
Ponce	36,077	36,490	37,812	38,442	37,383	40,797	39,673	27,147
Juana Diaz	46,481	46,659	48,057	47,462	35,409	39,623	48,298	35,689
Guayama	17,052	16,404	16,437	16,938	15,583	17,414	16,980	13,054
Hucar	9,534	9,368	9,439	9,813	8,512	9,902	9,565	7,649
Total	**338,394**	**335,496**	**342,438**	**347,921**	**308,534**	**317,386**	**340,654**	**271,196**

Source: PRHTA

Table 2.4: Year-On-Year Transaction Growth

	2014	2015	2016	2017	2018	2019	2020
Rio Grande	-0.8%	2.9%	2.4%	-20.8%	-1.9%	49.3%	-22.2%
Carolinas	-1.4%	2.2%	4.0%	-1.6%	7.4%	3.8%	-19.7%
Guaynabo	-2.2%	1.6%	1.4%	-2.0%	3.0%	5.6%	-19.0%
Montehiedra	-0.6%	-0.9%	3.5%	-5.7%	9.7%	-2.0%	-25.8%
Ceiba	-2.3%	1.6%	1.4%	1.6%	1.2%	1.7%	-18.5%
Humacao Norte	-32.3%	1.4%	3.5%	-27.3%	N/A	N/A	97.1%
Humacao Sur	39.1%	2.5%	-2.1%	-29.9%	N/A	N/A	117.6%
Caguas Norte	-0.6%	0.9%	1.1%	-10.2%	10.3%	-4.8%	-24.4%
Caguas Sur	-1.0%	2.5%	1.3%	-10.5%	5.4%	1.5%	-22.2%
Salinas	-0.8%	2.6%	2.3%	-8.0%	9.3%	-2.7%	-21.7%
Ponce	1.1%	3.6%	1.7%	-2.8%	9.1%	-2.8%	-31.6%
Juana Diaz	0.4%	3.0%	-1.2%	-25.4%	11.9%	21.9%	-26.1%
Guayama	-3.8%	0.2%	3.0%	-8.0%	11.7%	-2.5%	-23.1%
Hucar	-1.7%	0.8%	4.0%	-13.3%	16.3%	-3.4%	-20.0%

Source: PRHTA

2.9 We note that:

- In the last few years, traffic levels across the island have been impacted by several events, including strong hurricanes in 2017 (Hurricane Irma and Hurricane Maria both in September 2017), and most recent COVID-19 in 2020. These events explain the negative growth rates in those specific years.
- Both Humacao plazas, north and south, ceased operations September 2017 after Hurricane Maria and only re-opened in August 2019 just before COVID-19.
- Rio Grande and Juan Diaz were particularly impacted by Maria and operations did not return to normal until 2019.
- The proportion of heavy vehicles across all toll plazas is less than 1%.

2.10 Following these events Puerto Rico is expected to receive nearly $43 billion in relief recovery funding from the federal government to repair its electrical, education, housing and transportation infrastructure that was heavily impacted by the two hurricanes, as well as to support the economic recession after COVID 19.

2.11 Considering the recent impacts due to COVID-19, we selected 2019 as the base year for our analysis. The AADT (and its CAGR), annual revenue and average toll rate for 2019 are summarized in Table 2.5. We note that these revenue values do not include the additional revenue that could be collected from violators and so the actual final revenue could be slightly higher than the ones reported in the table.

Table 2.5: 2019 Traffic and Revenue

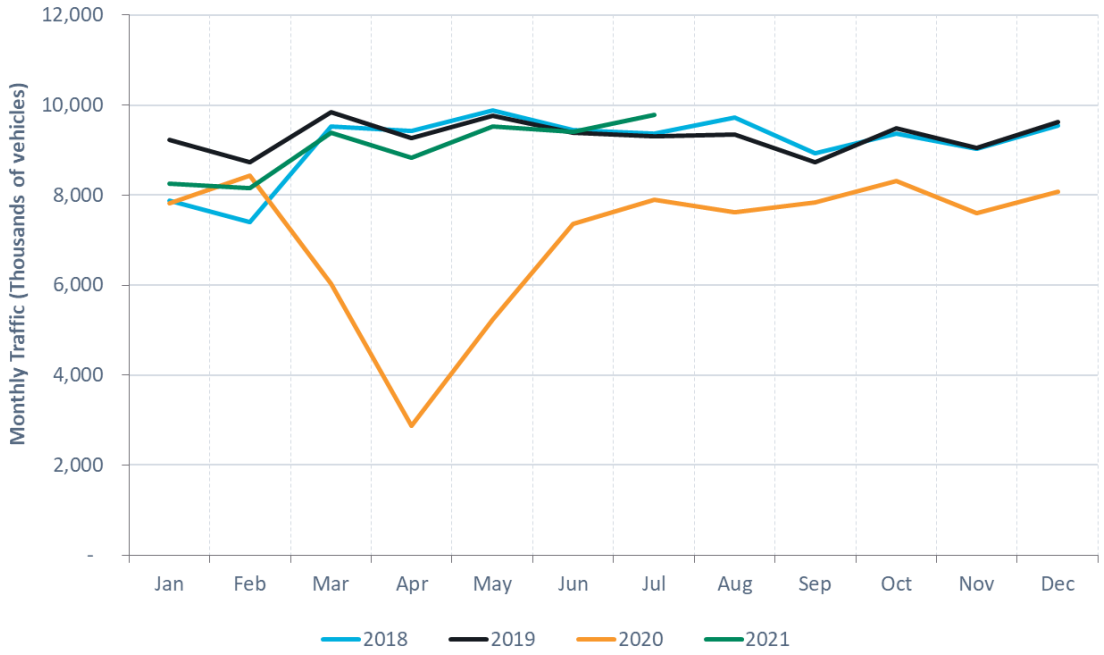
Plaza	AADT	AADT CAGR (2013- 2019)	Annual Revenue (Millions - Nominal)	Average Toll Rate
Portico Grande	25,840	3.26%	$9.90	$1.05
Carolinas	48,427	2.37%	$26.57	$1.50
Guaynabo	11,589	1.21%	$3.56	$0.84
Montehiedra	11,645	0.55%	$1.52	$0.36
Ceiba	9,283	0.87%	$3.44	$1.01
Humacao Norte	3,795	-18.38%	$1.43	$1.03
Humacao Sur	4,803	-9.96%	$1.83	$1.04
Caguas Norte	52,622	-0.74%	$29.95	$1.56
Caguas Sur	30,955	-0.27%	$12.17	$1.08
Salinas	27,178	0.32%	$14.79	$1.49
Ponce	39,673	1.60%	$11.44	$0.79
Juana Diaz	48,298	0.64%	$9.55	$0.54
Guayama	16,980	-0.07%	$3.20	$0.52
Hucar	9,565	0.05%	$3.67	$1.05
Total	**340,654**	**0.11%**	**$133.01**	**$1.07**

Source: PRHTA

COVID-19

2.12 To understand the impact that COVID-19 and its related mobility restrictions had on the PRHTA toll plazas, we analyzed the monthly profiles of the last couple years. Figure 2.1 shows the total monthly transactions for all the plazas together since 2018. We have excluded from the analysis the Humacaos and Rio Grande as they had gaps in the monthly data we received.

Figure 2.1: PRHTA Systemwide Monthly Transactions 2018-2021



Source: Steer analysis based on PRHTA data

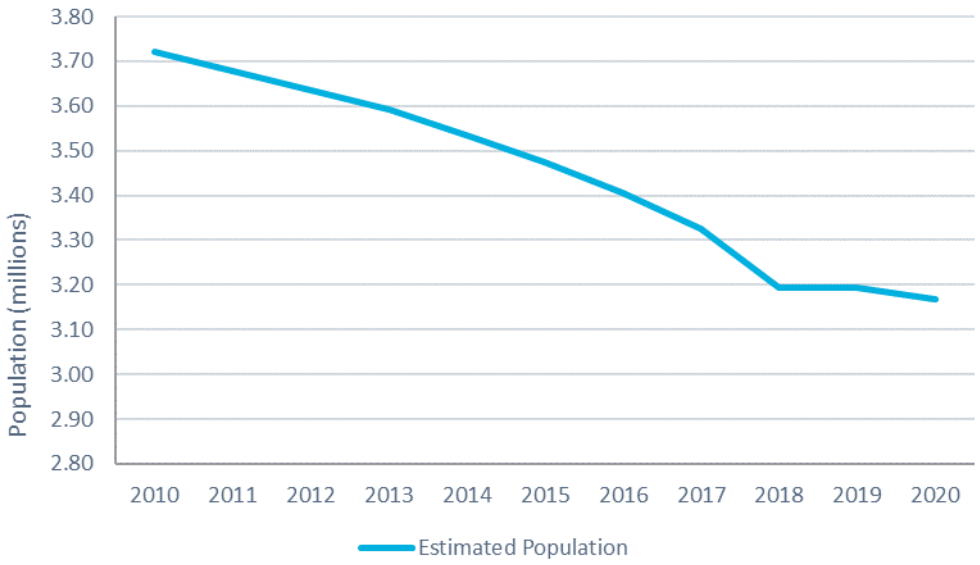
2.13 In January and February 2020, traffic was close to 2019 levels but in March, and driven by COVID-19 and all its related restrictions, traffic across the island started decreasing to reach the lowest point in April 2020, 70% lower than April 2019. After that point, traffic levels started to slowly recover but they did not fully reach the 2019 levels in 2020. In 2021 traffic continued recovering and by July all the toll plazas reported traffic volumes higher than the ones observed in 2019, with two exceptions, Guaynabo and Juan Diaz which both saw exceptional growth rates in 2019.

Demographics

Population

2.14 Figure 2.2 shows the historical population in the island as estimated by the US Census Bureau. The population of Puerto Rico declined by nearly 440,000, or 12%, over the past decade. According to estimates by the U.S. Census Bureau, this decline was relatively steady throughout the decade but did lessen between 2018 and 2020. The population has been declining since 2000 due to low birth rates and outward migration, with economic factors and natural disasters being contributing causes. This trend is expected to continue but probably with some re-organization around the main cities of the island.

Figure 2.2: Puerto Rico Population

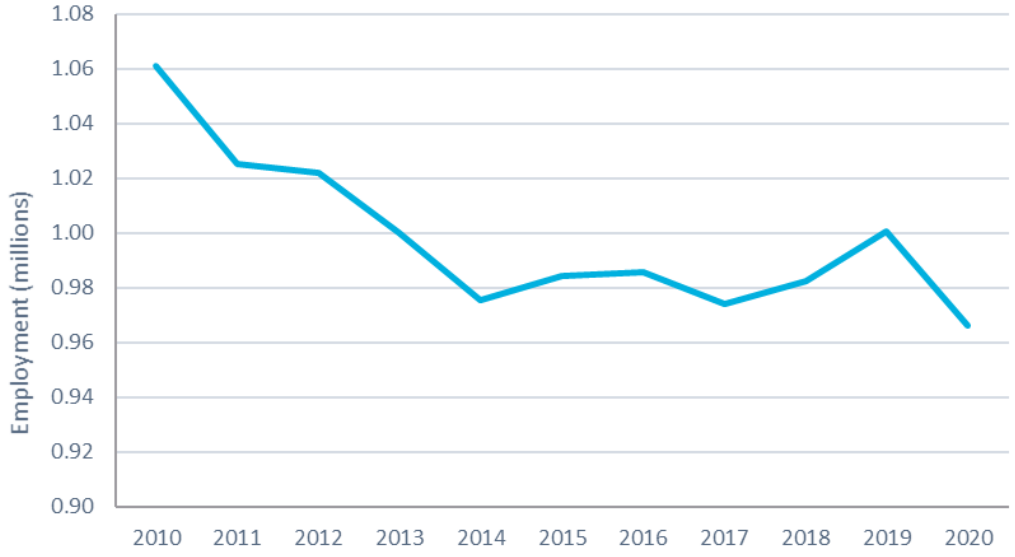


Source: Steer analysis of U.S. Census Bureau data

Employment

2.15 Figure **2.3** shows the historical employment in the island as reported by the US Bureau of Labor Statistics. Employment in Puerto Rico declined by nearly 94,000 jobs, or 9%, over the past decade, but was steadily increasing between 2014 and 2019 as the economy strengthened. As annual data is reported by averaging monthly data and data was not collected in March 2020 and April 2020, the employment impact of the COVID-19 pandemic is likely underestimated.

Figure 2.3: Puerto Rico Total Employment by Year

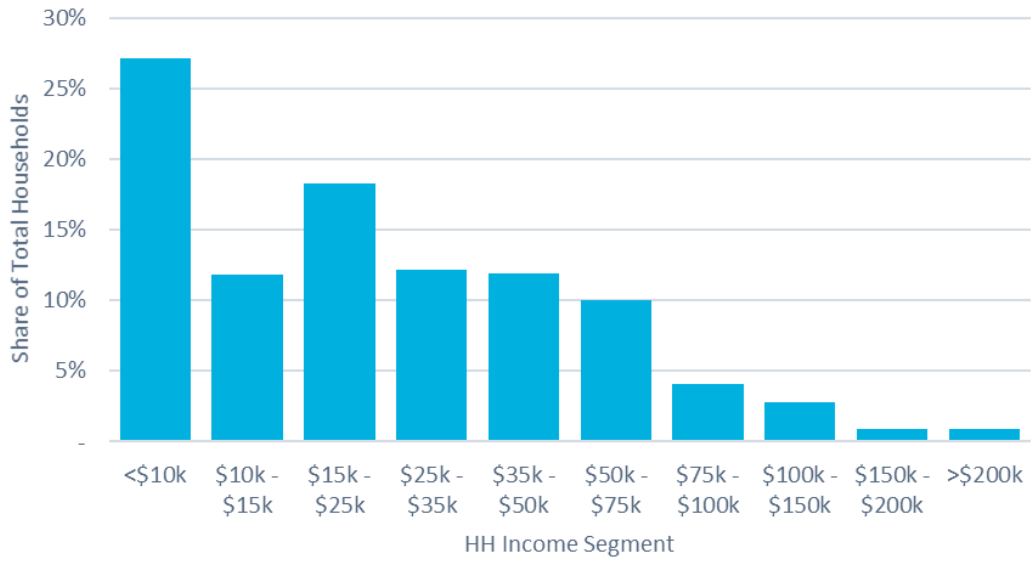


Source: Steer analysis of U.S. Bureau of Labor Statistics data

Household Income

2.16 In 2019, the median income for Puerto Rico was $20,539 and the mean income was $32,924. Approximately 27% of households earned less than $10,000 and over 50% earned less than $25,000 per year. Approximately 9% of households earned $75,000 or more, and 5% of households earned $100,000 or more.

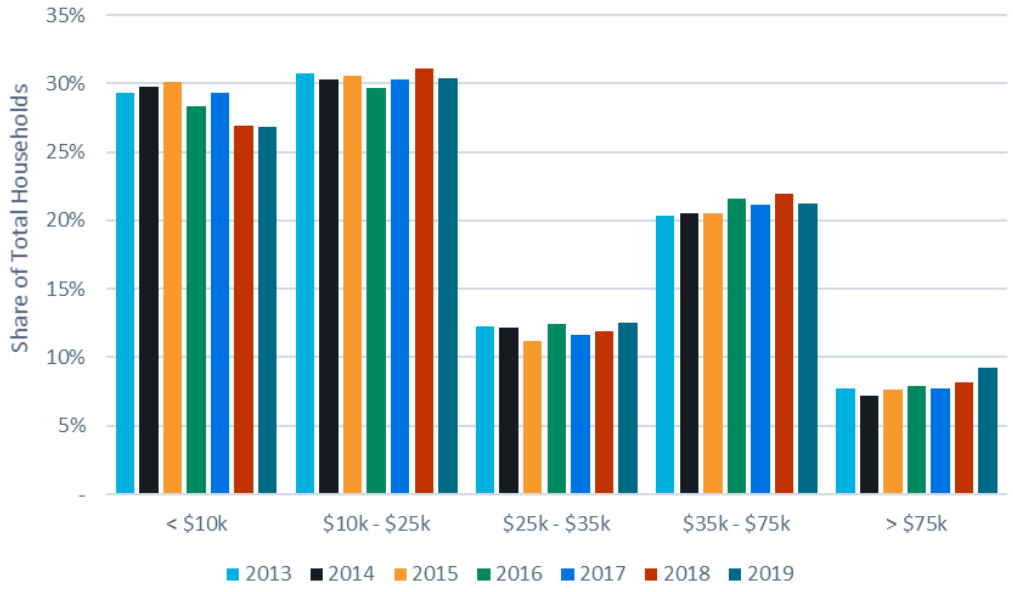
Figure 2.4: Puerto Rico Household Income Levels (2019)



Source: Steer analysis of American Community Survey 5-Year Estimates

2.17 Through the decade, the proportions of household wealth have remained relatively steady, with a slight decline in households earning less than $10,000 (29% to 27%) and an increase in households earning $75,000 or more (7% to 9%).

Figure 2.5: Puerto Rico Household Income Levels by Year

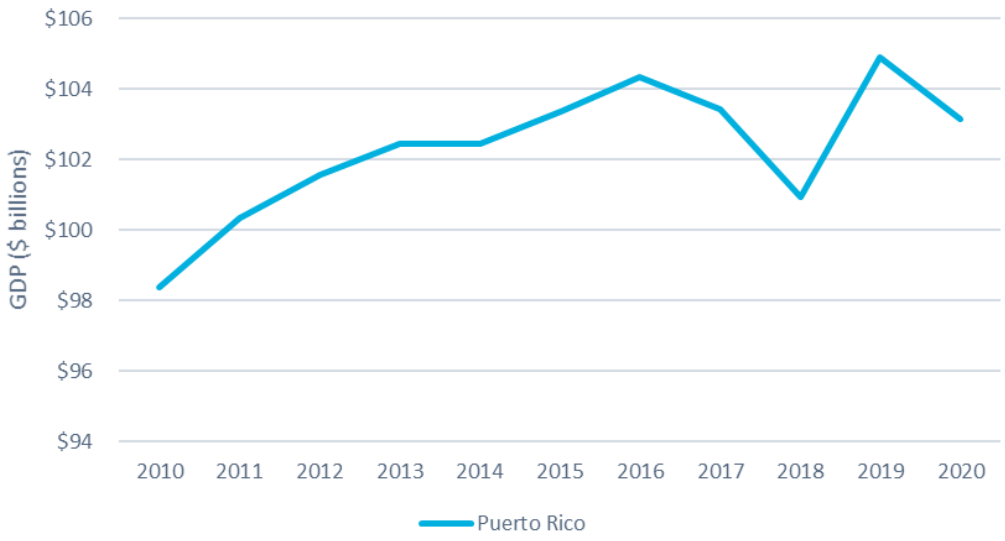


Source: Steer analysis of American Community Survey 1-Year Estimates

GDP

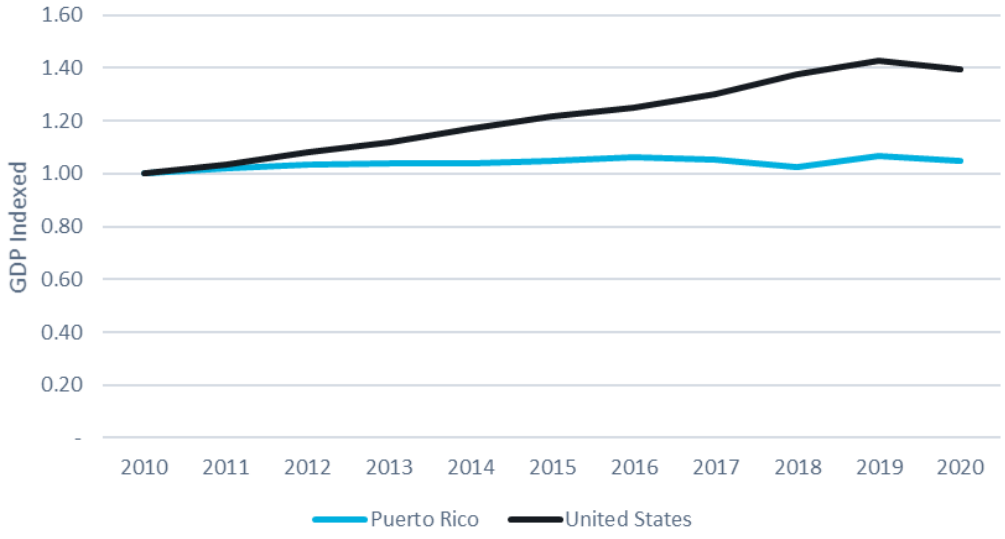
2.18 Figure 2.6 and Figure 2.7 show the GPD in the Island and comparison of the US and Puerto Rico GDP as reported by World Bank. Between 2010 and 2020, Puerto Rico's GDP increased from over $98 billion in 2010 to over $103 billion in 2020, or by over 4%. While GDP increased relatively quickly at the beginning of the decade, Hurricane Maria caused it to fall in 2017 and 2018. Recovery was then interrupted in 2020 by the economic repercussions of the COVID-19 pandemic. Puerto Rico GDP growth between 2010 and 2020 is small compared to that of the United States, which increased by nearly 40% in the same period.

Figure 2.6: Puerto Rico GDP by Year



Source: Steer analysis of World Bank National Accounts data

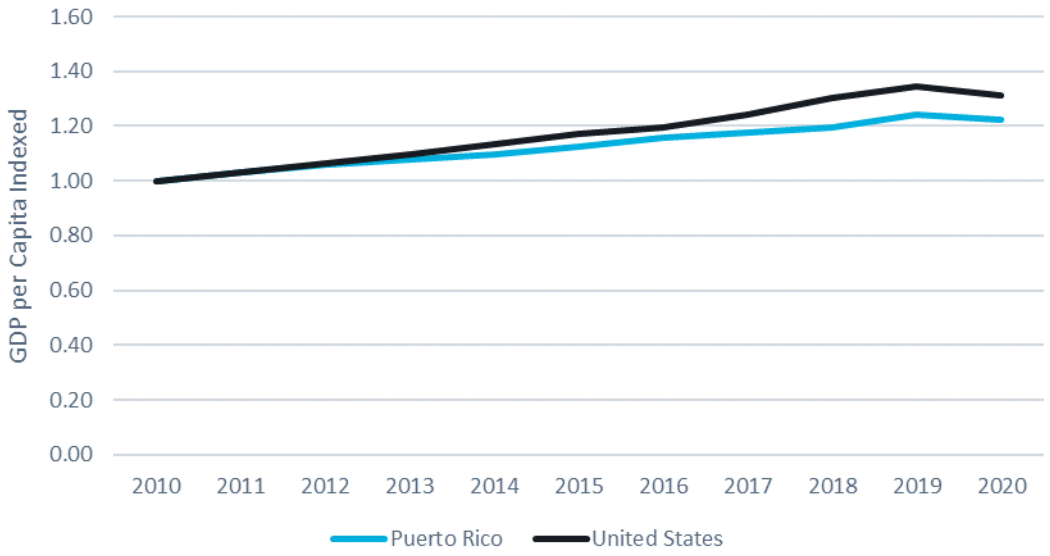
Figure 2.7: Indexed GDP by Year (2010 = 1.00)



Source: Steer analysis of World Bank National Accounts data

2.19 On the other hand, GDP per capita in Puerto Rico has increased steadily through the decade, growing from $26,436 in 2010 to $32,291 in 2020, or by 22%. As can be seen in Figure 2.8, this is relatively closer to the growth observed in the US.

Figure 2.8: Indexed GDP per Capita by Year (2010 = 1.00)



Source: Steer analysis of World Bank National Accounts data

Conclusions

- Over the last few years, traffic levels across then island have been impacted by several events, including strong hurricanes in 2017 (Hurricane Irma and Hurricane Maria in September 2017), and COVID-19 in 2020.
- Despite these events, and declining population in the island, transactions overall have shown small positive growth rates, with more growth for those plazas near big urban areas like San Juan and Ponce and less in other parts of the island.
- The fact that toll rates have not be adjusted by PRHTA since 2005 means, in real terms, that toll rates have actually decreased.
- In the last ten years Puerto Rico has suffered from a consistent decrease in population due to low birth rates and outward migration.
- Except for a short period of economic recovery after Hurricane Maria, employment has declined in Puerto Rico since 2010.
- Through the decade, the shares of household wealth per income bracket have remained relatively steady.
- Although GDP has grown at a slow pace in the last 10 years, the GDP per capita reflects a faster growth due to the declining population.
- In 2020, COVID-19 and all its related restrictions heavily impacted traffic across the island. Traffic has slowly recovered and by July 2021 all the toll plazas reported traffic volumes higher than the ones observed in 2019, with two exceptions, Guaynabo and Juan Diaz which both saw exceptional growth rates in 2019.

3 Forecasting Methodology

Overview

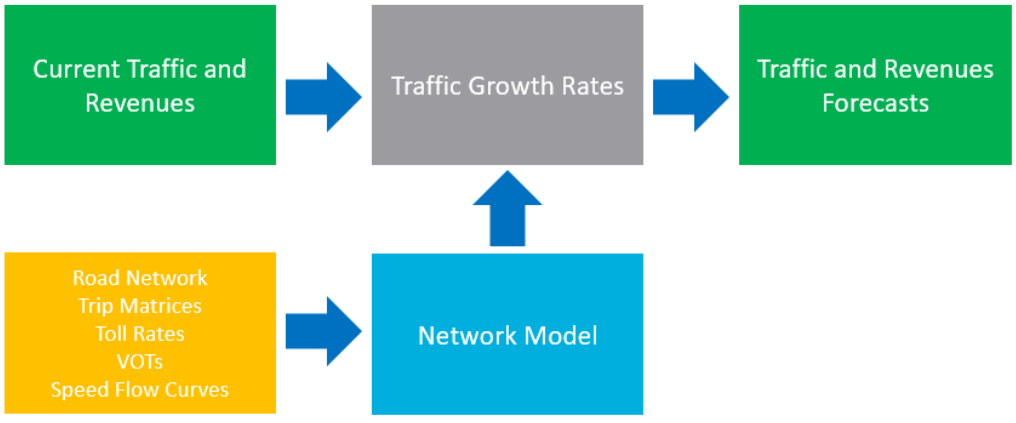
3.1 All the PRHTA toll plazas are brownfield assets, where the current and historical transactions are known. If this study was focused on understanding the impacts of marginal changes to the current tolling policy, we would have likely developed econometric models that base traffic growth on relationships with economic drivers and the historical responses to similar toll changes. However, the objective of this study is to forecast the response to toll rate changes not seen in the past as well as significant changes in the tolling structure of some of the toll plazas.

3.2 We have therefore developed our forecasts using network models which take into account the total in-scope demand for each toll plaza, the competitive position of each plaza with respect to its alternatives, congestion levels and the willingness to pay of the current and potential users. We believe this is the correct approach to estimate the impact of the proposed tolling changes.

3.3 The forecasting modeling framework is shown Figure 3.1 and has the following components:

- The current base traffic is the starting point and the in-scope demand of the analysis. We have estimated this traffic from transaction data but also from original traffic counts we collected specifically for this project.
- Traffic growth rates are estimated using the network model which in turn uses different transport and behavioral inputs to model congestion and capture rates across the network. We calibrated the network model to a base year of 2019.
- Traffic and revenue forecasts are estimated using traffic growth rates and traffic changes from the network models. We prepared forecasts from 2024 and 2030 future model years.

Figure 3.1: Forecasting Approach



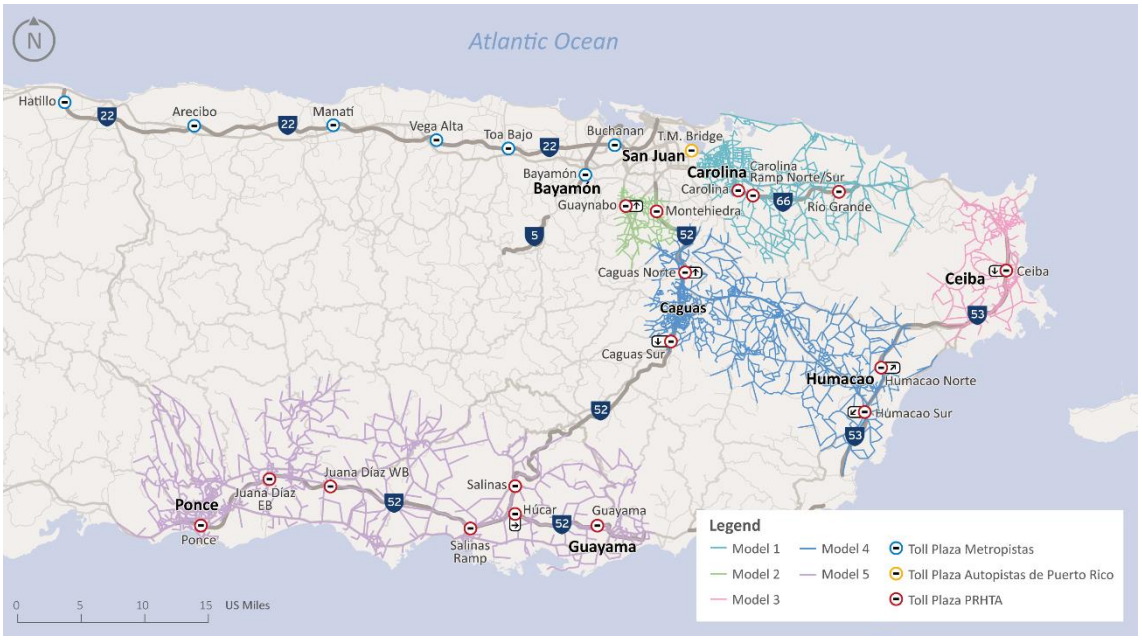
Source: Steer

3.4 We developed strategic network models for different areas of the island covering all the toll plazas included in the study. Each model is independent and groups those toll plazas that are likely to have common network effects due to their proximity. We developed the following five network models:

- **Model 1:** This model covers the corridor of the PR-66 east of San Juan.
- **Model 2:** This model covers the corridors of PR-1 and PR-52 between Caguas and San Juan.
- **Model 3:** This model covers the PR-53 corridor near Ceiba.
- **Model 4:** This model covers the PR-30 between Caguas and Humacao
- **Model 5:** This model covers the PR-52 and PR-52 south of the island between Ponce and Guayama.

3.5 Models 1 and 2 were updated from the 2018 study and Model 3 to 5 were built for the purpose of this study. Figure 3.2 shows the location and extent of the highway networks used for each network model

Figure 3.2: Strategic Network Models



Source: Steer

3.6 The remainder of this chapter explains in detail the development of the Steer Models, the calibration and validation results, and the assumptions and parameters of the model used to prepare the traffic and revenue forecasts.

Model Development

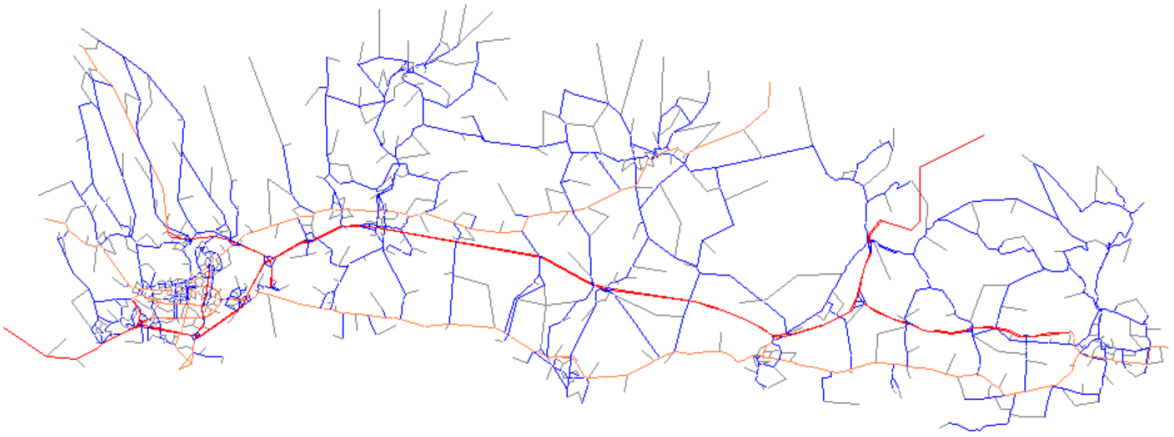
Zoning System and Highway Networks:

3.7 Each of the highway networks used in the five models is a subarea extracted from the LRTP model. The subarea networks include all the main and secondary roads within each study area and includes the link attributes from the LRTP network. We verified the coding of distance, number of

lanes, and facility types for key roads. We also reviewed the coding of the existing toll plazas and corresponding toll rates and made all the required changes, so the networks reflect the 2019 conditions.

3.8 Figure 3.3 shows an example of the subarea extracted for Model 5, covering the south coast between Ponce and Guayama, with highways shown in red and secondary roads in orange.

Figure 3.3: Model 5 Subarea Network



Source: Steer

Trip Matrices

3.9 We also extracted subarea trip matrices for each of the time periods of the LRTP model, which are as follows:

- AM Peak 2hr from 7:00 am to 9:00 am
- Midday 6hr from 9:00 am to 3:00 pm
- PM Peak 3hr from 3:00 pm to 6:00 pm
- Night 13hr from 6:00 pm to 7:00 am

3.10 We aggregated trips into four vehicle classes:

- Autos
- Commercial
- Medium Trucks
- Heavy Trucks

Value of Time

3.11 An individual's value of time (VOT) represents the amount that they would be willing to pay to save time. This can vary depending on their level of income, the urgency and time sensitivity of the trip.

3.12 To estimate the VOT for auto drivers we first carried out analysis of the income distribution of households in Puerto Rico. We grouped this distribution into five equal sized segments (each representing approximately 20% of the population) and estimated the mean VOT for each

segment assuming they would be equal to 50% of wage rate, with the wage rate equal to annual household income divided by 2,080.

3.13 The table below summarizes the income bands for the five segments and the corresponding VOT.

Table 3.1: VOT Income Group Distribution Based on Socioeconomic Analysis – 2019 $.

Income Groups	Share of Households (%)	VOT ($/hr)
Less than $10,000	27.1%	$1.20
$10,000 to $24,999	30.1%	$4.10
$25,000 to $34,999	12.2%	$7.21
$35,000 to $74,999	21.9%	$12.38
$75,000 or more	8.7%	$29.84

Source: Steer analysis of American Community Survey data

3.14 We further distributed these 5 income groups into 15 equally sized groups assuming +/-30% of the base values in Table 3.1 The assumed values are presented in Table 3.2.

Table 3.2: Steer Model Auto VOT Based on Income Distribution ($/hr)

Income Group	VOT ($/hr)
1 (-30%)	$0.8
1 (Base)	$1.20
1 (+ 30%)	$1.60
2 (-30%)	$2.74
2 (Base)	$4.10
2 (+ 30%)	$5.47
3 (-30%)	$4.81
3 (Base)	$7.21
3 (+ 30%)	$9.62
4 (-30%)	$8.26
4 (Base)	$12.38
4 (+ 30%)	$16.51
5 (-30%)	$19.89
5 (Base)	$29.84
5 (+ 30%)	$39.79

Source: Steer

3.15 We segmented commercial vehicles and trucks into three groups. We assumed VOTs for commercial vehicles to be equal to VOT for Autos Income Group 3 (Base), Income Group 4 (Base), and Income Group 5 (-30%). We assumed VOTs for medium and heavy trucks to be 1.5 and 2.0 times auto VOTs. The assumed VOTs for the three truck classes are presented in Table 3.3.

Table 3.3: Steer Model Truck VOT ($/hr) – 2019 $

Group	Commercial	Medium Trucks	Heavy Trucks
1	$7.21	$10.82	$14.42
2	$12.38	$18.60	$24.80
3	$19.89	$29.80	$39.78

Source: Steer

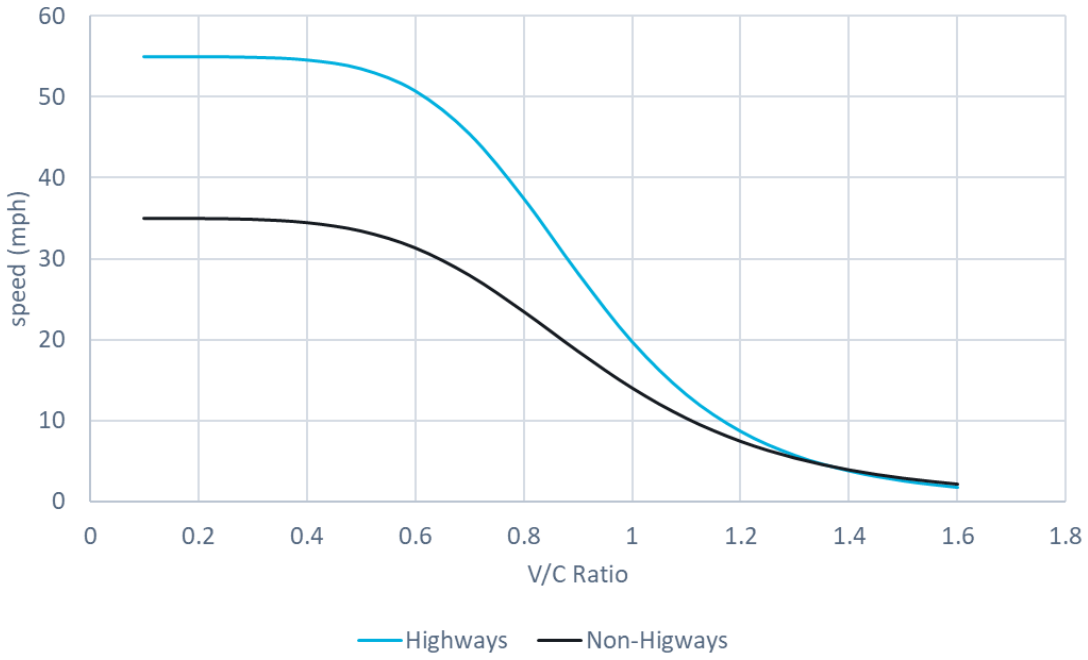
3.16 To incorporate a better variation in how different traveler groups might value the time savings offered by the tolled roads, we segmented trip matrices into different VOT segments as follows:

- We aggregated the PR LRTP trip matrices from the detailed zoning system into Municipios but keeping the implied proportions so we could disaggregate the matrices back to the original definition.
- We estimated the proportion of households in each income group in Table 3.1 for each of the municipalities and used these proportions to split the trip matrices. For AM we assigned income based on origins, for PM we assigned based on destinations and for Mid Day (MD)/Night Time (NT) we assigned using the average of both the origins and destinations.
- We then further split each trip matrix into 3 equally sized groups, and thus corresponding to the 15 VOT groups listed in Table 3.4.
- We then disaggregated the trip matrix using the proportions from the first bullet point.

Speed Flow Curves

3.17 Travel times on the network are estimated using a volume-delay function (VDF) relationship, based on the volume/capacity (V/C) ratio on each link of the network. The LRTP model, and therefore our models, use a BTR volume-delay function for each of the facility types. Figure 3.4 shows an example of the type of VDF curves in the models.

Figure 3.4: Volume-Delay Functions by Road Type



Source: LRTP Model

Calibration

3.18 A key objective of our modeling approach is for the network models to produce forecasts that represent the actual traffic conditions on the main roads. Accordingly, we used traffic data from various sources to calibrate a base year of 2019. The traffic data included:

- Transaction data from PRHTA through its consultants specialized on toll roads, Eclipse Management. We received detailed transaction data for September 2019 by toll plaza and time period. This data was the main source to calibrate/validate the network model.
- Traffic Counts from PRHTA in different locations of the network and for different years.
- Travel time data from the 2019 National Performance Management Research Data Set (NPMRDS) and extracted by Traffic Message Channel (TMC) code.

3.19 The level of calibration required for this kind of models reflects the structure and purpose of the models. We have followed standard procedures to validate the model and set the targets consistent with the intended use of the network models.

3.20 We first calibrated the model against the traffic volumes and transaction data. We provide the volume calibration in terms of the GEH statistic, which is a common measure calculated to determine how well forecasted traffic matches observed traffic. The GEH statistic is calculated as:

$$GEH = \sqrt{\frac{(Volume_{Modeled} - Volume_{Observed})^2}{(Volume_{Modeled} + Volume_{Observed}) * 0.5}}$$

3.21 For this study, we have considered that GEH values less than 10 indicate a good fit, while GEH values greater than 10 indicate that more attention may be needed on a specific location of the model.

3.22 In addition to calibrating traffic volumes, we sought to calibrate the models' prediction of travel times. Accurate representation of travel times is an important element of models used to evaluate time-cost trade-offs of potential toll facility users. We provide the travel time validation in terms of the comparison of the observed and modeled cumulative journey time along key corridors.

3.23 In general, the calibration results that we discuss in the following sections, indicate that all the models do a good job of matching the observed traffic conditions.

Model 1 (PR-66)

3.24 This model covers the Northeast area of the island. The main roads are the PR-66, with two lanes per direction, speed limit of 65 mph and two toll plazas, connecting San Juan with the northeastern part of the island including the municipality of Rio Grande. PR-3, the free alternative, is also included in the model with three lanes per direction and speed limit of 50 mph.

3.25 The toll plazas included in the model are:

- Carolina
- Carolina ramps north and south
- Rio Grande

3.26 The following figure shows the location of the study area for this model and toll plazas we analyzed.

Figure 3.5: Model 1 - Study Area

Source: Steer

Traffic Volumes

3.27 We considered volume data from the toll plazas to be the most accurate, and so our calibration focused primarily on aligning modeled and observed volumes for these locations. Table 3.2 presents the calibration results which show a good level of calibration against the GEH criteria for all plazas.

Table 3.4: Model 1 - Traffic Volumes Calibration Results (Daily and all Traffic)

Location	Direction	Observed Traffic	Modeled Traffic	% Diff	GEH
Plaza Carolina	Northbound	24,812	25,292	2%	0.62
Plaza Carolina	Southbound	24,337	24,583	1%	0.32
Carolina Ramp	Northbound	1,301	1,411	8%	0.61
Carolina Ramp	Southbound	1,161	1,517	31%	1.98
Plaza Rio Grande	Westbound	12,598	11,004	-13%	2.99
Plaza Rio Grande	Eastbound	13,258	12,022	-9%	2.24

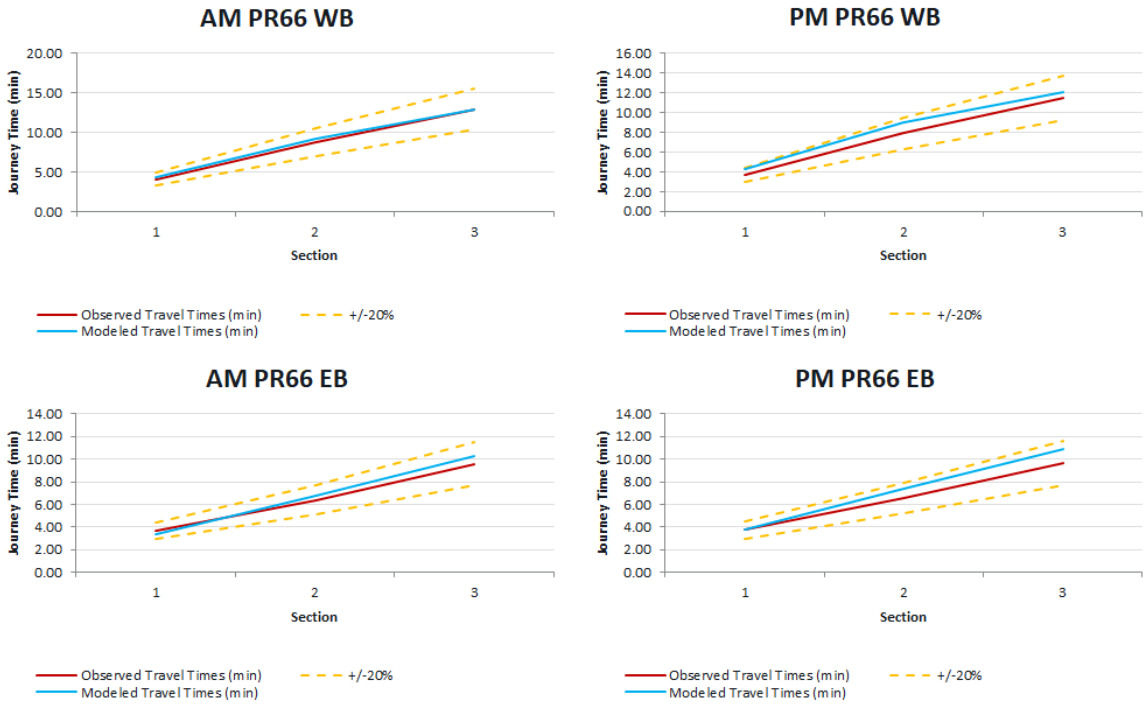
Source: Steer

Journey Times

3.28 Below we present figures that plot the model's predicted travel times for the PR-66 for AM and PM against the observed travel times. Each figure shows the modeled times compared to the observed times along with a buffer of 20%, which is the range that we typically use for this type of validation. The X-axis shows the different sections we considered for each road.

3.29 The results show the model performs well in replicating the observed travel times across all time periods and all segments.

Figure 3.6: PR66 Model Travel Times Calibration



Source: Steer

Model 2 (PR-20)

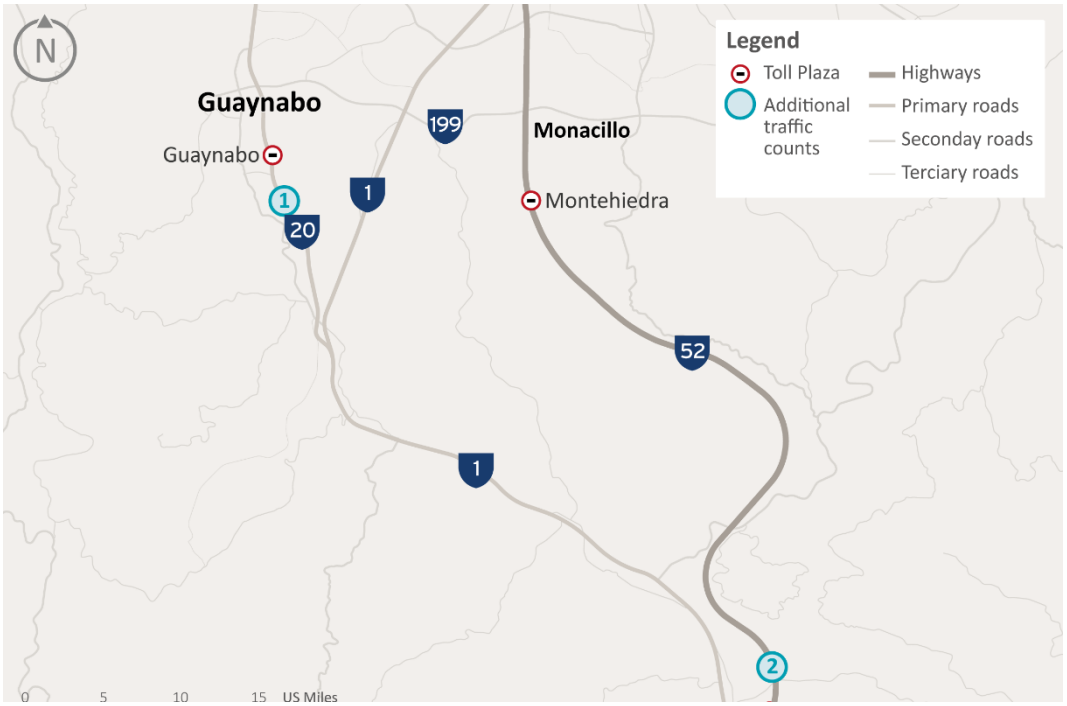
3.30 This model covers the corridor of the PR-20 between Caguas and the PR-99. PR-20 has 3 lanes per direction and a speed limit of 65 mph. Other key roads included in the network are PR-52, PR-1 and PR-169.

3.31 The toll plazas included in the model are:

- Guaynabo
- Montehiedra

3.32 The following figure shows the location of the study area for this model and the points we used to calibrate the model, which in this case include toll plazas and two additional points.

Figure 3.7: Model 2 - Study Area



Source: Steer

Traffic Volumes

3.33 We focused on information from the existing toll plazas and two additional points to calibrate the model. Table 3.3 shows the calibration results for all locations. This shows a good level of calibration against the GEH criteria for both plazas and the other locations.

Table 3.5: Model 2 - Traffic Volumes Calibration Results (Daily and all Traffic)

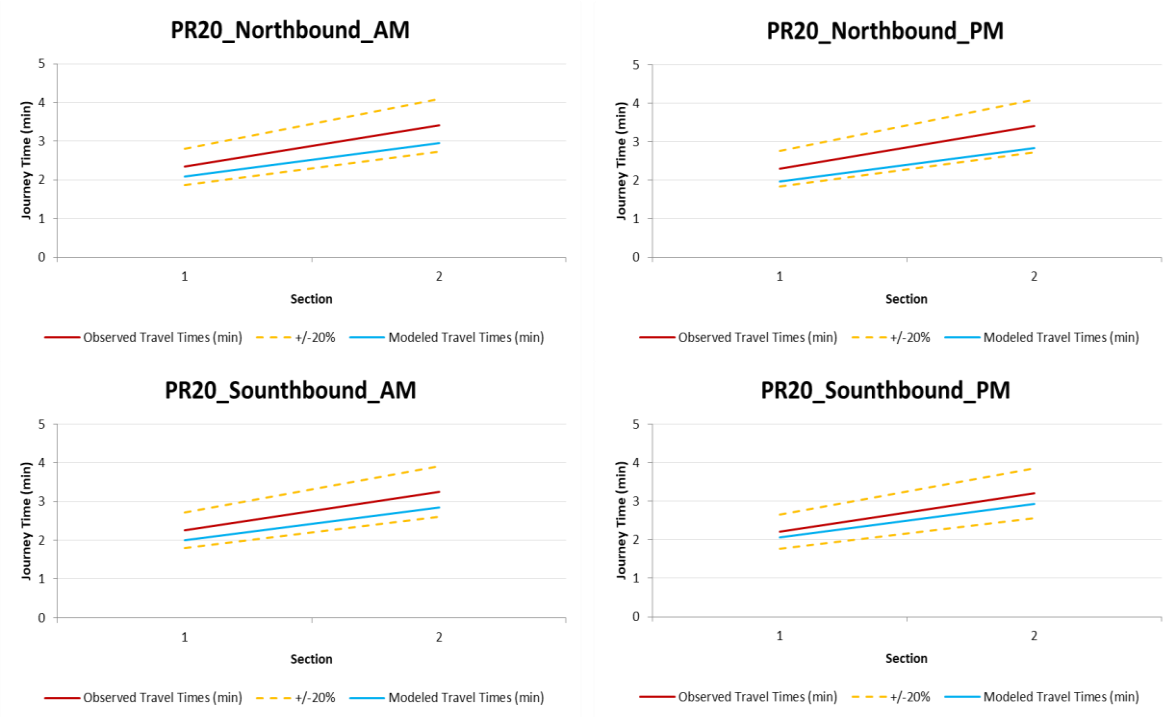
Location	Direction	Observed Traffic	Modeled Traffic	% Diff	GEH
Location 1 PR-20	Northbound	16,249	13,803	-15.1%	5.2
Location 1 PR-20	Southbound	18,562	21,538	16.0%	4.4
Location 2PR-52	Northbound	50,555	52,840	4.5%	2.0
Location 2 PR-52	Southbound	49,765	58,336	17.2%	2.8
Plaza Montehiedra	Northbound	9,735	7,921	-18.6%	0.5
Plaza Guaynabo	Northbound	11,149	12,986	16.5%	0.6

Source: Steer

Journey Time

3.34 The following figure illustrates the travel times that the model predicted, for the AM and PM periods in both directions against the observed travel times. The results show the model performs well in replicating the observed travel times across all time periods and all segments.

Figure 3.8: PR-20 Model Travel Time Calibration (AM and PM Periods)



Source: Steer

Model 3 (PR-53)

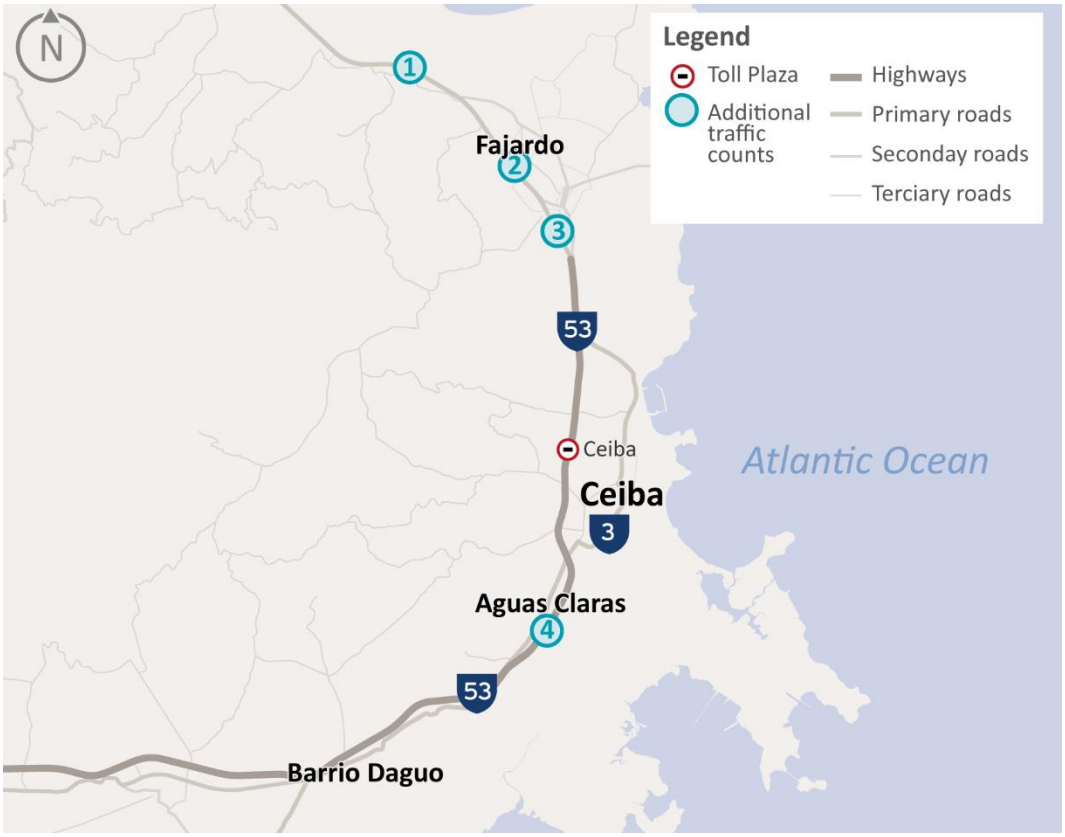
3.35 This model covers the PR-53 corridor on the east side of the island that goes between Fajardo and Salinas. In that area, PR-53 is one of the least congested tolled highways in Puerto Rico and is still under development as it is missing segments between Yabucoa and Guayama. The road has 2 lanes per direction and speed limit of 65 mph. The model also includes PR-3 which is the main alternative to avoid paying tolls and has 1 lane per direction and a speed limit of 35 mph.

3.36 The toll plaza included in the model is:

- Ceiba

3.37 The following figure shows the location of the study area for this model along with the points we used for calibration.

Figure 3.9: Model 3 - Study Area



Source: Steer

Traffic Volumes

3.38 The model was adjusted and calibrated using a set of factors and updates to the network to reflect current conditions. The following table shows the calibration results which are generally good for all the locations.

Table 3.6: Model 3 - Traffic Volumes Calibration Results (Daily Traffic)

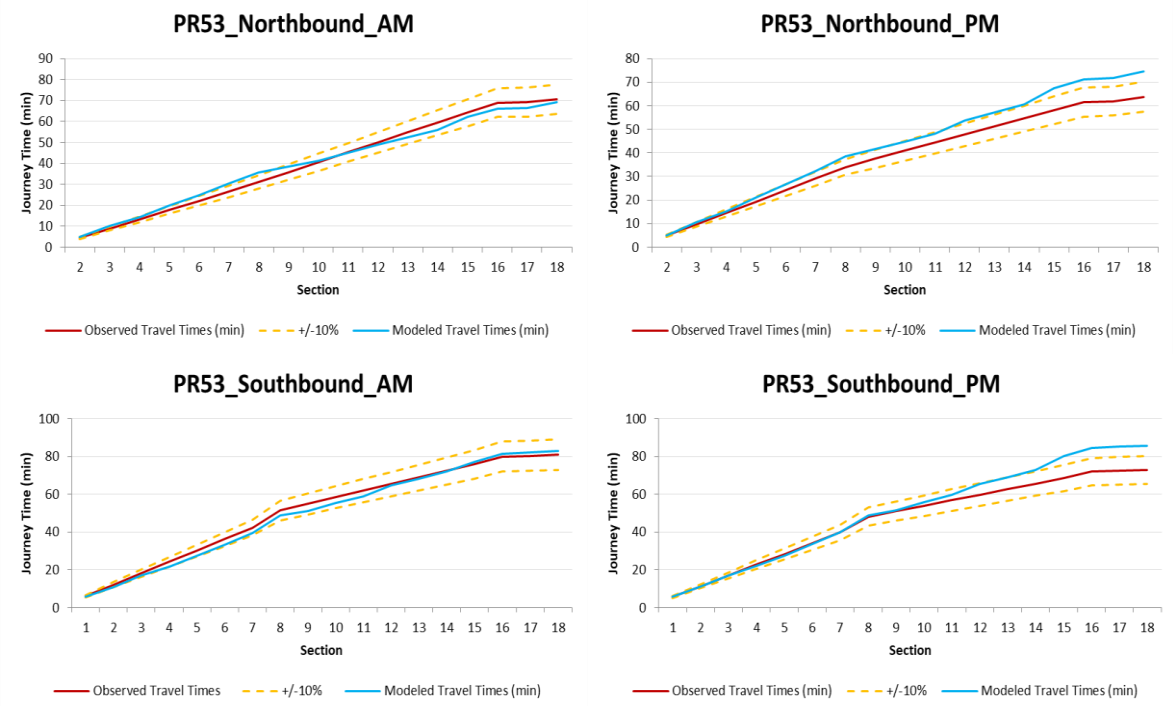
Location	Direction	Observed Traffic	Modeled Traffic	% Diff	GEH
Location 1 PR-3	Westbound	19,516	22,593	16%	4.3
Location 2 PR-3	Northbound	13,999	13,750	-2%	0.4
Location 2 PR-3	Southbound	15,859	17,748	12%	3.0
Location 3 PR-3	Northbound	13,937	16,710	20%	4.6
Location 3 PR-3	Southbound	14,303	16,853	18%	4.2
Location 4 PR-3	Northbound	1,851	2,672	44%	3.5
Location 4 PR-3	Southbound	2,200	1,478	-33%	3.4
Plaza Ceiba	Southbound	8,152	7,503	-8%	1.5

Source: Steer

Journey Time

3.39 The following figure illustrates the travel times that the model predicted for the AM and PM periods in both directions against the observed travel times. The results show the model generally performs well in replicating the observed travel times, although a bit high in the PM in both directions.

Figure 3.10: PR-3 Model Travel Time Calibration (AM and PM Periods)



Source: Steer

Model 4 (PR-53)

3.40 This model covers the East Central area of the island. The main roads are PR-30 and PR-53 with 2 lanes per direction and PR-52 with 3 lanes per direction. PR-52 and PR-30 have a speed limit of 60 mph while PR-53's speed limit is 65 mph. PR-189 is the free alternative also included in the model and it has one lane per direction and a posted speed of 30 mph.

3.41 The toll plazas included in the model are:

- Humacao Norte
- Humacao Sur
- Caguas Norte
- Caguas Sur

3.42 The following figure shows the location of the study area for this model along with the points we used for calibration.

Figure 3.11: Model 4 - Study Area

Source: Steer

Traffic Volumes

3.43 We considered volume data from the toll plazas to be the most accurate, and so our calibration focused primarily on aligning modeled and observed volumes for these locations. The following table shows the calibration results based on GEH, which are generally good for all plazas and locations.

Table 3.7: Model 4 - Traffic Volumes Calibration Results (Daily and all Traffic)

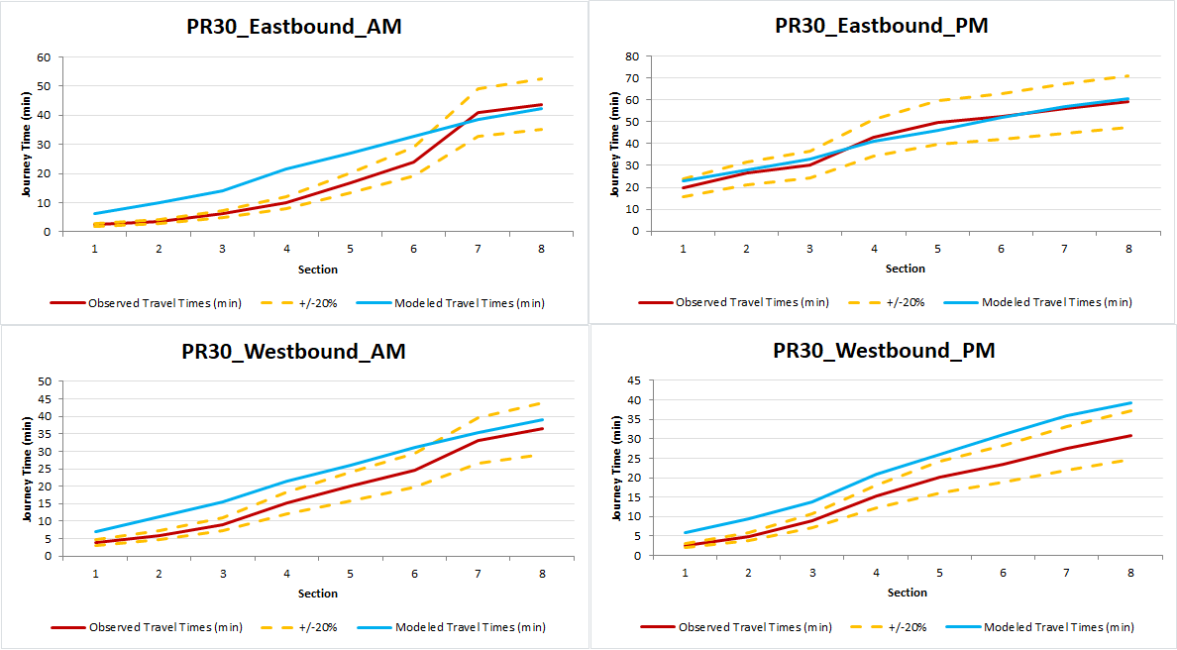
Location	Direction	Observed Traffic	Modeled Traffic	% Diff	GEH
Plaza Caguas North	Northbound	55,680	51,369	-8%	3.8
Plaza Caguas South	Southbound	33,486	33,591	0%	0.1
Plaza Humacao South	Southbound	13,842	13,966	1%	0.2
Plaza Humacao North	Northbound	11,221	11,416	2%	0.4
Location 1 (PR1)	Northbound	26,516	33,261	25%	8.0
Location 2 (PR1)	Southbound	24,956	22,578	-10%	3.2
Location 2 (PR30)	Eastbound	41,238	37,134	-10%	4.2
Location 2 (PR30)	Westbound	37,141	35,087	-6%	2.2
Location 3 (PR183)	Eastbound	7,198	7,546	5%	0.8
Location 3 PR183)	Westbound	7,429	8,044	8%	1.4

Source: Steer

Journey Times

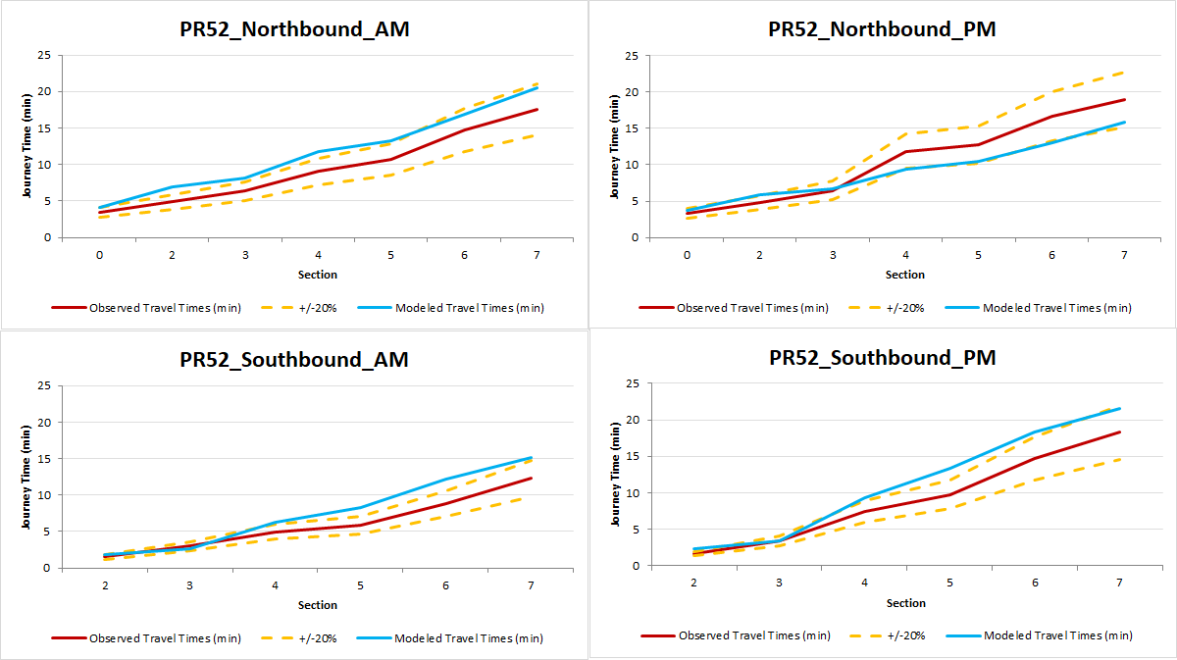
3.44 The following figures show the cumulative travel times for the AM and PM periods in both directions against the observed travel times for all three key roads included in the model. The results show the model generally performs well in replicating the observed travel times, with some segments and time periods having more variation.

Figure 3.12: PR30 Model Travel Times Calibration



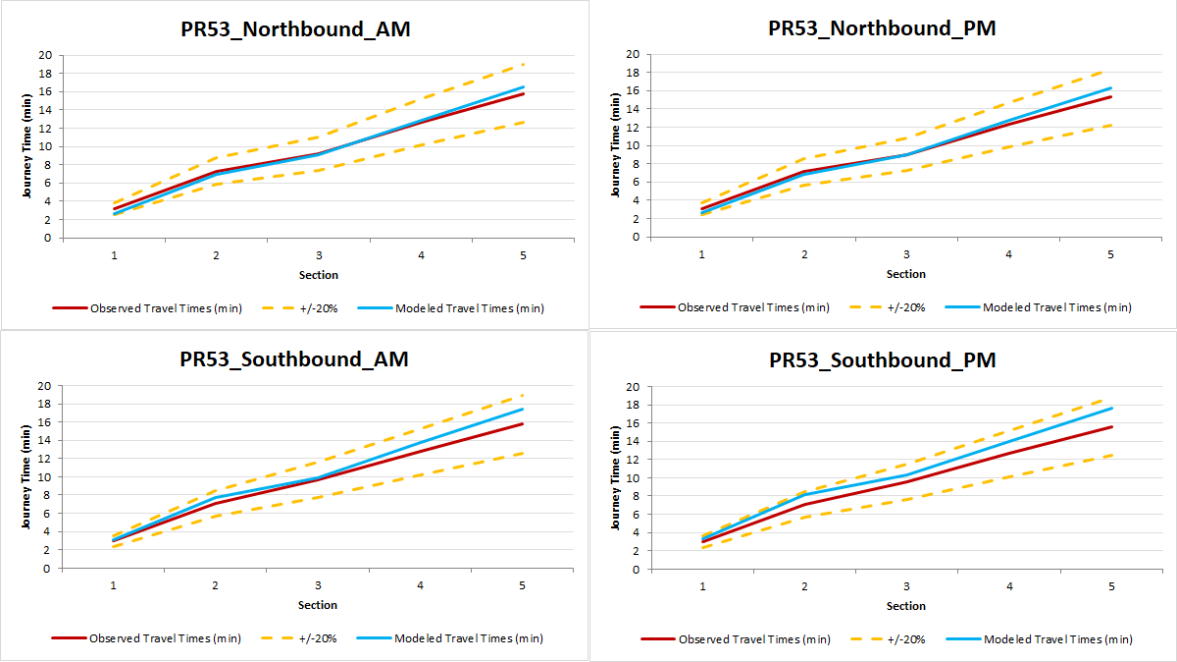
Source: Steer

Figure 3.13: PR52 model travel times calibration



Source: Steer

Figure 3.14: PR53 model travel times calibration



Source: Steer

Model 5 (PR-52 / PR-53)

3.45 This model covers the southern central part of the island, including Ponce, a large city on Puerto Rico's southern coast in the West and Guayama in the East. The key roads in the study area are the toll roads PR-52 and PR-53, and alternatives PR-12, PR-10 and PR-9.

3.46 In Ponce, PR-52 acts as a bypass to the south east of the city connecting to the PR2 in the south and PR10 in the North East of the City. The road can also be used for accessing the Port of Ponce and the Airport. The highway has two lanes per direction and a speed limit of 55 mph.

3.47 Outside Ponce, PR-52 connects Ponce with Salinas to the east. PR-52 then heads north-east providing the main strategic route to the North of the Island including the capital San Juan. Just to the West of Salinas the PR-53 branches off from the PR-52 providing a connection to the City of Guayama. These highways have two lanes per direction and a speed limit of 55 mph.

3.48 The following toll plazas are included in the model:

- Ponce Plaza EB and WB
- Juana Diaz Este, EB
- Juana Diaz Oeste Plaza, WB
- Salinas Sur Plaza NB and SB
- Salinas Plaza, NB
- Hucar Plaza
- Guayama Plaza EB and WB

3.49 The following figure shows the location of the study area for this model along with the points we used for calibration.

Figure 3.15: Model 5 – Study Area

Source: Steer

Traffic Volumes

3.50 The traffic volume data at the toll plaza was the most accurate source of information, so our calibration focused primarily on aligning modeled and observed volumes on those segments. Table 3.8 shows the calibration results for the all-day period. This shows a good level of calibration against the GEH criteria for all plazas.

Table 3.8: Model 5 - Traffic Volumes Calibration Results (Daily Traffic)

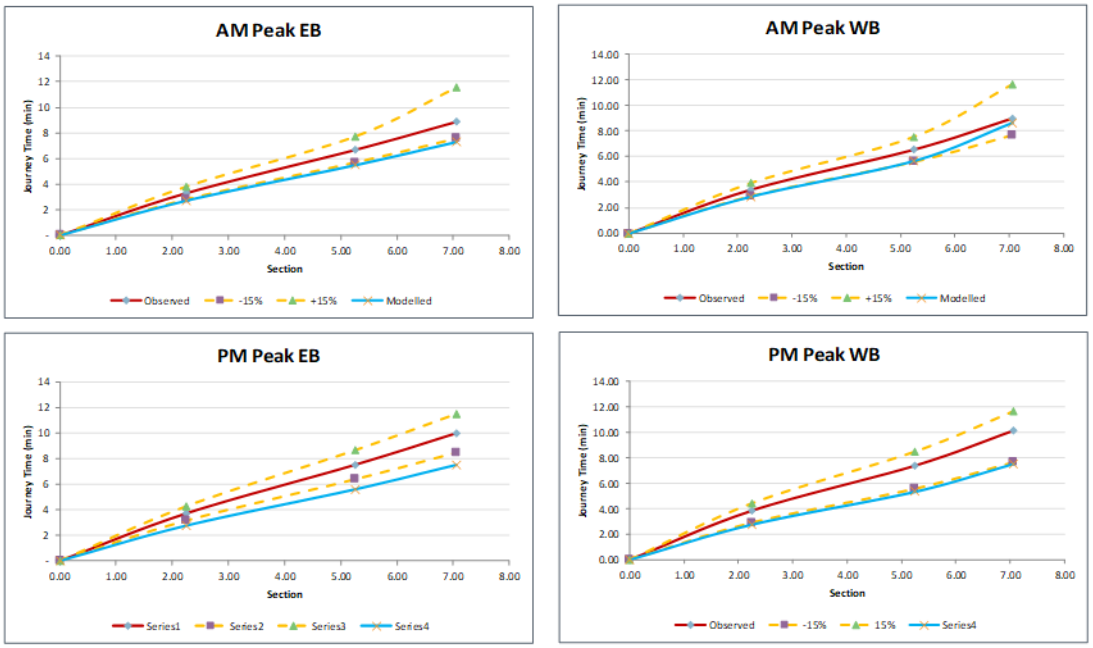
Location	Direction	Observed Traffic	Modeled Traffic	% Diff	GEH
Plaza Ponce	Eastbound	21,304	22,253	4%	1.3
Plaza Ponce	Westbound	21,593	19,559	-9%	2.9
Plaza Juana Diaz	Eastbound	21,453	21,204	-1%	0.3
Plaza Juana Diaz	Westbound	29,854	25,664	-14%	5.1
Plaza Salinas Ramps	Northbound	3,620	3,742	3%	0.4
Plaza Salinas Ramps	Southbound	3,631	6,199	71%	7.5
Plaza Salinas	Northbound	19,797	18,435	-7%	2.0
Plaza Hucar	Eastbound	10,578	13,602	29%	5.6
Plaza Guayama	Eastbound	9,520	10,123	6%	1.2
Plaza Guayama	Westbound	9,704	9,887	2%	0.4

Source: Steer

Journey Times

3.51 Traffic speeds on PR-52/53 and main alternative PR-1/2/3 have been calibrated to ensure that congestion levels are replicated to a reasonable level. Figure 3.16 shows the journey times for the PR52 in Ponce against the observed data. The results show the model performs reasonably well in replicating the observed travel times across all time periods and all segments. While the model is running on the quick side it shows that it reflects the distribution of delay to a reasonable level.

Figure 3.16: PR52 Journey Time Comparison Ponce



Source: Steer

Forecasting Assumptions

3.52 Once we calibrated all the models, we used them to understand the potential revenue that could be provided for the current and new toll plazas across the network. We prepared future scenarios for 2024 and 2030 with the assumptions we discuss in the next sections.

GNP and Inflation

3.53 We received the Gross National Product (GNP) and Inflation assumptions from PRHTA as shown in Table 3.9.

Table 3.9: GNP and Inflation Assumptions

Year	USA Real GDP	Puerto Rico Real GNP Growth	Inflation
2019	-2.26%	-0.7%	0.3%
2020	6.84%	-0.3%	0.1%
2021	2.69%	4.0%	2.0%
2022	2.92%	3.2%	3.3%
2023	2.71%	-0.2%	2.4%
2024	2.41%	-1.3%	1.9%
2025	1.99%	-1.0%	1.8%
2026	1.93%	-0.3%	1.8%
2027	2.01%	0.3%	1.8%

Year	USA Real GDP	Puerto Rico Real GNP Growth	Inflation
2028	1.99%	0.1%	1.8%
2029	2.04%	-0.3%	1.9%
2030	2.10%	-0.4%	1.8%
2031	2.12%	-0.7%	1.8%
2032	2.16%	-0.9%	1.8%
2033	2.11%	-0.9%	1.8%
2034	2.09%	-1.0%	1.8%
2035	2.04%	-1.3%	1.8%
2036	2.00%	-1.4%	1.9%
2037	1.98%	-1.0%	1.9%
2038	1.98%	-0.9%	1.9%
2039	1.97%	-0.7%	1.9%
2040	1.94%	-0.6%	1.9%
2041	1.93%	-0.6%	1.9%
2042	1.95%	-0.5%	1.9%
2043	1.93%	-0.4%	1.9%
2044	1.92%	-0.4%	1.9%
2045	1.92%	-0.4%	1.9%
2046	1.90%	-0.4%	1.9%
2047	1.92%	-0.4%	1.9%
2048	1.90%	-0.4%	1.90%
2049	1.89%	-0.4%	1.90%
2050	1.88%	-0.3%	1.90%
2051	1.88%	-0.30%	1.90%

Source: PRHTA

Future Network

3.54 We assumed no future infrastructure projects for any future scenario. That is, the base networks we used as part of the base year scenario (2019) are the same networks we used for all the future year tests. Toll rates were adjusted depending on the analysis performed.

Future Demand

3.55 Given the uncertainty about overall growth and specifically trip growth across the island, we assumed no growth in trip matrices for any modeled future year (2024 and 2030). The only exception was the trip matrices for the Model 1 (PR-66), for which we assumed trips to increase in line with GNP, recognizing the growth seen in recent years and the proximity with San Juan. The growth factors relative to 2019 are:

- Model 1 trip growth 2024: 1.05
- Model 1 trip growth 2030: 1.04

Values of Time (VOT)

3.56 As discussed before, we estimated VOTs for auto drivers based on income distribution of households in Puerto Rico and then assumed a further distribution to obtain 15 equally sized groups. For future years we assumed VOT will grow as a 2 / 3 of GNP. The resulting VOT for autos are summarized in Table 3.10.

Table 3.10: VOT ($/hr – nominal)

VOT Segment	2019	2022	2024	2030
1	$0.80	$0.83	$0.84	$0.91
2	$1.20	$1.25	$1.26	$1.37
3	$1.60	$1.67	$1.68	$1.83
4	$2.73	$2.85	$2.86	$3.12
5	$4.10	$4.28	$4.30	$4.69
6	$5.47	$5.71	$5.73	$6.26
7	$4.80	$5.01	$5.03	$5.49
8	$7.21	$7.52	$7.56	$8.25
9	$9.61	$10.03	$10.07	$10.99
10	$8.25	$8.61	$8.65	$9.43
11	$12.38	$12.92	$12.98	$14.16
12	$16.51	$17.23	$17.31	$18.88
13	$19.89	$20.75	$20.85	$22.75
14	$29.83	$31.13	$31.27	$34.11
15	$39.78	$41.51	$41.70	$45.49

Source: Steer

Development of Revenue Schedule

3.57 After running the Steer Models, there were a number of steps involved in translating the model outputs into the traffic and revenue forecasts for each toll plaza. These steps are:

- We ran the network models for all future years and estimated traffic growth rates for each toll plaza and vehicle type.
- We then structured the forecasts through three periods:
  - 2021: Based on observed data from January to July and the assumption that for the rest of the year all toll plazas will operate under normal conditions. Additionally, and only as a reference point, we estimated a hypothetical 2021 (2021 proxy) that would represent a year without any impact from COVID-19.
  - 2022: Forecast starting from the 2021 proxy (estimated by expanding the data collected in July 2021) applying growth from the network model.

  - 2023 to 2030: forecast based on 2022 traffic levels and applying growth from the network models.
- For 2030 and beyond, we extrapolated assuming that transactions would grow as an average of two trends:
  - GDP/GNP Trend: For Model 1 (PR-66) traffic would grow in line USA GDP and assuming an GDP elasticity of 0.4. For the rest of the plazas, traffic would grow in line with Puerto Rico GNP and a GNP elasticity of 0.75.
  - Trend approach: assuming growth between 2030 and 2040 will be 75% of the 2025-2030 CAGR and that between 2040 and 2050 will be 50% of the 2025-2030 CAGR for each toll plaza independently.
- Additionally, for the tests considering increases in toll rates we assumed a toll elasticity of -0.3 for Model 1 and -0.15 for the other plazas.
- Revenues were estimated using average toll rates from 2019 data, adjusted as required for each toll rate scenarios.

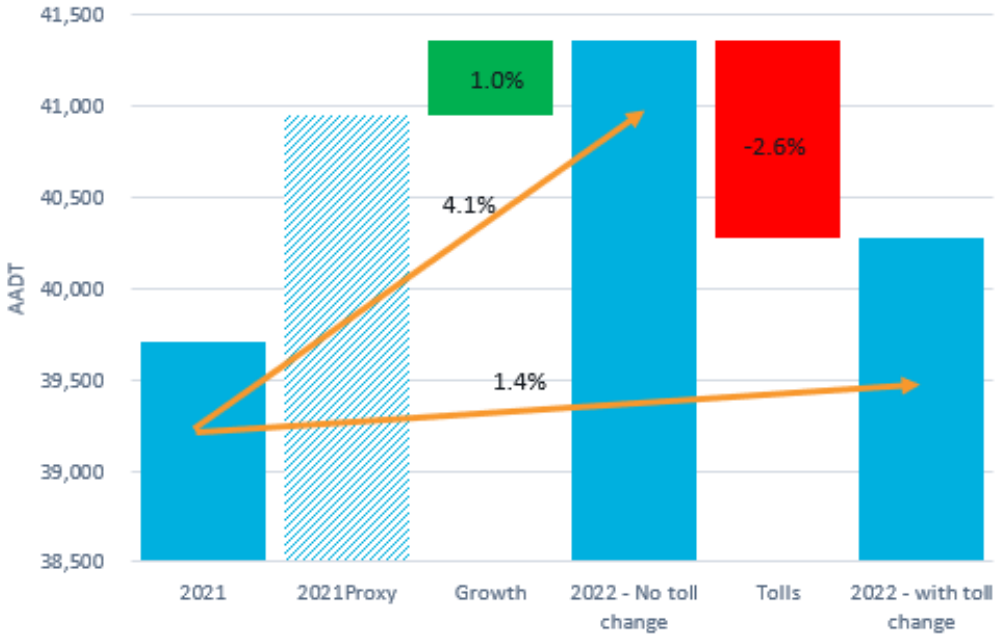
Short Term Example

3.58 Below is an example of how we estimated the 2022 AADT using the 2021 estimated, the 2021 proxy for Ponce and considering a toll increase of 8.3%:

- 2021 proxy is an increase of 3.1% over the 2021 value.
- There is growth of 1.0% for a No Toll Change scenario.
- Toll increases causes traffic to decrease by 2.6%.
- Which results in the 2020 with toll changes.

3.59 The same approach was used for all the toll plazas using the observed 2021 data and different toll rate assumptions.

Figure 3.17: Example of Forecasting Methodology to Establish 2022 Traffic Forecasts



Source: Steer

4 Traffic and Revenue forecasts for PRHTA toll facilities

Overview

4.1 Following the methodology and assumptions discussed in the previous chapter we prepared traffic and revenues forecasts for all the plazas and for four tolling scenarios:

- **Test 0:** No changes in tolls
- **Test 1:** Annual increase of 8.3% (nominal) in 2022, 8.4% (nominal) in 2023, 8.4% in 2024 (nominal) and then annual increases of CPI + 1.5%.
- **Test 2:** Annual increases of CPI + 1.5%.
- **Test 3:** Toll Optimization for 2022 and 2030 considering toll rate increase of -25%, +25%, +50%, +75% and 100%.

4.2 For Test 1 and 2 toll rate increases for all toll plazas are effective March 1st, 2022, except for PR-66 plazas (Carolinas and Rio Grande) for which toll increases are effective January 1st, 2025.

4.3 Table 4.1 shows the year-by-year toll rate increase for Test 1 and 2 based on the current toll rates and the and inflation assumption described in Chapter 3.

Table 4.1: Increase in Toll Rates

		Test 1			Test 2		
	Inflation	Real Increase	Nominal Increase	Increase Factor	Real Increase	Nominal Increase	Increase Factor
2021	2.0%			1.00			1.00
2022	3.3%	4.9%	8.3%	1.08	1.5%	4.8%	1.05
2023	2.4%	5.9%	8.4%	1.17	1.5%	3.9%	1.09
2024	1.9%	6.4%	8.4%	1.27	1.5%	3.4%	1.13
2025	1.8%	1.5%	3.4%	1.32	1.5%	3.4%	1.16
2026	1.8%	1.5%	3.4%	1.36	1.5%	3.4%	1.20
2027	1.8%	1.5%	3.4%	1.41	1.5%	3.4%	1.24
2028	1.8%	1.5%	3.4%	1.45	1.5%	3.4%	1.29
2029	1.9%	1.5%	3.4%	1.50	1.5%	3.4%	1.33
2030	1.8%	1.5%	3.4%	1.55	1.5%	3.4%	1.37

Source: Steer

4.4 In addition to the forecasting assumptions discussed in Chapter 3, we also assumed the following:

- No other potential impacts related to COVID-19.
- Normal economic conditions will occur in the island, without a major depression, national or regional emergency, or natural disaster that could restrict the use of motor vehicles.
- No new transportation service or technology will be introduced that would radically change travel behavior and preferences during the forecast period.

4.5 We also note that, given the socioeconomic forecasts for the island and in particular the forecasted decrease in population, forecasts beyond 2030 inevitably have a higher degree of uncertainty.

Results

4.6 The following figures and tables summarize the AADTs and annual revenues for all the plazas together for Tests 0 to 2. Further details per plaza are included in Appendix A of this report.

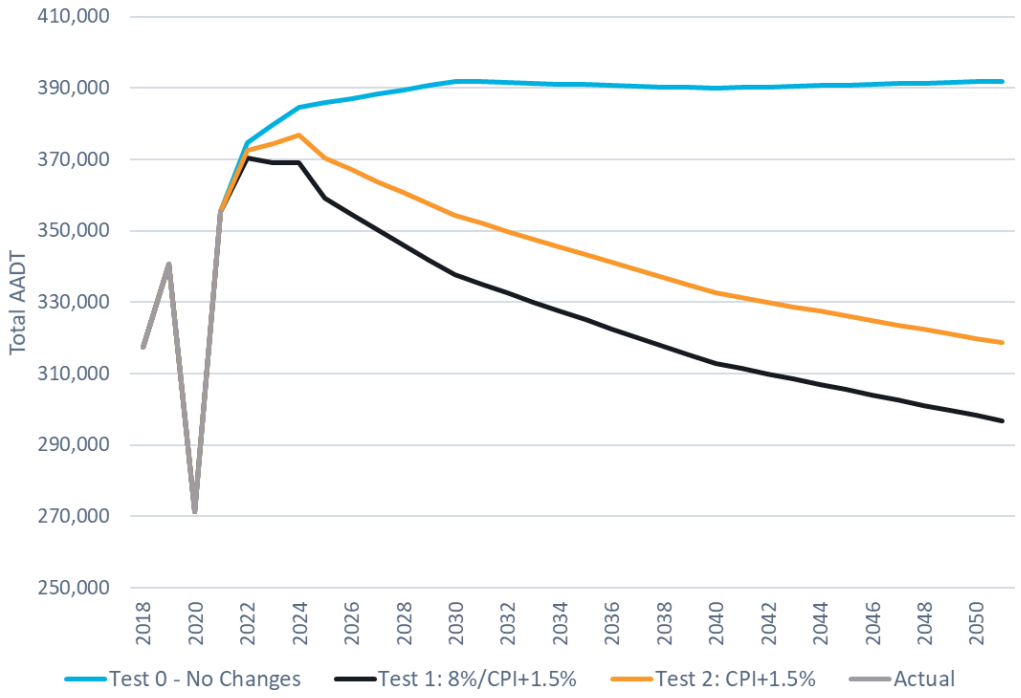
4.7 Table 4.2 and Figure 4-1 show the CAGR for the AADT and full traffic forecasts respectively. Test 0 is the only scenario where traffic continues to grow, at a low but positive rate. The other two scenarios show a traffic response to the increases in toll rates with traffic declining in the future.

Table 4.2: CAGR AADT – All Plazas

Test	2022-2030	2030-2040	2040-2051
Test 0 - No Changes	0.56%	-0.05%	0.05%
Test 1: 8.4%/CPI+1.5%	-1.14%	-0.76%	-0.48%
Test 2: CPI+1.5%	-0.62%	-0.63%	-0.39%

Source: Steer

Figure 4-1: Total AADT Forecasts



Source: Steer

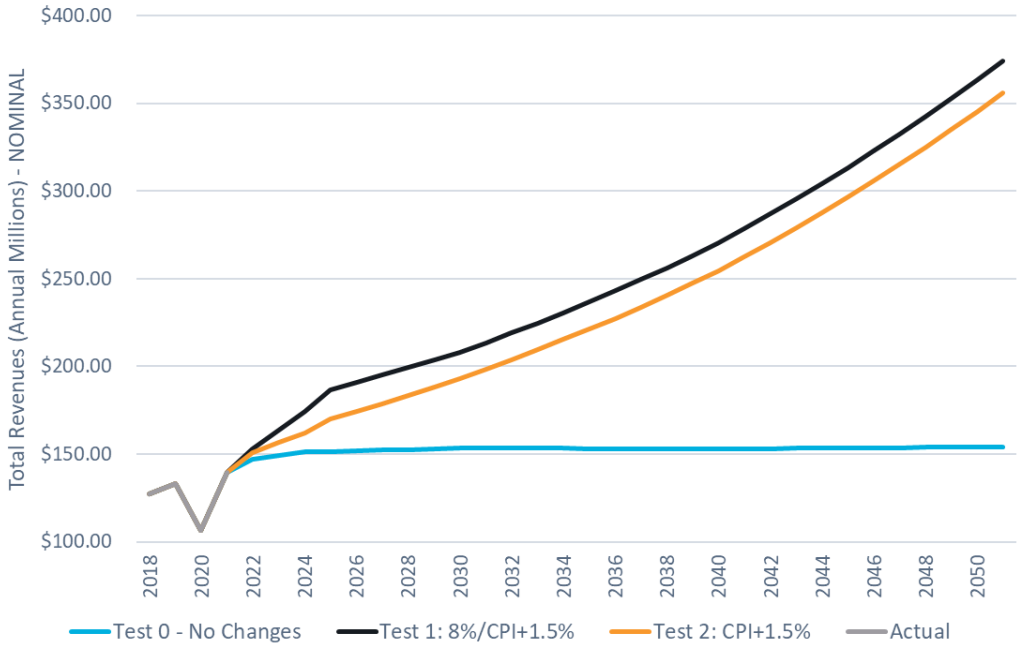
4.8 Table 4.3 and Figure 4-2 show the same information but for revenue. For this metric, all scenarios show positive growth with Test 1 growing the fastest as a response to the larger increase in toll rates.

Table 4.3: CAGR Revenue Nominal $ – All Plazas

Test	2022-2030	2030-2040	2040-2051
Test 0 - No Changes	0.53%	-0.03%	0.06%
Test 1: 8.4%/CPI+1.5%	3.92%	2.66%	2.99%
Test 2: CPI+1.5%	3.14%	2.81%	3.10%

Source: Steer

Figure 4-2: Total Annual Revenue Forecasts (Million – in Nominal $)



Source: Steer

4.9 The following tables provide the full traffic and revenue forecasts for these three scenarios.

Table 4.4: Total AADT Forecasts for All Plazas

Year	AADT			YoY Growth		
	Test 0	Test 1	Test 2	Test 0	Test 1	Test 2
2018	317,386	317,386	317,386			
2019	340,654	340,654	340,654	7.33%	7.33%	7.33%
2020	271,196	271,196	271,196	-20.39%	-20.39%	-20.39%
2021	355,387	355,387	355,387	31.04%	31.04%	31.04%
2022	374,663	370,240	372,500	5.42%	4.18%	4.82%
2023	379,617	369,152	374,462	1.32%	-0.29%	0.53%
2024	384,687	369,024	376,915	1.34%	-0.03%	0.66%
2025	385,870	359,086	370,321	0.31%	-2.69%	-1.75%
2026	387,060	354,665	367,043	0.31%	-1.23%	-0.89%
2027	388,257	350,319	363,807	0.31%	-1.23%	-0.88%
2028	389,462	346,047	360,611	0.31%	-1.22%	-0.88%
2029	390,673	341,846	357,457	0.31%	-1.21%	-0.87%
2030	391,892	337,716	354,343	0.31%	-1.21%	-0.87%
2031	391,684	335,136	352,092	-0.05%	-0.76%	-0.64%
2032	391,479	332,578	349,859	-0.05%	-0.76%	-0.63%
2033	391,277	330,042	347,642	-0.05%	-0.76%	-0.63%
2034	391,078	327,528	345,442	-0.05%	-0.76%	-0.63%
2035	390,883	325,035	343,259	-0.05%	-0.76%	-0.63%
2036	390,690	322,563	341,093	-0.05%	-0.76%	-0.63%
2037	390,502	320,112	338,943	-0.05%	-0.76%	-0.63%
2038	390,316	317,681	336,809	-0.05%	-0.76%	-0.63%
2039	390,134	315,272	334,691	-0.05%	-0.76%	-0.63%
2040	389,955	312,882	332,589	-0.05%	-0.76%	-0.63%
2041	390,123	311,386	331,286	0.04%	-0.48%	-0.39%
2042	390,292	309,897	329,990	0.04%	-0.48%	-0.39%
2043	390,463	308,417	328,701	0.04%	-0.48%	-0.39%
2044	390,636	306,944	327,417	0.04%	-0.48%	-0.39%
2045	390,811	305,480	326,139	0.04%	-0.48%	-0.39%
2046	390,987	304,023	324,868	0.05%	-0.48%	-0.39%
2047	391,166	302,574	323,603	0.05%	-0.48%	-0.39%
2048	391,346	301,133	322,344	0.05%	-0.48%	-0.39%
2049	391,528	299,700	321,091	0.05%	-0.48%	-0.39%
2050	391,712	298,274	319,844	0.05%	-0.48%	-0.39%
2051	391,898	296,856	318,603	0.05%	-0.48%	-0.39%

Source: Steer

Table 4.5: Total Annual Revenue Forecasts (million – in NOMINAL) for All Plazas

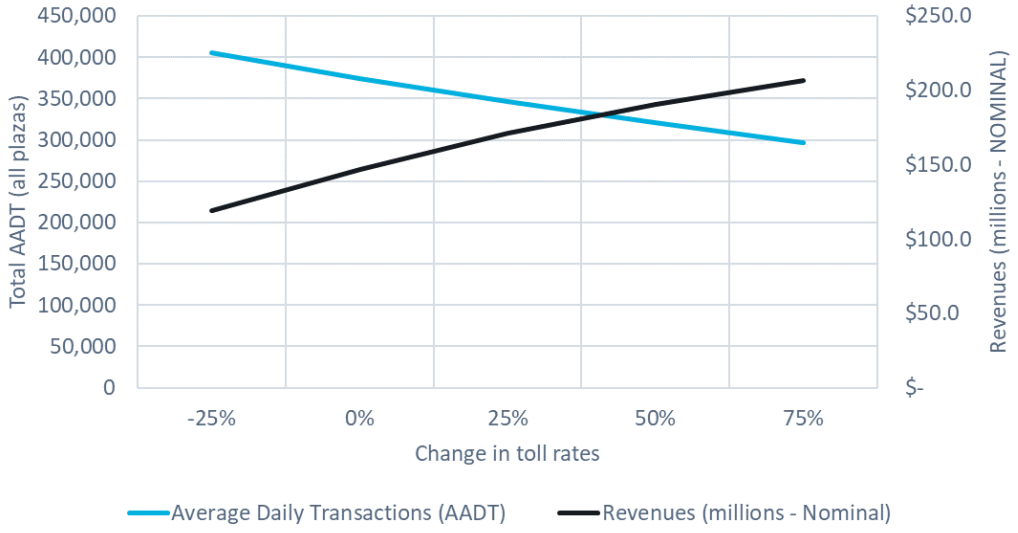
Year	Annual Revenues (millions – NOMINAL)			YoY Growth		
	Test 0	Test 1	Test 2	Test 0	Test 1	Test 2
2018	$ 127.04	$ 127.04	$ 127.04			
2019	$ 133.01	$ 133.01	$ 133.01	4.69%	4.69%	4.69%
2020	$ 106.64	$ 106.64	$ 106.64	-19.82%	-19.82%	-19.82%
2021	$ 139.68	$ 139.68	$ 139.68	30.98%	30.98%	30.98%
2022	$ 146.97	$ 152.91	$ 150.58	5.23%	9.48%	7.81%
2023	$ 149.00	$ 163.76	$ 156.76	1.38%	7.10%	4.10%
2024	$ 151.09	$ 174.19	$ 161.95	1.40%	6.37%	3.31%
2025	$ 151.46	$ 186.72	$ 169.94	0.25%	7.19%	4.93%
2026	$ 151.84	$ 190.76	$ 174.29	0.25%	2.16%	2.56%
2027	$ 152.21	$ 194.90	$ 178.76	0.25%	2.17%	2.56%
2028	$ 152.59	$ 199.14	$ 183.35	0.25%	2.17%	2.57%
2029	$ 152.98	$ 203.49	$ 188.07	0.25%	2.19%	2.58%
2030	$ 153.36	$ 207.93	$ 192.90	0.25%	2.18%	2.57%
2031	$ 153.31	$ 213.36	$ 198.24	-0.03%	2.62%	2.76%
2032	$ 153.27	$ 218.95	$ 203.72	-0.03%	2.62%	2.76%
2033	$ 153.22	$ 224.68	$ 209.35	-0.03%	2.62%	2.77%
2034	$ 153.17	$ 230.58	$ 215.16	-0.03%	2.62%	2.77%
2035	$ 153.13	$ 236.65	$ 221.15	-0.03%	2.63%	2.78%
2036	$ 153.09	$ 242.92	$ 227.34	-0.03%	2.65%	2.80%
2037	$ 153.05	$ 249.45	$ 233.79	-0.03%	2.69%	2.84%
2038	$ 153.01	$ 256.23	$ 240.50	-0.03%	2.72%	2.87%
2039	$ 152.97	$ 263.21	$ 247.40	-0.02%	2.72%	2.87%
2040	$ 152.94	$ 270.37	$ 254.51	-0.02%	2.72%	2.87%
2041	$ 153.03	$ 278.46	$ 262.39	0.06%	2.99%	3.09%
2042	$ 153.12	$ 286.80	$ 270.51	0.06%	2.99%	3.09%
2043	$ 153.22	$ 295.39	$ 278.88	0.06%	2.99%	3.09%
2044	$ 153.32	$ 304.23	$ 287.51	0.06%	2.99%	3.09%
2045	$ 153.41	$ 313.34	$ 296.41	0.06%	2.99%	3.10%
2046	$ 153.51	$ 322.73	$ 305.58	0.06%	2.99%	3.10%
2047	$ 153.61	$ 332.39	$ 315.04	0.06%	3.00%	3.10%
2048	$ 153.71	$ 342.35	$ 324.80	0.06%	3.00%	3.10%
2049	$ 153.81	$ 352.60	$ 334.85	0.07%	3.00%	3.10%
2050	$ 153.91	$ 363.17	$ 345.22	0.07%	3.00%	3.10%
2051	$ 154.01	$ 374.05	$ 355.92	0.07%	3.00%	3.10%

Source: Steer

4.10 Regarding Test 3, we present below the toll rate sensitivity for 2022 and 2030 considering all the toll plazas together. Individual results are included in Appendix A.

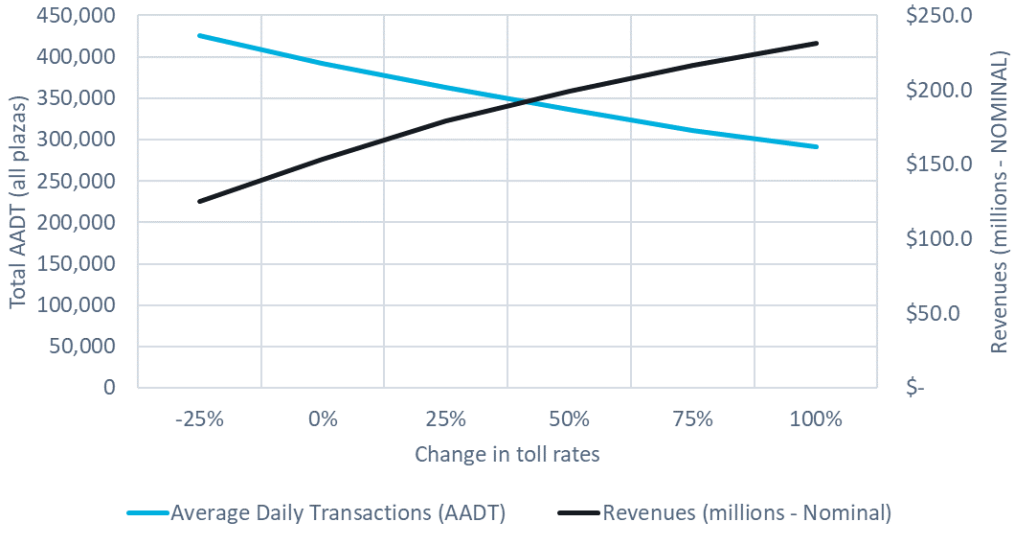
4.11 In general, and considering all plazas as a whole, current toll rates are below revenue maximizing rates. This result is different when checking the individual toll plazas. For the toll rate tests conducted, the aggregate results suggest that revenue levels would be highest with a 75% toll increase in 2022 and a 100% increase in 2030, although both toll rates would lead to a large traffic decrease which could cause significant impacts and delays to other parts of the PR road network.

Figure 4-3: Toll Rate Sensitivity 2022 (All Toll Plazas)



Source: Steer

Figure 4-4: Toll Rate Sensitivity 2030 (All Toll Plazas)



Source: Steer

5 Two-Way Tolling Analysis

Overview

5.1 In this chapter we present the approach we undertook to forecast the impact of modifying the tolling strategy to convert the current one-way tolling to two-way tolling for the following plazas:

- Guaynabo
- Ceiba
- Humacao Norte
- Humacao Sur
- Caguas Norte
- Hucar

5.2 Toll plazas currently collecting tolls in one direction that are not included as part of the two-way analysis are:

- Montehiedra: Minor Plaza in Metropolitan Area built by a developer and agreed as one-way tolling,
- Salinas and Caguas Sur: No alternatives available thus one-way tolling does not create leakage;
- Juana Diaz: gantries implemented in different locations but not really one-way.

5.3 We also present a comparison of our outputs with results obtained from a similar policy implemented on PR-22 in 2017. In addition to this, we complement the two-way analysis with a financial and cost-benefit.

Two Way Tolling

5.4 In order to quantify the impact of changing the current one-way tolling scheme to a two-way tolling scheme on the proposed plazas, we first carried out a data collection program on the plazas and then used the network models to understand sensitivities around different tolling scenarios to finally estimate the expected revenue impacts for each toll plaza.

5.5 For all the analysis we have assumed that the two-way tolls would be half of the current toll rates plus $0.05, all rounded up to the closest $0.05. Table 5.1 summarizes the 2-axle toll rates and effective average toll rates (considering the vehicle mix) for the one-way and two-way scenarios.

Table 5.1: One-Way and Two-Way Toll Rates

Plaza	Current 2-Axle Toll Rates in Tolled Direction	Current Average Toll Rates in Tolled Direction	2-Way 2-Axle Toll Rates	2-Way Average Toll Rates	% Increase in 2-Way Average Toll Rates
Guaynabo	$0.75	$0.84	$0.45	$0.50	20%
Ceiba	$1.00	$1.01	$0.55	$0.56	10%
Humacao North	$1.00	$1.03	$0.55	$0.57	10%
Humacao South	$1.00	$1.04	$0.55	$0.57	10%
Caguas North	$1.50	$1.56	$0.80	$0.83	7%
Hucar	$1.00	$1.05	$0.55	$0.58	10%

Source: Steer analysis and presentation of PRHTA data

5.6 When doing our analysis, we have considered that in converting a toll plaza from one-way tolling to two-way tolling, we expect tolled traffic to more than double:

- While traffic levels are generally higher in the non-tolled direction indicating that some travelers are traveling a different route to avoid the toll, the toll rate in the currently-tolled direction will decrease with the conversion and thus that direction should experience a higher traffic level.
- Once the toll rate is equal in both directions, the currently non-tolled direction should obtain a similar level of traffic as the currently-tolled direction with the lower two-way toll.
- The magnitude of the increase will be influenced by the size of the traffic difference between the current tolled and non-tolled directions and the attractiveness of the non-tolled route (which we try to measure through the network model)

5.7 The following section give details of our analysis and results.

Data Collection

5.8 Our analysis requires estimates of the traffic differential between the tolled and un-tolled directions. To estimate these volumes, we collected traffic counts in July 2021 by direction. We used the traffic counts, along with the historical transaction data, to estimate 2021 volumes for a hypothetical year without COVID-19. These estimates, termed as 2021 proxy, are consistent with other analysis we have done for this study.

Table 5.2 summarizes the estimated traffic volumes in the tolled and non-tolled directions.

Table 5.2: 2021 (Proxy) AADT per Plaza

Plaza	Tolled Direction	Non-Tolled Direction	Total	Directional % Difference
Guaynabo	10,999	25,290	36,290	130%
Ceiba	9,911	11,912	21,823	20%
Humacao North	10,389	12,172	22,560	17%
Humacao South	14,613	22,516	37,129	54%
Caguas North	53,135	65,921	119,056	24%
Hucar	10,098	10,724	20,822	6%

Source: Steer

5.9 We note that for Guaynabo traffic on the northbound does not include the free bypass, which probably explains some of the significant imbalance between the tolled and non-tolled directions.

Two-Way Impact

5.10 To assess the potential effect of changing the tolling system, we ran for each toll plaza three scenarios with our base year network models:

- **Test 0:** "As is": One-way tolling. These are outputs directly from the base year models without any adjustment.
- **Test 4:** "Two-way": Conversion of one-way tolling to two-way tolling. This is based on the base year model but assuming tolls are charged in both directions with the assumptions discussed before.
- **Test 5:** "Zero toll": Assuming both directions are toll-free. This is also based on the base year but assuming no tolls in either direction.

5.11 We used these model outputs to compare the forecast uplift within the "Zero toll" scenario to the forecast uplift within the "Two-way" scenario (each relative to the "As is" scenario). We then scale this ratio according to the observed differential between the current tolled and un-tolled directions, with the output uplift applied to the base forecasts.

5.12 The following equation outlines this calculation:

$$N = \left(\frac{T}{Z} \times O\% + 1\right) \times C$$

Where:

N = Forecast AADT for the new tolling system configuration (two-way)
T = Forecast uplift from the existing network model between the "As is" and "Two-way" scenarios
Z = Forecast uplift from the existing network model between the "As is" and "Zero toll" scenarios
O = Observed % differential between the current tolled and un-tolled directions
C = Forecast AADT for the current tolling system configuration (one-way)

5.13 This approach considers, among other things, the size of the un-tolled and tolled traffic differential which is a key in determining the final impact. Larger differentials indicate a greater willingness and familiarity of travelers to avoid the toll and result in higher impacts when implementing the two-way tolling. Given the current uncertainly with this type of analysis and to adopt a more conservative position we applied the following adjustment factors to the % differential (O) of the following plazas:

- Guaynabo – 75% reduction the O parameter
- Ceiba – 50% reduction the O parameter
- Humacao South – 50% reduction the O parameter

5.14 With these assumptions we estimated the impacts in tolled traffic and revenues shown in Table 5.3 . The last two columns of the table show the ratio between the tolled traffic before and after (that as discussed before we were expecting to be higher than two) and the increase revenues due to the two-way tolling. We note that this analysis assumes that once the two-way tolling is implemented daily traffic levels would be the same in both directions.

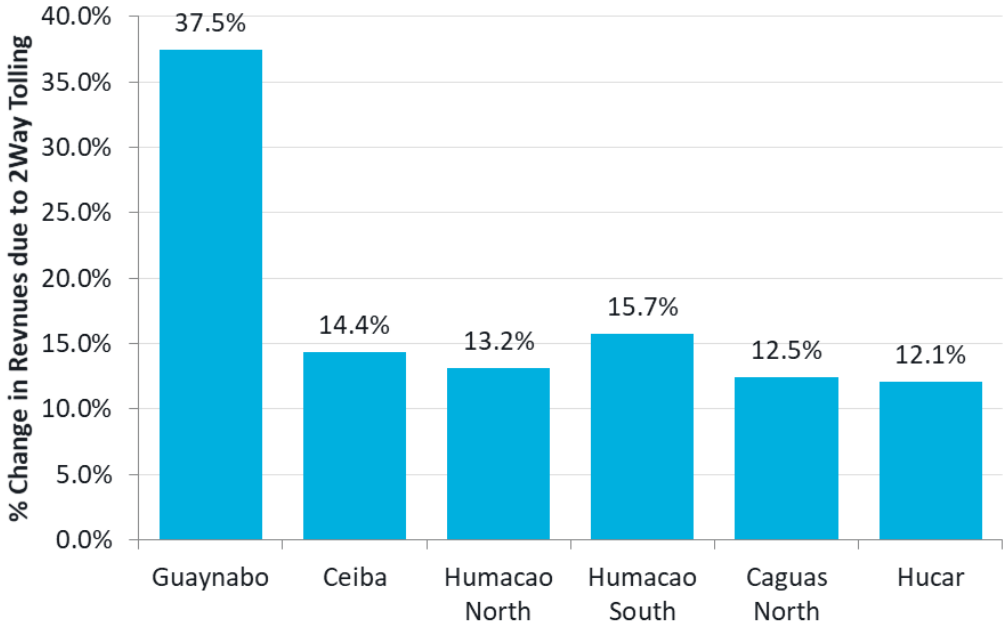
Table 5.3: Two-Way Tolling Conversion Impact

	One-Way Tolling			Two-Way Tolling			Ratio of Tolled Traffic	Increase in Revenues
	Tolled Traffic	Average Rate	Revenues (Millions)	Tolled Traffic	Average Rate	Revenues (Millions)		
Guaynabo	10,999	$0.84	$3.38	25,201	$0.50	$4.64	2.10	37.5%
Ceiba	9,911	$1.01	$3.67	20,611	$0.56	$4.20	2.08	14.4%
Humacao North	10,389	$1.03	$3.91	21,375	$0.57	$4.43	2.06	13.2%
Humacao South	14,613	$1.04	$5.57	30,746	$0.57	$6.45	2.10	15.7%
Caguas North	53,135	$1.56	$30.24	112,042	$0.83	$34.01	2.11	12.5%
Hucar	10,098	$1.05	$3.87	20,583	$0.58	$4.34	2.04	12.1%

Source Steer

5.15 Figure 5-1 shows graphically the change in revenues for each toll plaza. We note that due to rounding and a lower base to which the additional $0.05 is added, the Guaynabo toll rate increase was higher than for the other toll plazas which explains why the impact in revenues is higher than for the other plazas.

Figure 5-1: Revenue from Two-Way Tolling



Source: Steer

Benchmark

5.16 To benchmark our results, we had access to an analysis that reviewed the impact of a similar policy implemented on PR-22 in 2017. The analysis compared the tolled traffic before and after implementing the two-tolling and found that on average the total traffic in the previously tolled direction increased by 5%, which is equivalent to applying a factor of 2.1 to the current transactions to reach the new two-way transaction level. This factor is equivalent to the ratio of tolled traffic that we present in Table 5.3.

5.17 Using this assumption, we re-estimated the expected change in revenues which we present in Table 5.4.

Table 5.4: Two-Way Tolling Conversion Impact from Alternate Approach

Plaza	Tolled Traffic	Average Toll Rate	Revenues (Millions)	Increase in Revenues
Guaynabo	23,099	$0.46	$3.84	26.0%
Ceiba	20,814	$0.56	$4.24	15.5%
Humacao North	21,816	$0.57	$4.52	15.5%
Humacao South	30,688	$0.57	$6.43	15.5%
Caguas North	111,583	$0.83	$33.87	12.0%
Hucar	21,206	$0.58	$4.47	15.5%

Source: Steer

5.18 Table 5.5 shows a comparison the of the revenue impact from both approaches. This table shows that both approaches estimate a similar magnitude of revenue increase from converting to 2-way tolling.

Table 5.5: Impact in Revenues using Steer and Alternate Approach

Plaza	Steer	Alternative Approach
Guaynabo	37.5%	26.0%
Ceiba	14.4%	15.5%
Humacao North	13.2%	15.5%
Humacao South	15.7%	15.5%
Caguas North	12.5%	12.0%
Hucar	12.1%	15.5%

Source: Steer

Financial Analysis

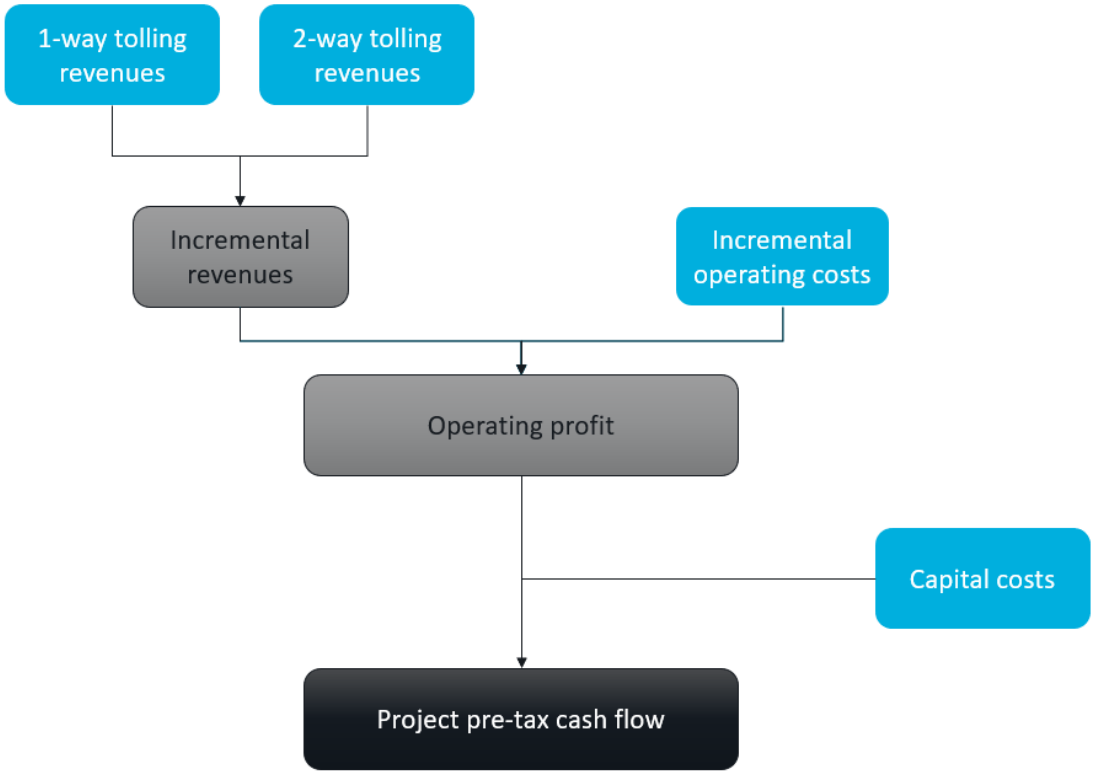
Overview

5.19 This section summarizes our financial analysis of converting the one-way plazas to two-way operation, based on the demand, revenue, and cost projections of the change. We discuss the key assumptions of the financial analysis and expand on the methodology to derive future financial projections.

5.20 The financial forecasting uses outputs as provided by PRHTA (information valid as of 16 November 2021), and a bespoke Excel-based analysis workbook created specifically for the purposes of this project. Overall, the analysis encompasses a 10-year period between 2022 and 2031 and assumes that toll plazas will be converted to bi-directional tolling in 2022 with no interruption in operations.

5.21 Results and key financial metrics are calculated on both a toll plaza and project level; in all cases, the analysis follows the structure outlined on Figure 5-2.

Figure 5-2: Financial Analysis Structure



Source: Steer

Revenue Forecasts

5.22 The project proposes the conversion of existing one-way toll plazas to bi-directional operation; as such, revenues generated by the toll plazas in the "As is" scenario (i.e., the scenario where no intervention takes place) are excluded from the analysis and only incremental revenues over and above those generated in the "As is" scenario are included.

5.23 As described before, we developed both "As is" and "Two-way" scenario revenue projections for the 2022-2031 period and have been included in the analysis in nominal terms. Table 5.6 presents the average annual and 10-year total incremental revenue by toll plaza. Inflation assumptions underlying revenue forecasts are identical to those used in the operating cost calculations and are presented in Table 5.7.

5.24 Overall, the project is estimated to generate $77.13 million in nominal incremental revenues ($7.71 million per annum on average) in the first ten years of the analysis. It is estimated that these revenues will be used to offset the initial capital outlay incurred by PRHTA and the ongoing operating expenses associated with the project.

Table 5.6: Incremental Toll Revenue Forecasts (2022-2031)

Toll Plaza	Average Annual Incremental Revenue (millions of nominal $)	Total 10-Year Incremental Revenue (millions of nominal $)
Guaynabo	$1.37	$13.74
Ceiba	$0.58	$5.75
Humacao North	$0.53	$5.31
Humacao South	$0.94	$9.37
Caguas North	$3.82	$38.17
Hucar	$0.48	$4.80
Total	**$7.71**	**$77.13**

Source: Steer

Cost Forecasts

5.25 The analysis utilized forecasts of two categories of cost expenditures for each toll plaza:

- CAPEX: The initial capital outlay to install toll gantries in the currently non-tolled direction.
- OPEX: Incremental operating expenses due to the additional transactions resulting from 2-way operations, with the following break-down:
  - $0.022 / new transaction - RoadSide System (RSS)
  - $0.045 / new transaction - Customer Service Center Backoffice (CSC)

5.26 Both cost inputs to the analysis were provided in real terms by PRHTA. For inclusion in the financial analysis, we indexed costs in real terms to a nominal basis using inflation assumptions supplied by PRHTA (see Table 5.7).

Table 5.7: Inflation Assumptions for the First Ten Years of Scheme Operation

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Inflation	3.3%	2.4%	1.9%	1.8%	1.8%	1.8%	1.8%	1.9%	1.8%	1.8%

Source: PRHTA

5.27 Based on the information provided by PRHTA, Table 5.8 presents the CAPEX and OPEX for each toll plaza. The table shows the total capital outlay for the project is $10.20 million (nominal), while average annual operating costs for the six toll plazas total $3.48 million (nominal) with total operating costs for the 10-year period between 2022 and 2031 being $34.83 million (nominal).

Table 5.8: Project Capital Outlay and Average Annual Operating Costs for the 10-Year Period between 2022 and 2031

Toll Plaza	Construction Year	CAPEX (millions of real $)	CAPEX (millions of nominal $)	Average Annual OPEX (millions of real $)	Avearge Annual OPEX (millions of nominal $)	Total OPEX (millions of nominal $)
Guaynabo	2022	1.56	1.61	0.38	0.43	4.27
Ceiba	2022	1.56	1.61	0.29	0.32	3.23
Humacao North	2022	1.56	1.61	0.28	0.31	3.13
Humacao South	2022	1.56	1.61	0.42	0.48	4.77
Caguas North	2022	2.06	2.13	1.46	1.65	16.47
Hucar	2022	1.56	1.61	0.26	0.30	2.97
Total		**9.88**	**10.20**	**3.08**	**3.48**	**34.83**

Source: Steer and PRHTA

Operating Profit Forecast and Pre-Tax Project Cash Flows

5.28 Using forecasted costs and revenues, we derived operating profit projections by subtracting operating expenses from incremental revenues. When looking at operating profits on a toll plaza level or a project level, in the 10-year period between 2022 and 2031 the project generates pre-tax operating surplus before accounting for capital outlays, as presented in Table 5.9.

Table 5.9: Toll Plaza Operating Profit/(Loss)

Toll Plaza	Average Annual Operating Profit/(Loss) (millions of nominal $)	Total Operating Profit/(Loss) (millions of nominal $)
Guaynabo	$0.95	$9.47
Ceiba	$0.25	$2.52
Humacao North	$0.22	$2.18
Humacao South	$0.46	$4.60
Caguas North	$2.17	$21.70
Hucar	$0.18	$1.83
Total	**$4.23**	**$42.30**

Source: Steer

5.29 In the last step of the analysis, we used the operating profits and capital costs to construct cash flow projections on a toll plaza and project level and calculate the internal rate of return (IRR) associated with the proposed investment. These results are presented in Table 5.10. It is to be noted that it was not possible to derive an IRR for Caguas North, as the operating profit in the first year more than offsets the initial capital outlay.

5.30 Overall, the analysis shows that all toll plazas generate positive pre-tax cash flows for the period between 2022 and 2031, and all toll plazas generate enough cumulative operating surplus to offset PRHTA's initial capital outlay in nominal terms. In terms of IRR, toll plaza IRR ranges from 3.1% to 136.91%, while the project-level IRR is 74.0%. Therefore, in the toll plazas presenting lower IRR, Humacao North and Hucar, operating profit may not be enough to recover the investment under certain future demand scenarios, and cross-subsidisation between toll-plazas may be required.

Table 5.10: Project Internal Rate of Return and Projected First Year of Positive Cash Flow

Toll Plaza	First Year with Positive Pre-Tax Cash Flow	Internal Rate of Return
Guaynabo	2023	136.91%
Ceiba	2028	11.96%
Humacao North	2029	7.75%
Humacao South	2025	38.87%
Caguas North	2022	Financially positive
Hucar	2030	3.10%
Project	**2024**	**74.0%**

Source: Steer

Cost Benefit Analysis (CBA)

Overview

5.31 In this section we summarize the analysis to assess the socioeconomic impact of converting currently one-way tolling to two-way tolling of the six toll plazas discussed in this chapter.

5.32 Adjusting toll rates will change the attractiveness of the roads relative to alternative routes that remain untolled. In general, tolls will tend to impose costs on users, increasing vehicle miles traveled (VMT), travel times and congestion for those that divert from the (now tolled) direction. The tolls could also reduce safety by increasing VMT, as well as increasing exposure to vehicle emissions by residents.

5.33 These impacts can be compared against the change in revenue from changing the tolling. The toll revenue is not a benefit (or cost) in the sense of the tolling impacts mentioned previously. Rather, the toll revenue is essentially a transfer, in this case from users who pay the toll to the road operator (in this case the government of Puerto Rico). This section outlines the methodology we used to develop the socioeconomic impacts and the comparison of toll revenues to these socioeconomic impacts.

Methodology

5.34 We considered the following four socioeconomic impacts:

- Safety impacts;
- Travel time impacts;
- Vehicle operating cost impacts; and

- The impacts of vehicle emissions.

5.35 These metrics were quantified based on the travel demand model outputs after comparing a Do Nothing (DN) and a Do Something (DS) scenario. The DN is our base year (Test 0) and represents the current situation of the current toll rates by direction on the roads or no tolls, while the DS represents conditions where two-way tolling toll rates have been imposed (Test 4).

5.36 As noted before, the toll rates included in the DS scenarios represent half of the current toll rate in the tolled direction plus $0.05 and rounded to the nearest $0.05.

5.37 To estimate the diversion impacts of tolling, we used the corresponding network model for each of the toll plazas considered for the two-way analysis and extracted results from the as is and two-way scenarios. Table 5.11 summarizes the corridors analyzed and the toll rates evaluated in the DN and DS scenarios.

Table 5.11: Socioeconomic Impact Analysis Details

Toll Plaza	DN Average toll Rate	DS Average Toll Rate
Guaynabo	$0.84	$0.50
Ceiba	$1.01	$0.56
Humacao North	$1.03	$0.57
Humacao South	$1.04	$0.57
Caguas North	$1.56	$0.83
Hucar	$1.05	$0.58

Source: Steer.

5.38 The various traffic impacts (travel time, safety, vehicle operating costs, and increased emissions) all need to be valued with a common metric, namely money. This valuation of each metric was done using guidance from the USDOT and its constituent administrations. All financial impacts shown are net changes. Positive values represent an increase in costs or a *cost*. Negative values represent a decrease in costs or a *benefit*.

5.39 At the outset, we do note that travel time savings and improved safety tend to be the major benefits of many road projects - infrastructure projects normally attract users away from congested roads that tend to be in worse conditions to faster and safer roads. However, in this case, as the DS will tend to shift more users from highways to more local roads,[1] it is expected that, at least with respect to safety and travel times, the project will generate *costs* rather than *benefits* (note that this depends on the length, congestion, and convenience of the alternative local road options). The change of vehicle operating costs and vehicle emissions depend on the length of the current and the alternative roads and so they could give *benefits* or *costs* depending on each individual case.

[1] Note that in the currently tolled direction, the lower toll rate in the DS scenario will attract more traffic to the highway, but this level of increased traffic is more than offset by the amount of traffic that is diverted away from the highway in the previously untolled direction.

Safety Impacts

5.40 Improved safety tends to be one of the major benefits of many transportation projects. However, in this case, as the DS will shift users from highways with relatively low accident rates to local roads with higher accident rates, it will generally be a *cost*, not a *benefit*.

5.41 Though attaching a monetary value to personal injuries and fatalities can seem somewhat arbitrary, several decades of research carried out by health experts and economists have yielded a relative consensus on the approach to this complex issue. For the purposes of an economic assessment, the monetary value attached to an avoided fatality or injury incorporates two core components:

- The first is a *human capital* measure that attaches a monetary value to an injury or fatality in terms of the lost productivity associated with lost work hours of the injured party.
- The second is a *willingness-to-pay* measure, namely the value that individuals ascribe to their own lives as deduced from expenditures on various safety enhancing investments (smoke detectors, seat belts, helmets, etc.)

5.42 We discuss below how these safety costs were calculated.

5.43 In order to estimate the costs of shifting travel from highways to local roads it is essential to have quantitative measures of the crash risks and associated costs for auto travel. To this end, unique values were calculated for highways and local roads where possible. Based on data available from the Federal Highway Administration (FHWA) and the Puerto Rico Traffic Safety Commission, incidence of the following was calculated on a VMT basis: Fatalities, injuries, and property damage only (PDO) events.

5.44 Note that for fatality rates unique values were estimated by road type as the data allowed it. This granularity of data was not available for injury and PDO crashes so values were calculated at an aggregate level across all road types.

5.45 Table 5.12 details the results of this calculation for highways and local roads in Puerto Rico.

Table 5.12: Rates by Road Type per 100 Million VMT

	Fatality rates per 100 million VMT	Injury rates per 100 million VMT	Property damage rate per 100 million VMT
Highways	1.09	163.80	992.35
Non-Highways	2.44	163.80	992.35

Sources: National Highway Traffic Safety Administration; PR Traffic Safety Commission

5.46 Based on the calculated accident rates and the change in annual VMT on each road type, the implied safety cost of the one vehicle mile on a local road is $0.15 higher than on a highway. This figure is applied to the VMT changes from users switching from highways to non-highways.

5.47 The base data for fatality per auto VMT is from the National Highway Traffic Safety Administration[2]. The data for injuries and PDO crashes is from the PR Traffic Safety Commission. Probabilities of injuries with varying severity are applied to the above value of injuries per VMT. Monetized values for each injury type, as well as for fatalities (obtained from USDOT guidance), are then used to obtain an aggregate cost per VMT of roadway crashes.

5.48 For property damage costs we use the recommended monetized value of property damage only crashes and apply this to the relevant crash rate.

5.49 Table 5.13 provides a summary of this source data, including:

- Default probabilities for injuries assigned for crashes involving autos[3];
- Monetized values for each injury type, including fatalities valued at a social cost of $10.9 million; and
- Monetized value of property damage.

Table 5.13: USDOT TIGER BCA resource guide: Probabilities of injury types and monetary values for injuries, severity unknown

Injury type (AIS scale)	Probability	Unit Value ($2019)
No injury (0)	22%	$ -
Minor (1)	63%	$32,700
Moderate (2)	10%	$512,300
Serious (3)	4%	$1,144,500
Severe (4)	0%	$2,899,400
Critical (5)	1%	$6,463,700
Unsurvivable (6)	n/a	$10,900,000
Property Damage Only (PDO) Crashes		$4,500

Source: United States Department of Transportation

5.50 The travel demand model outputs provided the VMT by road type in the DS and DN scenarios. The VMT changes together with the accident rates and values were used together to determine the safety impact. Table 5.14 provides a summary of the results of the safety analysis. Each toll plaza sees a net loss in highway VMT as vehicles are diverted off the highway due to the additional toll costs. Similarly, each toll plaza sees a net increase in non-highway VMT due to the increase in vehicles from the highway avoiding the toll. Each corridor sees an increase in safety costs as a result of traffic diverting from highways to local roads with higher fatality rates.

[2] https://rspcb.safety.fhwa.dot.gov/Dashboard/Default.aspx

[3] This assigns a probability of zero to fatalities, with these impacts calculated separately.

Table 5.14: Annual Safety Impacts

Toll Plaza	Net Change Highway VMT	Net Change Non-highway VMT	Value of Highway VMT Change	Value of Non-Highway VMT Change	Total Value of VMT Change ($2019)
Guaynabo (PR-20)	(1,339,177)	1,310,572	($652,875)	$831,143	$178,268
Ceiba (PR-53)	(1,206,060)	489,294	($587,979)	$310,302	($277,676)
Caguas Norte (CN)	(12,151,005)	18,681,581	($5,923,858)	$11,847,555	$5,923,697
Humacao Norte (HN)	(18,456,503)	13,945,292	($8,997,915)	$8,843,878	($154,037)
Humacao Sur (HS)	(13,564,188)	10,418,185	($6,612,813)	$6,607,044	($5,769)
Hucar (PR-53)	(25,471,534)	18,999,612	($12,417,883)	$12,049,245	($368,638)
Total	**(72,188,467)**	**63,844,535**	**($35,193,322)**	**$40,489,166**	**$5,295,843**

Note: Total value of VMT change is the sum of the value of Highway and non-highway VMT change.
Source: Steer

Travel Time Impacts

5.51 In general, most transportation projects result in changes in personal travel time. While this is usually a benefit, here this will be a net *cost* as a result of the DS toll rates diverting some users who used to travel via highways to use local roads. This shift would be expected to result in a higher travel time for these users as they are now traveling on roads with slower speeds.

5.52 Note that using the network models, we calculate travel time impacts for all affected users, including those diverted to alternative routes, those remaining on the road (now-tolled or higher tolled-whose travel times will decrease) and those who were already on the alternative road (whose travel time will increase).

5.53 Here the monetary values attached to each user's time are the VOTs used in the travel demand model which we presented in chapter 3 and list again in Table 5.15.

Table 5.15: Value of Time

Vehicle Class	Value of Time ($2019/hr)	Vehicle Class	Value of Time ($2019/hr)
Car 1	$0.80	Car 13	$19.89
Car 2	$1.20	Car 14	$29.83
Car 3	$1.60	Car 15	$39.78
Car 4	$2.73	Commercial 1	$7.21
Car 5	$4.10	Commercial 2	$12.38
Car 6	$5.47	Commercial 3	$19.89
Car 7	$4.80	Med Truck 1	$10.82
Car 8	$7.21	Med Truck 2	$18.60
Car 9	$9.61	Med Truck 3	$29.80
Car 10	$8.25	Heavy Truck 1	$14.42
Car 11	$12.38	Heavy Truck 2	$24.80
Car 12	$16.51	Heavy Truck 3	$39.78

Source: Steer

5.54 The outputs of the travel demand model were used as the basis for quantifying the total travel time in the DS and DN scenarios. Highway travel times decrease as there are fewer vehicles on the highway. Similarly, non-highway travel times increase as there are more vehicles on non-highways. The results of this analysis are shown below in Table 5.16. Each corridor sees an increase in travel time costs as a result of traffic diverting from highways to local roads with lower speeds.

Table 5.16: Annual Travel Time Impacts

Toll Plaza	Net Change in Person Travel Times (Highway)	Net Change in Person Travel Times (Non-Highway)	Net Change in Person Travel Times	Value of Changed Times
Guaynabo (PR-20)	(35,304)	186,396	151,092	$1,302,797
Ceiba (PR-53)	(28,222)	(5,136)	(33,358)	($226,850)
Caguas Norte (CN)	(987,147)	687,842	(299,306)	($3,075,431)
Humacao Norte (HN)	(555,817)	655,395	99,578	$1,009,405
Humacao Sur (HS)	(510,106)	46,250	(463,856)	($3,684,465)
Hucar (PR-53)	(502,709)	1,010,854	508,146	$4,335,937
Total	**(2,619,306)**	**2,581,600**	**(37,705)**	**($338,608)**

Source: Steer
Note that the decrease in non-highway travel times for Ceiba might see unusual, but the travel time change on the non-highway routes depends on the speed of the alternate routes.

Vehicle Operating Cost Impacts

5.55 As travel patterns are expected to change from the new toll rates, so too are vehicle operating costs (VOCs), which are expected to change with VMT. VOCs increase as additional miles are traveled and are reduced as VMT is reduced. In these projects it is expected that there will be some variability in the operating cost impacts, due to the varying lengths of the non-highway routes. If the non-highway is shorter in distance despite being longer in time, as seen in the travel time impacts, the alternative will result in reduced operating costs. Table 5.17 shows the values by vehicle class.

Table 5.17: Vehicle Operating Costs

Vehicle Type	Vehicle Operating Costs ($2019/mile)
Auto	$0.20
Med Truck	$0.80
Heavy Truck	$1.00

Source: Steer

5.56 The VOCs per mile together with the change in VMT are used for quantifying the total change in VOCs. The results of this analysis are shown below in Table 5.18.

Table 5.18: Operating Costs Impacts ($2019)

Toll Plaza	Daily VOC DN	Daily VOC DS	Daily Net Change	Total Annual VOC Change
Guaynabo (PR-20)	$473,627	$473,570	($57)	($16,933)
Ceiba (PR-53)	$215,868	$215,381	($487)	($144,186)
Caguas Norte (CN)	$1,794,417	$1,804,166	$9,749	$2,885,605
Humacao Norte (HN)	$1,794,417	$1,791,205	($3,212)	($950,701)
Humacao Sur (HS)	$1,794,417	$1,792,413	($2,004)	($593,315)
Hucar (PR-53)	$1,833,260	$1,828,805	($4,455)	($1,318,686)
Total	**$7,906,007**	**$7,905,541**	**($467)**	**($138,216)**

Note: The Do Nothing scenario is the same for Caguas Norte, Humacao Norte, and Humacao Sur as they all come from the same network model.
Source: Steer

Vehicle Emissions Impacts

5.57 Transportation activities can contribute significantly to local air pollution. Projects that reduce the vehicle miles traveled through diverting users to shorter routes tend to reduce emissions of air pollutants. In this project the impacts are very similar to the vehicle operating costs in terms of being *costs* or *benefits*. In some of the situations the alternative is shorter in distance than the highway route and therefore would result in a reduction in emissions.

5.58 The monetary values of emission come from the USDOT's *Benefit-Cost Analysis Guidance*. The USDOT provided recommended valuations for the most common pollutants generated by transportation activities: Sulfur dioxide (SO_2), nitrogen oxides (NO_x), fine particulate matter (PM), and volatile organic compounds. The values are shown in Table 5.19.

Table 5.19: Value of Emissions

Emission Type	Value ($2020/ short ton)	Emission Rate (gram/mile)
Carbon dioxide (CO_2)	$50	
Volatile Organic Compounds (VOCs)	$1,872	0.02
Nitrogen oxides (NO_x)	$15,700	0.17
Particulate matter (PM)	$729,300	0.01
Sulfur dioxide (SO_2)	$40,400	0.00

Source: UDOT's benefit-cost analysis guidance, EPA MOVES3

5.59 These monetary values taken together with vehicle emission rates from the Environmental Protection Agency (EPA) *Motor Vehicle Emission Simulator* (MOVES) model were used to assess the emission impacts. The results of this analysis are shown in Table 5.20.

Table 5.20: Emissions Impacts

Toll Plaza	Annual Net Change in VMT	Net Change in Emissions Values ($2019)
Guaynabo (PR-20)	(28,605)	($276)
Ceiba (PR-53)	(716,767)	($6,914)
Caguas Norte (CN)	6,530,576	$62,998
Humacao Norte (HN)	(4,511,211)	($43,518)
Humacao Sur (HS)	(3,146,002)	($30,349)
Hucar (PR-53)	(6,471,923)	($62,433)
Total	**(8,343,932)**	**($80,491)**

Source: Steer

Additional Potential Impacts

5.60 There were two additional potential impacts that were not considered here, namely the "deadweight loss" due to the imposition of a toll on an untolled facility (which we describe below) and more general impacts on what could be termed livability.

5.61 **Deadweight loss** refers to the general loss in user welfare[4] when a fee, tax or other charge is imposed. Essentially, if the additional cost represented by the charge reduces demand to any considerable degree, we would expect to be faced with a loss of welfare that would need to be

[4] The term welfare here is in the economic sense and refers to the utility that someone derives from consuming a good, including in this case transportation.

measured. This is of particular concern when the charge is levied on a good with few or no substitutes or alternatives. Since in the current analysis there are alternative routes to the roads proposed for tolling or higher tolls, we do not think that trip suppression (and the ensuing deadweight loss) would be of consequence, and we do not include an estimate for the category of impact.

5.62 **Livability** impacts would typically be concerned with effects that would increase (or decrease) the general quality of life in a location. In the current analysis we are assessing the impacts of potentially re-routing some traffic from an existing road onto smaller, more residential roadways. Besides the impacts of safety and increased localized vehicle emissions (which we analyze) one could also be concerned with the effects of **noise** on the quality of life. There is a large body of research into the effect of noise on well-being, with the impact usually measured in terms of reducing residential property values. There is also guidance, notably in the European Union, as to when to consider a noise increase to be of a magnitude sufficient to warrant taking into account analytically[5], with a generally accepted threshold for nuisance to be noise levels above 50 Db[6].

5.63 The literature finds a fairly consistent impact on property values, with ambient levels above 70 Db reducing property values by 1% to 3% depending on the studies. While there is evidence of a noise effect from transportation, we do not include such a measure here. First, the requisite noise data (including current and expected levels) would require data well beyond the scope of what is possible in the current analysis. Second, our analysis shows that most traffic would be diverted onto existing roadways with existing levels of traffic, and we would not expect that the increase in ambient noise would be of the same magnitude as the increases in travel time or emissions[7].

Results

5.64 The summary of results is shown below in Table 5.21. As expected, the safety and travel time impacts are net costs. This is a result of the project shifting people from highways to local roads which have higher accident rates and longer travel times. The impacts on VOCs and emissions depend on the road. In some of situations the non-tolled alternative route is shorter in distance despite require more travel time. In some of the corridors the changes in vehicle operating costs and emissions costs are net benefits while the rest of they are costs.

5.65 It is estimated that the total social costs of implementing the two-way tolling described in Table 5.10 would be close to $5 million a year, primarily due to increased accidents and resulting injuries and fatalities.

[5] See European Commission, 2014. *Guide to Cost-Benefit Analysis of Investment Projects Directorate.* Brussels: General for Regional and Urban Policy.

[6] Theebe, M. A., 2004. “Planes, Trains, and Automobiles: The Impact of Traffic Noise on House Prices’. *Journal of Real Estate Economics and Finance.* Vol. 28:2/3, pp. 209-234.; Boes, S. and S. Nüesch, 2009. “New Flight Regimes and Exposure to Aircraft Noise: Identifying Housing Price Effects Using a Ratio-of-Ratios Approach”. University of Zurich Working Paper No. 0906.

[7] Because of the reduction in travel speeds, one might actually experience a *decrease* in ambient noise levels, but we do not explore this outcome.

Table 5.21: Annual Impact Summary ($2019)

Toll Plaza	Safety Costs	Travel Time Costs	Vehicle Operating Costs	Emissions Costs	Total Change in Costs
Guaynabo (PR-20)	178,268	1,302,797	(16,933)	(276)	**1,463,856**
Ceiba (PR-53)	(277,676)	(226,850)	(144,186)	(6,914)	**(655,628)**
Caguas Norte (CN)	5,923,697	(3,075,431)	2,885,605	62,998	**5,796,869**
Humacao Norte (HN)	(154,037)	1,009,405	(950,701)	(43,518)	**(138,852)**
Humacao Sur (HS)	(5,769)	(3,684,465)	(593,315)	(30,349)	**(4,313,897)**
Hucar (PR-53)	(368,638)	4,335,937	(1,318,686)	(62,433)	**2,586,180**
Total	**5,295,843**	**(338,608)**	**(138,216)**	**(80,491)**	**4,738,528**

Source: Steer

5.66 Table 5.22 summarizes the total costs and extra revenues (based on the 2019 revenues presented in Table 2.5 and the two-way revenue impacts from Table 5.3) generated for each scenario.

Table 5.22: Annual Costs and Revenues ($2019)

Toll Plaza	Extra Revenues	Costs	Net Impact
Guaynabo (PR-20)	1,333,769	1,463,856	**(130,087)**
Ceiba (PR-53)	494,483	(655,628)	**1,150,111**
Caguas Norte (CN)	188,234	5,796,869	**(5,608,635)**
Humacao Norte (HN)	287,676	(138,852)	**426,528**
Humacao Sur (HS)	3,732,025	(4,313,897)	**8,045,922**
Hucar (PR-53)	444,339	2,586,180	**(2,141,841)**
Total	**6,480,526**	**4,738,528**	**1,741,998**

Source: Steer

6 Re-Location of Toll plazas

Overview

6.1 For a couple toll plazas, we analyzed alternate toll plaza locations to reduce the amount of toll evasion and leakage from traffic that exits prior to passing the toll plaza. In particular we looked at two plazas:

- Guaynabo: We evaluated four possible locations, including the option that we discussed in Chapter 5 of converting the current plaza to two-way tolling.
- Ponce: We evaluated a total of eleven locations split into two area, first considering locations on PR-10 / PR-9 (Phase 1) and second locations on PR-52 (Phase 2).

6.2 Similar to the two-way analysis, we had traffic data collected at all the potential locations we tested. The data was collected in July 2021 and we expanded it to represent full 2021 estimates.

6.3 We ran the corresponding network models with and without the changes and estimated the impacts in the form of proportions, which we then apply to the 2021 estimates and thus estimate final traffic and revenue impacts for each possible location. Recognizing that network models can sometimes have greater uncertainty and network "noise" related to changes in network coding, we present a base impact accompanied by a range that we would recommend considering for this type of study.

6.4 In all tests we have assumed the current toll rates apply for all locations.

6.5 This chapter summarizes our analysis, the options we tested, and the revenue impacts we estimated for each toll plaza and relocation option.

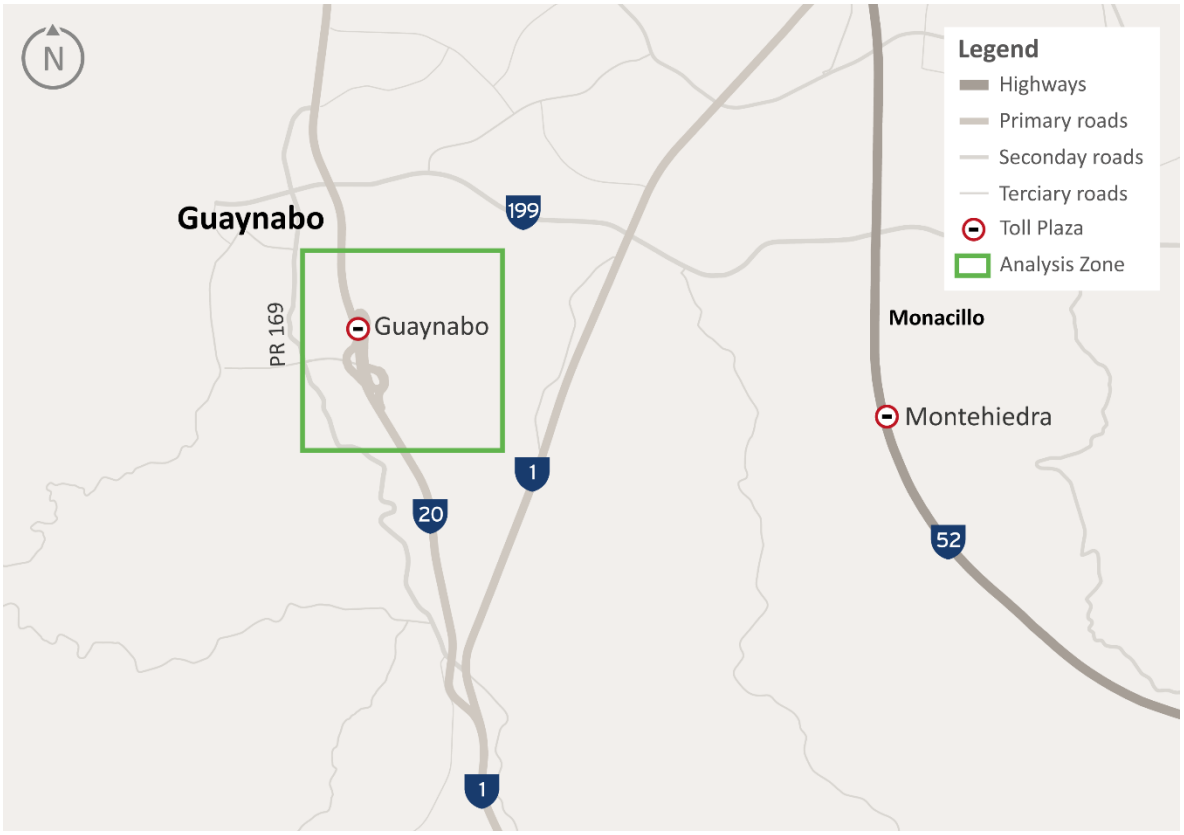
Guaynabo

6.6 The existing toll plaza is located on PR-20 just north of the intersection with Av David Urbina near Santa Paula and charges traffic in the northbound direction only. There is a by-pass traffic entering in the northbound direction from Santa Paula can use to avoid paying tolls. The main alternatives to travelling on PR-20 are:

- PR-1: a north-south highway parallel to PR-20 on the east.
- PR-169: is an arterial road parallel to PR-20 on the west and passes through Guaynabo's urban center.

6.7 Figure 6.1 shows the location of the current toll plaza

Figure 6.1: Guaynabo Toll Plaza – Current Location



Source: Steer

6.8 We received from PRHTA four potential locations to consider for relocation of the toll plaza, including the two-way locations already tested and discussed in Chapter 5.

- **Two-Way:** This is the scenario that we discussed in Chapter 5 where the same location is kept but with tolling added in the southbound directions (but not tolling the northbound bypass).
- **Test 6:** Northbound-only tolling further south (north of the off ramp to Av. David Urbina).
- **Test 7:** As Test 6 but also tolling the southbound direction.
- **Test 8:** Two-way tolling but further south of Test 6 and 7 (south of the off ramp to Av. David Urbina).

6.9 Figure 6.2 shows the location of these tests.

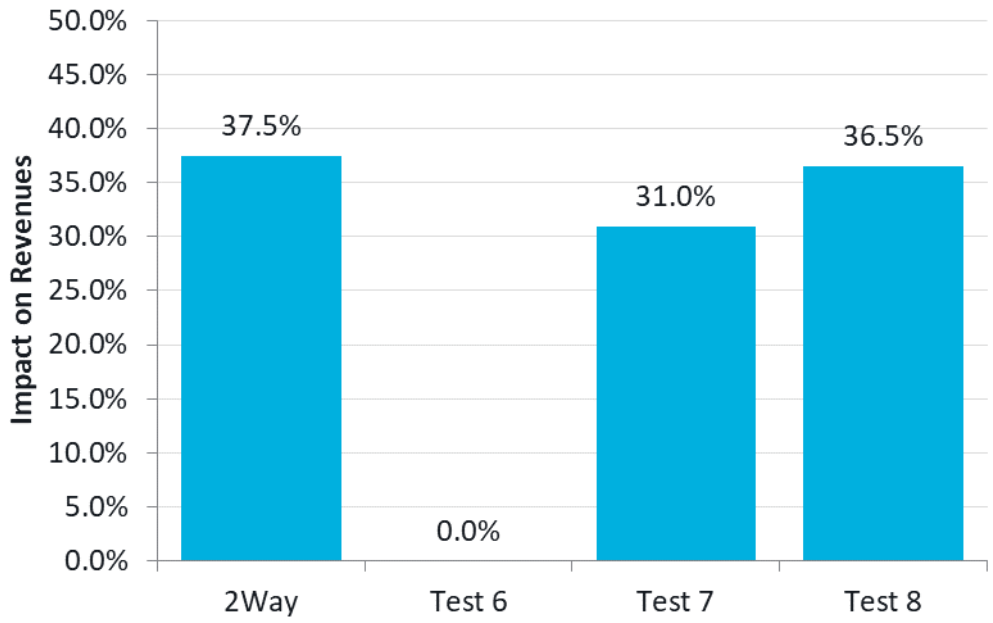
Figure 6.2: Guaynabo – Toll Plaza Location Tests

Source: PRHTA

6.10 We note that Test 6 is, in terms of capture rates, identical to the current situation as the by-pass from Santa Paula does not join PR-20 before the existing toll plaza. Also Test 7 and 8 are the same in the southbound traffic.

6.11 Following the approach discussed at the beginning of this chapter and with the data we collected for these locations, we estimated the revenue impacts for each test which we present in Figure 6.3.

Figure 6.3: Guaynabo – Revenue Impact for Toll Plaza Re-Locations



Source: Steer

6.12 As discussed before, we would recommend considering these results within a range, and we present these ranges in Table 6.1.

Table 6.1: Guaynabo - Revenue Impact Ranges

Test	Low	Base	High
2Way	18.7%	37.5%	56.2%
6	0.0%	0.0%	0.0%
7	15.5%	31.0%	46.5%
8	18.2%	36.5%	54.7%

Source: Steer

Ponce

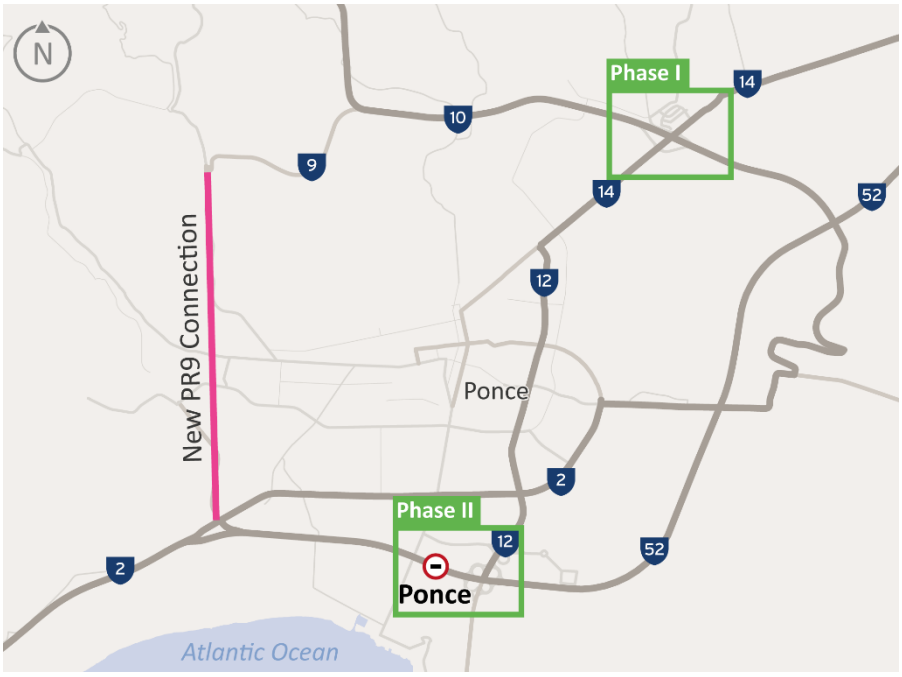
6.13 The existing Ponce toll plaza is a two-way plaza at the western end of the PR-52 between the PR-2 and PR-12 interchanges. The main alternatives to travelling on PR-52 in Ponce are:

- PR-1 and PR-2: run parallel to PR-52 and can be used to pass through Ponce. PR-1 has three lanes per direction and PR-2 has two lanes in each direction. The speed limit on both roads is 25 mph with several traffic signals along the route.
- PR-9: a new highway connection that would complete PR-9, connecting the North with PR-52 to the southwest of Ponce. This connection is currently under construction and is included when testing all the new locations. This road has a speed limit of 60 mph and connects with

PR-9/PR-10 which will provide a new alternative to the PR-52 to the north of Ponce city center.

6.14 Figure 6.4 shows the location of the current toll plaza as well as the new PR-9 extension which was included for all the modeling tests for this analysis.

Figure 6.4: Ponce Study Area



Source: Steer

6.15 We received from PRHTA potential locations to evaluate locations for two different areas:

- PR-10 / PR-9: This area has five potential locations around the intersection of PR-10 and PR-14, plus an additional location on PR-9. There were six potential locations in total.
- PR-52: This area has five potential locations around the intersection of PR-52 and PR-12, including the existing location.

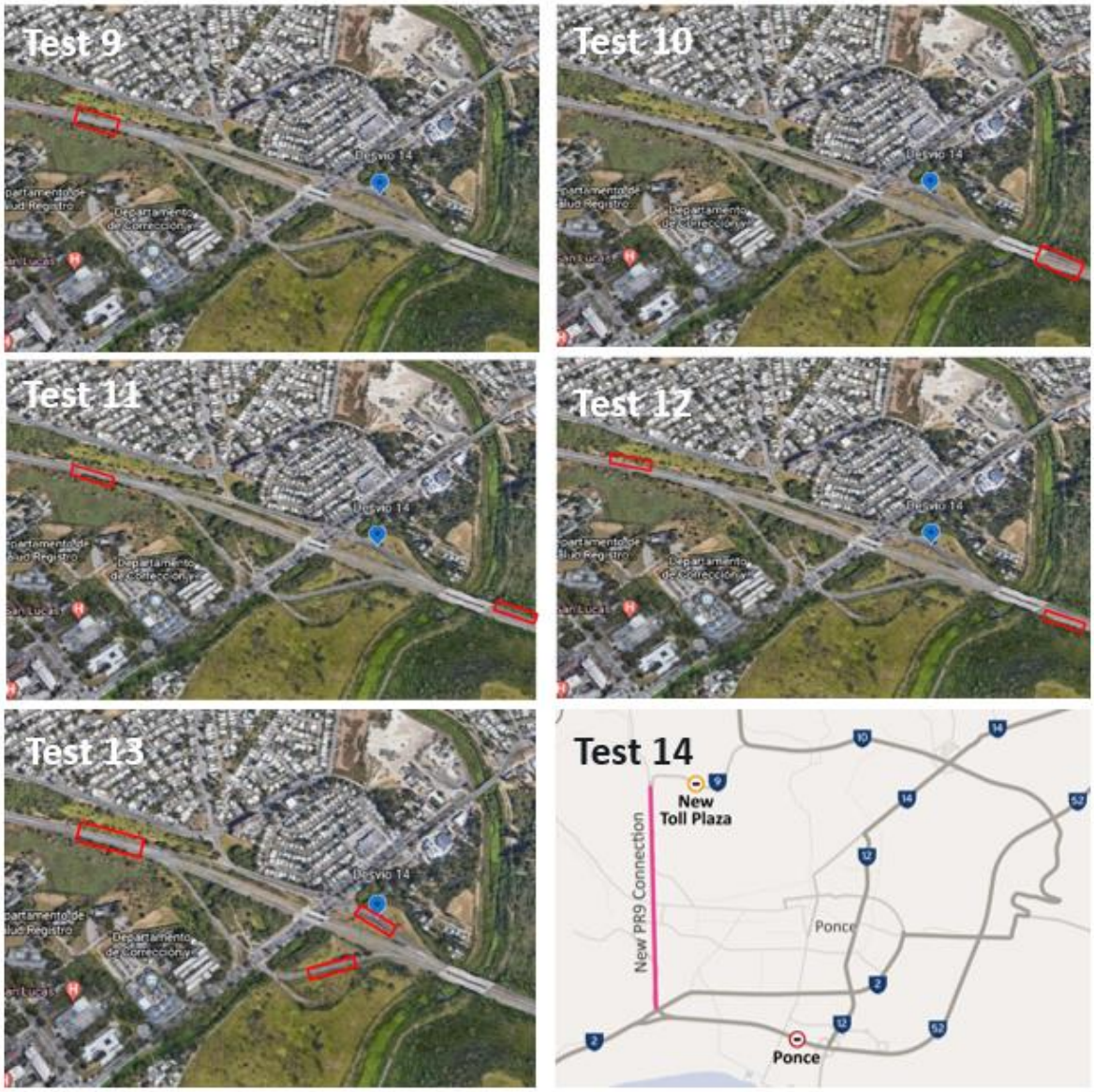
6.16 PRHTA asked to evaluate and select a preferred option for each area so at the end traffic has to pay at either PR-52 or PR-10/PR-9. We agreed with the client to first create a scenario including the new PR-9 connection, without any additional tolling, and then carry out the analysis over two phases:

- **Phase 1:** Keeping the existing toll plaza at PR-52 to evaluate six alternative toll plazas on PR-10/PR-9.
- **Phase 2:** With the preferred option from Phase 1, evaluate the additional four alternative toll plazas on PR-52.

Phase 1 Tests

6.17 Figure 6.5 shows the six toll plaza locations considered for Phase 1. Additionally, we also tested a scenario with the current situation but with the PR-9 connection (toll free) – this is presented as PR9Ext.

Figure 6.5: Ponce –Phase 1 Toll Plaza Location Tests

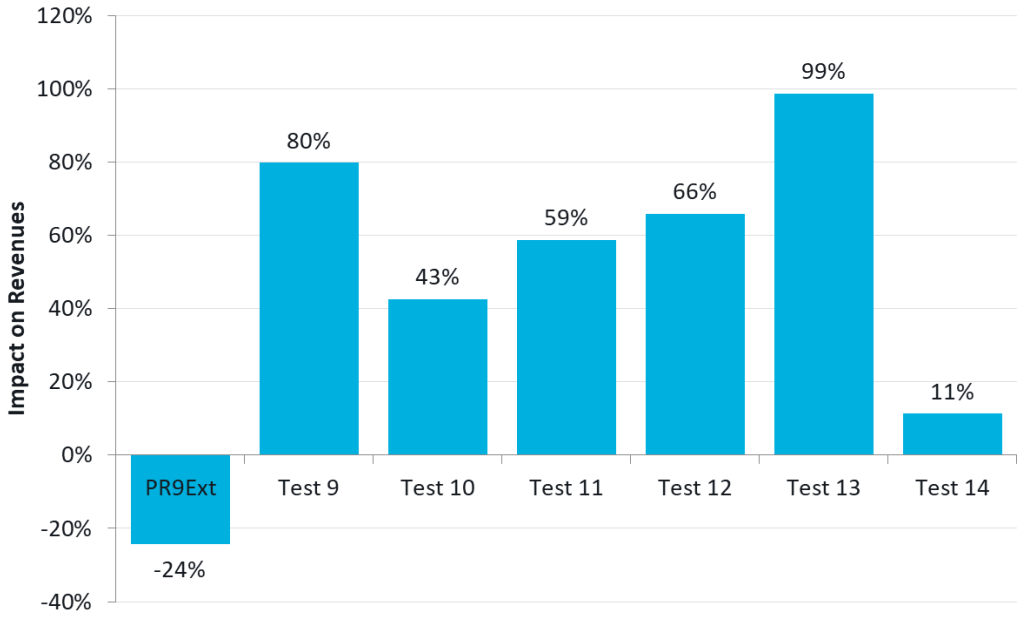


Source: PRHTA

6.18 We note that Test 14 is the only toll plaza location that ensures that all travelers who are making trips on the new PR-9 infrastructure pay a toll. Tests 9-13 would charge a toll on many trips that are currently toll-free and will not use PR-9.

6.19 Below we summarize the impact on revenues from each of the tests with respect to the current situation (Test 0, which does not include the PR-9 extension). The figure shows the base results and the table the range that we would recommend considering for this type of analysis.

Figure 6.6: Ponce Phase 1 Locations (+ existing Toll Plaza) – Revenue Impacts



Source: Steer

Table 6.2: Ponce - Phase 1 Range of Outputs

Test	Low	Base	High
PR9Ext	-12%	-24%	-37%
9	40%	80%	120%
10	21%	43%	64%
11	29%	59%	88%
12	33%	66%	99%
13	49%	99%	148%
14	6%	11%	17%

Source: Steer

6.20 We received confirmation from the client that **Test 14** was the preferred option and proceeded to analyze the additional locations under Phase 2.

Phase 2 Results

6.21 Figure 6.7 shows the five locations considered for Phase 2 (Test 15 to 19). We note that Test 14 and Test 15 are identical from the traffic perspective but were considered separate to mirror some of the cost analysis that PRHTA is undertaking.

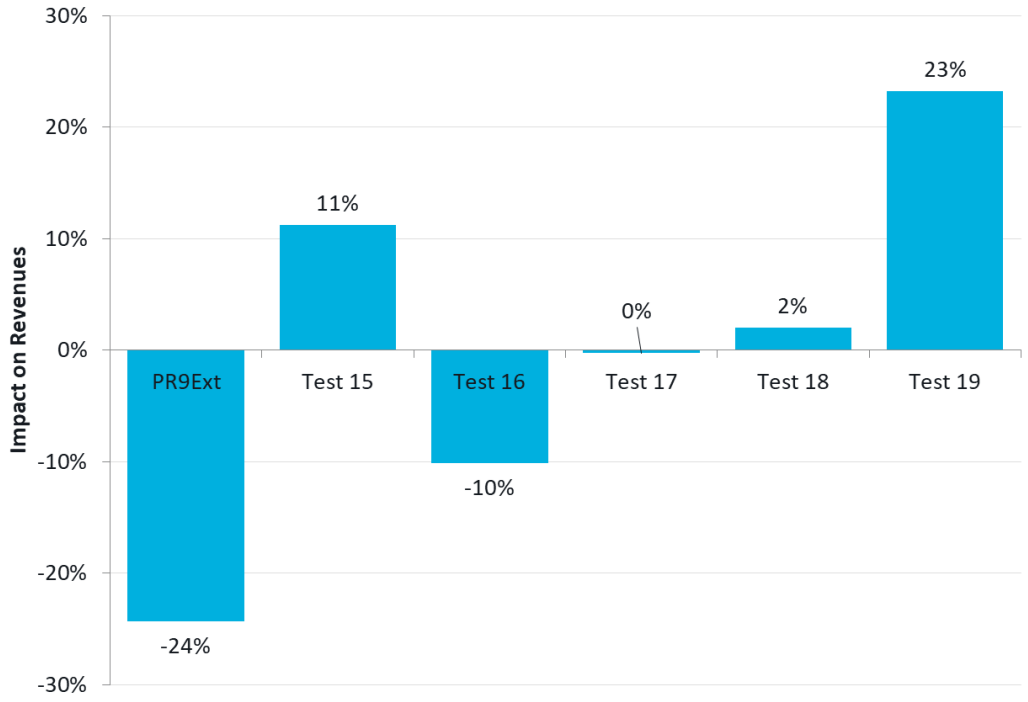
Figure 6.7: Ponce – Phase 2 Toll Plaza Location Tests

Source: PRHTA

6.22 Below we summarize the impact on revenues from each of these new tests with respect to the current situation (Test 0, which does not include the PR-9 extension). All tests, except Test PR9Ext, include the toll plaza on PR-9 (preferred option from Phase 1).

6.23 As above, the figure shows the base results and the table the range that we would recommend considering for this type of analysis.

Figure 6.8: Ponce Phase 2 Locations (+ New PR-9 Toll Plaza) – Revenue Impacts



Source: Steer

Table 6.3: Ponce Phase 2 Range of Outputs

Test	Low	Base	High
PR9Ext	-12%	-24%	-37%
15	6%	11%	17%
16	-5%	-10%	-15%
17	0%	0%	0%
18	1%	2%	3%
19	12%	23%	35%

Source: Steer

7 Summary of Results

Overview

7.1 We have performed tolling analysis of the PRHTA toll facilities considering three key elements:

- Prepare revenue forecasts for all PRHTA toll facilities considering different toll rate scenarios.
- Analyze the impact of modifying the current one-way tolling to two-way tolling structure for some toll plazas.
- Analyze the impact of re-locating some toll plazas to reduce the amount of toll evasion/leakage from traffic that exits the toll facilities prior to passing the toll plaza.

7.2 The results of each analysis are summarized in the next sections.

Traffic and Revenue Forecasts

7.3 Following the methodology and assumptions discussed in previous chapters, we prepared traffic and revenues forecasts for all the plazas and for four tolling scenarios:

- **Test 0:** No changes in tolls
- **Test 1:** Annual increase of 8.3% (nominal) in 2022, 8.4% (nominal) in 2023, 8.4% in 2024 (nominal) and then annual increases of CPI + 1.5%.
- **Test 2:** Annual increases of CPI + 1.5%.
- **Test 3:** Toll Optimization for 2022 and 2030 considering toll rate increase of -25%, +25%, +50%, +75% and 100%.

7.4 For Test 1 and 2 Toll rate increases for all toll plazas are effective March 1st 2022, except for PR-66 plazas (Carolinas and Rio Grande) for which toll increases are effective January 1st 2025.

7.5 The following figures and tables summarize the AADTs and annual revenues for all the plazas together for Tests 0 to 2. Further details per plaza are included in Appendix A of this report.

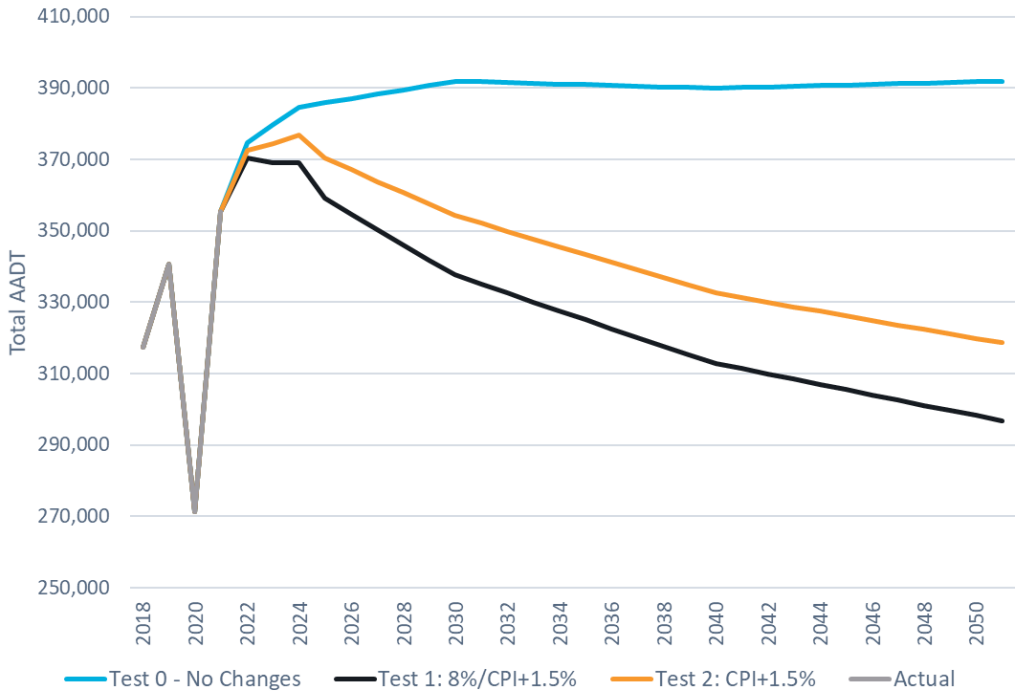
7.6 Table 7.1 and Figure 7-1 show the CAGR for the AADT and full traffic forecasts respectively. Table 7.2 and Figure 7-2 show the same information but for revenue.

Table 7.1: CAGR AADT – All Plazas

Test	2022-2030	2030-2040	2040-2051
Test 0 - No Changes	0.56%	-0.05%	0.05%
Test 1: 8.4%/CPI+1.5%	-1.14%	-0.76%	-0.48%
Test 2: CPI+1.5%	-0.62%	-0.63%	-0.39%

Source: Steer

Figure 7-1: Total AADT Forecasts



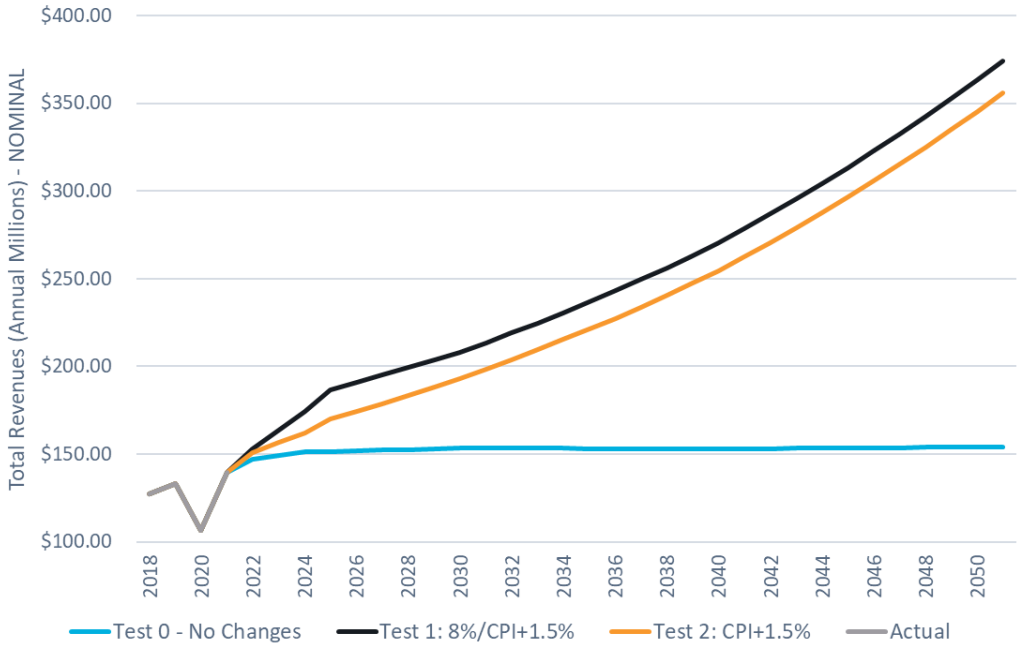
Source: Steer

Table 7.2: CAGR Revenue Nominal $ – All Plazas

Test	2022-2030	2030-2040	2040-2051
Test 0 - No Changes	0.53%	-0.03%	0.06%
Test 1: 8.4%/CPI+1.5%	3.92%	2.66%	2.99%
Test 2: CPI+1.5%	3.14%	2.81%	3.10%

Source: Steer

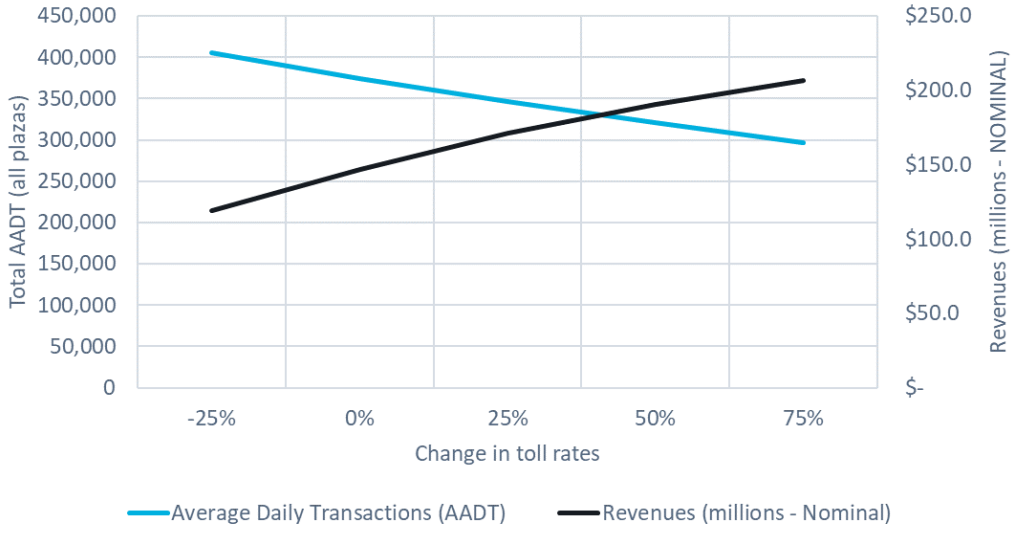
Figure 7-2: Total Annual Revenue Forecasts (Million – in Nominal $)



Source: Steer

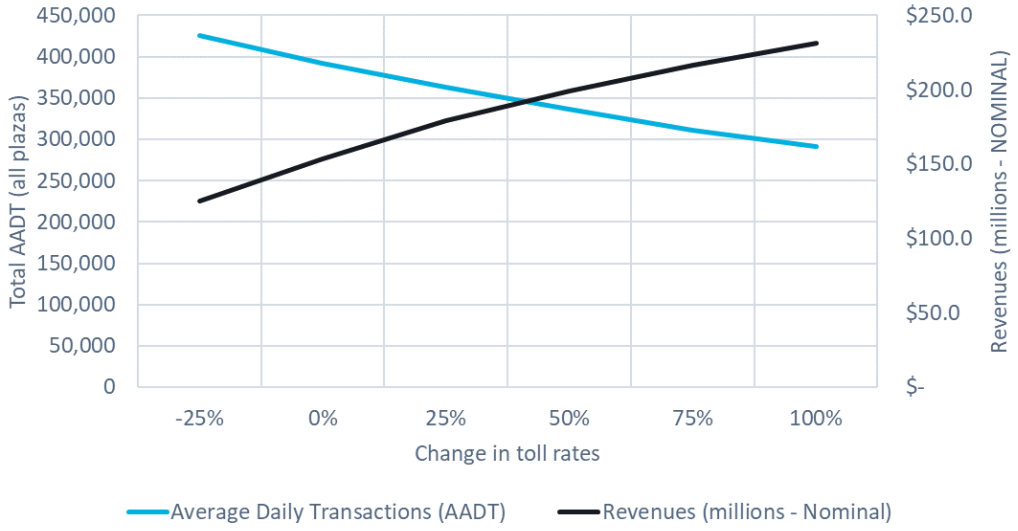
7.7 Regarding Test 3, we present below the toll rate sensitivity for 2022 and 2030 considering all the toll plazas together. Individual results are included in Appendix A.

Figure 7-3: Toll Rate Sensitivity 2022 (All Toll Plazas)



Source: Steer

Figure 7-4: Toll Rate Sensitivity 2030 (All Toll Plazas)



Source: Steer

Two-Way Tolling Analysis

7.8 We analyzed the impact of modifying the tolling strategy to convert the current one-way tolling to two-way tolling for the following plazas:

- Guaynabo
- Ceiba
- Humacao Norte
- Humacao Sur
- Caguas Norte
- Hucar

7.9 Additionally, we complement the two-way analysis with a financial and cost-benefit analysis of converting the one-way plazas to two-way tolling.

Revenue Impacts

7.10 For all the analysis we assumed that the two-way tolls would be half of the current toll rates plus $0.05, all rounded up to the closest $0.05.

7.11 For the analysis, we followed an approach that considers, among other things, the size of the un-tolled and tolled traffic differential which is a key in determining the final impact. The analysis was supported by original data collection and network model outputs from three scenarios:

- **Test 0:** "As is": One-way tolling. These are outputs directly from the base year models without any adjustment.
- **Test 4:** "Two-way": Conversion of one-way tolling to two-way tolling. This is based on the base year model but assuming tolls are charged in both directions with the assumptions discussed before.

- **Test 5:** "Zero toll": Assuming both directions are toll-free. This is also based on the base year but assuming no tolls in either direction.

7.12 With these assumptions we estimated the impacts in tolled traffic and revenues shown in Table 7.3. The last two columns of the table show the ratio between the tolled traffic before and after (which we would expect to be higher than two) and the increase in revenues due to the two-way tolling. We note that this analysis assumes that once the two-way tolling is implemented daily traffic levels would be the same in both directions.

Table 7.3: Two-Way Tolling Conversion Impact

	One-Way Tolling			Two-Way Tolling			Ratio of Tolled Traffic	Increase in Revenues
	Tolled Traffic	Average Rate	Revenues (Millions)	Tolled Traffic	Average Rate	Revenues (Millions)		
Guaynabo	10,999	$0.84	$3.38	25,201	$0.50	$4.64	2.10	**37.5%**
Ceiba	9,911	$1.01	$3.67	20,611	$0.56	$4.20	2.08	**14.4%**
Humacao North	10,389	$1.03	$3.91	21,375	$0.57	$4.43	2.06	**13.2%**
Humacao South	14,613	$1.04	$5.57	30,746	$0.57	$6.45	2.10	**15.7%**
Caguas North	53,135	$1.56	$30.24	112,042	$0.83	$34.01	2.11	**12.5%**
Hucar	10,098	$1.05	$3.87	20,583	$0.58	$4.34	2.04	**12.1%**

Source Steer

Financial Analysis

7.13 The financial forecasting uses outputs as provided by PRHTA (information valid as of 16 November 2021), and a bespoke Excel-based analysis workbook created specifically for the purposes of this project. Overall, the analysis encompasses a 10-year period between 2022 and 2031 and assumes that toll plazas will be converted to bi-directional tolling in 2022 with no interruption in operations.

7.14 The analysis considers incremental revenues as discussed in the previous sections, as well as CAPEX and OPEX estimates provided by PRHTA. We used the operating profits and capital costs to construct cash flow projections on a toll plaza and project level and calculate the internal rate of return (IRR) associated with the proposed investment. These results are presented in Table 7.4. It is to be noted that it was not possible to derive an IRR for Caguas North, as the operating profit in the first year more than offsets the initial capital outlay.

Table 7.4: Project Internal Rate of Return and Projected First Year of Positive Cash Flow

Toll Plaza	First Year with Positive Pre-Tax Cash Flow	Internal Rate of Return
Guaynabo	2023	136.91%
Ceiba	2028	11.96%
Humacao North	2029	7.75%

Toll Plaza	First Year with Positive Pre-Tax Cash Flow	Internal Rate of Return
Humacao South	2025	38.87%
Caguas North	2022	Financially positive
Hucar	2030	3.10%
Project	**2024**	**74.0%**

Source: Steer

Cost Benefit Analysis

7.15 We carried out an analysis to assess the socioeconomic impact of converting currently one-way tolling to two-way tolling of the six toll plazas listed before. We considered the following four socioeconomic impacts:

- Safety impacts;
- Travel time impacts;
- Vehicle operating cost impacts; and
- The impacts of vehicle emissions.

7.16 These metrics were quantified based on the travel demand model outputs after comparing a Do Nothing (DN) and a Do Something (DS) scenario. The DN is our base year (Test 0) and represents the current situation of the current toll rates by direction on the roads or no tolls, while the DS represents conditions where two-way tolling toll rates have been imposed (Test 4).

7.17 The summary of results for the four socioeconomic impacts is shown in Table 7.5 and Table 7.6 summarizes the total costs and extra revenues generated for each toll plaza.

Table 7.5: Annual Impact Summary ($2019)

Toll Plaza	Safety Costs	Travel Time Costs	Vehicle Operating Costs	Emissions Costs	Total Change in Costs
Guaynabo (PR-20)	178,268	1,302,797	(16,933)	(276)	**1,463,856**
Ceiba (PR-53)	(277,676)	(226,850)	(144,186)	(6,914)	**(655,628)**
Caguas Norte (CN)	5,923,697	(3,075,431)	2,885,605	62,998	**5,796,869**
Humacao Norte (HN)	(154,037)	1,009,405	(950,701)	(43,518)	**(138,852)**
Humacao Sur (HS)	(5,769)	(3,684,465)	(593,315)	(30,349)	**(4,313,897)**
Hucar (PR-53)	(368,638)	4,335,937	(1,318,686)	(62,433)	**2,586,180**
Total	**5,295,843**	**(338,608)**	**(138,216)**	**(80,491)**	**4,738,528**

Source: Steer

Table 7.6: Annual Costs and Revenues ($2019)

Toll Plaza	Extra Revenues	Costs	Net Impact
Guaynabo (PR-20)	1,333,769	1,463,856	**(130,087)**
Ceiba (PR-53)	494,483	(655,628)	**1,150,111**
Caguas Norte (CN)	188,234	5,796,869	**(5,608,635)**
Humacao Norte (HN)	287,676	(138,852)	**426,528**
Humacao Sur (HS)	3,732,025	(4,313,897)	**8,045,922**
Hucar (PR-53)	444,339	2,586,180	**(2,141,841)**
Total	**6,480,526**	**4,738,528**	**1,741,998**

Source: Steer

Re-Location of Toll Plazas

7.18 We analyzed alternate toll plaza locations to reduce the amount of toll evasion and leakage from traffic that exits prior to passing the toll plaza for two plazas:

- Guaynabo: We evaluated four possible locations, including the option that we discussed in Chapter 5 converting the current plaza to two-way tolling.
- Ponce: We evaluated a total of eleven locations split into two area, first considering locations on PR-10 / PR-9 (Phase 1) and second locations on PR-52 (Phase 2).

7.19 We ran the corresponding network models with and without the changes and estimated the impacts in the form of proportions. Similar to the two-way analysis, we had traffic data collected at all the potential locations we tested. Recognizing that network models can sometimes have greater uncertainty and network "noise" related to changes in network coding, we present a base impact accompanied by a range that we would recommend considering for this type of study.

Guaynabo

7.20 We received from PRHTA four potential locations to consider for relocation of the toll plaza (see Figure 7.5). We note that Test 6 is, in terms of capture rates, identical to the current situation as the by-pass from Santa Paula does not join PR-20 before the existing toll plaza. Also Test 7 and 8 are the same in the southbound traffic.

Figure 7.5: Guaynabo – Toll Plaza Location Tests

Source: PRHTA

7.21 Table 7.7 shows the revenue impact results for each locations.

Table 7.7: Guaynabo - Revenue Impact Ranges

Test	Low	Base	High
2Way	18.7%	37.5%	56.2%
6	0.0%	0.0%	0.0%
7	15.5%	31.0%	46.5%
8	18.2%	36.5%	54.7%

Source: Steer

Ponce

7.22 We received from PRHTA potential locations to evaluate for two different areas:

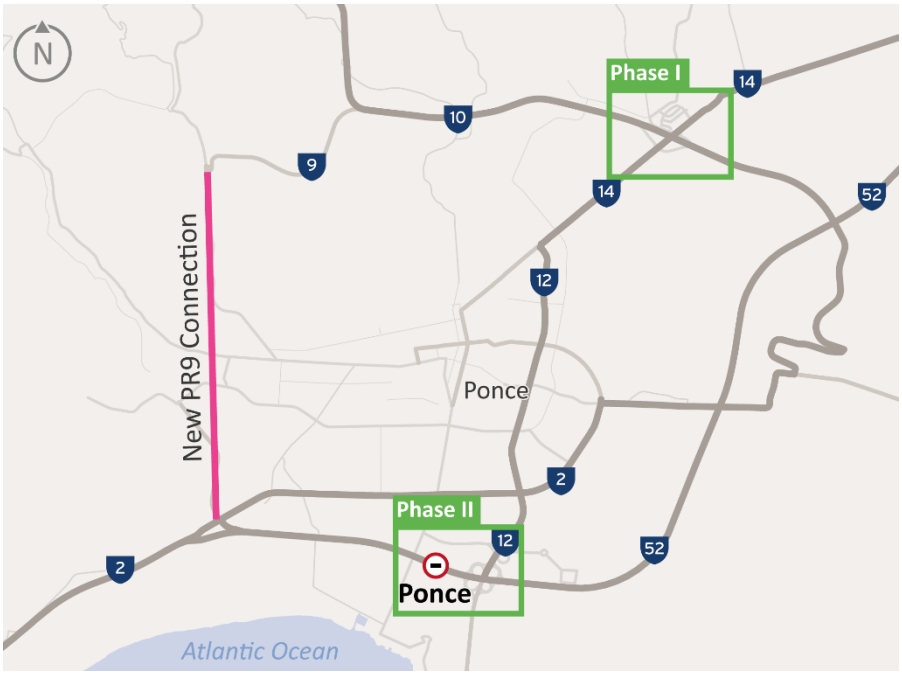
- PR-10 / PR-9: This area has five potential locations around the intersection of PR-10 and PR-14, plus an additional location on PR-9. There were six potential locations in total.
- PR-52: This area has five potential locations around the intersection of PR-52 and PR-12, including the existing location.

7.23 PRHTA asked to evaluate and select a preferred option for each area so at the end traffic has to pay at either PR-52 or PR-10/PR-9. We agreed to first create a scenario including the new PR-9 connection, without any additional tolling, and then carry out the analysis over two phases:

- **Phase 1:** Keeping the existing toll plaza at PR-52 to evaluate six alternative toll plazas on PR-10/PR-9.
- **Phase 2:** With the preferred option from Phase 1, evaluate the additional four alternative toll plazas on PR-52.

7.24 Figure 7.6 shows the location of the current toll plaza as well as the new PR-9 extension which was included for all the other tests analysis.

Figure 7.6: Ponce Study Area

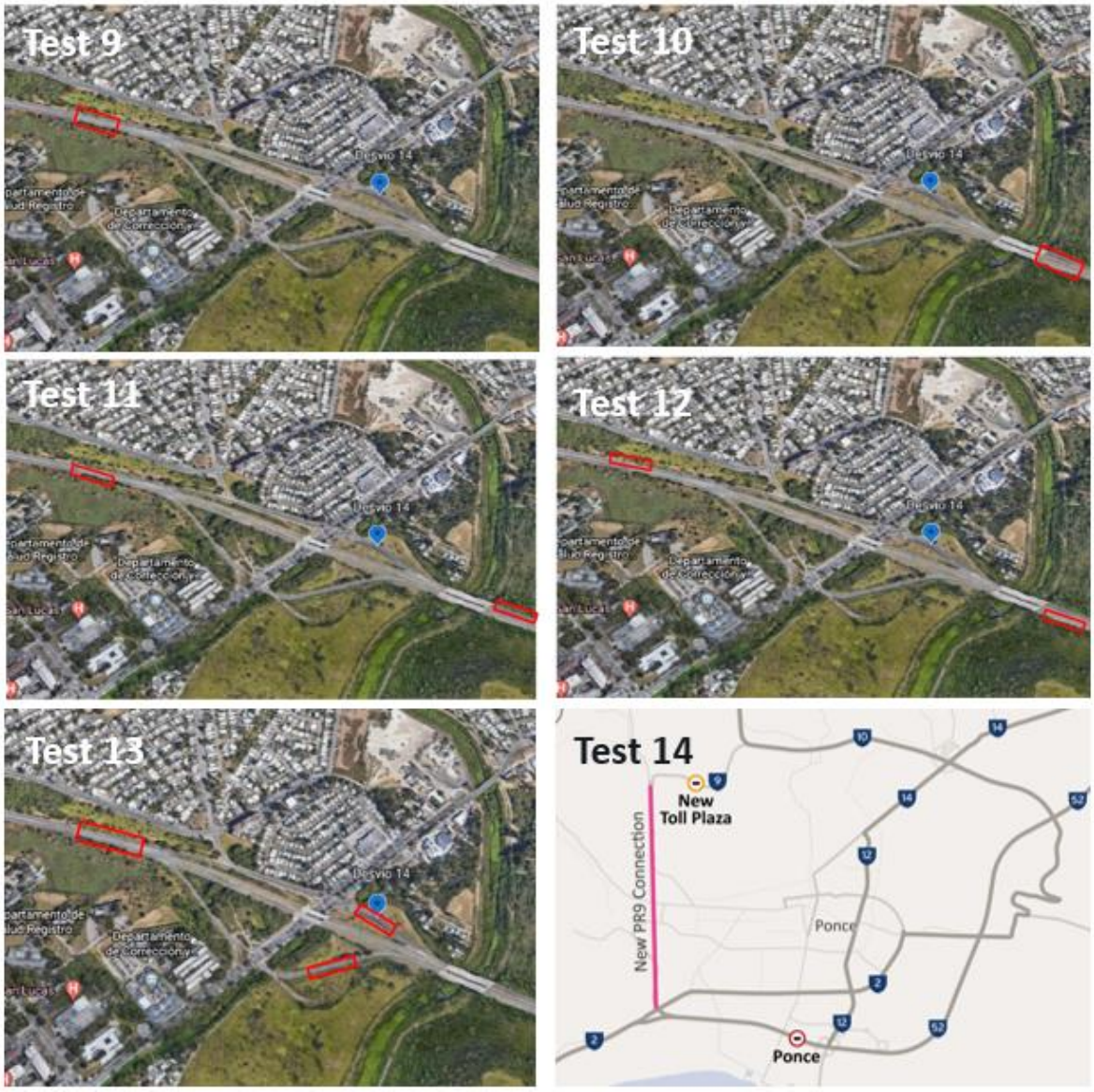


Source: Steer

Phase 1 Tests

7.25 Figure 7.7 shows the six toll plaza locations considered for Phase 1. Additionally, we also tested a scenario with the current situation but with the PR-9 connection (toll free) – this is presented as PR9Ext.

Figure 7.7: Ponce –Phase 1 Toll Plaza Location Tests



Source: PRHTA

7.26 Table 7.8 summarizes the impact on revenues from each of the tests with respect to the current situation (Test 0, which does not include the PR-9 extension).

Table 7.8: Ponce - Phase 1 Range of Outputs

Test	Low	Base	High
PR9Ext	-12%	-24%	-37%
9	40%	80%	120%
10	21%	43%	64%
11	29%	59%	88%

Test	Low	Base	High
12	33%	66%	99%
13	49%	99%	148%
14	6%	11%	17%

Source: Steer

7.27 We received confirmation from PRHTA that **Test 14** was the preferred option and proceeded to analyze the additional locations under Phase 2.

Phase 2 Results

7.28 Figure 7.8 shows the five locations considered for Phase 2 (Test 15 to 19). We note that Test 14 and Test 15 are identical from the traffic perspective but were considered separate to mirror some of the cost analysis that PRHTA is undertaking.

Figure 7.8: Ponce – Phase 2 Toll Plaza Location Tests

Source: PRHTA

7.29 Table 7.9 summarize the impact on revenues from each of these new tests with respect to the current situation (Test 0, which does not include the PR-9 extension). All tests, except Test PR9Ext, include the toll plaza on PR-9 (preferred option from Phase 1).

Table 7.9: Ponce Phase 2 Range of Outputs

Test	Low	Base	High
PR9Ext	-12%	-24%	-37%
15	6%	11%	17%
16	-5%	-10%	-15%
17	0%	0%	0%
18	1%	2%	3%
19	12%	23%	35%

Source: Steer

A Appendix A

Table A.1: Test 0 (No Change) - Annual Average Daily Transactions (AADT)

Plaza	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051
Guaynabo	10,963	11,243	11,491	11,745	11,848	11,952	12,057	12,163	12,269	12,377	12,375	12,373	12,371	12,370	12,368	12,366	12,364	12,362	12,361	12,359	12,365	12,371	12,378	12,384	12,391	12,397	12,403	12,410	12,416	12,422	12,429
Montehiedra	11,223	12,057	12,324	12,596	12,707	12,818	12,931	13,044	13,158	13,274	13,272	13,270	13,268	13,266	13,264	13,262	13,260	13,258	13,256	13,254	13,261	13,268	13,275	13,281	13,288	13,295	13,302	13,309	13,316	13,322	13,329
Caguas North	50,147	53,325	53,516	53,707	53,773	53,840	53,906	53,973	54,039	54,106	53,945	53,785	53,625	53,465	53,307	53,148	52,990	52,833	52,676	52,519	52,447	52,375	52,304	52,232	52,161	52,089	52,018	51,947	51,875	51,804	51,733
Caguas South	31,120	32,521	32,638	32,755	32,795	32,835	32,876	32,916	32,957	32,998	32,900	32,802	32,704	32,607	32,510	32,414	32,317	32,221	32,125	32,030	31,986	31,942	31,899	31,855	31,811	31,768	31,724	31,681	31,637	31,594	31,551
Salinas	20,177	20,812	20,840	20,868	20,887	20,906	20,925	20,944	20,963	20,983	20,918	20,853	20,789	20,724	20,660	20,596	20,533	20,469	20,406	20,343	20,314	20,284	20,255	20,225	20,196	20,167	20,138	20,108	20,079	20,050	20,021
Salinas Ramp	7,022	7,480	7,500	7,520	7,542	7,565	7,587	7,610	7,632	7,655	7,637	7,619	7,601	7,584	7,566	7,548	7,531	7,513	7,496	7,478	7,471	7,464	7,457	7,450	7,443	7,436	7,429	7,422	7,415	7,408	7,402
Juana Diaz EB	26,269	27,787	27,957	28,128	28,202	28,275	28,349	28,423	28,497	28,571	28,501	28,431	28,361	28,291	28,222	28,153	28,083	28,014	27,946	27,877	27,848	27,820	27,791	27,763	27,734	27,706	27,677	27,649	27,621	27,592	27,564
Juana Diaz WB	19,404	20,843	20,941	21,040	21,093	21,147	21,200	21,254	21,308	21,362	21,309	21,256	21,203	21,150	21,098	21,046	20,993	20,941	20,889	20,837	20,815	20,794	20,772	20,750	20,729	20,707	20,685	20,664	20,642	20,621	20,599
Ponce	39,711	41,358	41,773	42,192	42,435	42,679	42,925	43,172	43,421	43,671	43,615	43,560	43,504	43,449	43,393	43,338	43,283	43,227	43,172	43,117	43,107	43,097	43,086	43,076	43,066	43,056	43,045	43,035	43,025	43,015	43,004
Hucar	9,631	10,156	10,214	10,272	10,305	10,338	10,371	10,404	10,437	10,470	10,447	10,423	10,400	10,377	10,354	10,330	10,307	10,284	10,261	10,238	10,229	10,220	10,211	10,202	10,193	10,184	10,175	10,166	10,158	10,149	10,140
Guayama	16,647	17,722	17,824	17,925	17,983	18,040	18,097	18,155	18,213	18,271	18,230	18,190	18,149	18,108	18,068	18,027	17,987	17,947	17,906	17,866	17,851	17,835	17,819	17,804	17,788	17,772	17,757	17,741	17,725	17,710	17,694
Ceiba	9,699	10,106	10,304	10,506	10,640	10,775	10,912	11,051	11,192	11,335	11,350	11,365	11,380	11,395	11,411	11,426	11,441	11,457	11,472	11,487	11,505	11,522	11,539	11,557	11,574	11,592	11,609	11,627	11,644	11,662	11,679
Humacao South	13,680	14,856	15,102	15,352	15,481	15,611	15,742	15,873	16,006	16,141	16,136	16,131	16,126	16,122	16,117	16,112	16,108	16,103	16,098	16,094	16,100	16,107	16,114	16,120	16,127	16,134	16,141	16,147	16,154	16,161	16,168
Humacao North	9,968	10,463	10,538	10,613	10,657	10,701	10,746	10,790	10,835	10,879	10,859	10,839	10,818	10,798	10,777	10,757	10,737	10,717	10,696	10,676	10,669	10,663	10,656	10,649	10,642	10,635	10,628	10,621	10,615	10,608	10,601
Carolina	49,523	51,835	53,503	55,224	55,241	55,258	55,274	55,291	55,308	55,324	55,558	55,792	56,028	56,264	56,502	56,741	56,980	57,221	57,462	57,705	57,931	58,158	58,385	58,614	58,844	59,074	59,305	59,537	59,771	60,005	60,239
Carolina Ramp NB	1,363	1,571	1,626	1,682	1,681	1,679	1,678	1,676	1,675	1,673	1,680	1,686	1,693	1,699	1,705	1,712	1,718	1,725	1,731	1,738	1,744	1,751	1,757	1,763	1,770	1,776	1,783	1,789	1,796	1,802	1,809
Carolina Ramp SB	1,138	1,307	1,345	1,383	1,383	1,383	1,383	1,383	1,384	1,384	1,390	1,395	1,401	1,407	1,413	1,419	1,425	1,430	1,436	1,442	1,448	1,454	1,459	1,465	1,470	1,476	1,482	1,488	1,493	1,499	1,505
Rio Grande	27,703	29,222	30,184	31,177	31,217	31,258	31,298	31,339	31,379	31,420	31,564	31,709	31,855	32,001	32,148	32,296	32,444	32,593	32,743	32,893	33,030	33,168	33,306	33,444	33,584	33,723	33,864	34,005	34,146	34,288	34,431
Total	**355,387**	**374,663**	**379,617**	**384,687**	**385,870**	**387,060**	**388,257**	**389,462**	**390,673**	**391,892**	**391,684**	**391,479**	**391,277**	**391,078**	**390,883**	**390,690**	**390,502**	**390,316**	**390,134**	**389,955**	**390,123**	**390,292**	**390,463**	**390,636**	**390,811**	**390,987**	**391,166**	**391,346**	**391,528**	**391,712**	**391,898**
YoY Growth	31.0%	5.4%	1.3%	1.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	-0.1%	-0.1%	-0.1%	-0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Table A.2: Test 0 (No change) - Revenues (Annual Millions) – NOMINAL

Plaza	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051
Guaynabo	$ 3.364	$ 3.45	$ 3.53	$ 3.60	$ 3.64	$ 3.67	$ 3.70	$ 3.73	$ 3.77	$ 3.80	$ 3.80	$ 3.80	$ 3.80	$ 3.80	$ 3.80	$ 3.79	$ 3.79	$ 3.79	$ 3.79	$ 3.79	$ 3.79	$ 3.80	$ 3.80	$ 3.80	$ 3.80	$ 3.80	$ 3.81	$ 3.81	$ 3.81	$ 3.81	$ 3.81
Montehiedra	$ 1.46	$ 1.57	$ 1.61	$ 1.64	$ 1.65	$ 1.67	$ 1.68	$ 1.70	$ 1.71	$ 1.73	$ 1.73	$ 1.73	$ 1.73	$ 1.73	$ 1.73	$ 1.73	$ 1.73	$ 1.73	$ 1.73	$ 1.73	$ 1.73	$ 1.73	$ 1.73	$ 1.73	$ 1.73	$ 1.73	$ 1.73	$ 1.73	$ 1.73	$ 1.74	$ 1.74
Caguas North	$ 28.54	$ 30.35	$ 30.46	$ 30.57	$ 30.61	$ 30.65	$ 30.68	$ 30.72	$ 30.76	$ 30.80	$ 30.71	$ 30.61	$ 30.52	$ 30.43	$ 30.34	$ 30.25	$ 30.16	$ 30.07	$ 29.98	$ 29.89	$ 29.85	$ 29.81	$ 29.77	$ 29.73	$ 29.69	$ 29.65	$ 29.61	$ 29.57	$ 29.53	$ 29.49	$ 29.45
Caguas South	$ 12.23	$ 12.78	$ 12.83	$ 12.87	$ 12.89	$ 12.91	$ 12.92	$ 12.94	$ 12.95	$ 12.97	$ 12.93	$ 12.89	$ 12.85	$ 12.82	$ 12.78	$ 12.74	$ 12.70	$ 12.66	$ 12.63	$ 12.59	$ 12.57	$ 12.55	$ 12.54	$ 12.52	$ 12.50	$ 12.49	$ 12.47	$ 12.45	$ 12.43	$ 12.42	$ 12.40
Salinas	$ 14.05	$ 14.49	$ 14.51	$ 14.53	$ 14.54	$ 14.55	$ 14.57	$ 14.58	$ 14.59	$ 14.61	$ 14.56	$ 14.52	$ 14.47	$ 14.43	$ 14.38	$ 14.34	$ 14.29	$ 14.25	$ 14.21	$ 14.16	$ 14.14	$ 14.12	$ 14.10	$ 14.08	$ 14.06	$ 14.04	$ 14.02	$ 14.00	$ 13.98	$ 13.96	$ 13.94
Salinas Ramp	$ 0.96	$ 1.02	$ 1.03	$ 1.03	$ 1.03	$ 1.03	$ 1.04	$ 1.04	$ 1.04	$ 1.05	$ 1.04	$ 1.04	$ 1.04	$ 1.04	$ 1.03	$ 1.03	$ 1.03	$ 1.03	$ 1.03	$ 1.02	$ 1.02	$ 1.02	$ 1.02	$ 1.02	$ 1.02	$ 1.02	$ 1.02	$ 1.02	$ 1.01	$ 1.01	$ 1.01
Juana Diaz ORT EB	$ 5.13	$ 5.43	$ 5.46	$ 5.50	$ 5.51	$ 5.52	$ 5.54	$ 5.55	$ 5.57	$ 5.58	$ 5.57	$ 5.56	$ 5.54	$ 5.53	$ 5.51	$ 5.50	$ 5.49	$ 5.47	$ 5.46	$ 5.45	$ 5.44	$ 5.44	$ 5.43	$ 5.42	$ 5.42	$ 5.41	$ 5.41	$ 5.40	$ 5.40	$ 5.39	$ 5.39
Juana Diaz ORT WB	$ 3.89	$ 4.18	$ 4.20	$ 4.22	$ 4.23	$ 4.24	$ 4.25	$ 4.27	$ 4.28	$ 4.29	$ 4.28	$ 4.27	$ 4.26	$ 4.24	$ 4.23	$ 4.22	$ 4.21	$ 4.20	$ 4.19	$ 4.18	$ 4.18	$ 4.17	$ 4.17	$ 4.16	$ 4.16	$ 4.16	$ 4.15	$ 4.15	$ 4.14	$ 4.14	$ 4.13
Ponce	$ 11.45	$ 11.92	$ 12.04	$ 12.16	$ 12.23	$ 12.30	$ 12.38	$ 12.45	$ 12.52	$ 12.59	$ 12.57	$ 12.56	$ 12.54	$ 12.53	$ 12.51	$ 12.49	$ 12.48	$ 12.46	$ 12.45	$ 12.43	$ 12.43	$ 12.42	$ 12.42	$ 12.42	$ 12.42	$ 12.41	$ 12.41	$ 12.41	$ 12.41	$ 12.40	$ 12.40	$ 12.40
Hucar	$ 3.69	$ 3.89	$ 3.91	$ 3.94	$ 3.95	$ 3.96	$ 3.97	$ 3.99	$ 4.00	$ 4.01	$ 4.00	$ 3.99	$ 3.99	$ 3.98	$ 3.97	$ 3.96	$ 3.95	$ 3.94	$ 3.93	$ 3.92	$ 3.92	$ 3.92	$ 3.91	$ 3.91	$ 3.91	$ 3.90	$ 3.90	$ 3.90	$ 3.89	$ 3.89	$ 3.89
Guayama	$ 3.14	$ 3.34	$ 3.36	$ 3.38	$ 3.39	$ 3.40	$ 3.42	$ 3.43	$ 3.44	$ 3.45	$ 3.44	$ 3.43	$ 3.42	$ 3.42	$ 3.41	$ 3.40	$ 3.39	$ 3.39	$ 3.38	$ 3.37	$ 3.37	$ 3.37	$ 3.36	$ 3.36	$ 3.36	$ 3.35	$ 3.35	$ 3.35	$ 3.34	$ 3.34	$ 3.34
Ceiba	$ 3.59	$ 3.74	$ 3.81	$ 3.89	$ 3.94	$ 3.99	$ 4.04	$ 4.09	$ 4.14	$ 4.19	$ 4.20	$ 4.21	$ 4.21	$ 4.22	$ 4.22	$ 4.23	$ 4.23	$ 4.24	$ 4.25	$ 4.25	$ 4.26	$ 4.26	$ 4.27	$ 4.28	$ 4.28	$ 4.29	$ 4.30	$ 4.30	$ 4.31	$ 4.32	$ 4.32
Humacao South	$ 5.21	$ 5.66	$ 5.76	$ 5.85	$ 5.90	$ 5.95	$ 6.00	$ 6.05	$ 6.10	$ 6.15	$ 6.15	$ 6.15	$ 6.15	$ 6.15	$ 6.14	$ 6.14	$ 6.14	$ 6.14	$ 6.14	$ 6.13	$ 6.14	$ 6.14	$ 6.14	$ 6.14	$ 6.15	$ 6.15	$ 6.15	$ 6.15	$ 6.16	$ 6.16	$ 6.16
Humacao North	$ 3.75	$ 3.94	$ 3.97	$ 4.00	$ 4.01	$ 4.03	$ 4.05	$ 4.06	$ 4.08	$ 4.10	$ 4.09	$ 4.08	$ 4.07	$ 4.07	$ 4.06	$ 4.05	$ 4.04	$ 4.03	$ 4.03	$ 4.02	$ 4.02	$ 4.01	$ 4.01	$ 4.01	$ 4.01	$ 4.00	$ 4.00	$ 4.00	$ 4.00	$ 3.99	$ 3.99
Carolina	$ 27.88	$ 29.18	$ 30.12	$ 31.09	$ 31.10	$ 31.11	$ 31.12	$ 31.13	$ 31.14	$ 31.15	$ 31.28	$ 31.41	$ 31.54	$ 31.68	$ 31.81	$ 31.95	$ 32.08	$ 32.22	$ 32.35	$ 32.49	$ 32.62	$ 32.74	$ 32.87	$ 33.00	$ 33.13	$ 33.26	$ 33.39	$ 33.52	$ 33.65	$ 33.78	$ 33.92
Carolina Ramp NB	$ 0.39	$ 0.45	$ 0.46	$ 0.48	$ 0.48	$ 0.48	$ 0.48	$ 0.47	$ 0.47	$ 0.47	$ 0.48	$ 0.48	$ 0.48	$ 0.48	$ 0.48	$ 0.48	$ 0.49	$ 0.49	$ 0.49	$ 0.49	$ 0.49	$ 0.50	$ 0.50	$ 0.50	$ 0.50	$ 0.50	$ 0.50	$ 0.51	$ 0.51	$ 0.51	$ 0.51
Carolina Ramp SB	$ 0.32	$ 0.37	$ 0.38	$ 0.39	$ 0.39	$ 0.39	$ 0.39	$ 0.39	$ 0.39	$ 0.39	$ 0.40	$ 0.40	$ 0.40	$ 0.40	$ 0.40	$ 0.40	$ 0.41	$ 0.41	$ 0.41	$ 0.41	$ 0.41	$ 0.41	$ 0.42	$ 0.42	$ 0.42	$ 0.42	$ 0.42	$ 0.42	$ 0.43	$ 0.43	$ 0.43
Rio Grande	$ 10.61	$ 11.19	$ 11.56	$ 11.94	$ 11.96	$ 11.97	$ 11.99	$ 12.00	$ 12.02	$ 12.03	$ 12.09	$ 12.14	$ 12.20	$ 12.26	$ 12.31	$ 12.37	$ 12.43	$ 12.48	$ 12.54	$ 12.60	$ 12.65	$ 12.70	$ 12.76	$ 12.81	$ 12.86	$ 12.92	$ 12.97	$ 13.02	$ 13.08	$ 13.13	$ 13.19
Total	**$ 139.68**	**$ 146.97**	**$ 149.00**	**$ 151.09**	**$ 151.46**	**$ 151.84**	**$ 152.21**	**$ 152.59**	**$ 152.98**	**$ 153.36**	**$ 153.31**	**$ 153.27**	**$ 153.22**	**$ 153.17**	**$ 153.13**	**$ 153.09**	**$ 153.05**	**$ 153.01**	**$ 152.97**	**$ 152.94**	**$ 153.03**	**$ 153.12**	**$ 153.22**	**$ 153.32**	**$ 153.41**	**$ 153.51**	**$ 153.61**	**$ 153.71**	**$ 153.81**	**$ 153.91**	**$ 154.01**
YoY Growth	31.0%	5.2%	1.4%	1.4%	0.2%	0.2%	0.2%	0.2%	0.3%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%

Table A.3: Test 1 (8.4%/CPI+1.5%) - Annual Average Daily Transactions (AADT)

Plaza	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051
Guaynabo	10,963	10,884	10,639	10,463	10,245	10,032	9,823	9,619	9,419	9,223	9,109	8,997	8,886	8,776	8,668	8,561	8,455	8,351	8,248	8,146	8,081	8,016	7,952	7,889	7,825	7,763	7,701	7,639	7,578	7,518	7,458
Montehiedra	11,223	11,673	11,410	11,221	10,988	10,759	10,535	10,316	10,101	9,891	9,769	9,649	9,529	9,412	9,296	9,181	9,068	8,956	8,845	8,736	8,666	8,597	8,528	8,460	8,392	8,325	8,259	8,193	8,127	8,062	7,998
Caguas North	50,147	53,046	52,854	52,714	52,468	52,222	51,978	51,735	51,493	51,252	50,929	50,608	50,290	49,973	49,658	49,346	49,035	48,726	48,419	48,114	47,924	47,734	47,545	47,357	47,170	46,983	46,797	46,612	46,427	46,243	46,060
Caguas South	31,120	32,351	32,234	32,149	31,999	31,849	31,700	31,552	31,404	31,257	31,060	30,865	30,670	30,477	30,285	30,095	29,905	29,717	29,530	29,344	29,228	29,112	28,997	28,882	28,767	28,654	28,540	28,427	28,315	28,202	28,091
Salinas	20,177	20,774	20,751	20,735	20,710	20,685	20,660	20,635	20,611	20,586	20,483	20,381	20,279	20,178	20,077	19,977	19,877	19,777	19,679	19,580	19,520	19,460	19,399	19,339	19,280	19,220	19,161	19,101	19,042	18,984	18,925
Salinas Ramp	7,022	7,412	7,338	7,278	7,289	7,300	7,311	7,321	7,332	7,343	7,313	7,284	7,255	7,226	7,197	7,169	7,140	7,111	7,083	7,055	7,038	7,021	7,004	6,987	6,970	6,953	6,936	6,919	6,902	6,886	6,869
Juana Diaz ORT EB	26,269	27,421	27,092	26,833	26,619	26,407	26,196	25,987	25,780	25,575	25,382	25,191	25,001	24,813	24,626	24,440	24,256	24,073	23,892	23,712	23,599	23,486	23,373	23,262	23,150	23,040	22,930	22,820	22,711	22,602	22,494
Juana Diaz ORT WB	19,404	20,582	20,325	20,118	19,967	19,817	19,668	19,520	19,374	19,228	19,087	18,946	18,807	18,669	18,531	18,395	18,259	18,125	17,992	17,859	17,776	17,693	17,611	17,528	17,447	17,365	17,284	17,203	17,123	17,043	16,964
Ponce	39,711	40,443	39,611	38,960	38,421	37,889	37,365	36,848	36,338	35,835	35,486	35,141	34,799	34,460	34,125	33,792	33,464	33,138	32,815	32,496	32,293	32,091	31,891	31,691	31,493	31,297	31,101	30,907	30,713	30,522	30,331
Hucar	9,631	10,007	9,862	9,746	9,613	9,481	9,352	9,224	9,097	8,973	8,886	8,800	8,715	8,631	8,547	8,465	8,383	8,302	8,222	8,142	8,092	8,041	7,991	7,942	7,892	7,843	7,795	7,746	7,698	7,651	7,603
Guayama	16,647	17,463	17,210	17,007	16,775	16,545	16,319	16,096	15,876	15,658	15,507	15,357	15,209	15,061	14,916	14,772	14,629	14,487	14,347	14,208	14,120	14,033	13,945	13,859	13,773	13,687	13,602	13,518	13,434	13,351	13,268
Ceiba	9,699	9,649	9,229	8,906	8,682	8,465	8,252	8,045	7,843	7,646	7,540	7,435	7,331	7,229	7,128	7,028	6,930	6,833	6,738	6,644	6,584	6,524	6,465	6,407	6,348	6,291	6,234	6,177	6,121	6,066	6,011
Humacao South	13,680	14,363	13,939	13,613	13,282	12,960	12,645	12,337	12,038	11,745	11,585	11,426	11,270	11,117	10,965	10,815	10,667	10,522	10,378	10,236	10,146	10,056	9,967	9,878	9,791	9,704	9,618	9,533	9,448	9,364	9,281
Humacao North	9,968	10,235	10,001	9,813	9,673	9,535	9,399	9,265	9,133	9,003	8,914	8,825	8,738	8,652	8,566	8,481	8,397	8,314	8,232	8,151	8,099	8,047	7,996	7,946	7,895	7,845	7,795	7,745	7,696	7,647	7,599
Carolina	49,523	51,835	53,503	55,224	51,142	50,238	49,350	48,477	47,620	46,779	46,556	46,334	46,113	45,893	45,674	45,457	45,240	45,024	44,810	44,596	44,470	44,344	44,219	44,094	43,970	43,846	43,722	43,598	43,475	43,352	43,230
Carolina Ramp NB	1,363	1,571	1,626	1,682	1,577	1,548	1,519	1,491	1,464	1,437	1,430	1,422	1,415	1,408	1,401	1,394	1,387	1,380	1,373	1,366	1,362	1,358	1,354	1,350	1,346	1,342	1,338	1,334	1,330	1,326	1,322
Carolina Ramp SB	1,138	1,307	1,345	1,383	1,297	1,273	1,249	1,225	1,202	1,179	1,173	1,166	1,160	1,154	1,148	1,142	1,136	1,130	1,124	1,118	1,115	1,111	1,108	1,104	1,101	1,097	1,094	1,090	1,087	1,084	1,080
Rio Grande	27,703	29,222	30,184	31,177	28,339	27,661	26,999	26,353	25,722	25,107	24,928	24,751	24,575	24,400	24,227	24,055	23,884	23,714	23,545	23,378	23,275	23,173	23,071	22,970	22,869	22,769	22,669	22,570	22,471	22,372	22,274
Total	**355,387**	**370,240**	**369,152**	**369,024**	**359,086**	**354,665**	**350,319**	**346,047**	**341,846**	**337,716**	**335,136**	**332,578**	**330,042**	**327,528**	**325,035**	**322,563**	**320,112**	**317,681**	**315,272**	**312,882**	**311,386**	**309,897**	**308,417**	**306,944**	**305,480**	**304,023**	**302,574**	**301,133**	**299,700**	**298,274**	**296,856**
YoY Growth	31.0%	4.2%	-0.3%	0.0%	-2.7%	-1.2%	-1.2%	-1.2%	-1.2%	-1.2%	-0.8%	-0.8%	-0.8%	-0.8%	-0.8%	-0.8%	-0.8%	-0.8%	-0.8%	-0.8%	-0.5%	-0.5%	-0.5%	-0.5%	-0.5%	-0.5%	-0.5%	-0.5%	-0.5%	-0.5%	-0.5%

Table A.4: Test 1 (8.4%/CPI+1.5%) - Revenues (Annual Millions) – NOMINAL

Plaza	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051
Guaynabo	$ 3.36	$ 3.57	$ 3.83	$ 4.09	$ 4.14	$ 4.19	$ 4.24	$ 4.29	$ 4.34	$ 4.40	$ 4.49	$ 4.58	$ 4.67	$ 4.77	$ 4.87	$ 4.97	$ 5.08	$ 5.19	$ 5.30	$ 5.42	$ 5.56	$ 5.71	$ 5.86	$ 6.01	$ 6.17	$ 6.33	$ 6.49	$ 6.66	$ 6.84	$ 7.02	$ 7.20
Montehiedra	$ 1.46	$ 1.63	$ 1.74	$ 1.86	$ 1.88	$ 1.91	$ 1.93	$ 1.95	$ 1.98	$ 2.00	$ 2.04	$ 2.08	$ 2.13	$ 2.17	$ 2.22	$ 2.26	$ 2.31	$ 2.36	$ 2.41	$ 2.47	$ 2.53	$ 2.60	$ 2.67	$ 2.74	$ 2.81	$ 2.88	$ 2.96	$ 3.03	$ 3.11	$ 3.19	$ 3.28
Caguas North	$ 28.54	$ 32.31	$ 35.32	$ 38.18	$ 39.28	$ 40.42	$ 41.59	$ 42.79	$ 44.04	$ 45.31	$ 46.53	$ 47.78	$ 49.07	$ 50.40	$ 51.76	$ 53.18	$ 54.65	$ 56.17	$ 57.75	$ 59.36	$ 61.17	$ 63.03	$ 64.94	$ 66.91	$ 68.95	$ 71.04	$ 73.20	$ 75.43	$ 77.72	$ 80.09	$ 82.52
Caguas South	$ 12.23	$ 13.60	$ 14.87	$ 16.08	$ 16.54	$ 17.02	$ 17.51	$ 18.02	$ 18.54	$ 19.08	$ 19.59	$ 20.12	$ 20.66	$ 21.22	$ 21.80	$ 22.39	$ 23.01	$ 23.66	$ 24.32	$ 25.00	$ 25.76	$ 26.54	$ 27.35	$ 28.18	$ 29.04	$ 29.92	$ 30.83	$ 31.76	$ 32.73	$ 33.73	$ 34.75
Salinas	$ 14.05	$ 15.48	$ 16.96	$ 18.37	$ 18.97	$ 19.58	$ 20.22	$ 20.88	$ 21.56	$ 22.26	$ 22.89	$ 23.54	$ 24.20	$ 24.89	$ 25.60	$ 26.33	$ 27.09	$ 27.89	$ 28.70	$ 29.55	$ 30.47	$ 31.43	$ 32.41	$ 33.42	$ 34.47	$ 35.55	$ 36.66	$ 37.81	$ 38.99	$ 40.21	$ 41.47
Salinas Ramp	$ 0.96	$ 1.08	$ 1.18	$ 1.27	$ 1.31	$ 1.36	$ 1.41	$ 1.46	$ 1.51	$ 1.56	$ 1.61	$ 1.65	$ 1.70	$ 1.75	$ 1.80	$ 1.86	$ 1.91	$ 1.97	$ 2.03	$ 2.09	$ 2.16	$ 2.23	$ 2.30	$ 2.37	$ 2.45	$ 2.53	$ 2.61	$ 2.69	$ 2.78	$ 2.87	$ 2.96
Juana Diaz ORT EB	$ 5.13	$ 5.73	$ 6.21	$ 6.67	$ 6.84	$ 7.02	$ 7.20	$ 7.38	$ 7.57	$ 7.76	$ 7.96	$ 8.16	$ 8.37	$ 8.59	$ 8.81	$ 9.04	$ 9.28	$ 9.53	$ 9.78	$ 10.04	$ 10.34	$ 10.64	$ 10.96	$ 11.28	$ 11.62	$ 11.96	$ 12.31	$ 12.68	$ 13.05	$ 13.44	$ 13.83
Juana Diaz ORT WB	$ 3.89	$ 4.42	$ 4.79	$ 5.14	$ 5.27	$ 5.41	$ 5.55	$ 5.69	$ 5.84	$ 5.99	$ 6.15	$ 6.31	$ 6.47	$ 6.64	$ 6.81	$ 6.99	$ 7.18	$ 7.37	$ 7.57	$ 7.77	$ 8.00	$ 8.24	$ 8.48	$ 8.73	$ 8.99	$ 9.26	$ 9.53	$ 9.82	$ 10.11	$ 10.41	$ 10.72
Ponce	$ 11.45	$ 12.47	$ 13.41	$ 14.29	$ 14.57	$ 14.85	$ 15.14	$ 15.44	$ 15.74	$ 16.04	$ 16.42	$ 16.80	$ 17.20	$ 17.60	$ 18.02	$ 18.44	$ 18.89	$ 19.35	$ 19.82	$ 20.31	$ 20.88	$ 21.46	$ 22.06	$ 22.68	$ 23.32	$ 23.97	$ 24.64	$ 25.33	$ 26.04	$ 26.77	$ 27.52
Hucar	$ 3.69	$ 4.10	$ 4.44	$ 4.75	$ 4.85	$ 4.94	$ 5.04	$ 5.14	$ 5.24	$ 5.34	$ 5.47	$ 5.59	$ 5.73	$ 5.86	$ 6.00	$ 6.14	$ 6.29	$ 6.44	$ 6.60	$ 6.76	$ 6.95	$ 7.15	$ 7.35	$ 7.56	$ 7.77	$ 7.99	$ 8.21	$ 8.44	$ 8.68	$ 8.92	$ 9.17
Guayama	$ 3.14	$ 3.53	$ 3.81	$ 4.08	$ 4.16	$ 4.25	$ 4.33	$ 4.41	$ 4.50	$ 4.59	$ 4.70	$ 4.81	$ 4.92	$ 5.04	$ 5.15	$ 5.28	$ 5.40	$ 5.54	$ 5.67	$ 5.81	$ 5.97	$ 6.14	$ 6.31	$ 6.49	$ 6.67	$ 6.86	$ 7.05	$ 7.25	$ 7.46	$ 7.67	$ 7.88
Ceiba	$ 3.59	$ 3.82	$ 4.01	$ 4.19	$ 4.23	$ 4.26	$ 4.29	$ 4.33	$ 4.36	$ 4.39	$ 4.48	$ 4.56	$ 4.65	$ 4.74	$ 4.83	$ 4.92	$ 5.02	$ 5.12	$ 5.22	$ 5.33	$ 5.46	$ 5.60	$ 5.74	$ 5.89	$ 6.03	$ 6.19	$ 6.34	$ 6.50	$ 6.66	$ 6.83	$ 7.00
Humacao South	$ 5.21	$ 5.86	$ 6.24	$ 6.60	$ 6.66	$ 6.72	$ 6.78	$ 6.83	$ 6.89	$ 6.95	$ 7.09	$ 7.22	$ 7.36	$ 7.51	$ 7.65	$ 7.80	$ 7.96	$ 8.12	$ 8.29	$ 8.46	$ 8.67	$ 8.89	$ 9.12	$ 9.35	$ 9.58	$ 9.83	$ 10.08	$ 10.33	$ 10.59	$ 10.86	$ 11.14
Humacao North	$ 3.75	$ 4.12	$ 4.42	$ 4.70	$ 4.79	$ 4.88	$ 4.97	$ 5.07	$ 5.17	$ 5.26	$ 5.39	$ 5.51	$ 5.64	$ 5.77	$ 5.91	$ 6.05	$ 6.19	$ 6.34	$ 6.49	$ 6.65	$ 6.84	$ 7.03	$ 7.22	$ 7.43	$ 7.63	$ 7.85	$ 8.07	$ 8.29	$ 8.52	$ 8.76	$ 9.00
Carolina	$ 27.88	$ 29.18	$ 30.12	$ 31.09	$ 37.88	$ 38.46	$ 39.06	$ 39.66	$ 40.28	$ 40.90	$ 42.07	$ 43.27	$ 44.51	$ 45.78	$ 47.09	$ 48.45	$ 49.87	$ 51.34	$ 52.86	$ 54.42	$ 56.14	$ 57.91	$ 59.74	$ 61.63	$ 63.57	$ 65.58	$ 67.65	$ 69.79	$ 71.99	$ 74.26	$ 76.61
Carolina Ramp NB	$ 0.39	$ 0.45	$ 0.46	$ 0.48	$ 0.59	$ 0.60	$ 0.60	$ 0.61	$ 0.62	$ 0.63	$ 0.65	$ 0.67	$ 0.69	$ 0.71	$ 0.73	$ 0.75	$ 0.77	$ 0.79	$ 0.81	$ 0.84	$ 0.86	$ 0.89	$ 0.92	$ 0.95	$ 0.98	$ 1.01	$ 1.04	$ 1.07	$ 1.11	$ 1.14	$ 1.18
Carolina Ramp SB	$ 0.32	$ 0.37	$ 0.38	$ 0.39	$ 0.49	$ 0.49	$ 0.50	$ 0.51	$ 0.51	$ 0.52	$ 0.54	$ 0.55	$ 0.57	$ 0.58	$ 0.60	$ 0.62	$ 0.63	$ 0.65	$ 0.67	$ 0.69	$ 0.71	$ 0.74	$ 0.76	$ 0.78	$ 0.81	$ 0.83	$ 0.86	$ 0.88	$ 0.91	$ 0.94	$ 0.97
Rio Grande	$ 10.61	$ 11.19	$ 11.56	$ 11.94	$ 14.28	$ 14.41	$ 14.54	$ 14.67	$ 14.80	$ 14.93	$ 15.32	$ 15.72	$ 16.13	$ 16.56	$ 16.99	$ 17.44	$ 17.91	$ 18.39	$ 18.89	$ 19.41	$ 19.99	$ 20.59	$ 21.20	$ 21.84	$ 22.49	$ 23.17	$ 23.86	$ 24.57	$ 25.31	$ 26.07	$ 26.85
Total	**$ 139.68**	**$ 152.91**	**$ 163.76**	**$ 174.19**	**$ 186.72**	**$ 190.76**	**$ 194.90**	**$ 199.14**	**$ 203.49**	**$ 207.93**	**$ 213.36**	**$ 218.95**	**$ 224.68**	**$ 230.58**	**$ 236.65**	**$ 242.92**	**$ 249.45**	**$ 256.23**	**$ 263.21**	**$ 270.37**	**$ 278.46**	**$ 286.80**	**$ 295.39**	**$ 304.23**	**$ 313.34**	**$ 322.73**	**$ 332.39**	**$ 342.35**	**$ 352.60**	**$ 363.17**	**$ 374.05**
YoY Growth	31.0%	9.5%	7.1%	6.4%	7.2%	2.2%	2.2%	2.2%	2.2%	2.2%	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%	2.7%	2.7%	2.7%	2.7%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%

Table A.5: Test 2 (CPI+1.5%) - Annual Average Daily Transactions (AADT)

Plaza	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051
Guaynabo	10,963	11,048	11,025	11,038	10,884	10,732	10,582	10,434	10,288	10,144	10,045	9,947	9,850	9,753	9,658	9,563	9,470	9,377	9,285	9,194	9,137	9,079	9,022	8,966	8,909	8,853	8,798	8,742	8,687	8,633	8,579
Montehiedra	11,223	11,849	11,824	11,838	11,673	11,509	11,349	11,190	11,034	10,879	10,773	10,667	10,563	10,460	10,357	10,256	10,156	10,056	9,958	9,861	9,799	9,737	9,676	9,615	9,555	9,495	9,435	9,376	9,317	9,258	9,200
Caguas North	50,147	53,178	53,167	53,183	53,140	53,096	53,053	53,009	52,966	52,922	52,665	52,410	52,156	51,903	51,651	51,401	51,151	50,903	50,656	50,411	50,260	50,109	49,959	49,810	49,661	49,512	49,364	49,216	49,068	48,921	48,775
Caguas South	31,120	32,432	32,425	32,435	32,409	32,382	32,355	32,329	32,302	32,276	32,119	31,963	31,808	31,654	31,501	31,348	31,196	31,045	30,894	30,744	30,652	30,560	30,469	30,378	30,287	30,196	30,106	30,015	29,926	29,836	29,747
Salinas	20,177	20,790	20,787	20,789	20,766	20,744	20,721	20,699	20,676	20,654	20,552	20,450	20,349	20,248	20,148	20,048	19,949	19,850	19,752	19,654	19,594	19,534	19,475	19,415	19,356	19,296	19,237	19,178	19,120	19,061	19,003
Salinas Ramp	7,022	7,444	7,416	7,394	7,361	7,329	7,297	7,265	7,233	7,201	7,157	7,113	7,069	7,025	6,981	6,938	6,895	6,853	6,810	6,768	6,742	6,716	6,690	6,664	6,638	6,612	6,586	6,561	6,535	6,510	6,484
Juana Diaz ORT EB	26,269	27,609	27,534	27,492	27,273	27,057	26,842	26,628	26,417	26,207	26,010	25,814	25,620	25,427	25,236	25,046	24,858	24,671	24,486	24,301	24,185	24,070	23,955	23,840	23,727	23,613	23,501	23,388	23,277	23,166	23,055
Juana Diaz ORT WB	19,404	20,728	20,670	20,632	20,449	20,267	20,087	19,908	19,731	19,555	19,401	19,248	19,097	18,946	18,797	18,649	18,502	18,356	18,212	18,068	17,978	17,887	17,798	17,708	17,620	17,531	17,443	17,356	17,269	17,182	17,096
Ponce	39,711	40,939	40,777	40,692	40,198	39,709	39,226	38,749	38,278	37,813	37,468	37,127	36,790	36,455	36,123	35,794	35,468	35,146	34,826	34,509	34,308	34,108	33,909	33,711	33,515	33,319	33,125	32,932	32,740	32,549	32,359
Hucar	9,631	10,096	10,071	10,058	9,952	9,846	9,742	9,639	9,537	9,437	9,356	9,277	9,198	9,120	9,042	8,965	8,889	8,813	8,738	8,664	8,617	8,570	8,524	8,477	8,431	8,385	8,340	8,295	8,250	8,205	8,160
Guayama	16,647	17,618	17,575	17,552	17,366	17,182	17,001	16,821	16,643	16,467	16,327	16,189	16,051	15,914	15,779	15,645	15,512	15,380	15,249	15,119	15,037	14,955	14,874	14,793	14,713	14,633	14,554	14,475	14,396	14,318	14,240
Ceiba	9,699	9,886	9,781	9,716	9,474	9,238	9,008	8,784	8,565	8,352	8,236	8,121	8,009	7,897	7,788	7,680	7,573	7,468	7,364	7,262	7,196	7,132	7,067	7,004	6,940	6,878	6,816	6,754	6,693	6,633	6,573
Humacao South	13,680	14,568	14,416	14,319	14,104	13,893	13,685	13,481	13,279	13,080	12,947	12,816	12,686	12,557	12,429	12,303	12,178	12,055	11,932	11,811	11,734	11,657	11,581	11,505	11,430	11,356	11,281	11,208	11,135	11,062	10,990
Humacao North	9,968	10,378	10,337	10,311	10,159	10,010	9,862	9,717	9,575	9,434	9,339	9,245	9,152	9,060	8,969	8,879	8,789	8,701	8,613	8,527	8,472	8,417	8,362	8,308	8,255	8,201	8,148	8,096	8,043	7,991	7,940
Carolina	49,523	51,835	53,503	55,224	52,695	52,105	51,522	50,946	50,376	49,813	49,697	49,581	49,465	49,350	49,235	49,120	49,005	48,891	48,777	48,663	48,605	48,546	48,488	48,430	48,372	48,314	48,255	48,197	48,140	48,082	48,024
Carolina Ramp NB	1,363	1,571	1,626	1,682	1,605	1,592	1,579	1,566	1,553	1,540	1,538	1,536	1,534	1,532	1,530	1,528	1,526	1,524	1,522	1,521	1,520	1,519	1,518	1,518	1,517	1,516	1,515	1,515	1,514	1,513	1,512
Carolina Ramp SB	1,138	1,307	1,345	1,383	1,330	1,318	1,306	1,294	1,283	1,271	1,269	1,267	1,265	1,263	1,261	1,259	1,257	1,255	1,254	1,252	1,251	1,250	1,249	1,248	1,247	1,247	1,246	1,245	1,244	1,243	1,242
Rio Grande	27,703	29,222	30,184	31,177	29,484	29,033	28,589	28,152	27,722	27,298	27,192	27,087	26,982	26,878	26,774	26,670	26,567	26,464	26,362	26,260	26,201	26,143	26,085	26,027	25,969	25,911	25,853	25,795	25,738	25,681	25,623
Total	**355,387**	**372,500**	**374,462**	**376,915**	**370,321**	**367,043**	**363,807**	**360,611**	**357,457**	**354,343**	**352,092**	**349,859**	**347,642**	**345,442**	**343,259**	**341,093**	**338,943**	**336,809**	**334,691**	**332,589**	**331,286**	**329,990**	**328,701**	**327,417**	**326,139**	**324,868**	**323,603**	**322,344**	**321,091**	**319,844**	**318,603**
YoY Growth	31.0%	4.8%	0.5%	0.7%	-1.7%	-0.9%	-0.9%	-0.9%	-0.9%	-0.9%	-0.6%	-0.6%	-0.6%	-0.6%	-0.6%	-0.6%	-0.6%	-0.6%	-0.6%	-0.6%	-0.4%	-0.4%	-0.4%	-0.4%	-0.4%	-0.4%	-0.4%	-0.4%	-0.4%	-0.4%	-0.4%

Table A.6: Test 2 (CPI+1.5%) - Revenues (Annual Millions) – NOMINAL

Plaza	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051
Guaynabo	$ 3.36	$ 3.53	$ 3.68	$ 3.82	$ 3.89	$ 3.96	$ 4.04	$ 4.12	$ 4.20	$ 4.28	$ 4.38	$ 4.48	$ 4.59	$ 4.69	$ 4.81	$ 4.92	$ 5.04	$ 5.16	$ 5.29	$ 5.41	$ 5.57	$ 5.72	$ 5.88	$ 6.05	$ 6.22	$ 6.39	$ 6.57	$ 6.75	$ 6.94	$ 7.14	$ 7.34
Montehiedra	$ 1.46	$ 1.61	$ 1.68	$ 1.74	$ 1.77	$ 1.80	$ 1.84	$ 1.88	$ 1.91	$ 1.95	$ 1.99	$ 2.04	$ 2.09	$ 2.14	$ 2.19	$ 2.24	$ 2.29	$ 2.35	$ 2.41	$ 2.46	$ 2.53	$ 2.60	$ 2.68	$ 2.75	$ 2.83	$ 2.91	$ 2.99	$ 3.07	$ 3.16	$ 3.25	$ 3.34
Caguas North	$ 28.54	$ 31.50	$ 32.96	$ 34.11	$ 35.23	$ 36.39	$ 37.58	$ 38.82	$ 40.10	$ 41.42	$ 42.60	$ 43.81	$ 45.06	$ 46.34	$ 47.67	$ 49.04	$ 50.47	$ 51.95	$ 53.49	$ 55.06	$ 56.79	$ 58.57	$ 60.41	$ 62.31	$ 64.27	$ 66.28	$ 68.36	$ 70.51	$ 72.72	$ 75.01	$ 77.36
Caguas South	$ 12.23	$ 13.27	$ 13.88	$ 14.36	$ 14.83	$ 15.32	$ 15.83	$ 16.35	$ 16.89	$ 17.44	$ 17.94	$ 18.45	$ 18.97	$ 19.52	$ 20.07	$ 20.65	$ 21.25	$ 21.88	$ 22.52	$ 23.19	$ 23.92	$ 24.67	$ 25.44	$ 26.24	$ 27.06	$ 27.91	$ 28.79	$ 29.69	$ 30.63	$ 31.59	$ 32.58
Salinas	$ 14.05	$ 15.06	$ 15.76	$ 16.31	$ 16.84	$ 17.39	$ 17.95	$ 18.54	$ 19.15	$ 19.77	$ 20.33	$ 20.91	$ 21.50	$ 22.11	$ 22.74	$ 23.39	$ 24.07	$ 24.78	$ 25.51	$ 26.26	$ 27.08	$ 27.93	$ 28.80	$ 29.71	$ 30.64	$ 31.60	$ 32.59	$ 33.61	$ 34.66	$ 35.75	$ 36.87
Salinas Ramp	$ 0.96	$ 1.06	$ 1.10	$ 1.14	$ 1.17	$ 1.21	$ 1.24	$ 1.28	$ 1.32	$ 1.35	$ 1.39	$ 1.43	$ 1.47	$ 1.51	$ 1.55	$ 1.59	$ 1.63	$ 1.68	$ 1.73	$ 1.78	$ 1.83	$ 1.89	$ 1.94	$ 2.00	$ 2.06	$ 2.13	$ 2.19	$ 2.26	$ 2.33	$ 2.40	$ 2.47
Juana Diaz ORT EB	$ 5.13	$ 5.61	$ 5.86	$ 6.05	$ 6.21	$ 6.36	$ 6.53	$ 6.69	$ 6.87	$ 7.04	$ 7.22	$ 7.41	$ 7.60	$ 7.79	$ 7.99	$ 8.20	$ 8.42	$ 8.64	$ 8.87	$ 9.11	$ 9.38	$ 9.66	$ 9.94	$ 10.24	$ 10.54	$ 10.85	$ 11.17	$ 11.50	$ 11.84	$ 12.19	$ 12.55
Juana Diaz ORT WB	$ 3.89	$ 4.33	$ 4.52	$ 4.67	$ 4.78	$ 4.90	$ 5.02	$ 5.14	$ 5.27	$ 5.40	$ 5.53	$ 5.67	$ 5.82	$ 5.96	$ 6.12	$ 6.27	$ 6.44	$ 6.61	$ 6.78	$ 6.96	$ 7.16	$ 7.37	$ 7.59	$ 7.81	$ 8.04	$ 8.28	$ 8.52	$ 8.77	$ 9.02	$ 9.29	$ 9.56
Ponce	$ 11.45	$ 12.28	$ 12.80	$ 13.22	$ 13.50	$ 13.78	$ 14.07	$ 14.37	$ 14.68	$ 14.99	$ 15.35	$ 15.72	$ 16.10	$ 16.49	$ 16.88	$ 17.30	$ 17.72	$ 18.17	$ 18.62	$ 19.09	$ 19.63	$ 20.19	$ 20.77	$ 21.36	$ 21.97	$ 22.59	$ 23.24	$ 23.90	$ 24.58	$ 25.28	$ 26.00
Hucar	$ 3.69	$ 4.03	$ 4.20	$ 4.34	$ 4.44	$ 4.54	$ 4.65	$ 4.75	$ 4.86	$ 4.97	$ 5.10	$ 5.22	$ 5.35	$ 5.48	$ 5.62	$ 5.76	$ 5.91	$ 6.06	$ 6.21	$ 6.37	$ 6.56	$ 6.75	$ 6.94	$ 7.14	$ 7.35	$ 7.56	$ 7.78	$ 8.00	$ 8.23	$ 8.47	$ 8.71
Guayama	$ 3.14	$ 3.46	$ 3.61	$ 3.73	$ 3.82	$ 3.90	$ 3.99	$ 4.08	$ 4.18	$ 4.27	$ 4.38	$ 4.49	$ 4.60	$ 4.71	$ 4.83	$ 4.95	$ 5.07	$ 5.20	$ 5.34	$ 5.47	$ 5.63	$ 5.80	$ 5.96	$ 6.14	$ 6.31	$ 6.49	$ 6.68	$ 6.88	$ 7.07	$ 7.28	$ 7.49
Ceiba	$ 3.59	$ 3.81	$ 3.94	$ 4.05	$ 4.08	$ 4.12	$ 4.15	$ 4.18	$ 4.22	$ 4.25	$ 4.33	$ 4.41	$ 4.50	$ 4.58	$ 4.67	$ 4.76	$ 4.86	$ 4.96	$ 5.06	$ 5.16	$ 5.29	$ 5.42	$ 5.56	$ 5.70	$ 5.84	$ 5.99	$ 6.14	$ 6.29	$ 6.45	$ 6.61	$ 6.78
Humacao South	$ 5.21	$ 5.78	$ 5.98	$ 6.15	$ 6.26	$ 6.38	$ 6.49	$ 6.61	$ 6.73	$ 6.86	$ 7.01	$ 7.17	$ 7.34	$ 7.51	$ 7.68	$ 7.86	$ 8.05	$ 8.24	$ 8.44	$ 8.64	$ 8.88	$ 9.12	$ 9.38	$ 9.64	$ 9.91	$ 10.18	$ 10.46	$ 10.75	$ 11.05	$ 11.36	$ 11.67
Humacao North	$ 3.75	$ 4.07	$ 4.24	$ 4.37	$ 4.45	$ 4.54	$ 4.62	$ 4.71	$ 4.79	$ 4.88	$ 5.00	$ 5.11	$ 5.23	$ 5.35	$ 5.47	$ 5.60	$ 5.74	$ 5.87	$ 6.02	$ 6.16	$ 6.33	$ 6.51	$ 6.69	$ 6.87	$ 7.07	$ 7.26	$ 7.46	$ 7.67	$ 7.88	$ 8.10	$ 8.33
Carolina	$ 27.88	$ 29.18	$ 30.12	$ 31.09	$ 34.55	$ 35.32	$ 36.10	$ 36.90	$ 37.73	$ 38.56	$ 39.76	$ 40.99	$ 42.27	$ 43.58	$ 44.94	$ 46.35	$ 47.82	$ 49.36	$ 50.94	$ 52.58	$ 54.32	$ 56.13	$ 58.00	$ 59.92	$ 61.92	$ 63.98	$ 66.10	$ 68.30	$ 70.57	$ 72.92	$ 75.34
Carolina Ramp NB	$ 0.39	$ 0.45	$ 0.46	$ 0.48	$ 0.53	$ 0.54	$ 0.56	$ 0.57	$ 0.58	$ 0.60	$ 0.62	$ 0.64	$ 0.66	$ 0.68	$ 0.70	$ 0.73	$ 0.75	$ 0.77	$ 0.80	$ 0.83	$ 0.85	$ 0.88	$ 0.91	$ 0.94	$ 0.98	$ 1.01	$ 1.04	$ 1.08	$ 1.12	$ 1.15	$ 1.19
Carolina Ramp SB	$ 0.32	$ 0.37	$ 0.38	$ 0.39	$ 0.44	$ 0.45	$ 0.46	$ 0.48	$ 0.49	$ 0.50	$ 0.51	$ 0.53	$ 0.55	$ 0.57	$ 0.58	$ 0.60	$ 0.62	$ 0.64	$ 0.66	$ 0.69	$ 0.71	$ 0.73	$ 0.76	$ 0.78	$ 0.81	$ 0.84	$ 0.86	$ 0.89	$ 0.92	$ 0.96	$ 0.99
Rio Grande	$ 10.61	$ 11.19	$ 11.56	$ 11.94	$ 13.15	$ 13.39	$ 13.63	$ 13.87	$ 14.12	$ 14.37	$ 14.80	$ 15.23	$ 15.68	$ 16.15	$ 16.63	$ 17.12	$ 17.64	$ 18.17	$ 18.73	$ 19.30	$ 19.92	$ 20.56	$ 21.22	$ 21.91	$ 22.61	$ 23.34	$ 24.09	$ 24.87	$ 25.67	$ 26.49	$ 27.35
Total	**$ 139.68**	**$ 150.58**	**$ 156.76**	**$ 161.95**	**$ 169.94**	**$ 174.29**	**$ 178.76**	**$ 183.35**	**$ 188.07**	**$ 192.90**	**$ 198.24**	**$ 203.72**	**$ 209.35**	**$ 215.16**	**$ 221.15**	**$ 227.34**	**$ 233.79**	**$ 240.50**	**$ 247.40**	**$ 254.51**	**$ 262.39**	**$ 270.51**	**$ 278.88**	**$ 287.51**	**$ 296.41**	**$ 305.58**	**$ 315.04**	**$ 324.80**	**$ 334.85**	**$ 345.22**	**$ 355.92**
YoY Growth	31.0%	7.8%	4.1%	3.3%	4.9%	2.6%	2.6%	2.6%	2.6%	2.6%	2.8%	2.8%	2.8%	2.8%	2.8%	2.8%	2.8%	2.9%	2.9%	2.9%	3.1%	3.1%	3.1%	3.1%	3.1%	3.1%	3.1%	3.1%	3.1%	3.1%	3.1%

Table A.7: Test 3 (Toll Rate Sensitivity) – Annual Average Daily Transactions (AADT)

	2022					2030					
Both Directions	**-25%**	**0%**	**25%**	**50%**	**75%**	**-25%**	**0%**	**25%**	**50%**	**75%**	**100%**
Guaynabo	13,507	11,243	9,366	7,670	6,578	14,727	12,377	10,235	8,922	7,476	6,288
Montehiedra	11,869	12,057	12,356	12,914	12,734	12,999	13,274	13,374	14,006	13,940	14,051
Caguas North	53,631	53,325	51,691	50,056	49,025	56,053	54,106	53,056	51,425	49,464	48,744
Caguas South	32,708	32,521	31,525	30,528	29,899	34,185	32,998	32,357	31,363	30,167	29,728
Salinas	21,162	20,812	20,577	20,460	20,405	21,298	20,983	20,730	20,503	20,459	20,415
Salinas Ramp	7,785	7,480	7,106	7,063	6,720	7,868	7,655	7,135	7,169	6,998	6,556
Juana Diaz ORT EB	29,606	27,787	25,721	24,327	22,805	30,283	28,571	26,508	25,056	23,883	22,341
Juana Diaz ORT WB	21,878	20,843	19,424	18,404	17,744	22,456	21,362	20,081	18,815	18,184	17,572
Ponce	46,411	41,358	36,613	32,274	28,155	48,124	43,671	38,779	34,735	30,781	27,458
Hucar	11,448	10,156	9,374	8,558	8,042	11,729	10,470	9,705	8,858	8,274	7,899
Guayama	20,032	17,722	16,296	14,933	13,515	20,161	18,271	16,486	15,142	13,855	12,905
Ceiba	13,132	10,106	7,775	6,359	5,302	13,790	11,335	8,576	7,126	6,017	4,918
Humacao South	18,084	14,856	12,444	10,014	8,565	20,065	16,141	13,663	11,616	9,670	8,030
Humacao North	11,582	10,463	9,232	8,116	7,143	12,456	10,879	9,825	8,976	7,848	6,992
Carolina	56,634	51,835	48,323	43,904	38,323	60,119	55,324	51,452	45,451	41,247	36,514
Carolina Ramp NB	1,684	1,571	1,483	1,362	1,164	1,770	1,673	1,569	1,403	1,258	1,090
Carolina Ramp SB	1,437	1,307	1,221	1,124	952	1,518	1,384	1,295	1,162	1,037	883
Rio Grande	33,183	29,222	26,314	22,903	19,523	35,831	31,420	28,343	24,213	20,916	18,343
	405,774	**374,663**	**346,840**	**320,969**	**296,595**	**425,433**	**391,892**	**363,168**	**335,940**	**311,473**	**290,728**

Table A.8: Test 3 (Toll Rate Sensitivity) – Revenues (Annual Millions) – NOMINAL

	2022					2030					
Both Directions	**-25%**	**0%**	**25%**	**50%**	**75%**	**-25%**	**0%**	**25%**	**50%**	**75%**	**100%**
Guaynabo	$ 3.12	$ 3.45	$ 3.51	$ 3.37	$ 3.36	$ 3.43	$ 3.80	$ 3.83	$ 3.95	$ 3.83	$ 3.66
Montehiedra	$ 1.55	$ 1.57	$ 1.61	$ 1.68	$ 1.66	$ 1.69	$ 1.73	$ 1.74	$ 1.82	$ 1.82	$ 1.83
Caguas North	$ 22.93	$ 30.35	$ 36.76	$ 42.81	$ 49.00	$ 24.14	$ 30.80	$ 37.64	$ 43.91	$ 49.53	$ 55.74
Caguas South	$ 9.59	$ 12.78	$ 15.98	$ 19.17	$ 22.37	$ 9.73	$ 12.97	$ 16.21	$ 19.45	$ 22.70	$ 25.94
Salinas	$ 11.11	$ 14.49	$ 17.90	$ 21.37	$ 24.86	$ 11.25	$ 14.61	$ 18.04	$ 21.42	$ 24.94	$ 28.45
Salinas Ramp	$ 0.78	$ 1.02	$ 1.24	$ 1.47	$ 1.63	$ 0.80	$ 1.05	$ 1.26	$ 1.51	$ 1.72	$ 1.87
Juana Diaz ORT EB	$ 4.27	$ 5.43	$ 6.40	$ 7.27	$ 8.00	$ 4.40	$ 5.58	$ 6.65	$ 7.58	$ 8.44	$ 9.13
Juana Diaz ORT WB	$ 3.27	$ 4.18	$ 4.92	$ 5.64	$ 6.38	$ 3.38	$ 4.29	$ 5.13	$ 5.83	$ 6.59	$ 7.32
Ponce	$ 10.02	$ 11.92	$ 13.16	$ 13.92	$ 14.23	$ 10.53	$ 12.59	$ 14.17	$ 15.21	$ 15.70	$ 16.14
Hucar	$ 3.25	$ 3.89	$ 4.52	$ 4.99	$ 5.50	$ 3.37	$ 4.01	$ 4.73	$ 5.23	$ 5.73	$ 6.27
Guayama	$ 2.84	$ 3.34	$ 3.87	$ 4.26	$ 4.46	$ 2.92	$ 3.45	$ 4.01	$ 4.41	$ 4.71	$ 4.99
Ceiba	$ 3.61	$ 3.74	$ 3.60	$ 3.55	$ 3.44	$ 3.80	$ 4.19	$ 3.99	$ 3.98	$ 3.92	$ 3.43
Humacao South	$ 5.16	$ 5.66	$ 5.86	$ 5.59	$ 5.57	$ 5.72	$ 6.15	$ 6.49	$ 6.55	$ 6.29	$ 5.98
Humacao North	$ 3.27	$ 3.94	$ 4.34	$ 4.58	$ 4.71	$ 3.52	$ 4.10	$ 4.62	$ 5.06	$ 5.16	$ 5.26
Carolina	$ 23.90	$ 29.18	$ 33.96	$ 37.01	$ 37.51	$ 25.38	$ 31.15	$ 36.16	$ 38.28	$ 40.44	$ 40.72
Carolina Ramp NB	$ 0.36	$ 0.45	$ 0.53	$ 0.58	$ 0.57	$ 0.38	$ 0.47	$ 0.56	$ 0.60	$ 0.62	$ 0.61
Carolina Ramp SB	$ 0.31	$ 0.37	$ 0.44	$ 0.48	$ 0.47	$ 0.32	$ 0.39	$ 0.46	$ 0.50	$ 0.52	$ 0.50
Rio Grande	$ 9.52	$ 11.19	$ 12.50	$ 13.01	$ 12.84	$ 10.28	$ 12.03	$ 13.47	$ 13.73	$ 13.79	$ 13.62
	$ 118.86	**$ 146.97**	**$ 171.09**	**$ 190.77**	**$ 206.55**	**$ 125.05**	**$ 153.36**	**$ 179.15**	**$ 199.02**	**$ 216.44**	**$ 231.45**

Control Information

Prepared by

Steer

+1 (617) 391 2300
www.steergroup.com

Prepared for

Authority
Puerto Rico Highway and Transportation Authority (PRHTA)

Steer project/proposal number

24038401

Client contract/project number

Author/originator

Alejandro Obregon

Reviewer/approver

Dave Cuneo

Other contributors

Liza Rios Berrios
Manuel Castillo
Alex Malerba
Oszkar Lovas
Tom Caulfield
Sekai Zengeza
Henry Kosch
Jeandres Chu

Distribution

Client: PRHTA Steer:

Version control/issue number

First Draft without Appendix
Final version with updated macroeconomics and appendix
Updated disclaimer and new title
New version with minor edits

Date

Dec 8 2021
Jan 17 2022
February 9 2022
March 15 2022

steer

QUALITY SYSTEM CERTIFICATION
DNV·GL
ISO 9001:2015

steergroup.com

steer