

## APPENDIX C – BENEFIT-COST ANALYSIS

### East Loop Tiger II Discretionary Grant Application

#### Introduction

This report presents additional information on benefit-cost analysis for the East Loop Project. This benefit-cost analysis attempts to measure the dollar value of the benefits and costs of the Project to all members of society (residents of the United States) on a NPV basis. The Project is being built in two sections with independent utility. Section 3 of the East Loop Project would not require any Tiger II Grant funding and a portion of Section 2 would require \$23 million of Tiger II Grant funding. The \$23 million of Tiger II Grant funding, that is requested to complete the construction of Section 2 of the Project, is 19 percent of the total funding for the East Loop Project. This benefit-cost analysis only focuses on Section 2 of the Project; since this section has independent utility (see **Figure 1**). The limits of Section 2 of the Project are from FM 3068 to the Port of Brownsville (7.6 miles). As the analysis below indicates, the \$23 million in TIGER II Grant funding will return over \$42 million in benefits, an approximately 2:1 benefit ratio.

The study area for this benefit-cost analysis covers the eastern portion of the City of Brownsville that is located at the southern end of Cameron County adjacent to the United States border with Mexico. **Figure 1** shows the study area, defined as:

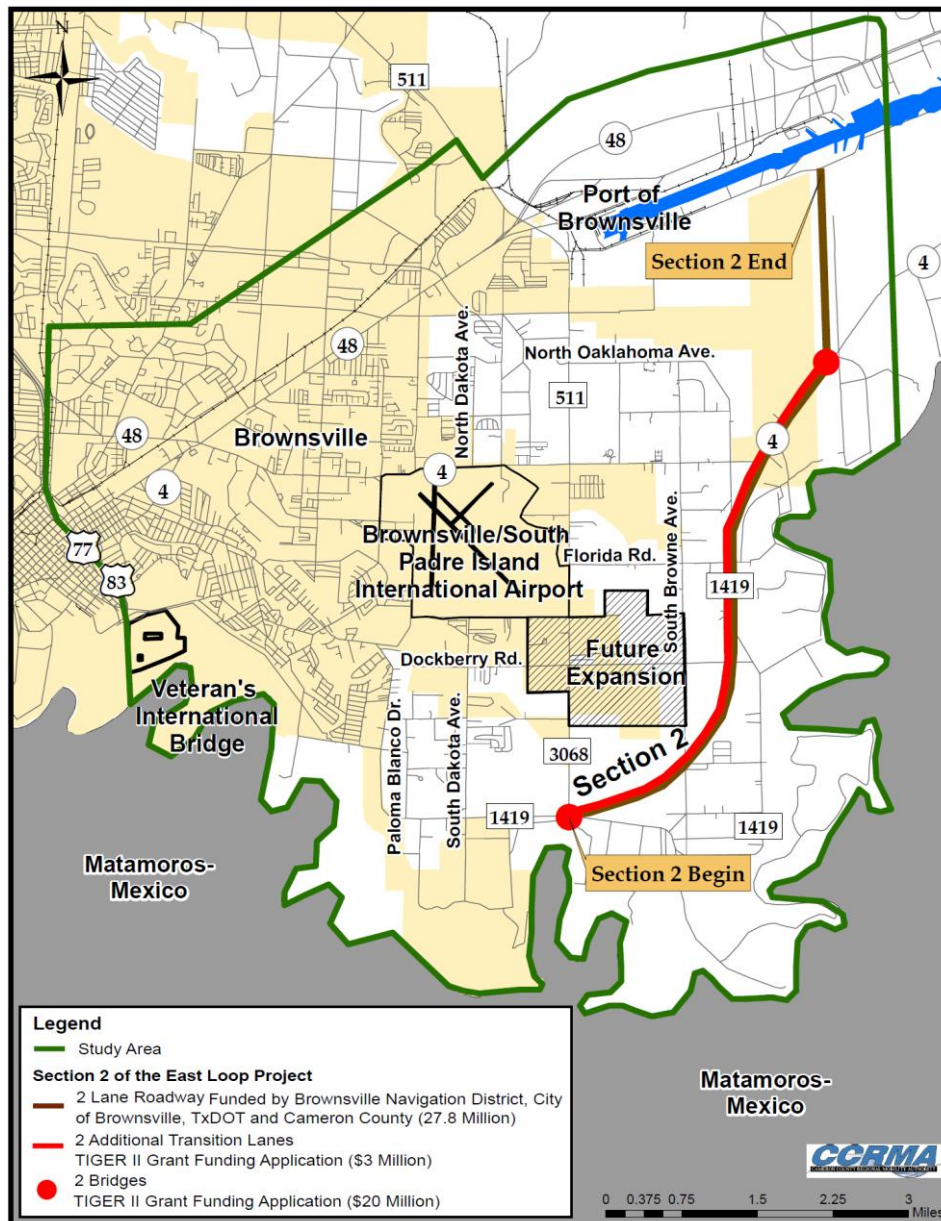
- Western boundary – U.S. 77/83
- Eastern boundary – The Rio Grande River (United States border with Mexico) and approximately 0.8 miles to the east of the City of Brownsville city boundary
- Northern boundary – Approximately 1.0 miles north of State Highway (SH) 48 from U.S. 77/83 to FM 511 and approximately 0.5 miles north of SH 48 from FM 511 to the eastern boundary of the study area
- Southern boundary – The Rio Grande River (United States border with Mexico)

This report includes four sections. **Report Section 1** presents a project summary that provides a starting point for the benefit-cost analysis. **Report Section 2** presents the No-Build scenario that provide a “base case” that the benefits and costs of Section 2 of the Project (Build scenario) were measured against; and **Report Section 3** presents the quantifying and monetizing of the full range of future costs and benefits of the Tiger II Grant funded portion of Section 2 of the Project. **Report Section 4** presents the discounting of future benefits and costs to present the NPV of the net benefits and a conclusion stating the extent to which the benefits of the Tiger Grant funded portion of Section 2 of the Project will exceed the costs on a NPV basis.

#### 1. Project Summary

This section provides a starting point for the benefit-cost analysis and includes summaries of the current infrastructure, description of Section 2 of the Project, general justification for Section 2 of the Project, population that will benefit from Section 2 of the Project, the economic effects of Section 2 of the Project, project benefits, and the project funding. **Figure 1** presents Section 2 of the Project and study area

**Figure 1. Section 2 of the East Loop Project and Study Area**



Source: HNTB, 2010.

***Current Infrastructure***

Today, approximately 5.45 miles of the project area is undeveloped land and approximately 2.15 miles consists of existing two-lane roadways. Current infrastructure in the project area includes the following:

- Southern portion from FM 3068 to Dockberry Road – This 2.5 mile portion of the project area consists of undeveloped land with two intersecting roadways. The two intersecting

roadways include South Browne Avenue; a two-lane north-south collector that intersects the project area approximately 1.3 miles northeast of FM 3068 and Dockberry Road; a two-lane east-west secondary arterial that intersects the project area about 2.5 miles northeast of FM 3068.

- Central portion from Dockberry Road to SH 4 – This 2.0 mile portion of the project area consists of 0.95 miles of undeveloped land and 1.05 miles of FM 1419 (two-lane primary arterial). Florida Road is an east- west collector that intersects FM 1419 in the project area approximately 1.0 mile north of Dockberry Road.
- Northern portion from SH 4 to the Port of Brownsville – This 3.1 mile portion of the project area consists of 1.1 miles of SH 4 (two-lane primary arterial) and approximately 2.0 miles of undeveloped land.

### ***Proposed Project***

Section 2 of the Project would be approximately 7.6 miles from FM 3068 to the Port of Brownsville and include a new non-tolled, 4-lane divided highway (interim construction of 2 lanes) with bridges at FM 3068 and SH 4 (see **Figure 1**). Approximately 1.1 miles of Section 2 of the Project will be located in the City of Brownsville and approximately 6.5 miles will be located in unincorporated Cameron County.

### ***Justification for the Proposed Project***

The new roadway and bridges will reduce long-term maintenance and repair of the overburdened streets and highways in the study area, reduce travel times on congested streets and highways, improve livability by eliminating the high number of hazardous and overweight truck traffic traveling through school zones, and significantly improve safety by reducing vehicle crashes in the study area. The project will also result in reduced freight travel times for this National Export Initiative project.

### ***Population that will Benefit from the Proposed Project***

The population that will benefit from Section 2 of the Project includes the following:

- Truck traffic that currently uses the SH 48/SH 4 corridor to access the Port of Brownsville and the Veteran’s International Bridge at Los Tomates and truck traffic that currently uses FM 511 to access the Brownsville-South Padre Island Airport.
- Passenger vehicle users within the study area that use the transportation network that currently serves the Port of Brownsville, the Veteran’s International Bridge at Los Tomates, and the Brownsville-South Padre Island Airport (FM 511, SH 48, SH 4, FM 1419 and FM 3068).
- Children attending schools in six school zones along SH 4 (2 Elementary, 3 Intermediate and 1 High School).

- Residents of the City of Brownsville and Cameron County.

### ***Economic Effects of the Proposed Project***

The economic effects of Section 2 of the Project include the following:

- The areas immediately adjacent to the Port of Brownsville and the Brownsville-South Padre Island International Airport will see increased economic growth.
- The international movement of goods will be facilitated through the improvement of facilities to the Port of Brownsville and the Brownsville/South Padre Island International Airport.
- Improved access to the Port of Brownsville and the Brownsville/South Padre Island International Airport will help in reducing the cost of moving services, goods, and people.

### ***Project Benefits***

This section summarizes Section 2 of the Project's expected benefits with respect to state of good repair, economic competitiveness, safety and livability within the Brownsville and Cameron County area. **Report Section 3** presents the quantifying and monetizing of each of these benefits.

### ***State of Good Repair***

Section 2 of the Project is expected to improve the state of good repair of roads within the study area by reducing long-term maintenance and repair costs of the overburdened streets and highways in the study area, since the project would remove overweight truck traffic from these overburdened streets and highways. Currently, overweight truck traffic predominantly use the transportation network that serves the Port of Brownsville, the Veteran's International Bridge, and the Brownsville-South Padre Island Airport (FM 511, SH 48/SH 4, FM 1419 and FM 3068). Section 2 (from FM 3068 to the Port of Brownsville) of the East Loop Project would provide a facility capable of handling the significant amount of truck traffic between the Port, Bridge and Airport and greatly reduce the maintenance needs on FM 511, SH 48/SH 4, FM 1419 and FM 3068. The reinforced concrete pavement on the East Loop Corridor will also reduce maintenance costs.

### ***Economic Competitiveness***

Section 2 of the Project is expected to improve the economic competitiveness of the City of Brownsville and Cameron County by reducing travel times for passenger vehicle users within the study area, since a significant amount of trucks on congested streets and highways would shift their route to Section 2 of the Project that would provide a facility capable of handling a significant amount of truck traffic. In addition passenger vehicle users and truck traffic is

expected to experience travel time savings, since Section 2 of the Project would redirect truck traffic from congested streets and highways within the study area to a roadway specifically designed for truck traffic.

***Safety and Livability***

Section 2 of the Project is expected to significantly improve safety by reducing vehicle crashes in the study area, since the project will remove truck traffic from the transportation network that currently serves the Port of Brownsville, the Veteran’s International Bridge, and the Brownsville-South Padre Island Airport (FM 511, SH 48, FM 1419 and FM 3068). The transportation network that currently serves the Port, Bridge and Airport has crash rates that vastly exceed the statewide crash rates for similar facilities. In addition, Section 2 of the Project is expected to improve the livability within the study by eliminating hazardous and overweight truck traffic from six school zones (2 Elementary, 3 Intermediate and 1 High School).

***Project Funding***

The Cameron County Regional Mobility Authority’s (CCRMA’s) General Engineering Consultant (GEC) has developed a preliminary estimate of the development capital costs required to implement Section 2 of the Project. The estimated total project cost for Section 2 of the Project is approximately \$50.8 million. **Table 1** presents a breakdown of the funding sources that was identified by the CCRMA.

**Table 1. Funding Sources for the Proposed Project**

<b>Source</b>	<b>Estimate</b>	<b>Status</b>
<b>Brownsville Navigation District</b>	\$7 million	Committed
<b>City of Brownsville</b>	\$1.5 million	Committed
<b>Texas Department of Transportation (TxDOT)</b>	\$14.3 million	Committed
<b>Cameron County</b>	\$5 million	Committed
<b>Tiger II Grant</b>	\$23.0 million	Pending
<b>Total</b>	<b>\$50.8 million</b>	

Source: HNTB, 2010.

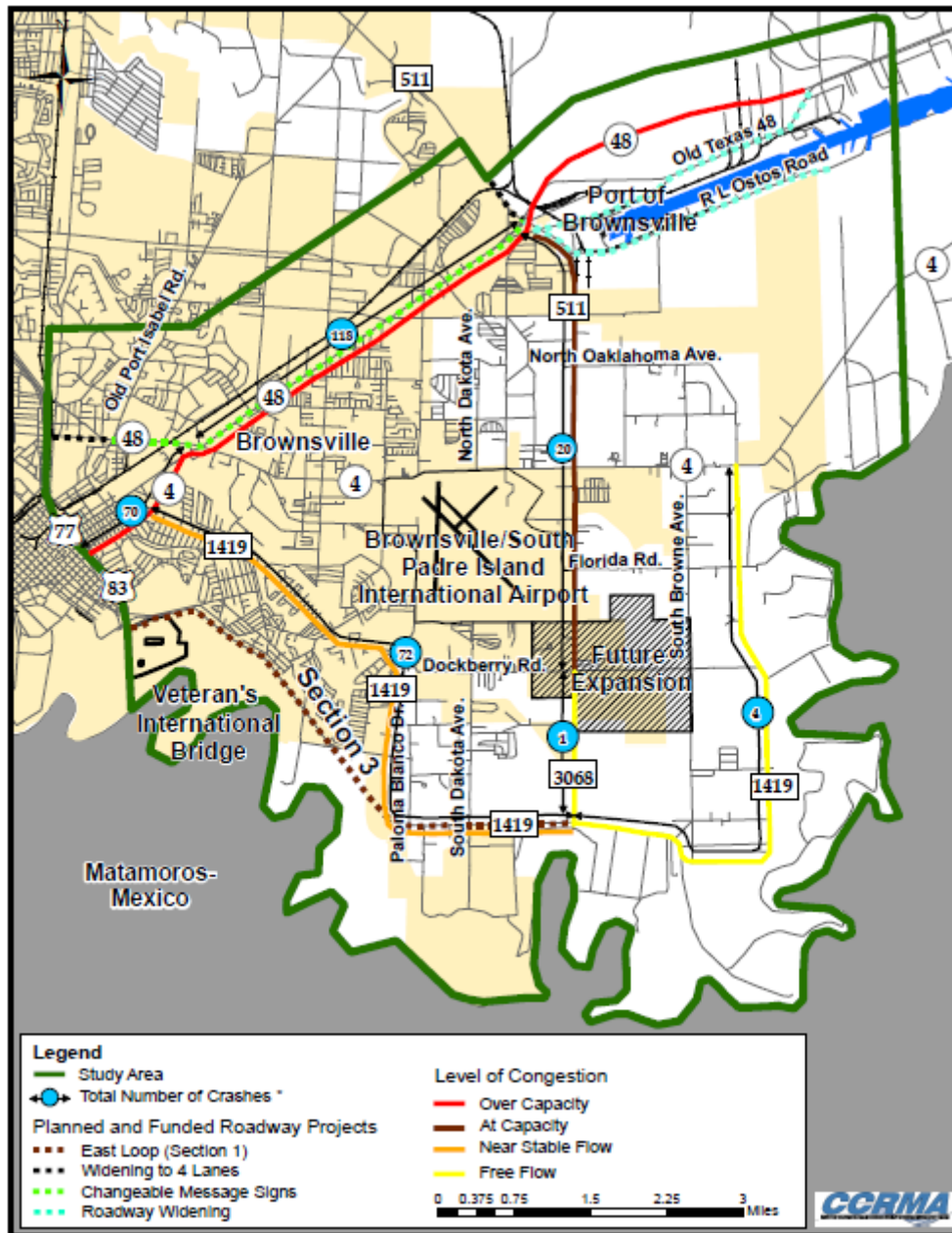
The total cost of Section 2 of the Project is estimated at \$50.8 million. The CCRMA has identified \$27.8 million in funding from local and state funds. The Tiger II Grant request of \$23 million would fill the gap needed to complete Section 2 of the Project.

**2. No-Build Scenario**

This section describes the No-Build scenario that includes an assessment of the way the study area would look if Section 2 of the Project does not get built (if the project does not receive the requested Tiger II Grant funding). The No-Build scenario includes the existing conditions and any projected changes that would occur even if Section 2 of the Project were not funded (see **Figure 2**). The purpose of the No-Build scenario assessment was to provide a baseline that

Section 2 of the Project costs and benefits were measured against (see **Section 3**). The conditions for the No-Build scenario are based on data from the Brownsville MPO and the Texas Department of Transportation. This section summarizes the road network, travel time, and crashes for the No-Build scenario.

**Figure 2. No-Build Scenario**



Sources: HNTB, 2010; Texas Department of Transportation, 2010; and 2010-2035 Brownsville MTP, 2009; and the Brownsville MPO 1999 and 2030 Travel Demand Model (TDM).

\* The total number of crashes for the No-Build scenario includes the average of the total crashes from 2006 to 2009.

### ***Road Network***

The study area roadway network for the No-Build scenario includes approximately 328.9 miles of roadway. Approximately 328.0 miles of the roadway network includes existing roadways and approximately 0.9 miles includes new planned and funded roadways. The following planned and funded roadway projects are included in the 2010 - 2035 Brownsville Metropolitan Transportation Plan (MTP) (see **Figure 2**):

- East Loop (Section 1) from the Veteran's International Bridge to FM 3068 (approximately 0.9 miles will be new roadway and the remainder of the project will be improvements to the existing roadway).
- Widening of SH 48 to four lanes from U.S. 77/83 to Old Port Isabel Road.
- Widening of FM 511 to four lanes from the northern boundary of the study area to SH 48.
- Intelligent Transportation Systems (ITS) improvements that include the installation of changeable message signs along SH 48 from Old Port Isabel Road to FM 511.
- Widening of Capt. Donald L. Foust Road and Old Texas 48 from FM 511 to SH 48.
- Widening of R L Ostos Road from FM 511 to approximately 1.8 miles east of Coffee Port Road.

The road network within the study area includes one expressway (U.S. 77/83), primary arterials, secondary arterials, collectors and local streets. Primary arterials within the study area include FM 511, FM 3068 FM 1419, SH 4 and SH 48. The secondary arterials and collectors within the study area are constituted of a grid system with major east-west and north-south secondary arterials and collectors at one-mile intervals and the large majority of the local streets within the study area serve the residential areas that are located on the western portion of the study area.

### ***Level of Traffic Congestion***

Passenger vehicles and trucks that use the transportation network that currently serves the Port of Brownsville, the Veteran's International Bridge, and the Brownsville-South Padre Island Airport (FM 511, SH 48, SH 4, FM 1419 and FM 3068) experience significant levels of congestion that results in significant travel delays. The volume-to-capacity (V/C) is the ratio of the number of vehicles using the road to the capacity of the road and is an indicator of the level of congestion on a roadway. **Table 2** presents the 2015 V/C ratio for the five roadways that are included in the transportation network that currently serves the Port of Brownsville, Veteran's International Bridge, and the Brownsville-South Padre Island Airport.

**Table 2. Congestion on Roadways within the Study Area (2015)**

Roadway	Limits	V/C Ratio	LOS	Level of Congestion
<b>SH 48/SH 4</b>	Port of Brownsville to Veteran's International Bridge	1.03	F	Over Capacity
<b>FM 1419</b>	SH 4 to FM 3068 (West)	0.79	D	Near Stable Flow
<b>FM 1419</b>	SH 4 to FM 3068 (East)	0.15	A	Free Flow
<b>FM 511</b>	SH 48 to FM 3068	0.90	E	At Capacity
<b>FM 3068</b>	FM 511 to FM 1419	0.23	A	Free Flow

Brownsville MPO, 2010.

**Crashes**

Under the No-Build scenario, the crash rates on SH 48 and SH 4 located in the northern portion on the study area compare very unfavorably with the statewide rates for 2008. For a State highway, the statewide crash rate was 85.99 crashes per one hundred vehicle miles for an urban roadway and 199.68 crashes per one hundred vehicle miles for a rural roadway. Based on year 2008 crashes for SH 48 between FM 511 and SH, a 3.88-mile segment with an average Annualized Daily Traffic of 21,725 vehicles, at one hundred million vehicle miles this segment of roadway would have a crash rate of 445.3 crashes per one hundred million vehicle miles. For the segment of SH 4 between SH 48 and U.S. 77/83, a 1.55 mile segment with an average Annualized Average Daily Traffic of 32,333 vehicles, the crash rate would be 382.7 crashes per one hundred million vehicle miles.

**Table 3** illustrates the crashes and associated fatalities and injuries occurring on SH 48, SH 4 and additional roadways in the network serving the Port of Brownsville and the Veteran's Memorial International Bridge, and Brownsville-South Padre Island Airport that are located within the study area.

**Table 3. Crash Data on Roadways within the Study Area (2006 to 2009)**

Roadway	Limits	Total Collisions	Fatalities	Injuries (includes possible and unknown injuries)
<b>SH 48</b>	FM 511 to SH 4	471	2	387
<b>SH 4</b>	SH 48 to U.S. 77/U.S. 83	279	0	216
<b>FM 1419</b>	SH 4 to FM 3068 (West)	289	4	247
<b>FM 1419</b>	SH 4 to FM 3068 (East)	15	1	10
<b>FM 511</b>	SH 48 to FM 3068	78	1	65
<b>FM 3068</b>	FM 511 to FM 1419	4	0	6
<b>TOTALS</b>		<b>1136</b>	<b>8</b>	<b>931</b>

Source: Texas Department of Transportation Traffic Operations, Data Analysis; year 2009 not certified.



### 3. Project Benefits and Costs (Build Scenario)

This section describes the benefits and costs of the Build scenario that includes an assessment of the way the study area would look if Section 2 of the Project gets built (if the project receives the requested Tiger II Grant funding). The full range of undiscounted benefits and costs discussed in this section were measured against the No-Build scenario (see **Report Section 2**). Construction letting for Section 2 of the Project could begin as early as the second quarter of 2013, with construction completed and the project open to traffic by early 2015, therefore, the beginning point of the year-by-year stream of benefits and costs is 2013 (the first year in which the project will start generating benefits or costs) and the ending point is 2030 (the usable life of Section 2 of the Project without capital improvement). Benefits of Section 2 of the Project are expected to accrue over an assumed 15-year project lifespan (2015 to 2030). This section presents the quantifying and monetizing of the full range of future benefits and costs of Section 2 of the Project from 2013 to 2030.

#### **Project Benefits**

This section presents the quantifying and monetizing of the full range of benefits of Section 2 of the Project. The benefits of Section 2 of the Project were quantified by comparing the conditions under the Build scenario with the No-Build scenario and monetized by applying standard dollar values to the quantities. A life-cycle (2013 to 2030) benefit analysis approach was used in estimating the benefits of Section 2 of the Project. The benefits are discussed for each of the long-term outcomes of Section 2 of the Project that includes state of good repair, economic competitiveness, safety and livability.

#### ***State of Good Repair***

When comparing the Build scenario with the No-Build scenario, Section 2 of the Project is expected to reduce long-term maintenance and repair costs of the transportation network that currently serves the Port of Brownsville, Veteran's International Bridge, and the Brownsville-South Padre Island Airport (FM 511, SH 48, SH 4, FM 1419 and FM 3068). The long-term maintenance and repair costs of the current transportation network that serves the Port, Bridge and Airport will reduce, since a significant number of vehicles and trucks will use Section 2 of the Project to access the Port, Bridge or Airport to avoid traffic congestion.

**Figure 2** shows Section 1 of the East Loop Project that is included in the No-Build scenario. Section 2 of the East Loop Project (see **Figure 1**) will complete the East Loop Project to provide a roadway that connects the Port of Brownsville, the Veteran's International Bridge, and the Brownsville/South Padre Island International Airport. The completed Section 2 of the East Loop Project will provide congestion relieve on the transportation network that currently serves the Port, Bridge and Airport and is the only project included in the 2010-2035 Brownsville MTP that will provide congestion relieve on the transportation network that currently serves the Port, Bridge and Airport. The current congestion levels of this transportation network are shown in **Figure 2**. A significant number of vehicles and trucks are expected to use Section 2 of the Project to access the Port, Bridge or Airport to avoid traffic congestion. The reduced number of vehicles and trucks on the current transportation network will result in a reduction in long-term

maintenance and repair costs of the roadways included in the network, since the vehicle- miles-travelled (VMT) on the network will reduce. The analysis of the long-term maintenance and repair costs as a result of Section 2 of the Project are based on the following assumptions:

- The long-term maintenance and repair benefits were calculated for the entire East Loop Project and proportionally allocated to the proportion of the East Loop Project cost that would be funded by the Tiger II Grant. The Tiger II Grant portion is 30 percent of the total cost for the East Loop Project.
- 1999 and 2030 Brownsville MPO TDM data was used to estimate the 2015 and 2030 VMT on the transportation network that currently serves the Port, Bridge and Airport (see **Tables 4 and 5**).
- The total VMT on the transportation network that currently serves the Port, Bridge and Airport for 2015 and 2030 were estimated by applying a 2.55 percent annual growth rate to the 1999 Brownsville MPO VMT. The 2.55 percent growth rate is based on the VMT growth for the Brownsville MPO model from 1999 to 2030.
- 5 percent (2,589) of the daily vehicles on the transportation network that serves the Port, Bridge and Airport under the No-Build scenario are trucks; therefore 5 percent of the VMT under the No-Build scenario are truck travel.
- 75 percent of the trucks that use the transportation network that currently serves the Port, Bridge and Airport will use the East Loop Project after completion.
- 6,000 vehicles on the transportation network that currently serves the Port, Bridge and Airport are estimated to use East Loop (Section 2) in the first year after completion (2015).
- 20,000 vehicles on the transportation network that currently serves the Port, Bridge and Airport are estimated to use East Loop (Section 2) in 2030.
- The monetary value of long-term maintenance and repair were obtained from a publication regarding the evaluation of truck impacts on pavement maintenance costs that was published by the University of California, Davis Institute of Transportation Studies in 1990. The results of the study indicate that, on a typical roadway, the average annual maintenance cost per heavy truck per day amounts to approximately \$7.60 per mile per year and the corresponding cost per passenger car is approximately \$0.08. The 1990 annual maintenance cost was adjusted to reflect the maintenance cost in the opening year (2015) by applying a 2.55 percent annual growth factor. The 2015 maintenance cost that was used in this analysis per heavy truck per day amounts to \$14.26 per mile per year and the corresponding cost per passenger car is \$0.150.

As mentioned earlier, the long term maintenance and repair costs of the transportation network is based on the VMT. **Table 4** shows a comparison of the VMT for the No-Build and Build

scenario in the opening year (2015). In 2015 the Build scenario will result in a reduction of 41,705 VMT on the transportation network that currently serve the Port, Airport, and Bridge.

**Table 4. Build and No-Build VMT Comparison in the Opening Year (2015)**

Roadway	Limits	No-Build	Build	VMT Reduction
		VMT	VMT	
<b>SH 48/SH 4</b>	Port of Brownsville to US 77/83	205,858	182,005	-23,854
<b>FM 1419</b>	SH 4 to FM 3068 (West)	104,496	92,388	-12,108
<b>FM 1419</b>	SH 4 to FM 3068 (East)	7,221	6,384	-837
<b>FM 511</b>	SH 48 to FM 3068	39,378	34,815	-4,563
<b>FM 3068</b>	FM 511 to FM 1419	2,957	2,615	-343
<b>Total</b>		<b>359,911</b>	<b>318,206</b>	<b>-41,705</b>

**Table 5** shows a comparison of the VMT for the No-Build and Build scenario in 2030. In 2030 the Build scenario will result in a reduction of 139,016 VMT on the transportation network that currently serve the Port, Airport, and Bridge.

**Table 5. VMT Change in the Opening Year (2030)**

Roadway	Limits	No-Build	Build	VMT Reduction
		VMT	VMT	
<b>SH 48/SH 4</b>	Port of Brownsville to US 77/83	300,333	220,820	-79,513
<b>FM 1419</b>	SH 4 to FM 3068 (West)	152,453	112,091	-40,362
<b>FM 1419</b>	SH 4 to FM 3068 (East)	10,535	7,746	-2,789
<b>FM 511</b>	SH 48 to FM 3068	57,450	42,240	-15,210
<b>FM 3068</b>	FM 511 to FM 1419	4,314	3,172	-1,142
<b>Total</b>		<b>525,086</b>	<b>386,069</b>	<b>-139,016</b>

**Table 6** shows a comparison of the Build and No-Build scenario for the life-cycle (2013 to 2030) of the East Loop Project and the total value of maintenance reductions for both the East Loop Project and the Tiger II Grant portion of the Project. The total undiscounted benefits as a result of the Tiger II Grant portion of the East Loop Project are \$2,589,374.

**Table 6. No-Build and Build VMT Comparison (2013 to 2030)**

Calendar Year	Project Year	Daily VMT		Reduction in VMT	Truck VMT	Personal Vehicle VMT	Total Value of Maintenance Reductions (US Dollars)	Total (Tiger II Grant Portion)*
		No-Build	Build					
2013	1	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2014	2	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2015	3	359,911	318,206	41,705	17,996	23,709	\$260,173	\$78,052
2016	4	369,089	322,343	46,746	20,171	26,575	\$291,621	\$87,486
2017	5	378,500	326,533	51,967	22,424	29,543	\$324,194	\$97,258
2018	6	388,152	330,778	57,374	24,757	32,617	\$357,925	\$107,377
2019	7	398,050	335,079	62,972	27,172	35,799	\$392,846	\$117,854
2020	8	408,200	339,435	68,766	29,672	39,093	\$428,993	\$128,698
2021	9	418,610	343,847	74,762	32,260	42,502	\$466,402	\$139,921
2022	10	429,284	348,317	80,967	34,937	46,030	\$505,109	\$151,533
2023	11	440,231	352,845	87,385	37,707	49,679	\$545,151	\$163,545
2024	12	451,457	357,432	94,024	40,571	53,453	\$586,568	\$175,970
2025	13	462,969	362,079	100,890	43,534	57,356	\$629,398	\$188,819
2026	14	474,775	366,786	107,989	46,597	61,391	\$673,683	\$202,105
2027	15	486,881	371,554	115,327	49,764	65,563	\$719,464	\$215,839
2028	16	499,297	376,384	122,912	53,037	69,876	\$766,784	\$230,035
2029	17	512,029	381,277	130,751	56,419	74,332	\$815,688	\$244,706
2030	18	525,086	386,069	139,016	59,986	79,031	\$867,249	\$260,175
<b>Total</b>		<b>7,002,520</b>	<b>5,618,967</b>	<b>1,383,553</b>	<b>597,003</b>	<b>786,550</b>	<b>\$8,631,247</b>	<b>\$2,589,374</b>

Note: The long-term maintenance costs of Section 2 of the Project and the portion of Section 2 of the Project that will be funded by the Tiger II Grant are included in the Project Costs Section of this document.

N/A – The Project would not result in any maintenance cost reductions from 2013 to 2015, since the Project will be under construction.

\* The Tiger II Grant portion of the maintenance costs saved for the Project is based on the proportion of the total cost of the Project that would need Tiger II Grant funding (30 percent).

### ***Economic Competitiveness***

When comparing the Build scenario with the No-Build scenario, Section 2 of the Project is expected to relieve congestion and generate travel time savings for personal vehicle and truck users of the transportation network that currently serve the Port of Brownsville, Veteran's International Bridge, and the Brownsville-South Padre Island Airport (FM 511, SH 48, SH 4, FM 1419 and FM 3068). The personal vehicle users will experience reduced travel times since overweight truck traffic will be redirected from the transportation network that currently serves the Port, Bridge and Airport to Section 2 of the Project and truck users will experience reduced travel times, since their mobility will increase by using Section 2 of the Project. In addition, a significant amount of personal vehicle users that currently use the transportation network the serves the Port, Bridge and Airport are expected to use the Section 2 of the Project to avoid congestion on the current transportation network.

**Figure 2** shows Section 3 of the East Loop Project that is included in the No-Build scenario. Section 2 of the Project (see **Figure 1**) will complete the East Loop Project to provide a roadway that connects the Port of Brownsville, the Veteran’s International Bridge, and the Brownsville/South Padre Island International Airport. The completed East Loop Project will provide congestion relieve on the transportation network that currently serves the Port, Bridge and Airport and is the only project included in the 2010-2035 Brownsville MTP that will provide congestion relieve on the transportation network that currently serves the Port, Bridge and Airport. The analysis of the value of travel time savings as a result of Section 2 of the Project is based on the following assumptions.

- The value of travel time savings were calculated for the entire East Loop Project and proportionally allocated to the proportion of the Project cost that would be funded by the Tiger II Grant. The Tiger II Grant portion is 30 percent of the total cost for the East Loop Project.
- 1999 and 2030 Brownsville MPO TDM data was used to estimate the 2015 and 2030 V/C ratios and Average Annual Daily Travel (AADT) on the transportation network that currently serves the Port, Bridge and Airport (see **Tables 7 and 8**).
- The total AADT on the transportation network that currently serves the Port, Bridge and Airport for 2015 and 2030 were estimated by applying a 2.55 percent annual growth rate to the 1999 Brownsville MPO AADT. The 2.55 percent growth rate is based on the VMT growth for the Brownsville MPO model from 1999 to 2030.
- 6,000 vehicles on the transportation network that currently serves the Port, Bridge and Airport are estimated to use East Loop (Section 2) in the first year after completion (2015).
- 20,000 vehicles on the transportation network that currently serves the Port, Bridge and Airport are estimated to use East Loop (Section 2) in 2030.
- The Speed for the No-Build and Build scenarios were calculated by using the BPR (Bureau of Public Roads) function.

$$\text{Speed} = \text{Free-Flow Speed} / (1 + 0.15 * (V/C) ^ 4)$$

Where,

v = Traffic Volume

c = Capacity of Facility

- The travel time for the No-Build scenario and the Build scenario were calculated using the appropriate speed, AADT and length of the roadway segment affected by the Project and the total value of time saved was calculated by multiplying the value of time with the travel time saved in the Build scenario.

$$\text{Travel Time} = \text{Affected AADT} * (\text{Affected Length} / \text{Speed})$$

$$\text{Total Value of Time Saved} = \text{Value of Time} * \text{Travel Time Saved Build}$$

- The capacity of the completed Section 2 of the Project will be 28,000 AADT and the free-flow speed will be 50 miles per hour.
- The monetary values of the cost associated with congestion were obtained from the U.S. Department of Transportation Office of the Assistant Secretary for Transportation Policy. Periodically, the U.S. Department of Transportation estimates the benefit of travel time savings due the traffic congestion. The benefit of reducing travel time is measured by the value of time. In February 2003, the U.S. Department of Transportation estimated the value of time for all purpose local surface travel to be \$11.20 per hour (2000 U.S. \$ per person-hour).

As mentioned earlier, the value of the travel time saved for the transportation network is based on the V/C ratio and the length of the roadway segment affected by the Project. **Table 7** shows a comparison of the V/C ratios and travel time for the No-Build and Build scenario in the opening year (2015). In 2015 the Build scenario will slightly increase the travel time for the transportation network from 3,537,399 to 3,563,168, since the East Loop Project will be longer than the other roadways that serve the Port, Bridge and Airport and users of the East Loop Project will experience slightly longer travel times. A significant number of users (6000 vehicles and trucks) are expected to use the East Loop Project, since it will be less congested than the other roadways in the network. However, in 2016 the total travel time will be lower for the Build scenario when compared to the No-build scenario.

**Table 7. Travel Time Savings in Opening Year (2015)**

Roadway	Limits	No-Build		Build		Travel Time Saved (Build Scenario)
		V/C Ratio	Travel Time (Hours)	V/C Ratio	Travel Time (Hours)	
<b>SH 48/SH 4</b>	Port of Brownsville to U.S. 77/U.S.83	1.03	2,114,143	0.91	1,766,291	347,852
<b>FM 1419</b>	SH 4 to FM 3068 (West)	0.79	979,601	0.70	848,155	131,446
<b>FM 1419</b>	SH 4 to FM 3068 (East)	0.15	58,560	0.13	51,773	6,787
<b>FM 511</b>	SH 48 to FM 3068	0.90	361,092	0.80	308,238	52,854
<b>FM 3068</b>	FM 511 to FM 1419	0.23	24,003	0.21	21,219	2,784
<b>East Loop Project</b>	Port of Brownsville to Veteran's Intl. Bridge	N/A	N/A	0.24	567,492	-567,492
<b>Total</b>			<b>3,537,399</b>		<b>3,563,168</b>	<b>-25,769</b>

N/A – The East Loop Project is not included in the No-Build scenario  
 Source: Brownsville MPO, 2010

**Table 8** shows a comparison of the V/C ratios and travel time for the No-Build and Build scenario in 2030. In 2030 the Build scenario will result in a reduction of 595,160 hours in travel time when compared to the No-Build scenario.

**Table 8. Travel Time Savings in 2030**

Roadway	Limits	No-Build		Build		Travel Time Saved (Build Scenario)
		V/C Ratio	Travel Time (Hours)	V/C Ratio	Travel Time (Hours)	
<b>SH 48/SH 4</b>	Port of Brownsville to US 77/83	1.41	4,203,468	1.11	2,398,149	1,805,319
<b>FM 1419</b>	SH 4 to FM 3068 (West)	0.97	1,529,575	0.86	1,077,514	452,060
<b>FM 1419</b>	SH 4 to FM 3068 (East)	0.21	85,491	0.16	63,125	22,366
<b>FM 511</b>	SH 48 to FM 3068	1.34	711,563	0.97	401,497	310,065
<b>FM 3068</b>	FM 511 to FM 1419	0.34	46,696	0.33	34,482	12,214
<b>East Loop Project</b>	Port of Brownsville to Veteran's Intl. Bridge	N/A	N/A	0.8	2,006,865	-2,006,865
<b>Total</b>			<b>6,576,792</b>		<b>5,981,632</b>	<b>595,160</b>

N/A – The East Loop Project is not included in the No-Build scenario

Source: Brownsville MPO, 2010.

**Table 9** shows a comparison of the Build and No-Build scenario for the life-cycle (2013 to 2030) of the East Loop Project and the total value of the travel time saved for both the East Loop Project and the Tiger II Grant portion of the Project. The total undiscounted benefits as a result of the Tiger II Grant portion of the Proposed Project are \$14,772,377.

**Table 9. No-Build and Build Travel Time Comparison (2013 to 2030)**

Calendar Year	Project Year	Affected Drivers	Travel Time (Hours)		Travel Time Saved (Build Scenario)	Total Value of Time Saved	Total Value of Tiger II Grant Portion
			No-Build	Build			
<b>2013</b>	1	N/A	N/A	N/A	N/A	N/A	N/A
<b>2014</b>	2	N/A	N/A	N/A	N/A	N/A	N/A
<b>2015</b>	3	51,779	3,537,399	3,563,168	-25,769	-\$288,610	-\$86,583
<b>2016</b>	4	53,141	3,686,678	3,683,959	2,718	\$30,443	\$9,133
<b>2017</b>	5	54,538	3,842,255	3,808,846	33,410	\$374,188	\$112,256
<b>2018</b>	6	55,973	4,004,399	3,937,966	66,433	\$744,049	\$223,215
<b>2019</b>	7	57,445	4,173,384	4,071,463	101,922	\$1,141,521	\$342,456
<b>2020</b>	8	58,956	4,349,501	4,209,485	140,016	\$1,568,177	\$470,453
<b>2021</b>	9	60,506	4,533,050	4,352,187	180,863	\$2,025,668	\$607,700
<b>2022</b>	10	62,097	4,724,345	4,499,726	224,619	\$2,515,730	\$754,719
<b>2023</b>	11	63,731	4,923,712	4,652,267	271,445	\$3,040,188	\$912,057
<b>2024</b>	12	65,407	5,131,493	4,809,978	321,514	\$3,600,959	\$1,080,288
<b>2025</b>	13	67,127	5,348,042	4,973,037	375,005	\$4,200,055	\$1,260,017
<b>2026</b>	14	68,892	5,573,729	5,141,623	432,106	\$4,839,591	\$1,451,877
<b>2027</b>	15	70,704	5,808,940	5,315,924	493,017	\$5,521,787	\$1,656,536
<b>2028</b>	16	72,564	6,054,078	5,496,133	557,944	\$6,248,975	\$1,874,692
<b>2029</b>	17	74,472	6,309,560	5,682,452	627,107	\$7,023,602	\$2,107,081
<b>2030</b>	18	76,490	6,575,823	5,981,632	594,191	\$6,654,936	\$1,996,481
<b>Total</b>			<b>78,576,386</b>	<b>74,179,846</b>	<b>4,396,541</b>	<b>\$49,241,258</b>	<b>\$14,772,377</b>

N/A – The Project would not result in any travel time savings in 2013 and 2014, since the Project will be under construction.

\* The Tiger II Grant portion of the value of time saved for the Project is based on the proportion of the total cost of the Project that would need Tiger II Grant funding (30 percent).

### *Safety and Livability*

When comparing the Build scenario with the No-Build scenario, Section 2 of the Project is expected to significantly reduce crashes (fatalities and injuries) and improve safety for personal vehicle users of the transportation network that currently serve the Port of Brownsville, Veteran's International Bridge, and the Brownsville-South Padre Island Airport (FM 511, SH 48, SH 4, FM 1419 and FM 3068). The personal vehicle users will experience reduced crashes since overweight truck traffic would be redirected from the transportation network that currently serves the Port, Bridge and Airport to Section 2 of the Project.

**Figure 2** shows Section 3 of the East Loop Project that is included in the No-Build scenario. Section 2 of the East Loop Project (see **Figure 1**) will complete the East Loop Project to provide a roadway specifically designed for trucks between the Port of Brownsville, the Veteran's International Bridge, and the Brownsville/South Padre Island International Airport. The completed East Loop Project will reduce crashes on the transportation network that currently serves the Port, Bridge and Airport and is the only project included in the 2010-2035 Brownsville MTP that will provide congestion relieve on the transportation network that currently serves the Port, Bridge and Airport. The analysis of safety and livability benefits as a result of Section 2 of the Project are based on the following assumptions:

- The value of the reduction in fatalities and injuries were calculated for the entire East Loop Project and proportionally allocated to the proportion of the East Loop Project cost that would be funded by the Tiger II Grant. The Tiger II Grant portion is 30 percent of the total cost for the East Loop Project.
- The total number of fatalities and injuries on the transportation network that currently serves the Port, Bridge and Airport for 2015 and 2030 were estimated by applying a 2.55 percent annual growth rate to the average annual fatalities and injuries between 2006 and 2009 (see **Table 10**). The 2.55 percent growth rate is based on the VMT growth for the Brownsville MPO model from 1999 to 2030.
- Fatalities and Injuries on the transportation network that currently serves the Port, Bridge and Airport will reduce by 50 percent as a result of the East Loop Project, since overweight trucks will be redirected from the current transportation network to the East Loop Project.
- The monetary values of loss associated with crashes were obtained from the U.S. Department of Transportation Office of the Assistant Secretary for Transportation Policy. Periodically, the U.S. Department of Transportation estimates the benefit of preventing fatal and non-fatal injuries due to motor vehicle crashes. The benefit of preventing a fatality is measured by the Value of a Statistical Life (VSL), defined as the value of improvements in safety that result in a reduction by one in the expected number of



fatalities. In March 2009, the U.S. Department of Transportation estimated the VSL to be \$6 million.

- The benefit of preventing a non-fatal injury is measured by a standardized method that interpolates values of expected outcomes, scaled in proportion to the VSL. Relative value coefficients for preventing injuries of varying severity and duration are based on the Abbreviated Injury Scale (AIS), which categorizes injuries into 5 levels ranging from minor (0.0020 of VSL) to critical (0.7625 of VSL). Since the severity of the injuries included in this benefit-cost analysis is unknown, the cost of an injury is assumed to be at 0.0155 of the VSL, therefore the cost of preventing an injury is estimated at \$93,000.

As mentioned earlier, the safety and livability benefits of the transportation network is based on the reduction in the number of injuries and fatalities. **Table 10** shows a comparison of the total fatalities and injuries for the No-Build and Build scenario and the reductions in fatalities and injuries as a result of the East Loop Project in the opening year (2015) and 2030. In 2015 the Build scenario will result in a reduction of one fatality and 135 injuries on the transportation network that serve the Port, Bridge and the Airport and in 2030 the Build scenario will result in a reduction of 2 fatalities and 198 injuries.

**Table 10. No-Build and Build Fatalities and Injuries Comparison (2015 to 2030)**

Year	Total Fatalities		Total Injuries		Reduction in Fatalities	Reduction in Injuries
	No-Build	Build	No-Build	Build		
2015	2	1	271	136	1	135
2030	3	1	395	198	2	197

Source: Texas Department of Transportation Traffic Operations, Data Analysis and HNTB, 2010.

**Table 11** shows a comparison of the Build and No-Build scenario for the life-cycle (2013 to 2030) of the East Loop Project and the total value of the reduction in injuries and fatalities for both the East Loop Project and the Tiger II Grant portion of the Project. The total undiscounted benefits as a result of the Tiger II Grant portion of Section 2 of the Project are \$114,888,600.

**Table 11. No-Build and Build Crash Comparison (2013 to 2030)**

Calendar Year	Project Year	Total Fatalities		Total Injuries		Reduction in Fatalities	Reduction in Injuries	Total Value (Reduction in Injuries and Fatalities)	Total Value of Tiger II Grant Portion*
		No-Build	Build	No-Build	Build				
2013	1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2014	2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2015	3	2	1	271	136	1	135	\$18,555,000	\$5,566,500
2016	4	2	1	278	139	1	139	\$18,927,000	\$5,678,100
2017	5	2	1	285	142	1	143	\$19,299,000	\$5,789,700
2018	6	2	1	292	146	1	146	\$19,578,000	\$5,873,400
2019	7	2	1	300	150	1	150	\$19,950,000	\$5,985,000

Calendar Year	Project Year	Total Fatalities		Total Injuries		Reduction in Fatalities	Reduction in Injuries	Total Value (Reduction in Injuries and Fatalities)	Total Value of Tiger II Grant Portion*
		No-Build	Build	No-Build	Build				
2020	8	2	1	307	154	1	153	\$20,229,000	\$6,068,700
2021	9	2	1	315	158	1	157	\$20,601,000	\$6,180,300
2022	10	2	1	323	162	1	161	\$20,973,000	\$6,291,900
2023	11	2	1	331	166	1	165	\$21,345,000	\$6,403,500
2024	12	3	1	340	170	2	170	\$27,810,000	\$8,343,000
2025	13	3	1	349	174	2	175	\$28,275,000	\$8,482,500
2026	14	3	1	357	179	2	178	\$28,554,000	\$8,566,200
2027	15	3	1	367	183	2	184	\$29,112,000	\$8,733,600
2028	16	3	1	376	188	2	188	\$29,484,000	\$8,845,200
2029	17	3	1	386	193	2	193	\$29,949,000	\$8,984,700
2030	18	3	1	395	198	2	197	\$30,321,000	\$9,096,300
<b>Total</b>		<b>39</b>	<b>16</b>			<b>23</b>		<b>\$382,962,000</b>	<b>\$114,888,600</b>

N/A – The Project would not result in any reductions in crash related fatalities or injuries in 2013 and 2014, since the Project would be under construction.

\* The Tiger II Grant portion of the pollution costs for the Project is based on the proportion of the total cost of the Project that would need Tiger II Grant funding (30 percent).

### Project Costs

This section presents the costs of Section 2 of the Project and the Tiger II funded portion of the Project. A life-cycle (2013 to 2030) cost analysis approach was used in estimating the costs of the Tiger II funded portion of the Project. Section 2 of the Project is expected to result in pollution costs (sustainability) and project construction, operation and maintenance costs.

### Sustainability

When comparing the Build scenario with the No-Build scenario, Section 2 of the Project is expected to slightly increase vehicle emissions on the transportation network that serves the Port of Brownsville, Veteran’s International Bridge, and the Brownsville-South Padre Island Airport. The vehicle emissions on the transportation network will slightly increase, since the annual VMT on the transportation network will slightly increase. Section 2 of the Project will decrease congestion on the current network and will allow traffic to bypass Brownsville on a longer roadway at higher speeds. Traffic bypassing Brownsville on a longer roadway will result in a slight increase in VMT on the transportation network.

**Figure 2** shows Section 3 of the East Loop Project that is included in the No-Build scenario. Section 2 of the East Loop Project (see **Figure 1**) will complete the East Loop Project to provide a longer roadway with decreased congestion between the Port of Brownsville, the Veteran’s International Bridge, and the Brownsville/South Padre Island International Airport. The completed East Loop Project is the only project included in the 2010-2035 Brownsville MTP that will provide congestion relieve on the transportation network that currently serves the Port, Bridge and Airport. A significant number of vehicles and trucks are expected to use the East Loop Project to access the Port, Bridge or Airport to avoid traffic congestion. The increased

number of vehicles and trucks that are expected to use the East Loop Project will result in an increase in pollution costs, since the annual VMT on the network will increase. The analysis of the pollution costs as a result of Section 2 of the Project is based on the following assumptions:

- The pollution costs were calculated for the East Loop Project and proportionally allocated to the proportion of the East Loop Project cost that would be funded by the Tiger II Grant. The Tiger II Grant portion is 30 percent of the total cost for the East Loop Project.
- 1999 and 2030 Brownsville MPO TDM data was used to estimate the 2015 and 2030 AADT and annual VMT on the transportation network that currently serves the Port, Bridge and Airport (see **Tables 12** and **13**).
- The total AADT and annual VMT on the transportation network that currently serves the Port, Bridge and Airport for 2015 and 2030 were estimated by applying a 2.55 percent annual growth rate to the 1999 Brownsville MPO AADT. The 2.55 percent growth rate is based on the VMT growth for the Brownsville MPO model from 1999 to 2030.
- 6,000 vehicles on the transportation network that currently serves the Port, Bridge and Airport are estimated to use East Loop (Section 2) in the first year after completion (2015).
- 20,000 vehicles on the transportation network that currently serves the Port, Bridge and Airport are estimated to use East Loop (Section 2) in 2030.
- The monetary values associated with the cost of pollution were obtained from the Victoria Transport Policy Institute (VTPI). According to the VTPI, the weighted fleet average air pollution health cost was 0.112 U.S. Dollars per VMT in 1990. The 1990 air pollution cost was adjusted to reflect the air pollution cost in the opening year (2015) by applying a 2.55 percent annual growth factor. The 2015 pollution cost that was used in this analysis is 0.210 U.S. Dollars per VMT.

As mentioned earlier, the pollution costs of the transportation network is based on the annual VMT. **Table 12** shows a comparison of the annual VMT for the No-Build and Build scenario in the opening year (2015). In 2015 the Build scenario will result in an increase of 13,138,309 annual VMT on the transportation network that currently serve the Port, Airport and Bridge.

**Table 12. Annual VMT Change in the Opening Year (2015)**

Roadway	Limits	No-Build	Build	Annual VMT Change
		Annual VMT	Annual VMT	
<b>SH 48/SH 4</b>	Port of Brownsville to US 77/83	75,138,326	66,431,683	-8,706,643
<b>FM 1419</b>	SH 4 to FM 3068 (West)	38,141,134	33,721,535	-4,419,598
<b>FM 1419</b>	SH 4 to FM 3068 (East)	2,635,590	2,330,191	-305,399
<b>FM 511</b>	SH 48 to FM 3068	14,373,065	12,707,588	-1,665,477
<b>FM 3068</b>	FM 511 to FM 1419	1,079,394	954,320	-125,075
<b>East Loop Project</b>	Port of Brownsville to Veteran’s Intl. Bridge	N/A	28,360,500	28,360,500
<b>Total</b>		<b>131,367,508</b>		<b>13,138,309</b>

N/A – The East Loop Project is not included in the No-Build scenario.  
 Source: Brownsville MPO, 2010.

**Table 13** shows a comparison of the annual VMT for the No-Build and Build scenario in 2030. In 2030 the Build scenario will result in an increase of 43,794,038 annual VMT on the transportation network that currently serve the Port, Airport, and Bridge.

**Table 13. Annual VMT Change in the Opening Year (2030)**

Roadway	Limits	No-Build	Build	Annual VMT Change
		Annual VMT	Annual VMT	
<b>SH 48/SH 4</b>	Port of Brownsville to US 77/83	109,621,687	80,599,359	-29,022,328
<b>FM 1419</b>	SH 4 to FM 3068 (West)	55,645,310	40,913,221	-14,732,089
<b>FM 1419</b>	SH 4 to FM 3068 (East)	3,845,146	2,827,144	-1,018,002
<b>FM 511</b>	SH 48 to FM 3068	20,969,320	15,417,695	-5,551,625
<b>FM 3068</b>	FM 511 to FM 1419	1,574,762	1,157,844	-416,918
<b>East Loop Project</b>	Port of Brownsville to Veteran’s Intl. Bridge	N/A	94,535,000	94,535,000
<b>Total</b>		<b>191,656,226</b>	<b>235,450,264</b>	<b>43,794,038</b>

N/A – The East Loop Project is not included in the No-Build scenario  
 Source: Brownsville MPO, 2010.

**Table 14** shows a comparison of the Build and No-Build scenario for the life-cycle (2013 to 2030) of the East Loop Project and the total value of the cost of pollution increases for both the East Loop Project and the Tiger II Grant portion of the Project. The total undiscounted costs as a result of the Tiger II Grant portion of the Project are \$27,032,572.

**Table 14. No-Build and Build Annual VMT Comparison (2013 to 2030)**

Calendar Year	Project Year	Annual VMT		Increase in Annual VMT	Total Value of Cost of Pollution	Total Value of Tiger II Grant Portion*
		No-Build	Build			
2013	1	N/A	N/A	N/A	N/A	N/A
2014	2	N/A	N/A	N/A	N/A	N/A
2015	3	131,367,508	144,505,817	13,138,309	\$2,759,045	\$827,713
2016	4	134,717,380	149,288,960	14,571,580	\$3,060,032	\$918,010
2017	5	138,152,673	154,230,424	16,077,752	\$3,376,328	\$1,012,898
2018	6	141,675,566	159,335,451	17,659,885	\$3,708,576	\$1,112,573
2019	7	145,288,293	164,609,455	19,321,162	\$4,057,444	\$1,217,233
2020	8	148,993,144	170,058,028	21,064,883	\$4,423,626	\$1,327,088
2021	9	152,792,469	175,686,948	22,894,479	\$4,807,841	\$1,442,352
2022	10	156,688,677	181,502,186	24,813,509	\$5,210,837	\$1,563,251
2023	11	160,684,239	187,509,909	26,825,670	\$5,633,391	\$1,690,017
2024	12	164,781,687	193,716,487	28,934,800	\$6,076,308	\$1,822,892
2025	13	168,983,620	200,128,502	31,144,883	\$6,540,425	\$1,962,128
2026	14	173,292,702	206,752,756	33,460,054	\$7,026,611	\$2,107,983
2027	15	177,711,666	213,596,272	35,884,606	\$7,535,767	\$2,260,730
2028	16	182,243,314	220,666,309	38,422,995	\$8,068,829	\$2,420,649
2029	17	186,890,518	227,970,364	41,079,846	\$8,626,768	\$2,588,030
2030	18	191,656,226	235,450,264	43,794,038	\$9,196,748	\$2,759,024
<b>Total</b>		<b>2,555,919,682</b>	<b>2,985,008,132</b>	<b>429,088,450</b>	<b>\$90,108,575</b>	<b>\$27,032,572</b>

N/A – The Project would not result in any pollution costs in 2013 and 2014, since the Project will be under construction.

\* The Tiger II Grant portion of the pollution costs for the Project is based on the proportion of the total cost of the Project that would need Tiger II Grant funding (30 percent).

### ***Project Construction, Operation and Maintenance Costs***

Section 2 of the Project will result in significant construction, operation and maintenance costs. **Table 15** presents the schedule of costs of Section 2 of the Project and the Tiger II Grant portion from 2013 to 2030. The total undiscounted costs of the Tiger II Grant portion of Section 2 of the Project are expected to be \$35,313,806.

**Table 15. Schedule of Costs of the Project**

<b>Calendar Year</b>	<b>Project Year</b>	<b>Construction Costs</b>	<b>Operations and Maintenance Costs*</b>	<b>Total (Section 2 of the Project)</b>	<b>Total (Tiger II Grant Portion)*</b>
<b>2013</b>	1	\$12,600,000	N/A	\$12,600,000	\$5,707,800
<b>2014</b>	2	\$23,100,000	N/A	\$23,100,000	\$10,464,300
<b>2015</b>	3	\$15,100,000	N/A	\$15,100,000	\$6,827,900
<b>2016</b>	4	N/A	\$1,313,400	\$1,313,400	\$594,970
<b>2017</b>	5	N/A	\$1,349,453	\$1,349,453	\$611,302
<b>2018</b>	6	N/A	\$1,430,096	\$1,430,096	\$647,833
<b>2019</b>	7	N/A	\$1,450,759	\$1,450,759	\$657,194
<b>2020</b>	8	N/A	\$1,755,068	\$1,755,068	\$795,046
<b>2021</b>	9	N/A	\$1,551,253	\$1,551,253	\$702,718
<b>2022</b>	10	N/A	\$2,043,943	\$2,043,943	\$925,906
<b>2023</b>	11	N/A	\$1,979,969	\$1,979,969	\$896,926
<b>2024</b>	12	N/A	\$1,742,761	\$1,742,761	\$789,471
<b>2025</b>	13	N/A	\$2,070,152	\$2,070,152	\$937,779
<b>2026</b>	14	N/A	\$1,722,775	\$1,722,775	\$780,417
<b>2027</b>	15	N/A	\$2,069,663	\$2,069,663	\$937,557
<b>2028</b>	16	N/A	\$1,818,852	\$1,818,852	\$823,940
<b>2029</b>	17	N/A	\$2,500,176	\$2,500,176	\$1,132,580
<b>2030</b>	18	N/A	\$2,384,474	\$2,384,474	\$1,080,167
<b>Total</b>		<b>\$50,800,000</b>	<b>\$27,182,794</b>	<b>\$77,982,794</b>	<b>\$35,313,806</b>

\* The Tiger II Grant portion of the construction, maintenance and operation costs for Section 2 of the Project is based on the proportion of the total cost of Section 2 of the Project that would need Tiger II Grant funding (45.3 percent).

N/A – The Section 2 of the Project would not result in any construction costs from 2016 to 2030 and any operations and maintenance costs from 2013 to 2015.

### **Discounting Project Benefits and Costs**

This section presents the discounting of future costs and benefits of the Tiger II Grant funded portion of Section 2 of the Project to present values. As mentioned earlier, the beginning point of the year-by-year stream of costs and benefits is 2013 (the first year in which Section 2 of the Project will start generating costs or benefits) and the ending point is 2030 (the usable life of Section 2 of the Project without capital improvement). The Tiger II Grant portion of Section 2 of the Project will result in net benefits with a NPV of approximately \$21,616,841 with a discount rate of 7 percent and approximately \$42,491,494 with a discount rate of 3 percent (see **Table 16**). The TIGER II Grant funding will provide approximately \$2 in benefits for every \$1 spent.

**Table 16. Discounting of Future Benefits and Costs (2013 to 2030)**

Calendar Year	Project Year	Total Value of Maintenance Costs Saved	Total Value of Travel Time Saved	Total Value of Reduction in Fatalities and Injuries	Pollution Costs	Project Construction, Operations and Maintenance Costs	Undiscounted Net Benefits of Tiger II Funding	Net Benefits of Tiger II Funding Discounted at 7%	Net Benefits of Tiger II Funding Discounted at 3%
2013	1	N/A	N/A	N/A	N/A	\$5,707,800	(\$5,707,800)	(\$4,659,265)	(\$5,223,446)
2014	2	N/A	N/A	N/A	N/A	\$10,464,300	(\$10,464,300)	(\$7,983,164)	(\$9,297,395)
2015	3	\$78,052	-\$86,583	\$5,566,500	\$827,713	\$6,827,900	(\$2,097,645)	(\$1,495,592)	(\$1,809,447)
2016	4	\$87,486	\$9,133	\$5,678,100	\$918,010	\$594,970	\$4,261,739	\$2,839,777	\$3,569,140
2017	5	\$97,258	\$112,256	\$5,789,700	\$1,012,898	\$611,302	\$4,375,014	\$2,724,539	\$3,557,287
2018	6	\$107,377	\$223,215	\$5,873,400	\$1,112,573	\$647,833	\$4,443,586	\$2,586,207	\$3,507,808
2019	7	\$117,854	\$342,456	\$5,985,000	\$1,217,233	\$657,194	\$4,570,883	\$2,486,258	\$3,503,201
2020	8	\$128,698	\$470,453	\$6,068,700	\$1,327,088	\$795,046	\$4,545,718	\$2,310,812	\$3,382,441
2021	9	\$139,921	\$607,700	\$6,180,300	\$1,442,352	\$702,718	\$4,782,851	\$2,272,298	\$3,455,233
2022	10	\$151,533	\$754,719	\$6,291,900	\$1,563,251	\$925,906	\$4,708,994	\$2,090,850	\$3,302,794
2023	11	\$163,545	\$912,057	\$6,403,500	\$1,690,017	\$896,926	\$4,892,159	\$2,030,072	\$3,331,322
2024	12	\$175,970	\$1,080,288	\$8,343,000	\$1,822,892	\$789,471	\$6,986,895	\$2,709,638	\$4,619,161
2025	13	\$188,819	\$1,260,017	\$8,482,500	\$1,962,128	\$937,779	\$7,031,429	\$2,548,514	\$4,513,207
2026	14	\$202,105	\$1,451,877	\$8,566,200	\$2,107,983	\$780,417	\$7,331,782	\$2,483,528	\$4,568,924
2027	15	\$215,839	\$1,656,536	\$8,733,600	\$2,260,730	\$937,557	\$7,407,688	\$2,345,084	\$4,481,773
2028	16	\$230,035	\$1,874,692	\$8,845,200	\$2,420,649	\$823,940	\$7,705,339	\$2,279,732	\$4,526,075
2029	17	\$244,706	\$2,107,081	\$8,984,700	\$2,588,030	\$1,132,580	\$7,615,877	\$2,105,853	\$4,343,228
2030	18	\$260,175	\$1,996,481	\$9,096,300	\$2,759,024	\$1,080,167	\$7,513,764	\$1,941,699	\$4,160,189
NPV		<b>\$2,589,374</b>	<b>\$14,772,377</b>	<b>\$114,888,600</b>	<b>\$27,032,572</b>	<b>\$35,313,806</b>	<b>\$69,903,973</b>	<b>\$21,616,841</b>	<b>\$42,491,494</b>

HNTB, 2010.