

Methodology to Prioritize Agriculture Transportation Projects

Methodology

Transportation infrastructure is vital to the agriculture sector and facilitates the movement of goods to market in an efficient, cost-saving manner. Researchers developed a methodology to prioritize transportation projects based on their impacts to agriculture. The analysis began by selecting projects from Texas Department of Transportation's (TxDOT's) 10-year transportation project plan, the Unified Transportation Program (UTP) and from TxDOT's Project Tracker. In cases where applicable UTP projects were not available, local projects were examined. Projects were selected based on their relative importance to freight truck traffic crossing the US-Mexico border. Once a project was selected, the cost, let year, and length of the project were obtained from the UTP. A benefit cost analysis was performed on each project. The portion of the benefits that impact the agriculture sector were identified and incorporated into a project prioritization factor. The project prioritization factor is not a benefit cost ratio, as it is not possible to allocate a specific portion of the total project cost to the agricultural sector. Rather, the project prioritization factor provides an estimate of the relative benefit to the agricultural sector per dollar spent on the transportation project.

Transportation Cost Savings Factors

The benefit cost analysis will calculate the vehicle operating cost savings, business and personal time and reliability cost savings, safety benefits, logistics/ freight cost savings, environmental benefits, and economic impacts in the form of business output and the positive effect of wage income. Appendix A shows the default values used in the analysis that were obtained from the Transportation Economic Development Impact System (TREDIS).¹ Other variables include:

- Cost: The total cost of the project in 2018 dollars
- Let Year: The year in which construction begins
- Discount Rate: Interest rate used to calculate the net present value of costs and benefits
- Length: The total distance of the project in miles
- Average Annual Daily Travel (AADT): The average number of vehicle trips on the project roadway each day
- Average Speed: The average speed of vehicles on the project roadway in miles per hour (mph)
- Truck Percent: The percent of vehicles on the project roadway that are commercial freight trucks
- Commodity Mix: The percentage of truck freight by each industry sector
- Project Type: Can be Urban, Suburban, or Rural, depending on the project

Data used to determine the traffic, speed, and congestion inputs was assembled from TxDOT's Design and Construction Information System (DCIS). The commodity mix of freight trucks was gathered from

¹ TREDIS® is an economic tool developed by EDR Group, Inc. www.tredis.com.

the Bureau of Transportation Statistics (BTS) import and export data.² These variables are explained in detail, below.

Project Prioritization Model

The first step of the project prioritization model is the cost calculation. An operation start year was determined by the let year and the number of years of construction. If the number of construction years was not available, then a construction time of 3 years was assumed along with an asset life of 30 years. The construction costs were then distributed evenly over the construction period and discounted. All costs and benefits assume a 3 percent discount rate.

The model then generates travel impact costs for the baseline (no-build) scenario and the project (build) scenario. The difference in costs between the baseline and project scenario is the cost savings or benefit of the project. These costs are calculated separately for passenger and truck travel.

In order to calculate these costs, first the number of trips, vehicle miles traveled (VMT), vehicle hours traveled (VHT), were calculated.

- Trips
 - Annual Trips = Average Annual Daily Traffic (AADT) x 365
 - Truck Trips = Annual Trips x Percent of Truck Traffic
 - Passenger Trips = Annual Trips – Truck Trips
- VMT = Trips x Project Length
- VHT = VMT / Average Speed³

Vehicle Operating Cost Savings

These variables were then used to calculate several annual truck and passenger vehicle costs for the baseline and project scenarios. Vehicle operating cost is the cost per hour of operating a passenger vehicle or truck. This factor includes maintenance, tires, mileage-based depreciation, and insurance. Fuel costs are also calculated and added. An increase in speed in the project scenario will result in less vehicles hours of travel, leading to less operating costs, consequently creating a benefit.

- Vehicle Operating Costs
 - Base Operating Cost (Truck and Passenger) = (VHT x Vehicle Operating Cost per Hour)
 - Fuel Operating Cost (Truck and Passenger) = (VHT x Gallons per Hour) x Fuel Cost per Gallon

Business and Personal Time and Reliability Cost Savings

Value of time is the crew cost for trucks and the personal time costs for passenger vehicles. Time-savings result from multiplying the number of crew or passengers per vehicle by the crew or passenger cost per hour factor from TREDIS for each crew- member/passenger, and then multiplying by the VHT in each scenario. The difference between the two scenario costs is the cost savings.

- Value of Time

² Bureau of Transportation Statistics. *Transborder Freight Data*. <https://www.bts.gov/transborder>

³ If the change in average speed is less than 1 mph between the baseline and project scenarios, the baseline speed is rounded down to the nearest mph and the project speed is the baseline speed plus 1 mph.

- Truck Business Time Cost = (Number of Crew per Vehicle x Crew Cost per hour per crew member) x Truck VHT
- Passenger Business Time Cost = (Number of Passengers per Vehicle x Passenger Cost per Hour per Passenger) x (Passenger VHT x Percentage of Business Personal Time)
- Personal Time Cost = (Passengers per Vehicle x Passenger Cost per Hour per Passenger) x (Passenger VHT x Percentage of Passenger Personal Time)

Environmental and Safety Benefits

Environmental costs are the truck and passenger vehicle emissions cost. Reduced congestion results in lower idle times for all vehicles, which reduces vehicles emissions per trip. Emission costs are calculated using the per hour rate for Volatile Organic Compounds (VOCs), Nitrogen Oxide (NOx), Sulfur Dioxide (Sox), Particulate Matter (PM), and Carbon Dioxide (CO₂). Safety costs are the truck and passenger property damage, injury, and fatality costs. The project scenarios assume a decrease in accident rates, based on the type of project, which reduces safety costs.

- Environmental Costs (Truck and Passenger)
 - VHT x Environmental Cost per Hour
- Safety Costs (Truck and Passenger)
 - ((VMT / 100,000,000) x Fatality Rate per 100m VMT) x \$ per Fatality
 - ((VMT / 100,000,000) x Injury Rate per 100m VMT) x \$ per Injury
 - ((VMT / 100,000,000) x Property Damage Rate per 100m VMT) x \$ per Property Damage

Logistics/ Freight Cost Savings

Logistics/ freight cost represents the time and shipping cost to industries that produce or consume the freight goods on the trucks moving through the port of entry (POE). The logistics/ freight cost savings consists of commodity time costs and a freight logistics factor. The commodity time cost for each commodity results from multiplying the tons per vehicle by the commodity percent of freight and then by the commodity cost per hour and the total VHT. The resulting commodity time cost is then multiplied by the freight logistics factor of \$1.67 per hour per US ton. This calculation repeats for each commodity moving through the POE. The cost per hour factor for each commodity are TREDIS factors and are updated to 2017 dollars based on the consumer price index. This captures the opportunity cost associated with freight travel time that can manifest as lost sales or late fees, handling and storage costs, or rises in production costs due to increases in extra inventory or materials. There is typically an increase in vehicle speeds resulting from the project scenario, which reduces total VHT. This generates a savings in logistics costs.

- Logistics Costs (Truck)
 - For each commodity:
 - Commodity Time Cost= Truck VHT x ((Tons per Vehicle x Commodity Percent of Freight) x Commodity Cost per Hour)
 - The Commodity Time Cost x Freight Logistics Factor

Transportation cost savings are calculated annually for both the baseline and project scenarios. The project costs are then subtracted from the baseline costs to produce annual project benefits for each

cost category. These annual benefits are discounted, then summed to provide total discounted project benefits for each cost category.

Economic Effects

The economic effects of the project are also calculated. These include the business output and wage income. Business output is associated with construction spending on the project and is presented as the sum of worker wages and business income. The positive economic effect of wage income is the impact of increased worker income associated with construction spending on the economy.

- Business Output = Discounted Construction Cost x Business Output Multiplier⁴
- Economic Effect of Wage Income = Discounted Construction Cost x Wage Income Multiplier⁵

Project Prioritization Factor

In order to calculate the benefits solely accrued by the agricultural sector, the project and baseline costs were calculated a second time, however only the truck trips attributable to agricultural sector activity were counted as represented by the percentage of freight attributable to agricultural sector commodities. This percentage was then applied to the total number of freight trips, to determine the number of agricultural sector trips. The cost savings were then calculated a second time using this focused number of trips. This resulted in total benefits that are directly accrued to the agricultural sector.

The total benefits and costs are shown in the final results table for each project. Each benefit is summed to calculate the total discounted benefit. The total discounted benefits are then divided by the total discounted costs to calculate the benefit cost ratio of the project. A benefit cost ratio of greater than 1.0 is positive indicating that the benefits of building the project outweigh the cost. The agricultural sector only benefits are also divided by the cost of the project to calculate the project prioritization factor. The project prioritization factor is not a cost benefit ratio, as it is not possible to allocate a specific portion of the total project cost to the agricultural sector. Rather, the project prioritization factor provides an estimate of the relative benefit to the agricultural sector per dollar spent on the transportation project.

⁴Business Output Multiplier changes based on Urban, Suburban, or Rural classification

⁵Wage Income Multiplier changes based on Urban, Suburban, or Rural classification

Lower Rio Grande Projects

For the purposes of this study, the Lower Rio Grande Region includes the Pharr International Bridge and the Progreso International Bridge. Two projects relevant to the Pharr bridge were selected, while the third was near the Progreso bridge. The results display the total benefits, costs, and benefit/cost ratio of the project as a whole. Also displayed are the benefits directly accrued by the agricultural sector, as well as the project prioritization factor, which shows the return to the agricultural sector per dollar spent on the project.

Project 1: US 281

The first project examined in the Lower Rio Grande Valley was a 10-mile stretch US 281 in northern Hidalgo County, from 0.7 miles south of SH 186 to 0.3 miles north of FM 490. This project would expand the existing stretch of US 281 into a rural expressway facility. This should facilitate freight movement from the Pharr International Bridge. The project is expected to begin construction in 2022. The total benefits of this project are estimated at \$177 million. Benefits solely to the agricultural sector are calculated at \$3.60 million, with a project prioritization factor of 0.06.

Benefits and Costs	Present Value (2018 \$ mil)
Vehicle Operating Cost Savings	\$5
Business Time and Reliability Cost Savings	\$5
Personal Time and Reliability Cost Savings	\$2
Safety Benefits	\$4
Logistics/Freight Cost Savings	\$4
Environmental Benefits	\$0
Business Output	\$109
Positive Economic Effect of Wage Income	\$49
Total Benefits	\$177
Capital Costs	\$65
Total Costs	\$65
Benefit/Cost Ratio	2.72
<i>Total Agriculture Benefits</i>	<i>\$3.60</i>
Project Prioritization Factor	0.06

Project 2: FM 1015

The second project examined in the Lower Rio Grande Valley was a 4.4-mile stretch of FM 1015 north of Weslaco. The project runs from Mile 12 Road to SH 107. This project would expand the road from a rural four lane undivided road to an urban four lane divided road. This should facilitate freight movement from the Progreso International Bridge. This project is expected to begin construction in 2025. The total benefits of the project are estimated at \$21 million. Benefits solely to the agricultural sector are calculated at \$0.49 million, with a project prioritization factor of 0.07.

Benefits and Costs	Present Value (2018 \$ mil)
Vehicle Operating Cost Savings	\$1
Business Time and Reliability Cost Savings	\$1
Personal Time and Reliability Cost Savings	\$0
Safety Benefits	\$1
Logistics/Freight Cost Savings	\$0
Environmental Benefits	\$0
Business Output	\$12
Positive Economic Effect of Wage Income	\$6
Total Benefits	\$21
Capital Costs	\$7
Total Costs	\$7
Benefit/Cost Ratio	3.10
<i>Total Agriculture Benefits</i>	<i>\$0.49</i>
Project Prioritization Factor	0.07

Project 3: West Hi Line Road

The third project examined in the Lower Rio Grande Valley was a 1.3-mile stretch of West Hi Line Road in Pharr. The project runs from US 281 (Cage Blvd) to South Jackson Road. This project would expand the existing two-lane road into a divided 5-lane road. This should facilitate freight movement near the Pharr International Bridge. The project is expected to begin construction in 2020. This is not a TxDOT sponsored project. Traffic counts were available from the Hidalgo County Regional Mobility Authority (HCRMA). Researchers estimated the percent truck traffic and operating speeds based on the location and roadway classification. The analysis assumes no existing congestion. The total benefits of this project are estimated at \$16 million. Benefits solely to the agricultural sector are calculated at \$0.96 million, with a project prioritization factor of 0.18.

Benefits and Costs	Present Value (2018 \$ mil)
Vehicle Operating Cost Savings	\$1
Business Time and Reliability Cost Savings	\$1
Personal Time and Reliability Cost Savings	\$0
Safety Benefits	\$0
Logistics/Freight Cost Savings	\$1
Environmental Benefits	\$0
Business Output	\$9
Positive Economic Effect of Wage Income	\$4
Total Benefits	\$16
Capital Costs	\$5
Total Costs	\$5
Benefit/Cost Ratio	3.02
<i>Total Agriculture Benefits</i>	<i>\$0.96</i>
Project Prioritization Factor	0.18

Lower Rio Grande Summary

Individual project benefits to the agriculture sector range from \$490,000 to \$3.60 million for the Lower Rio Grande Valley sample of projects. This represents the amount of the total project benefits that directly impact trucks moving agriculture products. The project prioritization factors for the sample set of projects range from 0.06 to 0.18 (Table 1).

Table 1. Lower Rio Grande Valley Project Results

Project	Total Agriculture Benefits	Project Prioritization Factor
US 281	\$3.60	0.06
FM 1015	\$0.49	0.07
West Hi Line Road	\$0.96	0.18

While the US 281 project has the highest agriculture benefits, it does not have the highest project prioritization factor. The West Hi Line Road project has the highest project prioritization factor, indicating that for every dollar spent on the West Hi Line Road project, \$0.18 in benefits would be

accrued to the agriculture sector. The greater the project prioritization factor, the greater the relative impact on agriculture. While the US 281 project produced the greatest amount of agriculture benefits, it also comprises the largest construction cost of the sample, lowering its project prioritization factor.

Laredo Projects

For the purposes of this study, the Laredo Region focuses on the World Trade Bridge. Three projects relevant to the World Trade Bridge were selected. The results display the total benefits, costs, and benefit/cost ratio of the project as a whole. Also displayed are the benefits directly accrued by the agricultural sector, as well as the project prioritization factor, which shows the return to the agricultural sector per dollar spent on the project.

Project 1: US 59

The first project examined in Laredo was a 23.4 mile stretch of US 59 east of Laredo. The project runs from 7.6 miles west of FM 2895 to the Duval County line. This project would widen the existing highway to provide passing lanes, which should facilitate freight movement to and from the World Trade Bridge in Laredo. The project is expected to begin in 2023. The total benefits of this project are estimated at \$99 million. Benefits solely to the agricultural sector are calculated at \$0.39 million, with a project prioritization factor of 0.01.

Benefits and Costs	Present Value (2018 \$ mil)
Vehicle Operating Cost Savings	\$2
Business Time and Reliability Cost Savings	\$2
Personal Time and Reliability Cost Savings	\$1
Safety Benefits	\$1
Logistics/Freight Cost Savings	\$2
Environmental Benefits	\$0
Business Output	\$63
Positive Economic Effect of Wage Income	\$28
Total Benefits	\$99
Capital Costs	\$38
Total Costs	\$38
Benefit/Cost Ratio	2.62
<i>Total Agriculture Benefits</i>	<i>\$0.39</i>
Project Prioritization Factor	0.01

Project 2: SH 359

The second project examined in Laredo was a 12.6 mile stretch of SH 359 east of Laredo. The project runs from 8.9 miles east of SL 20 to 1.5 miles west of FM 2895. This project would widen the existing highway to provide passing lanes, which should facilitate freight movement to and from the World Trade Bridge in Laredo. The project is expected to begin in 2027. The total benefits of this project are estimated at \$28 million. Benefits solely to the agricultural sector are calculated at \$0.20 million, with a project prioritization factor of 0.02.

Benefits and Costs	Present Value (2018 \$ mil)
Vehicle Operating Cost Savings	\$1
Business Time and Reliability Cost Savings	\$2
Personal Time and Reliability Cost Savings	\$1
Safety Benefits	\$2
Logistics/Freight Cost Savings	\$1
Environmental Benefits	\$0
Business Output	\$15
Positive Economic Effect of Wage Income	\$7
Total Benefits	\$28
Capital Costs	\$9
Total Costs	\$9
Benefit/Cost Ratio	3.15
<i>Total Agriculture Benefits</i>	<i>\$0.20</i>
Project Prioritization Factor	0.02

Project 3: IH 69

The third project examined in Laredo was a 1.75 mile stretch of IH 69 in Laredo, just east of the World Trade Bridge. The project runs from the World Trade Bridge to IH 35. This project would widen the existing highway to six lanes, which should facilitate freight movement across the World Trade Bridge in Laredo. The project is expected to begin in 2027. The total benefits of this project are estimated at \$38 million. Benefits solely to the agricultural sector are calculated at \$0.73 million, with a project prioritization factor of 0.08.

Benefits and Costs	Present Value (2018 \$ mil)
Vehicle Operating Cost Savings	\$3
Business Time and Reliability Cost Savings	\$3
Personal Time and Reliability Cost Savings	\$1
Safety Benefits	\$1
Logistics/Freight Cost Savings	\$4
Environmental Benefits	\$0
Business Output	\$18
Positive Economic Effect of Wage Income	\$8
Total Benefits	\$38
Capital Costs	\$10
Total Costs	\$10
Benefit/Cost Ratio	3.96
<i>Total Agriculture Benefits</i>	<i>\$0.73</i>
Project Prioritization Factor	0.08

Laredo Summary

Individual project benefits to the agriculture sector range from \$200,000 to \$730,000 for the Laredo sample of projects. This represents the amount of the total project benefits that directly impact trucks moving agriculture products. The project prioritization factors for the sample set of projects range from 0.01 to 0.08 (Table 2).

Table 2. Laredo Project Results

Project	Total Agriculture Benefits	Project Prioritization Factor
US 59	\$0.39	0.01
SH 359	\$0.20	0.02
IH 69	\$0.73	0.08

The IH 69 project has the highest total agriculture benefits, as well as the highest project prioritization factor. For every dollar spent on the IH 69 project, \$0.08 in benefits would be accrued to the agriculture sector. The greater the project prioritization factor, the greater the relative impact on agriculture.

El Paso Projects

For the purposes of this study, the El Paso Region focuses on the Bridge of the Americas and the Ysleta-Zaragoza International Bridge. Two projects relevant to the Bridge of the Americas were selected, while the project selected was relevant to the Ysleta-Zaragoza Intern. The results display the total benefits, costs, and benefit/cost ratio of the project as a whole. Also displayed are the benefits directly accrued by the agricultural sector, as well as the project prioritization factor, which shows the return to the agricultural sector per dollar spent on the project.

Project 1: IH 10 (US 62 to Airway Blvd)

The first project examined in El Paso was a 1.7 mile stretch of IH 10 through El Paso, east of the Bridge of the Americas. The project runs from US 62 to Airway Boulevard. This project would add one lane in each direction from restriping, which should facilitate freight movement across the Bridge of the Americas in El Paso. The project is expected to begin in 2025. The total benefits of this project are estimated at \$54 million. Benefits solely to the agricultural sector are calculated at \$0.43 million, with a project prioritization factor of 0.07.

Benefits and Costs	Present Value (2018 \$ mil)
Vehicle Operating Cost Savings	\$7
Business Time and Reliability Cost Savings	\$12
Personal Time and Reliability Cost Savings	\$6
Safety Benefits	\$8
Logistics/Freight Cost Savings	\$4
Environmental Benefits	\$0
Business Output	\$12
Positive Economic Effect of Wage Income	\$5
Total Benefits	\$54
Capital Costs	\$6
Total Costs	\$6
Benefit/Cost Ratio	8.60
<i>Total Agriculture Benefits</i>	<i>\$0.43</i>
Project Prioritization Factor	0.07

Project 2: IH 10 (NM/TX State Line to SH 20)

The second project examined in El Paso was an 11.1 mile stretch of IH 10 through El Paso, west of the Bridge of the Americas. The project runs from the New Mexico State line to SH 20. This project would expand the interstate from four to six lanes, which should facilitate freight movement across the Bridge of the Americas in El Paso. The project is expected to begin in 2021. The total benefits of this project are estimated at \$221 million. Benefits solely to the agricultural sector are calculated at \$1.76 million, with a project prioritization factor of 0.03.

Benefits and Costs	Present Value (2018 \$ mil)
Vehicle Operating Cost Savings	\$19
Business Time and Reliability Cost Savings	\$25
Personal Time and Reliability Cost Savings	\$12
Safety Benefits	\$23
Logistics/Freight Cost Savings	\$15
Environmental Benefits	\$0
Business Output	\$91
Positive Economic Effect of Wage Income	\$37
Total Benefits	\$221
Capital Costs	\$55
Total Costs	\$55
Benefit/Cost Ratio	4.04
<i>Total Agriculture Benefits</i>	<i>\$1.76</i>
Project Prioritization Factor	0.03

Project 3: FM 659

The third project examined in El Paso was a 3.9 mile stretch of FM 659 through El Paso, northeast of the Ysleta-Zaragoza International Bridge. The project runs from IH 10 to Loop 375. This project would expand the road from four to six lanes, which should facilitate freight movement across the Ysleta-Zaragoza International Bridge. The project is expected to begin in 2024. The total benefits of this project are estimated at \$107 million. Benefits solely to the agricultural sector are calculated at \$0.75 million, with a project prioritization factor of 0.03.

Benefits and Costs	Present Value (2018 \$ mil)
Vehicle Operating Cost Savings	\$13
Business Time and Reliability Cost Savings	\$20
Personal Time and Reliability Cost Savings	\$11
Safety Benefits	\$3
Logistics/Freight Cost Savings	\$6
Environmental Benefits	\$0
Business Output	\$39
Positive Economic Effect of Wage Income	\$16
Total Benefits	\$107
Capital Costs	\$23
Total Costs	\$23
Benefit/Cost Ratio	4.58
<i>Total Agriculture Benefits</i>	<i>\$0.75</i>
Project Prioritization Factor	0.03

El Paso Summary

Individual project benefits to the agriculture sector range from \$430,000 to \$1.76 million for the El Paso sample of projects. This represents the amount of the total project benefits that directly impact trucks moving agriculture products. The project prioritization factors for the sample set of projects range from 0.03 to 0.07 (Table 3).

Table 3. El Paso Project Results

Project	Total Agriculture Benefits	Project Prioritization Factor
IH 10 (1)	\$0.43	0.07
IH 10 (2)	\$1.76	0.03
FM 659	\$0.75	0.03

The second IH 10 project has the highest total agriculture benefits at \$1.76 million, while the first IH 10 project has the highest project prioritization factor at 0.07. For every dollar spent on the project, \$0.07 in benefits would be accrued to the agriculture sector. The greater the project prioritization factor, the greater the relative impact on agriculture.

New Mexico Projects

Three border related projects in New Mexico were selected, focusing on the Santa Theresa Port of Entry and the Columbus Port of Entry. The results display the total benefits, costs, and benefit/cost ratio of the project as a whole. Also displayed are the benefits directly accrued by the agricultural sector, as well as the project prioritization factor, which shows the return to the agricultural sector per dollar spent on the project.

Project 1: Airport Road

The first project examined in New Mexico was a 1 mile stretch of Airport Road north of the Santa Theresa Port of Entry. The project runs from NM 136 to Industrial Drive. This project would expand the road to 4 lanes, which should facilitate freight movement through the Santa Theresa Port of Entry. The project is expected to begin in 2018. The total benefits of this project are estimated at \$8 million. Benefits solely to the agricultural sector are calculated at \$0.04 million, with a project prioritization factor of 0.01.

Benefits and Costs	Present Value (2018 \$ mil)
Vehicle Operating Cost Savings	\$0
Business Time and Reliability Cost Savings	\$0
Personal Time and Reliability Cost Savings	\$0
Safety Benefits	\$0
Logistics/Freight Cost Savings	\$0
Environmental Benefits	\$0
Business Output	\$5
Positive Economic Effect of Wage Income	\$2
Total Benefits	\$8
Capital Costs	\$3
Total Costs	\$3
Benefit/Cost Ratio	2.83
<i>Total Agriculture Benefits</i>	<i>\$0.04</i>
Project Prioritization Factor	0.01

Project 2: NM 273

The second project examined in New Mexico was a 0.9 mile stretch of NM 273 east of the Santa Theresa Port of Entry. The project runs from Racetrack Road to Corishain Bridge. This project would expand the road to 4 lanes and add a center turn lane, which should facilitate freight movement east of the Santa Theresa Port of Entry. The project is expected to begin in 2020. The total benefits of this project are estimated at \$14 million. Benefits solely to the agricultural sector are calculated at \$0.10 million, with a project prioritization factor of 0.02.

Benefits and Costs	Present Value (2018 \$ mil)
Vehicle Operating Cost Savings	\$1
Business Time and Reliability Cost Savings	\$1
Personal Time and Reliability Cost Savings	\$0
Safety Benefits	\$0
Logistics/Freight Cost Savings	\$0
Environmental Benefits	\$0
Business Output	\$8
Positive Economic Effect of Wage Income	\$3
Total Benefits	\$14
Capital Costs	\$5
Total Costs	\$5
Benefit/Cost Ratio	2.84
<i>Total Agriculture Benefits</i>	<i>\$0.10</i>
Project Prioritization Factor	0.02

Project 3: NM 11

The third project examined in New Mexico was a 1.3 mile stretch of NM 11 North of the Columbus Port of Entry, through Deming. The project runs from Dona Ana Road to Walnut Street. This project would expand the road to three lanes, which should facilitate freight movement North of the Columbus Port of Entry. The project is expected to begin in 2020. The total benefits of this project are estimated at \$13 million. Benefits solely to the agricultural sector are calculated at \$0.76 million, with a project prioritization factor of 0.17.

Benefits and Costs	Present Value (2018 \$ mil)
Vehicle Operating Cost Savings	\$1
Business Time and Reliability Cost Savings	\$1
Personal Time and Reliability Cost Savings	\$0
Safety Benefits	\$0
Logistics/Freight Cost Savings	\$0
Environmental Benefits	\$0
Business Output	\$7
Positive Economic Effect of Wage Income	\$3
Total Benefits	\$13
Capital Costs	\$4
Total Costs	\$4
Benefit/Cost Ratio	2.92
<i>Total Agriculture Benefits</i>	<i>\$0.76</i>
Project Prioritization Factor	0.17

New Mexico Summary

Individual project benefits to the agriculture sector range from \$40,000 to \$760,000 for the New Mexico sample of projects. This represents the amount of the total project benefits that directly impact trucks moving agriculture products. The project prioritization factors for the sample set of projects range from 0.01 to 0.17 (Table 4).

Table 4. New Mexico Project Results

Project	Total Agriculture Benefits	Project Prioritization Factor
Airport Road	\$0.04	0.01
NM 273	\$0.10	0.02
NM 11	\$0.76	0.17

The NM 11 project has the highest total agriculture benefits at \$760,000, as well as the highest project prioritization factor at 0.17. For every dollar spent on the project, \$0.17 in benefits would be accrued to the agriculture sector. The greater the project prioritization factor, the greater the relative impact on agriculture.

Arizona Projects

Three border related projects in Arizona were selected, focusing on the Nogales Port of Entry and the San Luis Port of Entry. The results display the total benefits, costs, and benefit/cost ratio of the project as a whole. Also displayed are the benefits directly accrued by the agricultural sector, as well as the project prioritization factor, which shows the return to the agricultural sector per dollar spent on the project.

Project 1: SR 189/Mariposa Road

The first project examined in Arizona was a 2.8 mile stretch of SR 189, running from the Nogales Port of Entry to I-19. This project would widen the road to six lanes and improve intersections, which should facilitate freight movement North of the Columbus Port of Entry. The project was assumed to begin in 2018. The total benefits of this project are estimated at \$45 million. Benefits solely to the agricultural sector are calculated at \$2.66 million, with a project prioritization factor of 0.06.

Benefits and Costs	Present Value (2018 \$ mil)
Vehicle Operating Cost Savings	\$3
Business Time and Reliability Cost Savings	\$4
Personal Time and Reliability Cost Savings	\$2
Safety Benefits	\$2
Logistics/Freight Cost Savings	\$2
Environmental Benefits	\$0
Business Output	\$75
Positive Economic Effect of Wage Income	\$30
Total Benefits	\$119
Capital Costs	\$45
Total Costs	\$45
Benefit/Cost Ratio	2.63
<i>Total Agriculture Benefits</i>	\$2.66
Project Prioritization Factor	0.06

Project 2: I-19

The second project examined in Arizona was an 18.13 mile stretch of I-19 north of Nogales, running from SR 189 to Tumacacori. This project would provide capacity improvements, which should facilitate freight movement north along I-19 from the Nogales Port of Entry. The project was assumed to begin in 2018. The total benefits of this project are estimated at \$514 million. Benefits solely to the agricultural sector are calculated at \$8.26 million, with a project prioritization factor of 0.02.

Benefits and Costs	Present Value (2018 \$ mil)
Vehicle Operating Cost Savings	\$9
Business Time and Reliability Cost Savings	\$11
Personal Time and Reliability Cost Savings	\$5
Safety Benefits	\$13
Logistics/Freight Cost Savings	\$5
Environmental Benefits	\$0
Business Output	\$859
Positive Economic Effect of Wage Income	\$384
Total Benefits	\$1,287
Capital Costs	\$514
Total Costs	\$514
Benefit/Cost Ratio	2.50
<i>Total Agriculture Benefits</i>	<i>\$8.26</i>
Project Prioritization Factor	0.02

Project 3: US 95

The third project examined in Arizona was a 2 mile stretch of US 95, running from Avenue 9 E to Fortuna Road. This project would widen the existing road, which should facilitate freight movement from the Nogales Port of Entry. The project was assumed to begin in 2018. The total benefits of this project are estimated at \$24 million. Benefits solely to the agricultural sector are calculated at \$0.20 million, with a project prioritization factor of 0.02.

Benefits and Costs	Present Value (2018 \$ mil)
Vehicle Operating Cost Savings	\$1
Business Time and Reliability Cost Savings	\$1
Personal Time and Reliability Cost Savings	\$0
Safety Benefits	\$1
Logistics/Freight Cost Savings	\$0
Environmental Benefits	\$0
Business Output	\$15
Positive Economic Effect of Wage Income	\$6
Total Benefits	\$24
Capital Costs	\$9
Total Costs	\$9
Benefit/Cost Ratio	2.64
<i>Total Agriculture Benefits</i>	<i>\$0.20</i>
Project Prioritization Factor	0.02

Arizona Summary

Individual project benefits to the agriculture sector range from \$200,000 to \$8.26 million for the Arizona sample of projects. This represents the amount of the total project benefits that directly impact trucks moving agriculture products. The project prioritization factors for the sample set of projects range from 0.02 to 0.06 (Table 5).

Table 5. Arizona Project Results

Project	Total Agriculture Benefits	Project Prioritization Factor
SR 189	\$2.66	0.06
I-19	\$8.26	0.02
US 95	\$0.20	0.02

The I-19 project has the highest total agriculture benefits at \$8.26 million, while the SR 189 project has the highest project prioritization factor at 0.06. For every dollar spent on the project, \$0.06 in benefits would be accrued to the agriculture sector. The greater the project prioritization factor, the greater the relative impact on agriculture.

California Projects

Three border related projects in California were selected, focusing on the Otay Mesa Port of Entry. The results display the total benefits, costs, and benefit/cost ratio of the project as a whole. Also displayed are the benefits directly accrued by the agricultural sector, as well as the project prioritization factor, which shows the return to the agricultural sector per dollar spent on the project.

Project 1: SR 125

The first project examined in California was a 9.3 mile stretch of SR 125, running from SR 905 to San Miguel Ranch Road. This project would add four toll lanes, which should reduce traffic, thus facilitating freight movement north from the Otay Mesa Port of Entry. The project was assumed to begin in 2035. The total benefits of this project are estimated at \$392 million. Benefits solely to the agricultural sector are calculated at \$2.24 million, with a project prioritization factor of 0.02.

Benefits and Costs	Present Value (2018 \$ mil)
Vehicle Operating Cost Savings	\$19
Business Time and Reliability Cost Savings	\$31
Personal Time and Reliability Cost Savings	\$17
Safety Benefits	\$34
Logistics/Freight Cost Savings	\$6
Environmental Benefits	\$0
Business Output	\$203
Positive Economic Effect of Wage Income	\$82
Total Benefits	\$392
Capital Costs	\$122
Total Costs	\$122
Benefit/Cost Ratio	3.21
<i>Total Agriculture Benefits</i>	<i>\$2.24</i>
Project Prioritization Factor	0.02

Project 2: I-805

The second project examined in California was a 3.3 mile stretch of I-805, running from SR 905 to Palomar Street. This project would add managed/HOV lanes, which should reduce traffic, thus facilitating freight movement north from the Otay Mesa Port of Entry. The project was assumed to begin in 2025. The total benefits of this project are estimated at \$726 million. Benefits solely to the agricultural sector are calculated at \$370,000, with a project prioritization factor of 0.00.

Benefits and Costs	Present Value (2018 \$ mil)
Vehicle Operating Cost Savings	\$3
Business Time and Reliability Cost Savings	\$6
Personal Time and Reliability Cost Savings	\$3
Safety Benefits	\$6
Logistics/Freight Cost Savings	\$1
Environmental Benefits	\$0
Business Output	\$479
Positive Economic Effect of Wage Income	\$227
Total Benefits	\$726
Capital Costs	\$263
Total Costs	\$263
Benefit/Cost Ratio	2.76
<i>Total Agriculture Benefits</i>	<i>\$0.37</i>
Project Prioritization Factor	0.00

Project 3: SR 905

The second project examined in California was a 6.5 mile stretch of SR 905, running from I-805 to the Otay Mesa Port of Entry. This project would add two general purpose lanes, thus facilitating freight movement north from the Otay Mesa Port of Entry. The project was assumed to begin in 2018. The total benefits of this project are estimated at \$508 million. Benefits solely to the agricultural sector are calculated at \$3.18 million, with a project prioritization factor of 0.02.

Benefits and Costs	Present Value (2018 \$ mil)
Vehicle Operating Cost Savings	\$12
Business Time and Reliability Cost Savings	\$17
Personal Time and Reliability Cost Savings	\$8
Safety Benefits	\$17
Logistics/Freight Cost Savings	\$8
Environmental Benefits	\$0
Business Output	\$317
Positive Economic Effect of Wage Income	\$128
Total Benefits	\$508
Capital Costs	\$191
Total Costs	\$191
Benefit/Cost Ratio	2.66
<i>Total Agriculture Benefits</i>	<i>\$3.18</i>
Project Prioritization Factor	0.02

California Summary

Individual project benefits to the agriculture sector range from \$370,000 to \$3.18 million for the California sample of projects. This represents the amount of the total project benefits that directly impact trucks moving agriculture products. The project prioritization factors for the sample set of projects range from 0.00 to 0.02 (Table 6).

Table 6. California Project Results

Project	Total Agriculture Benefits	Project Prioritization Factor
SR 125	\$2.24	0.02
I-805	\$0.37	0.00
SR 905	\$3.18	0.02

The SR-905 project has the highest total agriculture benefits at \$3.18 million, and is tied with the SR 125 project for the highest project prioritization factor at 0.02. For every dollar spent on the project, \$0.02 in benefits would be accrued to the agriculture sector. The greater the project prioritization factor, the greater the relative impact on agriculture.

Appendix A – TREDIS Default Values

The default values used for this analysis were obtained from TREDIS and are displayed in Table 7 and Table 8.⁶ Additionally, it was assumed that passenger vehicles are used 42.5% of the time for business and 57.5% of the time for personal use.

Table 7. TREDIS Default Values

Assumption	Passenger	Truck
Persons per Vehicle (Business)	1.2	1.1
Persons per Vehicle (Personal)	1.6	-
Crew Cost Factor (\$/hr per Crew Member)	-	\$29.48
Passenger Personal Cost Factor (\$/hr per occupant)	\$11.53	-
Passenger Business Cost Factor (\$/hr per occupant)	-	\$33.58
Environmental Cost \$/hr	\$0.03	\$0.63
Fatality Accidents per 100m VMT	1.15	0.2
Personal Injury Accidents per 100m VMT	75	6.9
Property Damage Accidents per 100m VMT	186	96
Vehicle Operating Cost \$/Mile (Congested)	\$0.26	\$0.93
Vehicle Operating Cost \$/Mile (Free Flow)	\$0.24	\$0.79
\$ per Fatalities Accident	\$9,600,000	\$9,600,000
\$ per Personal Injury Accident	\$174,030	\$174,030
\$ per Property Damage Accident	\$4,252	\$4,252

⁶ TREDIS Software Group. *TREDIS® Data Sources and Default Values*. January 24, 2017.

https://500.tredis.net/user_resources/TREDIS%20500%20Data%20Sources%20and%20Default%20Values.pdf

Table 8. TREDIS Commodity Cost per Hour

Freight Classification System	Short Description	Long Description	Cost Per Hour (relative to avg)
SCTG	Live animals/fish	Live animals and live fish	\$1.50
SCTG	Cereal grains	Cereal grains	\$0.53
SCTG	Other ag prods.	Other agricultural products	\$0.83
SCTG	Animal feed	Animal feed and products of animal origin, n.e.c.	\$0.68
SCTG	Meat/seafood	Meat, fish, seafood, and their preparations	\$1.87
SCTG	Milled grain prods.	Milled grain products and preparations, bakery products	\$0.91
SCTG	Other foodstuffs	Other prepared foodstuffs and fats and oils	\$1.01
SCTG	Alcoholic beverages	Alcoholic beverages	\$1.38
SCTG	Tobacco prods.	Tobacco products	\$1.50
SCTG	Building stone	Monumental or building stone	\$1.42
SCTG	Natural sands	Natural sands	\$0.18
SCTG	Gravel	Gravel and crushed stone	\$0.14
SCTG	Nonmetallic minerals	Nonmetallic minerals n.e.c.	\$0.39
SCTG	Metallic ores	Metallic ores and concentrates	\$0.18
SCTG	Coal	Coal	\$0.30
SCTG	Crude petroleum	Crude Petroleum	\$0.50
SCTG	Gasoline	Gasoline and aviation turbine fuel	\$0.71
SCTG	Fuel oils	Fuel oils	\$0.58
SCTG	Coal-n.e.c.	Coal and petroleum products, n.e.c.	\$0.63
SCTG	Basic chemicals	Basic chemicals	\$0.89
SCTG	Pharmaceuticals	Pharmaceutical products	\$5.00
SCTG	Fertilizers	Fertilizers	\$0.48
SCTG	Chemical prods.	Chemical products and preparations, n.e.c.	\$1.78
SCTG	Plastics/rubber	Plastics and rubber	\$1.59
SCTG	Logs	Logs and other wood in the rough	\$0.89
SCTG	Wood prods.	Wood products	\$0.99
SCTG	Newsprint/paper	Pulp, newsprint, paper, and paperboard	\$1.24
SCTG	Paper articles	Paper or paperboard articles	\$1.28
SCTG	Printed prods.	Printed products	\$1.03
SCTG	Textiles/leather	Textiles, leather, and articles of textiles or leather	\$1.98
SCTG	Nonmetal min. prods.	Nonmetallic mineral products	\$0.65
SCTG	Base metals	Base metal in primary or semi-finished forms and in finished basic shapes	\$1.05

SCTG	Articles-base metal	Articles of base metal	\$1.35
SCTG	Machinery	Machinery	\$3.93
SCTG	Electronics	Electronic and other electrical equipment and components and office equipment	\$3.93
SCTG	Motorized vehicles	Motorized and other vehicles (including parts)	\$4.28
SCTG	Transport equip.	Transportation equipment, n.e.c.	\$1.69
SCTG	Precision instruments	Precision instruments and apparatus	\$5.00
SCTG	Furniture	Furniture, mattresses and mattress supports, lamps, lighting fittings, and illuminated signs	\$1.76
SCTG	Misc. mfg. prods.	Miscellaneous manufactured products	\$2.71
SCTG	Waste/scrap	Waste and scrap	\$1.00
SCTG	Mixed freight	Mixed freight	\$1.00
SCTG	Unknown	Commodity unknown	\$1.00