

# BENEFIT-COST ANALYSIS

## CAMPUS PARKWAY PROJECT

July 23, 2009

This Benefit-Cost Analysis has been prepared to support Merced County's application for a TIGER Discretionary Grant to construct Campus Parkway Segments 2 and 3. The purpose of the analysis is to demonstrate the superior benefit-to-cost attributes of the Campus Parkway project compared to other projects competing for TIGER Grant funds.

### 1. Project Overview:

- 1.1. Name of Project: CAMPUS PARKWAY
- 1.2. Project Type: Highway (New Expressway)
- 1.3. Project Location:
  - City of Merced (Merced Urbanized Area)
  - County of Merced
  - State of California
  - 18<sup>th</sup> Congressional District
- 1.4. Total Project Cost: \$128.7 million
- 1.5. Contact Information:

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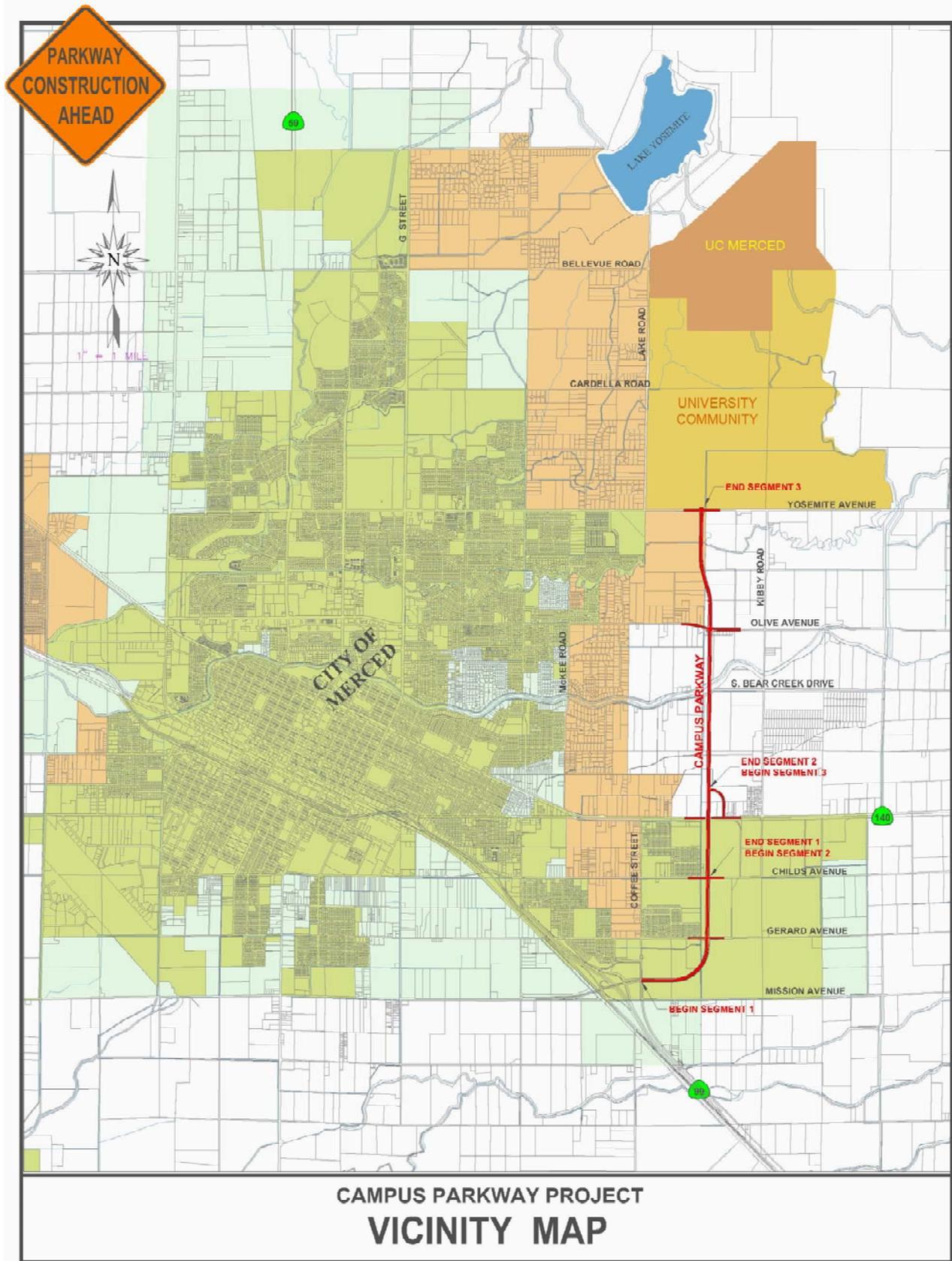
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2. **Project Description:** The Campus Parkway project involves the construction of a new 4-lane limited access expressway on the east side of the City of Merced extending from Coffee Street to Yosemite Avenue, a length of approximately 4.5 miles.

The Vicinity Map on page 2 shows the location of the Campus Parkway project in relation to the City of Merced, The University of California – Merced Campus, State Route 99 and State Route 140. The Vicinity Map also indicates the three (3) construction segments. Segment 1 (from Coffee Street to Childs Avenue) is currently under construction. Segment 2 (from Childs Avenue to State Route 140) and Segment 3 (from State Route 140 to Yosemite Avenue) are planned to be constructed as soon as sufficient funds have been secured.

The Campus Parkway project is being developed by the County of Merced in conjunction with the City of Merced, MCAG, Caltrans and UC Merced. Project will be fully operational in 2012 (if funding is secured).





- 3. Project Purpose:** The purpose of the Campus Parkway project is as follows:
- 3.1. Provide access from State Route 99 and State Route 140 to areas planned for commercial and industrial development on the east side of the City of Merced; and,
  - 3.2. Provide more direct access to the University of California – Merced Campus from State Route 99, State Route 140 and the City of Merced; and,
  - 3.3. Provide improved access to areas in north Merced planned for urban development; and,
  - 3.4. Provide improved access to State Route 99 to property along Childs Avenue and Kibby Road already developed with industrial projects; and,
  - 3.5. Provide improved emergency service access to the City of Merced not restricted by frequent closures of existing north-south transportation corridors created by operation of the Burlington Northern – Santa Fe (BNSF) railroad tracks; and,
  - 3.6. Improve the Bicycle transportation network in the City of Merced through development of a Class 1 Bike Path parallel to Campus Parkway; and,
  - 3.7. Improve ridesharing through the development of a Park and Ride Lot adjacent to the intersection of Campus Parkway and State Route 140 in conformance with the State Route 99 Corridor System Management Plan, published October 2008 by Caltrans.
  - 3.8. Create a transportation project consistent with the local and regional transportation plans for an eastern expressway which has been identified to be necessary to support growth anticipated to occur in the City of Merced General Plan and the County of Merced General Plan.
- 4. Project Benefits:** The resulting benefits of the Campus Parkway project are as follows:
- 4.1. Stimulus to growth
  - 4.2. Increase in job opportunities
  - 4.3. Increased interest in UC Merced
  - 4.4. Reduced number of overall motor vehicle accidents
  - 4.5. Reduced fuel consumption
  - 4.6. Reduction in Greenhouse Gas Emissions (CO<sub>2</sub>)
  - 4.7. Reduced travel time for motorists
  - 4.8. Reduced travel time for emergency service vehicles
  - 4.9. Reduced conflicts between commercial vehicles and developed urban areas
  - 4.10. Increase in bus ridership
  - 4.11. Increase in bicycle use
  - 4.12. Increase in ride sharing

- 5. Project Beneficiaries:** The primary beneficiaries of the Campus Parkway project are:
- Residents of the Merced Urbanized Area and other nearby urban areas
  - Businesses and Employers located in the Merced Urbanized Area
  - Students and Research Efforts of the University of California – Merced Campus
- 6. Base Case (No Campus Parkway):** The Base Case to be used in this Benefit-Cost Analysis is the “No-Build” scenario. Since the Campus Parkway project alignment has already been approved, no alternatives will be considered.
- 7. Benefit-Cost Analysis:** Multiple methods have been used to determine the benefits and costs of the Campus Parkway project.

7.1. Benefits:

- 7.1.1. Construction Job Creation. The number of construction jobs estimated to be created by the Campus Parkway project has been determined using an estimate of 18,000 new jobs for every \$1 billion in construction expenditure based on research results of the California Infrastructure Coalition<sup>1</sup>.

Based on the estimated construction cost of \$97.8 million for Campus Parkway Segments 2 and 3, a total of 1,760 construction jobs will be created. The economic value resulting from the construction jobs resulting from Campus Parkway can be determined from the following data:

- Number of Jobs Created from construction of Segments 2 and 3 of the Campus Parkway project can be determined to be:

$$\text{Number of Jobs} = 18,000 \times \$97,800,000 / \$1,000,000,000 = 1,760 \text{ jobs}$$

- The average per capita income in Merced County is \$25,012

The anticipated income received by workers in the region as a result of the construction of Campus Parkway can be calculated to be:

$$\text{Income} = 1,760 \text{ jobs} \times \$25,012 \times 2 \text{ years length of construction} = \$88,042,240.$$

It is important to understand that this figure includes the assumption that 57% of these jobs are a direct result of construction and the remaining 43% are indirectly induced jobs resulting from the construction.

- 7.1.2. Permanent Job Creation: A significant number of permanent jobs will be generated as a result of the construction of the Campus Parkway project. There are two primary sources for these permanent jobs: 1) Growth occurring in areas planned for industrial and commercial development in the City of Merced adjacent to the Campus Parkway corridor; and, 2) Growth occurring in areas planned for research and development on the UC Merced Campus and abutting University Community.

- 7.1.2.1. Growth in the City of Merced. Adjacent to the Campus Parkway corridor, the City of Merced has designated approximately 985 acres for industrial development and approximately 150 acres for commercial/business park development. The Campus Parkway project accommodates and promotes development by providing an efficient transportation corridor connecting

these areas to SR 99, SR 140, the City of Merced and UC Merced. This area, the Campus Parkway Job Growth Corridor, is already being considered for projects by major employers.

- Wal-Mart distribution warehouse. A 1.1 million square foot distribution warehouse is proposed by Wal-Mart adjacent to the Campus Parkway corridor. A Final EIR is currently being prepared and this project is anticipated to be considered for approval by the Merced City Counsel before the end of 2009. The Wal-Mart project depends on access created by Campus Parkway Segment 1. On opening day, this project will create 600 full-time jobs. The number of jobs created by this project is anticipated to grow to 1,200 full-time jobs when the warehouse becomes fully operational.

The Wal-Mart warehouse is likely to be fully operational 5 years after the completion of Campus Parkway Segment 2. The economic value of the jobs created by this warehouse can be calculated. Using the average per capita income in Merced County of \$25,012, the total per year economic benefit of this project can be determined to be:

$$\text{Annual Economic Benefit} = 1,200 \times \$25,012 = \$30,014,400$$

The total economic benefit of this project over the 20 year design life of Campus Parkway can be calculated to be:

$$\text{Total Economic Benefit} = \$30,014,400 \times 15 \text{ years} = \$450,216,000$$

- Merced Gateway Center: A consortium of developers is working with the City of Merced to develop a regional commercial center, known as the Merced Gateway Center, to be located along Campus Parkway near State Route 99. A draft EIR has not yet been prepared for this project. Although this project is located along Segment 1 of Campus Parkway, prospective tenants have indicated to the property owner that the project site will not be viable without Campus Parkway being extended to also connect with State Route 140 which is part of Segment 2. The Notice of Preparation of an Environmental Impact Report circulated for the Merced Gateway East project indicates the potential for 704,800 square feet of commercial uses including retail, restaurants and office space. The Merced Gateway West project will essentially double the size of the Merced Gateway Center resulting in approximately 1.4 million gross leasable square feet of commercial and office space. The range of the anticipated number of employees for the entire Merced Gateway Center is between 500 to 1,500 part-time and full-time employees.

The economic value of these jobs can be calculated. Since many of these jobs will be part-time (working 20 hours per week), the full-time equivalent number of jobs created by the Merced Gateway Center will be between 250 and 750 jobs, many occurring during seasonal retail peak periods. For this analysis, a total of 500 year-round full time equivalent jobs will be assumed to be created.

Using the average per capita income in Merced County of \$25,012, the total per year economic benefit of this project can be determined to be:

$$\text{Annual Economic Benefit} = 500 \times \$25,012 = \$12,506,000$$

Since the Merced Gateway Center Project is not likely to be fully operational for 10 years, the total economic benefit of this project over the 20 year design life of Campus Parkway can be calculated to be:

$$\text{Total Economic Benefit} = \$12,506,000 \times 20/10 = \$125,060,000$$

- Other potential projects. Approximately 750 acres of additional vacant land zoned for industrial development has the potential to be developed adjacent to Campus Parkway. Based on the typical number of employees per acre for an industrial land use of 10 employees per acre, this vacant acreage represents a potential for 7,500 additional new jobs being created. However, the timing for creation of these jobs is uncertain. Assuming 1,200 jobs are created over the design life of Campus Parkway, the economic benefit of these new jobs equates to an amount equal to the economic benefit of the jobs anticipated to be created by the proposed Wal-Mart Distribution Center. Thus, economic benefit for the potential creation of 1,200 new jobs in these other areas zoned for industrial development will be assumed to be the same as for the proposed Wal-Mart warehouse.

$$\text{Total Economic Benefit} = \$450,216,000$$

- 7.1.2.2. Reduced Number of Overall Accidents. The total number of accidents occurring on roadways in the Merced Urbanized Area will decrease as a result of the construction of the Campus Parkway project. A total of 19,000 vehicle trips per day is estimated to be diverted from the existing network of urban arterial roadways to the Campus Parkway expressway. The estimated number of reduced accidents can be calculated through a comparison of the statewide average accident rates on a 4-lane undivided urban arterial compared to the statewide average accident rate for a 4-lane divided expressway.

The calculation for the reduction in accidents follows:

- Determine Million Vehicle Miles Traveled per year on Campus Parkway (represents travel diverted from existing arterials).  

$$\text{MVM} = 19,000 \text{ trips/day} \times 4.5 \text{ miles} \times 365 \text{ days} = 31.2 \text{ MVM/yr}$$
- Average Statewide Accident Rate on 4-lane undivided arterial (inside city) = 2.47
- Average Statewide Accident Rate on 4-lane divided expressway (inside + outside city) = 1.00
- Resulting Difference in Accident Rates =  $2.47 - 1.00 = 1.47$
- Reduced Total Accidents Per Year =  $31.2 \times 1.47 = 46$  less accidents

According to the 2007 Collision Data on California State Highways, the percentage of injury versus fatal accidents on a 4-lane undivided arterial is:

- Injury Accident Percentage: 38.3%. Thus, a total of 18 injury accidents can be determined to be reduced per year.
- Fatal Accident Percentage: 0.01%. Thus, a total of 1 fatal accident can be determined to be reduced per year.

Cost of Accidents: The “Cal-BC” benefit-cost analysis spreadsheet developed by Caltrans has assigned the following dollar values for accident types:

- PDO (Property Damage Only) Accidents: \$7,198
- Injury Accidents: \$85,716
- Fatal Accidents: \$3,262,459

The resulting cost benefit related to accident reduction resulting from the construction of the Campus Parkway project can be calculated to be:

$$\begin{aligned} \text{Accident Reduction Value} &= 27 \times \$7,198 + 18 \times \$85,716 + 1 \times \$3,262,459 \\ &= \$194,346 + \$1,542,888 + \$3,262,459 \\ &= \underline{\$4,999,693/\text{year, say } \$5,000,000/\text{yr}} \end{aligned}$$

In reality, this number represents the dollar savings for year 20 of the project. Assuming a linear growth rate over 20 years, the total accident reduction value for the 20 year design life of the project can be determined:

$$\text{Annual Value} = n \times \$250,000$$

Over 20 years, the total Accident Reduction Value can be determined to be:

$$20 \text{ year value} = \$250,000 \times n^2/2, n = 20$$

$$\text{Accident Reduction Value (20 years)} = \underline{\$50,000,000}$$

- 7.1.2.3. **Reduced Fuel Consumption:** The Campus Parkway project will reduce the amount of fuel consumed. The savings in fuel can be calculated from average fuel consumption rates for vehicles assigned in the Cal-BC benefit-cost analysis spreadsheet. On existing arterial roads, the average travel speed is 35 miles per hour. On the new Campus Parkway expressway, the average travel speed is estimated to be 45 miles per hour. A total of 19,000 trips per day will be diverted from the existing roadway network to Campus Parkway. The following information is necessary to calculate the reduced fuel consumption.

- The average fuel consumption for a vehicle travelling at 35 mph is 0.045 gallons per vehicle mile.
- The average fuel consumption for a vehicle travelling at 45 mph is 0.041 gallons per vehicle mile.
- Total vehicles miles travelled by cars on Campus Parkway (calculated in Section 7.1.2.2) are 31,200,000 vehicle miles per year at year 20.

The total fuel savings can be calculated as follows:

$$\text{Annual Fuel Reduction} = (0.045 - 0.041) \times 31,200,000 = 124,800 \text{ gallons.}$$

Over 20 years, the total fuel reduction can be determined to be:

$$\text{Annual Value} = n \times 6,240$$

$$20 \text{ year value} = 6,240 \times n^2/2, \text{ Where } n = 20$$

$$\underline{\text{Total Fuel Reduction (20 years)} = 1,248,000 \text{ gallons}}$$

Using an estimated average fuel cost of \$2.85 per gallon, the value of the fuel savings for year 20 can be calculated to be \$355,680.

Over 20 years, the total fuel savings value can be determined to be:

$$\text{Annual Value} = n \times \$17,784$$

$$20 \text{ year value} = \$17,784 \times n^2/2, n = 20$$

$$\underline{\text{Fuel Savings Value (20 years)} = \$3,556,800}$$

7.1.2.4. Reduction in Greenhouse Gas Emissions (CO<sub>2</sub>): The Campus Parkway project will reduce the amount of Greenhouse Gas Emissions as a result of the reduction in fuel consumption. The following data is necessary to calculate the value of the reduction in emissions:

- Reduced Fuel Consumption (calculated previously) = 124,800 gallons/yr
- CO<sub>2</sub> emissions per gallon of gasoline = 8.8 kilograms (pursuant to “Emission Facts” published by the EPA [EPA420-F-05-004]).
- Value of Emission Reduction = \$33 per metric ton (pursuant to TIGER Grant Application Guidelines)

The total CO<sub>2</sub> emission reduction can be determined to be:

$$\text{Annual Reduction} = (124,800 \text{ gal} \times 8.8 \text{ kg/gal})/1,000 = 1,098 \text{ metric tons}$$

Over 20 years, the total emission reduction can be determined to be:

$$\text{Annual Value} = n \times 54.9$$

$$20 \text{ year value} = 54.9 \times n^2/2, \text{ Where } n = 20$$

$$\underline{\text{Greenhouse Gas Emissions Reduction (20 years)} = 10,980 \text{ metric tons}}$$

$$\text{Annual Value of reduction} = \$33 \times 1,098 = \$36,234$$

Over 20 years, the total emission reduction value can be determined to be:

$$\text{Annual Value} = n \times \$1,812$$

$$20 \text{ year value} = \$1,812 \times n^2/2, n = 20$$

$$\underline{\text{Greenhouse Gas Emissions Reduction Value (20 years)} = \$362,400}$$

7.1.2.5. Reduced Travel Time: The increased average speed a motorist experiences by traveling on Campus Parkway versus the existing congested roadway network will result in a reduced travel time. The cumulative travel

time saved can be determined and its corresponding economic value calculated. The average travel speed on the existing roadway network is 35 mph. The anticipated average travel speed on the Campus Parkway expressway is 45 mph. The savings to an individual motorist can be calculated from the following information:

- Average Trip Length = 4.5 miles
- Travel time for trip at 45 mph = 4.5 miles/45 mph = 0.10 hours = 6 min.
- Travel time for trip at 35 mph = 4.5 miles/35 mph = 0.129 hours = 7.7 min.
- Resulting savings in time per trip = 1.7 minute.

The total savings in travel time for a year for all motorists (during year 20) can be determined to be:

- Annual Travel Time Savings = 1.7 min. x 19,000 trips x 365 days  
= 11,789,500 min. = 196,492 hours

Over the 20 year design life of Campus Parkway, the total travel time savings can be determined (assuming a linear growth in travel from year 0 to year 20):

Annual Savings = 196,492/20 = n x 9,824, where n = years

Total Savings = 9,824 x n<sup>2</sup>/2, where n = 20.  
= 1,964,800 hours

The average per capita full-time income in Merced County is \$25,012/year. Assuming a 40 hour work week, this equates to \$12.00/hour. The value of the total travel time savings can be calculated to be:

- Travel Time Savings Value = 1,964,800 hrs x \$12.00/hr  
= \$23,577,600

## 7.2. Costs:

- 7.2.1. Preliminary Engineering Costs. The cost to process the environmental clearance, obtain permits and prepare the PS&E for the Campus Parkway project is \$8,500,000.
- 7.2.2. Right-of-Way Acquisition Costs. The cost to acquire the right-of-way and for acquisition of required environmental mitigation costs (purchase of conservation credits) has been estimated to be \$14,882,000.
- 7.2.3. Construction Costs. The cost to construct Campus Parkway Segments 2 and 3 has been estimated to be \$97.8 million. The construction cost of Segment 1 (under construction) has been determined to be \$6.2 million. Thus, the total construction cost for Campus Parkway is \$104 million.
- 7.2.4. Operation and Maintenance Costs. The cost to operate and maintain Campus Parkway (all three segments) has been estimated using the following general formula:

Annual Cost = \$14,150 per lane mile x 4.5 miles x 4 lanes = \$254,700/year

Over 20 years, the present value of the anticipated annual expenditure for operation and maintenance calculates to be: \$3.17 million (using 7% discount rate)

- 7.3. **Benefits vs. Cost Summary:** The following table summarizes the calculated financial benefits of the Campus Parkway Project versus the costs over a 20-year period:

	<b>Benefit</b>	<b>Cost</b>
Jobs Created (Construction)	\$88,042,000	
New Jobs (Wal-Mart Warehouse)	\$450,216,000	
New Jobs (Merced Gateway Center)	\$125,060,000	
New Jobs (other industrial areas)	\$450,216,000	
Accident Reduction Value	\$50,000,000	
Fuel Savings Value	\$3,556,800	
Greenhouse Gas Reduction Value	\$362,400	
Travel Time Savings	\$23,577,600	
PE Costs (Environmental/Design)	\$0	(\$8,500,000)
ROW Acquisition Costs	\$0	(\$14,882,000)
Construction Cost Segment 1	\$0	(\$6,200,000)
Construction Cost Segments 2 & 3	\$0	(\$97,800,000)
Operation & Maintenance Costs	\$0	(\$3,170,000)
<b>TOTALS:</b>	<b>\$1,191,030,800.00</b>	<b>(\$130,552,000.00)</b>

- 7.4. **Benefit-Cost Ratio**

The resulting Benefit to Cost Ratio for the Campus Parkway Project is:

$$\text{Benefit/Cost Ratio} = \$1,191,030,800 / \$130,552,000 = 9.12$$

- 7.5. **Additional Unquantified Benefits**

Additional benefits resulting from the development of the Campus Parkway project have not been quantified in this analysis. Yet, these benefits are real and are likely to have an economic benefit to the region. These Unquantified benefits include:

- Reduced travel time for emergency service vehicles (value of reduced property damage and quicker medical response)
- Reduced conflicts between commercial vehicles and developed urban areas (intrinsic improvement to an urban area as a result of reduced commercial truck traffic)

- Increase in bus ridership (reductions in vehicle use, reductions in fuel consumption, reductions in greenhouse gas emissions)
- Increase in bicycle use (reductions in vehicle use, reductions in fuel consumption, reductions in greenhouse gas emissions, improved health as a result of exercise)
- Increase in ride sharing (reductions in vehicle use, reductions in fuel consumption, reductions in greenhouse gas emissions)

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<sup>i</sup>“Economic Impact of Funding California’s Transportation Infrastructure, An Economic Benefit Assessment of California’s Investment in Transportation Infrastructure,” published (no date) by the California Infrastructure Coalition, [www.calinfrastructure.org/pdf/economic\\_impact\\_of\\_funding.pdf](http://www.calinfrastructure.org/pdf/economic_impact_of_funding.pdf)