The South Carolina Department of Transportation and Its Economic Impact on the State of South Carolina

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Executive Summary

Adequate infrastructure is vital for economies everywhere. Whether in terms of supporting and expanding existing economic activity or enticing new activity, successful economic development depends on a strong infrastructure. Infrastructure can refer to many factors, but perhaps the most critical is an economy's transportation system. Investments in transportation enhance an economy's stock of infrastructure, and such actions are necessary for economic development and economic growth.

The South Carolina Department of Transportation (SCDOT) holds the primary responsibility for transportation investment in South Carolina. SCDOT pursues many activities that enhance the state's transportation network. In dollar terms, the primary activity of SCDOT is the construction and maintenance of South Carolina's highway system. However, other areas of concern for SCDOT relate to mass transit projects, projects and campaigns designed to increase traffic safety, programs to assist local governments with transportation services, and more.

All of these activities of SCDOT work to enhance the overall transportation system across South Carolina. These enhancements to the infrastructure of South Carolina entail many different kinds of economic benefits for the state, both in the short- and long-term, as shown in Figure A. Among the short-term, quantifiable economic impacts of SCDOT revealed by this report, and summarized in Figure B (next page), are:

Figure A. Economic Benefits of SCDOT Activities

- SCDOT supports a total of $2.1 billion of economic output annually. Of this total, $1.6 billion is attributable to highway construction and maintenance projects.
- $768.6 million in labor income for South Carolinians each year can be linked to the activities of SCDOT. This amounts to roughly 1.1 percent of total labor earnings statewide.
- SCDOT's annual operations support a total of 24,360 full-time equivalent jobs distributed across all regions and sectors of the South Carolina economy.
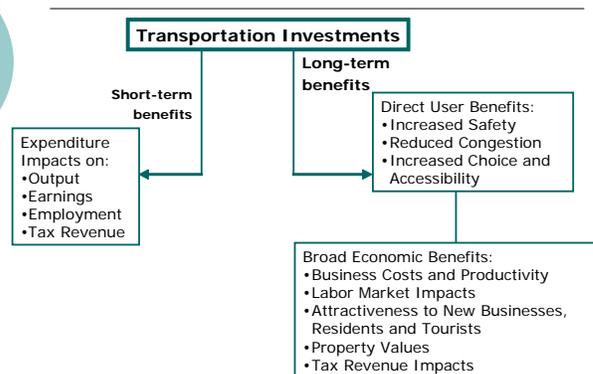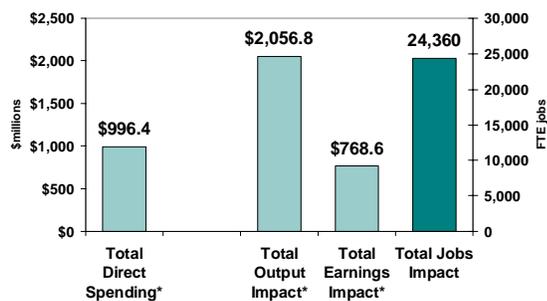
Figure B. Annual Economic Impacts of SCDOT Investments

*2002 dollars.

- A total of $91.6 million in annual, recurring tax revenue for South Carolina is supported by SCDOT's activities. Of this total, $79.3 million flows to the state's general revenue fund, while $12.3 million is directly allocated to education via the Education Improvement Act

Over the long-term, the South Carolina economy benefits in many more ways from SCDOT's enhancements to the transportation network. While these benefits are difficult or impossible to quantify, the state undoubtedly benefits from SCDOT's transportation investments in terms of the positive impacts on:

- Business costs and productivity
- Labor market access
- Economic competitiveness
- Attractiveness to new business, residents, and tourists
- Property values
- Long-term tax revenues

Overall, this report demonstrates that the activities of SCDOT can have substantial benefits for the state economy, both in the short-term and—as importantly—in the long-term. Taken in the context of concerns over inadequate funding of transportation investments in South Carolina, these benefits demonstrate what the state stands to lose if a stable and adequate funding source is unavailable to SCDOT. However, these also represent benefits that can continue to grow over time and continue to accrue to the South Carolina economy if the funding concerns are properly addressed.

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The South Carolina Department of Transportation and Its Economic Impact on the State of South Carolina

1. Introduction

Adequate infrastructure is vital for economies everywhere. Whether in terms of supporting and expanding existing economic activity or enticing new activity, successful economic development depends on a strong infrastructure. Infrastructure has many facets, but perhaps the most critical is an economy's transportation system. Investments in transportation enhance an economy's stock of infrastructure, and such actions are necessary for economic development and economic growth.

The South Carolina Department of Transportation (SCDOT) holds the primary responsibility for transportation investment in South Carolina. SCDOT pursues many activities that enhance the state's transportation network. In dollar terms, the primary activity of SCDOT is the construction and maintenance of South Carolina's highway system. However, other areas of concern for SCDOT relate to mass transit programs, projects and campaigns designed to increase traffic safety, programs to assist local governments with transportation services, and more.

All of these activities of SCDOT work to enhance the overall transportation system across South Carolina. These enhancements to the infrastructure of South Carolina entail many different kinds of economic benefits for the state. The purpose of this report is to identify, and where possible quantify the economic benefits for South Carolina resulting from SCDOT's varied activities. The full range of economic benefits addressed in this study is shown in Figure 1.

The short-term benefits of SCDOT's activities arise because of the direct injection of money into the South Carolina economy via the agency's funding of its various programs. For example, high-way construction and maintenance involves substantial expenditures on the part of SCDOT. This spending has a direct effect on the economy by supporting activity in the state's construction sector. This direct effect then leads to other *ripple effects* that can touch every part of the South Carolina economy. As money invested by SCDOT flows through the state's economy, it supports activity that can be measured in terms of economic output, labor

Figure 1. Economic Benefits of SCDOT Activities

Transportation Investments

Short-term benefits

Long-term benefits

Expenditure Impacts on:
• Output
• Earnings
• Employment
• Tax Revenue

Direct User Benefits:
• Increased Safety
• Reduced Congestion
• Increased Choice and Accessibility

Broad Economic Benefits:
• Business Costs and Productivity
• Labor Market Impacts
• Attractiveness to New Businesses, Residents and Tourists
• Property Values
• Tax Revenue Impacts

earnings, and employment. This report uses a well-established methodology for tracing and estimating all of these direct and indirect economic benefits.

As will be seen in Section 3 of this report, these measurable impacts are substantial. Overall, the operations of SCDOT on average in recent years have supported:

- $2.1 billion of economic output annually, of this total, $1.6 billion is attributable to highway construction and maintenance projects.
- $768.6 million in labor income for South Carolinians annually, roughly 1.1 percent of total labor earnings statewide.
- 24,360 full-time equivalent jobs, distributed across all sectors of the state's economy.
- $91.6 million in annual, recurring tax revenue for South Carolina ($79.3 million to the general revenue fund; $12.3 million to education via the Education Improvement Act).

The longer-term economic benefits associated with SCDOT's activities arise primarily because of the actual enhancements to the state's transportation system. That is, the short-term benefits are primarily due to the money used to finance enhancements, while the effects on the transportation system itself will work to generate economic benefits over the long-term. This report considers these broader benefits affecting businesses, households, and governments across South Carolina. These benefits can generally be said to arise from the relationship between transportation investments and economic development, and include the positive impacts on:

- Business costs and productivity
- Labor market access
- Economic competitiveness
- Attractiveness to new business, residents, and tourists
- Property values
- Long-term tax revenues

Overall, this report will show that the activities of SCDOT can have substantial benefits for the state economy, both in the short-term and—as importantly—in the long-term. Taken in the context of concerns over inadequate funding of transportation investments in South Carolina, these benefits demonstrate what the state stands to lose if a stable and adequate funding source is not available to SCDOT. However, these also represent benefits that can continue to grow over time and continue to accrue to the South Carolina economy if the funding concerns are properly addressed.

The remainder of this report is organized as follows. Section 2 describes the methodology used to estimate the short-term quantifiable economic benefits of SCDOT's operations. Section 3 then presents the results of this economic impact analysis. Here, expenditures of SCDOT are broken into broad categories, and benefits in terms of economic output, earnings, and employment are discussed. Section 4 then provides a consideration of the broader long-term economic benefits arising from enhancing South Carolina's infrastructure through investments in the transportation system. Section 5 concludes the study.

2. Modeling the Economic Impacts

Transportation investments and services provided by SCDOT benefit the South Carolina economy in myriad ways. Some of these benefits are, for various reasons, inherently difficult or impossible to measure. As an example,

the beneficial relationship between transportation infrastructure and economic development is important and widely accepted; however, it is likely impossible to accurately quantify the benefits. More information on these broad and longer-term benefits is provided in Section 4 of this report.

This section provides a brief introduction to the estimation of the quantifiable, short-term impacts of SCDOT's activities. The provision of transportation services and investment in the state's transportation system will have immediate positive impacts on the state economy. The construction of a new highway or the maintenance of the state's road network will generate economic activity that can be measured in terms of the impact on overall economic output, labor earnings, and employment.

More precisely, the funds expended by SCDOT to finance these activities will support a certain quantifiable level of economic activity in South Carolina. For example, money invested via highway construction will support additional economic activity in the state's construction sector. Expenditures supporting other aspects of SCDOT's operations, including payroll expenses, will support additional activity in virtually every sector of the state economy.

The expenditures on behalf of SCDOT constitute the *direct impacts* on the economy. If SCDOT spends $25 million locally on a construction project, this $25 million provides a direct boost to the construction sector. However, the direct spending associated with the operation of SCDOT will have a much larger impact on the economy. Money initially injected into the state economy by SCDOT will ripple throughout the economy via two distinct channels. The simple example that follows outlines the flow of economic benefits arising from SCDOT funding of construction.

The increased level of activity in the construction sector supported by SCDOT's expenditures will also have an impact on those industries that are suppliers to the construction industry, or the construction sector's first-tier suppliers. Among the industries that are the largest suppliers to South Carolina's construction sector are mining (stone, sand and gravel), manufacturing (asphalt coatings, paving mixtures and concrete products), wholesale trade, and services (engineering, architectural, insurance, banking, and bonding).

Based on detailed industry linkage information, a given direct impact on the construction sector can be traced backward to the associated impact on construction's suppliers. Additionally, these suppliers' suppliers, or the construction sector's second-tier suppliers, will also be met with additional demand and so on. All of these impacts working through interindustry linkages represent the *indirect impact* of SCDOT's expenditures.

So far, we have the straightforward direct effects and the indirect effects that rely on the precise interindustry relationships present in the economy. However, there is yet one more important source of additional impacts. A portion of the employment, and the associated labor earnings, of the businesses affected by the direct and indirect effects can be attributed to SCDOT's direct spending. A portion of these employee wages and salaries will be spent in the local economy, beginning yet another round of impacts.

For example, construction workers will spend a portion of their wages locally on, for example, food, clothing, entertainment and health services. A portion of the wages earned in those industries is attributable to the construction worker's spending, which in turn supports further household expenditures. These impacts stemming from household spending are termed the *induced impacts*. Figure 2 (next page) summarizes the direct, indirect, and induced impacts. The total impact of SCDOT's spending is the sum of these separate impacts.

The successive rounds of indirect and induced impacts do not go on forever. For example, a portion of an increase in household income will be saved, used to pay taxes, or spent outside the local economy. Money that leaks from

the local area in this way cannot be used to support additional activity. Therefore, the indirect and induced impacts become smaller and smaller over time until, eventually, the additional activity in each round approaches zero. Because of these leakages, it is useful to consider the notion of an economic multiplier.

An economic multiplier can be used to determine what the total impact (direct plus indirect plus induced) will be, given a certain value for the direct impact. For example, if $100 of direct spending within a particular sector ultimately results in a total spending impact of $200, it can be said that the output multiplier is 2—the $100 in direct spending times the multiplier of 2 equals $200 in total spending or total output. The value of the multiplier varies from sector to sector, and is determined largely by the size of the local supplier network. At a broad industry level, the construction and manufacturing sectors typically have the largest multipliers, while multipliers for the service and retail trade sectors are generally smaller.

The above discussion implies that economic impact analysis essentially involves: *(i)* determining the appropriate levels of direct spending, and *(ii)* determining and applying the correct values for economic multipliers to calculate the total impact on output, earnings, and employment. Data provided by SCDOT on its expenditures during the last three fiscal years are used to determine the levels of direct spending within categories including construction, maintenance, other operations and payroll expenditures.

To accomplish the second step, a detailed structural model of the South Carolina economy was utilized. This model is known as an *input-output* model. An input-output model contains specific information on economic linkages between different industries. Therefore, the input-output model of the South Carolina economy is equipped to quantify, for example, the pattern of local input purchases by the state's construction sector. This model can be used to estimate the full range of indirect and induced impacts described previously. The specific model utilized is provided by the input-output modeling software *IMPLAN*. With this software, the model can be tailored to a specific local area or to the state or national level economy. More details on input-output modeling are available in the appendix to this report.

The input-output model can be used in conjunction with the direct expenditure data to estimate the direct, indirect, and induced economic impacts in terms of three distinct measures as shown in Figure 3: total output, labor earnings, and employment. Total output can be thought of as an aggregate measure of total spending resulting from the initial direct expenditure. It includes all spending by consumers and businesses on both goods and services, including labor services by businesses. It is therefore a broad, all-inclusive measure of the impact on total economic activity.

It is important to note that this concept of total output is not comparable to measures such as Gross Domestic Product (GDP) or Gross State Product (GSP). These measures are designed to only capture the value of *final goods and services*, and in this way they do not include spending on intermediate goods or services. Total output as used in this report and as typically used in impact analysis refers to a much broader concept that does include spending on intermediate goods and services.

Labor earnings represent total employee compensation. This measure of earnings includes all payroll expenses for labor, such as wages, salaries, and benefits. Finally, employment measures the impact on jobs in terms of full-time equivalent positions. The total impact on the *number of positions* is likely larger because some of the full-time equivalent positions will actually represent a greater number of full- *and part-time* positions.

Economic impact modeling can be performed in one of two valid ways. The first approach could be called an "economic linkage" approach that describes how some direct activity supports additional economic activity through the full array of industry linkages that exist in an economy. This is a valid and acceptable approach to impact analysis, as long as the impacts are interpreted correctly.

For example, an employment impact estimated via the economic linkage approach should correctly be thought of as the number of jobs—already present in the economy—that are supported by the direct spending on a specific industry or commodity. That is, these are existing jobs in the area that are related to the specified industry through various interindustry linkages. However, these are not necessarily jobs that are created because of the direct spending. To the extent that the direct injection is spending by residents of the local economy who could just as easily spend that money on another industry or commodity in the local area, the impacts do not represent a true net addition to the economy.

For an industry to truly provide a net addition to the economy, it must be, to some degree, an export industry. This simply means that the industry produces a good or service in the area that is purchased by someone who is not a resident of the area. Therefore, new money is being brought into the local economy. Impact analysis that hinges on this kind of export activity can be called an "economic base" analysis. Here, the impacts represent the net addition to the existing economic base.

This analysis of the impacts of the spending associated with SCDOT's activities does not explicitly represent the economic base approach. In particular, no distinction was made between the sources of funding for the Department's operations. To the extent that SCDOT is using federal money to fund its activities, the impact analysis is in line with the economic base approach. That is, impacts in that case would represent a true net addition to the state's economy. Likewise, to the extent that the funding comes from taxes levied on South Carolinians, the analysis more closely resembles the economic linkage approach.

In the case of SCDOT, many of the funds used to finance construction and maintenance projects come from federal matching dollars. Further, a significant portion of the fuel tax, which provides more than 90 percent of SCDOT's state funding, is likely generated by out-of-state visitors to South Carolina. Thus, to the extent that SCDOT's operations are financed by a federal match arrangement or by fuel tax collections from visitors, the impacts presented in this report represent actual net additions to the South Carolina economy.

3. Economic Impact Results

To estimate the various impacts of SCDOT's activities, the agency's expenditures were broken down into three broad categories:

1.   Construction and Maintenance Expenditures.
2.   Other Operating Expenditures.
3.   Employee Payroll Expenditures.

Each of these categories of expenditures and the associated impacts on output, earnings, and employment will now be considered in turn. Throughout this section, unless otherwise noted, all dollar figures are in terms of 2002 dollars. That is, the expenditures of SCDOT and their resulting impacts have been appropriately inflated to be easily interpreted in current dollars. This is necessary to insure that the results are not skewed because of changes in prices over time.

Construction and Maintenance Expenditures

The primary activity of SCDOT is the construction and maintenance of South Carolina's highway system. SCDOT is charged with maintaining the fourth largest state-maintained highway system in the United States. Overall, 65 percent of total road miles in South Carolina lie under the jurisdiction of SCDOT. This far exceeds the national average of 21 percent.

Data provided directly by SCDOT reveal that the agency has invested an average of $746 million each of the last three fiscal years on construction, maintenance, and funding the State Infrastructure Bank (SIB). The SIB is a part of SCDOT's innovative financing strategy that is used to help fund major construction projects across the state, including the Conway Bypass in the Grand Strand region, the Cooper River Bridges project in the Charleston area, the Upstate GRID project in the Greenville area, and the Lake Murray Dam project in the Midlands. The SIB selects and assists with financing major projects that provide benefits by promoting economic development, enhancing mobility and public safety, and improving quality of life and the general welfare of the public.

This direct investment on the part of SCDOT represents the direct increase in output produced by the construction sector in South Carolina. After adjusting for inflation, the direct impact on economic output from SCDOT's construction and maintenance activities totaled $780.9 million on average during each of the last three fiscal years. However, because of the economic multiplier effects, the total impact on output must exceed this direct contribution.

As shown in Figure 4, the annual direct spending of $780.9 million resulted in an annual indirect im-

Figure 4. Annual Output Impacts of SCDOT Construction and Maintenance Investment
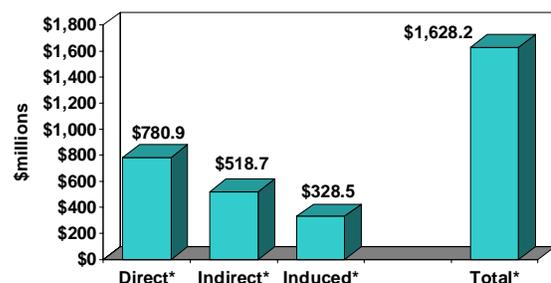
*2002 dollars.

pact on output of $518.7 million. Again, this figure measures the impact on economic activity within the businesses that supply to the state's construction sector.

The direct spending also resulted in an induced impact on output equal to $328.5 million each year. Table 1 shows the breakdown of these indirect and induced impacts by sector of the South Carolina economy.

Table 1. Annual Output Impacts by Sector Due to Construction and Maintenance Investment

Industry	Impacts			
---	Direct	Indirect	Induced	Total
Agriculture	$0	$6,367,822	$2,210,750	$8,578,572
Mining	0	625,148	147,660	772,808
Construction	780,940,160	7,380,253	6,174,175	794,494,592
Manufacturing	0	244,359,808	74,838,888	319,198,688
TCPU	0	44,697,124	30,915,964	75,613,088
Trade	0	85,395,664	62,600,812	147,996,464
FIRE	0	28,403,746	65,492,720	93,896,464
Services	0	92,985,600	78,296,456	171,282,064
Government	0	8,467,210	7,870,056	16,337,266
TOTAL	$780,940,160	$518,682,375	$328,547,480	$1,628,170,006

Notes: All figures are in terms of 2002 dollars. TCPU stands for Transportation, Communications and Public Utilities, FIRE stands for Finance, Insurance and Real Estate, and Trade includes Retail and Wholesale Trade. Elements may not sum to the listed total because of rounding.

Summing the direct, indirect, and induced impacts reveals a total impact on economic output in excess of $1.6 billion annually. This significant impact stems only from the highway construction and maintenance activities of SCDOT. The impacts of other SCDOT activities are given later in this section.

Turning next to the impacts on labor earnings, SCDOT's construction and maintenance expenditures supported a total of $242.6 million in labor earnings each year. This direct impact on worker income is fully realized by the state's construction sector. As seen in Figure 5, the indirect and induced spending resulting from SCDOT's initial expenditures helped support a total of $169.1 million in indirect labor earnings and $114.1 million in induced earnings, for an annual total of $283.3 million in income beyond the direct impact.

In total, the construction and maintenance activities undertaken by SCDOT supported a total of $525.8 million in personal income in South Carolina each year. The breakdown by sector of these earnings impacts is shown in Table 2.

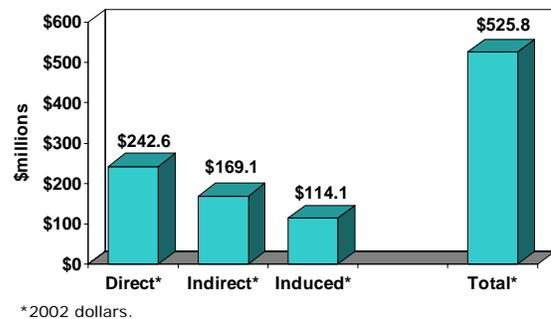**Figure 5. Annual Earnings Impacts of SCDOT Construction and Maintenance Investment**

*2002 dollars.

Table 2. Annual Earnings Impacts by Sector Due to Construction and Maintenance Investment

Industry	Direct	Impacts Indirect	Induced	Total
Agriculture	$0	$1,605,628	$557,434	*$2,163,062*
Mining	0	217,862	51,459	*269,321*
Construction	242,552,112	2,292,232	1,917,636	*246,761,984*
Manufacturing	0	55,050,400	16,860,018	*71,910,424*
TCPU	0	12,526,248	8,664,115	*21,190,364*
Trade	0	37,913,004	27,792,802	*65,705,808*
FIRE	0	5,203,567	11,998,267	*17,201,834*
Services	0	48,103,328	40,504,332	*88,607,656*
Government	0	6,206,301	5,768,599	*11,974,901*
TOTAL	*$242,552,112*	*$169,118,569*	*$114,114,662*	*$525,785,353*

Notes: All figures are in terms of 2002 dollars. TCPU stands for Transportation, Communications and Public Utilities, FIRE stands for Finance, Insurance and Real Estate, and Trade includes Retail and Wholesale Trade. Elements may not sum to the listed total because of rounding.

Figure 6 shows that, in terms of employment, SCDOT's construction and maintenance budget directly supported an average of 7,107 construction sector jobs during each of the last three fiscal years. Again, this figure actually refers to the number of full-time equivalent positions, that is, the number of 40 hour/per week jobs. Within those industries that supply to the construction sector, another 5,465 indirect jobs were supported. Finally, the induced impacts resulted in 3,875 additional jobs.

Overall, the construction and maintenance activities of SCDOT in recent years helped support an average of 16,447 full-time positions annually statewide.[1] The indirect and induced jobs are shown by sector in Table 3.

Figure 6. Annual Employment Impacts of SCDOT Construction and Maintenance Investment
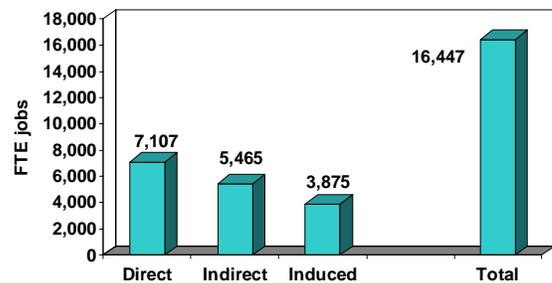
The earnings and employment impacts combined reveal that the jobs supported by SCDOT's construction and maintenance activities are generally well-paying jobs. The total earnings impact of $525.8 million divided by the total employment impact of 16,447 yields average earnings per job across all impacted sectors equal to $31,969.

Other Operating Expenditures

SCDOT provides numerous other transportation services to the state of South Carolina besides highway construction and maintenance. For example, SCDOT's Division of Mass Transit is engaged in improving and expand-

Table 3. Annual Employment Impacts by Sector Due to Construction and Maintenance Investment

| Industry | Impacts | | | |
---	Direct	Indirect	Induced	Total
Agriculture	0	128.6	44.6	173.2
Mining	0	4.8	1.1	5.9
Construction	7,107.3	67.2	56.2	7,230.6
Manufacturing	0	1,276.0	390.8	1,666.8
TCPU	0	282.9	195.7	478.6
Trade	0	1,665.3	1,220.8	2,886.0
FIRE	0	159.9	368.8	528.7
Services	0	1,717.8	1,446.5	3,164.3
Government	0	162.2	150.7	312.9
TOTAL	7,107.3	5,464.7	3,875.2	16,447.1

Notes: All figures are in terms of full-time equivalent positions. TCPU stands for Transportation, Communications and Public Utilities, FIRE stands for Finance, Insurance and Real Estate, and Trade includes Retail and Wholesale Trade. Elements may not sum to the listed total because of rounding.

ing South Carolina's multi-modal transportation system. Research and investment in the area of mass transit in South Carolina is an important part of the state's long-range economic development goals.

SCDOT also undertakes expenditures for the purpose of improving the safety of the state's transportation network. While the construction and maintenance activities of SCDOT are vital for increasing the safety of the state's highways, there are safety-specific activities of SCDOT. These various projects designed to improve safety include Railroad Crossing Improvements, Hazard Elimination, Intersection Improvements, and Safety Campaigns. One of the most visible promotional projects during the period studied here has been the "Highways or Dieways" campaign that began in April 2000.

There are many economic benefits that can accrue to the state because of these mass transit and safety efforts. Section 4 of this report examines some of the broader and longer-term economic benefits that can be realized. In this section, the short-term and measurable impacts of these various SCDOT activities are estimated.

SCDOT expended $66.2 million on average over the last three years on other activities. For example, an average of $9.8 million went to support statewide mass transit efforts. Another $21.4 million was used for general administration, including safety campaigns and technology modernization intended to increase internal efficiency at SCDOT. An additional $17 million per year was expended on the state highway system from state C-Fund dollars.

The State of South Carolina provides a significant amount of funding for local roads through the state C-Fund Program. The state Appropriations Act has included $178.5 million for this purpose over the last three years. State law requires SCDOT to transfer an additional $9.5 million per year from the state Highway Fund to the C-Fund Program. So, the total allocation for the C-Fund Program over the last three years has been $207 million, or roughly $69 million per year. State law requires that 25 percent of these funds be expended on roads in the state highway system. The other 75 percent may be used for local roads.

There are 22,395 miles of local roads in South Carolina. The C-Fund Program provides up to $52 million each year for funding these roads. This annually equates to $2,322 per mile in state dollars for local roads. The C-Fund Program also averages $17 million each year for roads in the state system. These funds are generally invested in resurfacing of non-federally eligible roads. There are 24,542 miles of non-federally eligible roads in the state system. There is currently no other source of funding available for the resurfacing of those roads. The annual C-Fund investment in non-federally eligible roads is $693 per mile.

This average direct expenditure of $66.2 million resulted in an annual direct impact on economic output of $69.8 million (in 2002 dollars). The indirect and induced impacts resulting from this direct expenditure totaled $30.1 million and $31.3 million respectively each year, as shown in Figure 7. The overall total impact on output from SCDOT's other operations amounts to $131.2 million annually. Via the indirect and induced effects, this impact on economic activity is felt across virtually every sector of the South Carolina economy, as shown in Table 4.

Figure 7. Annual Output Impacts of SCDOT's Other Operations

*2002 dollars.
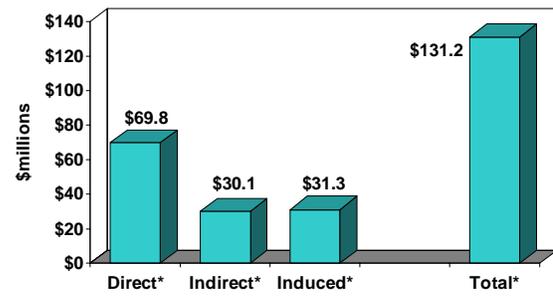
The direct expenditures on these other activities supported a total of $32.0 million in labor earnings directly at those firms doing business with SCDOT. As shown in Figure 8, the indirect impact on labor earnings was $10.9 million, and the induced effect on earnings was $11.8 million. In total, then, these various activities of SCDOT, other than construction and maintenance, helped support $54.7 million in annual labor earnings in South Carolina. Table 5 shows how this personal income impact is distributed across sectors of the state economy.

Table 4. Annual Output Impacts by Sector Due to Other Operations

Industry	Direct	Indirect	Induced	Total
Agriculture	$0	$305,444	$210,405	$515,850
Mining	0	45,460	14,049	59,508
Construction	17,893,497	1,477,337	587,184	19,958,018
Manufacturing	0	11,564,659	7,120,511	18,685,170
TCPU	12,751,171	3,663,737	2,941,279	19,356,187
Trade	0	3,890,969	5,955,492	9,846,461
FIRE	6,630,492	2,485,043	6,227,263	15,342,799
Services	9,986,646	6,021,423	7,446,595	23,454,664
Government	22,538,194	713,895	748,469	24,000,558
TOTAL	*$69,800,000*	*$30,167,967*	*$31,251,247*	*$131,219,214*

(Header: Impacts)

Notes: All figures are in terms of 2002 dollars. TCPU stands for Transportation, Communications and Public Utilities, FIRE stands for Finance, Insurance and Real Estate, and Trade includes Retail and Wholesale Trade. Elements may not sum to the listed total because of rounding.

Figure 8. Annual Earnings Impacts of SCDOT's Other Operations

*2002 dollars.
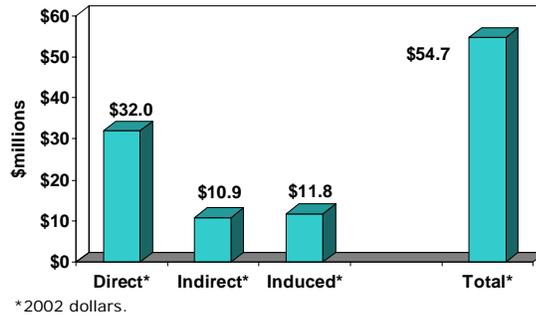
Table 5. Annual Earnings Impacts by Sector Due to Other Operations

Industry	Direct	Indirect	Induced	Total
		Impacts		
Agriculture	$0	$83,793	$57,722	$141,515
Mining	0	17,236	5,327	22,563
Construction	5,557,538	499,221	198,421	6,255,180
Manufacturing	0	2,834,582	1,745,289	4,579,872
TCPU	3,573,481	1,117,098	896,816	5,587,395
Trade	0	1,879,471	2,876,706	4,756,176
FIRE	1,214,706	495,319	1,241,218	2,951,243
Services	5,166,294	3,389,097	4,191,241	12,746,632
Government	16,520,061	569,315	596,886	17,686,262
TOTAL	$32,032,080	$10,885,132	$11,809,625	$54,726,838

Notes: All figures are in terms of 2002 dollars. TCPU stands for Transportation, Communications and Public Utilities, FIRE stands for Finance, Insurance and Real Estate, and Trade includes Retail and Wholesale Trade. Elements may not sum to the listed total because of rounding.

Turning to the employment impacts, 830 full-time equivalent positions were directly supported by SCDOT's funding in areas including mass transit, safety promotion, the County Transportation Committee, and other aspects of general administration including the Transportation Enhancement Program. Figure 9 reveals another 318 jobs were supported due to the indirect effects, while 368 jobs were supported because of the induced effects. The total impact on jobs from these various SCDOT expenditures was 1,516. The industry-level distribution of jobs is given in Table 6.

Figure 9. Annual Employment Impacts of SCDOT's Other Operations

Industry	Impacts			
	Direct	Indirect	Induced	Total
Agriculture	0.0	6.1	4.3	10.4
Mining	0.0	0.4	0.1	0.4
Construction	281.6	13.4	5.3	300.4
Manufacturing	0.0	60.3	37.1	97.5
TCPU	60.3	23.2	18.6	102.0
Trade	0.0	75.8	116.0	191.8
FIRE	27.9	14.0	35.0	76.8
Services	137.8	111.1	137.4	386.3
Government	322.4	13.7	14.3	350.4
TOTAL	829.9	318.0	368.1	1,516.0

Notes: All figures are in terms of fulltime equivalent positions. TCPU stands for Transportation, Communications and Public Utilities, FIRE stands for Finance, Insurance and Real Estate, and Trade includes Retail and Wholesale Trade. Elements may not sum to the listed total because of rounding.
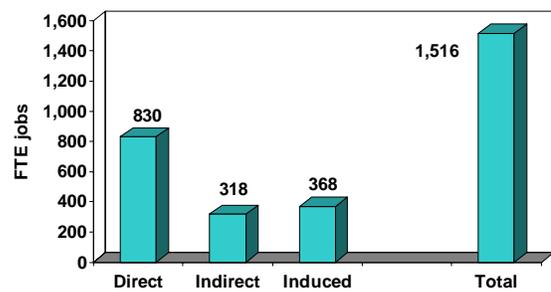
Employee Payroll Expenditures

The previous sections estimate the economic impacts arising from SCDOT's expenditures in support of its construction, maintenance, safety, mass transit, and other activities. For example, these various operations together help support a total of 17,963 jobs in South Carolina. These represent jobs at the businesses that directly or indirectly supply goods and services to SCDOT, and businesses that are affected by the induced impacts.

However, SCDOT itself employs roughly 4,966 additional workers. These SCDOT employees receive total compensation of about $137.5 million annually. A portion of this compensation will be spent in the local economy and will therefore yield further induced economic impacts. It is assumed that 70 percent of the total employee compensation will be spent in South Carolina. This accounts for the fact that this compensation will also consist of: medical benefits and other noncash payroll items, money used to pay taxes, and money used to make purchases out-of-state due to travel and electronic commerce.

Therefore, it is assumed that SCDOT's direct payroll expenditures will result in direct instate spending by SCDOT employees of $96.3 million annually. These direct payroll expenditures on the part of SCDOT and the ensuing household spending yield a total annual economic output impact of $297.5 million.

The total impact on labor earnings amounts to $188.0 million each year. This includes the total compensation of SCDOT employees and all of the earnings generated via the induced effect. The overall employment impact is 6,397 full-time jobs. This figure includes the annual average of 4,966 directly employed by SCDOT, and an additional 1,431 jobs supported via the induced effects.

Figure 10 summarizes the total impacts on output, earnings, and employment resulting from SCDOT's direct payroll expenses. The distribution of the output, earnings and employment impacts by sector is given in Table 7.

Figure 10. Annual Economic Impacts of SCDOT's Payroll Expenditures
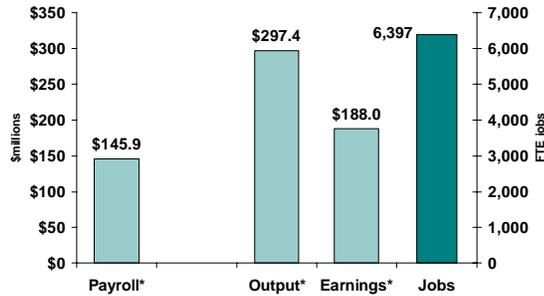
*2002 dollars.

Table 7. Annual Economic Impacts by Sector Due to Payroll Expenditures

Industry	Impacts		
	Output	Earnings	Employment
Agriculture	$840,375	$211,898	17.0
Mining	55,517	19,347	0.4
Construction	2,239,284	695,499	20.4
Manufacturing	27,914,718	6,288,745	145.8
TCPU	11,843,697	3,319,164	75.0
Trade	23,407,072	10,392,007	456.5
FIRE	23,124,850	4,236,473	130.2
Services	28,618,748	14,805,056	528.7
Government	148,873,049	148,073,690	5,023.3
Other	30,488,085	0	0
TOTAL	$297,405,393	$188,041,878	6,397.2

Notes: All figures are in terms of 2002 dollars. TCPU stands for Transportation, Communications and Public Utilities, FIRE stands for Finance, Insurance and Real Estate, and Trade includes Retail and Wholesale Trade. Elements may not sum to the listed total because of rounding.

Tax Revenue Impacts

In addition to the economic impacts on output, earnings, and employment, the activities of SCDOT also contribute to tax revenue collections for the State of South Carolina. Two specific avenues by which SCDOT helps contribute to government revenues are via the department's large volume of purchases of sales-taxable construction inputs, and the sales and income tax revenues generated by the labor earnings attributable to SCDOT.

South Carolina's sales and use tax laws provide for substantial exemptions on the purchases of inputs to manufacturing firms. However, the purchases of construction inputs on the part of SCDOT are not exempted from the sales and use tax. On average across the nation, of every dollar spent on construction, 20 cents goes directly to labor while the remaining 80 cents is used for the purchase of materials. Therefore, 80 percent of SCDOT's expenditures on highway construction and maintenance are used to purchase sales-taxable construction inputs.

In 2002 dollars, SCDOT invests an average of $780.9 million annually in highway construction and maintenance. Of this total, $624.8 million (80 percent) is used to purchase non-labor inputs. Therefore, $624.8 million worth of purchases each year are subject to South Carolina's sales tax. The total sales tax rate in South Carolina is 5 percent; however, this can be broken down further. The sales tax rate for the state's general fund is 4 percent, while another 1 percent is allocated directly to fund education via the Education Improvement Act. Thus, SCDOT's construction input purchases generate $25.0 million each year in general fund sales tax revenue, and another $6.2 million each year for the Education Improvement Act. In total, these input purchases support $31.2 million annually in sales tax revenue for South Carolina.

The second major source of tax revenue supported by SCDOT is the sales and income tax collections generated by the labor earnings impacts of SCDOT's activities. The total labor earnings impact of SCDOT is $768.6 million annually. This income will be used to pay income taxes in South Carolina and will also be used to make instate purchases subject to the sales tax. One way to estimate these tax revenue collections is to calculate historical average income and sales tax rates and apply these rates to the total level of earnings supported. In South Carolina, total individual income tax collections average 3.9 percent of total labor income, while total sales tax collections average roughly 4.0 percent of total labor income.

These average tax rates, coupled with the total labor earnings impact, reveals that a total of $29.8 million in individual income tax revenue is supported annually by SCDOT's operations, all of which goes to the state's general fund. Household expenditures generate another $24.5 million in sales tax revenue for the general fund, and an additional $6.1 million in sales tax revenue for the Education Improvement Act. Therefore, the labor earnings impact of SCDOT supports a total of $60.4 million in state tax revenue each year.

Table 8 summarizes these various tax revenue impacts of SCDOT. A grand total of $91.6 million in tax revenue for state government is supported each year by SCDOT's operations. Of this, $79.3 million is general fund revenue available for a variety of uses at the state level, while $12.3 million is directly allocated to education per the South Carolina Education Improvement Act. This tax revenue impact is the result of total SCDOT investment of $949.8 million on average each of the last three years. Of every dollar invested in the South Carolina transportation network by SCDOT, 9.6 cents of tax revenue is generated for state government.

Table 8. Annual Tax Revenue Impacts

Source	General Fund	EIA	Total
Sales tax, inputs	$25.0	$6.2	$31.2
Sales tax, labor earnings	$24.5	$6.1	$30.6
Income tax, labor earnings	$29.8	NA	$29.8
TOTAL	*$79.3*	*$12.3*	*$91.6*

Notes: All values are millions of 2002 dollars.

Total Economic Impacts

SCDOT invested a total of $949.8 million on average during each of the last three fiscal years—$746.0 million on construction and maintenance, $66.2 million on other activities, and $137.5 million to cover payroll expenses. The total impacts of this direct spending are shown in Figure 11.

Overall, SCDOT's operations support a total of $2.1 billion in economic output each year. The bulk of this impact comes through the department's construction and maintenance activities. At a broad industrial level, the construction sector produces the largest economic output multiplier in the state's economy. That is, a given dollar amount of spending on construction will have a larger impact than identical spending in any other sector of the South Carolina economy.

Figure 11. Annual Economic Impacts of All SCDOT Activities

All dollar values are in terms of 2002 dollars.

As seen in the section on construction and maintenance impacts, the output multiplier in that case was 2.08. That is, for every dollar spent on construction projects, an *additional* $1.08 is supported through the indirect and induced effects. In other sectors of the state economy, such as retail trade or services, the output multipliers are closer to about 1.75, such that a dollar spent in these other sectors supports an additional $0.75 in spending or output.
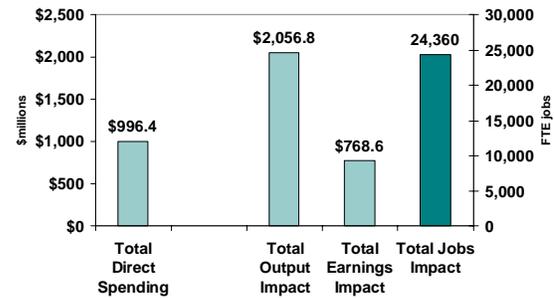
The larger multipliers in the case of the construction and manufacturing sectors reflect a more prominent instate supplier network for those industries. In South Carolina, many of the raw materials and manufactured goods that serve as inputs to the construction sector generate from within the state. From this perspective, a dollar allocated towards highway construction and maintenance has a much larger economic impact than a dollar spent in the state's retail trade sector.

In total, SCDOT's activities support $768.6 million in labor earnings each year. While the impact on economic output is difficult to gauge relative to the overall economy, there is a well-defined counterpart to measure the labor earnings impact against.[2] During 2000, total labor earnings in South Carolina were $67.3 billion. After adjusting this figure for inflation for comparability, the total labor earnings impact estimated in this report implies that roughly 1.1 percent of all labor earnings statewide can be attributed to activities of SCDOT. For more perspective on the earnings impact, 27 of the state's 46 counties have annual earnings levels that are less than the $768.6 million in earnings supported by SCDOT.

The activities of SCDOT also work to support a total of 24,360 full-time equivalent jobs in South Carolina each year. Again, the majority of these jobs (16,447) are due to the construction and maintenance expenditures, and another 4,955 are the direct employees of SCDOT. Total employment in South Carolina averaged 1,835,300 during 2001. Therefore, the full impact on jobs of SCDOT represents roughly 1.3 percent of all positions in the state.

The economic impacts of SCDOT's activities are not only substantial in magnitude, but they are also far reaching. Geographically, construction and maintenance activities are taking place in every region of South Carolina. The direct spending and the many ripple effects help support local economies across the state. Further, the impacts are not felt only within the state's construction sector. Because of the interindustry relationships and the role of house-

hold spending, the total output, earnings and employment impacts are felt in every sector of the state's economy, as shown in Table 9.

These economic benefits for South Carolina of SCDOT's activities are sustainable only if funding of these activities is maintained at this level. However, many of the projects undertaken by SCDOT during this period have been possible only through the issuance of bonds. These bonds are set to be repaid using future federal matching funds.

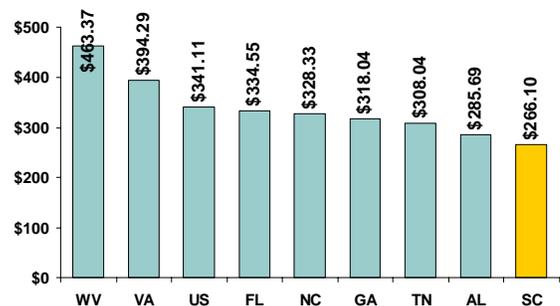### Table 9. Annual Economic Impacts by Sector Due to All SCDOT Activities

Industry	Output	Earnings	Employment
Agriculture	9,934,797	2,516,475	200.6
Mining	887,833	311,231	6.7
Construction	816,691,894	253,712,663	7,551.4
Manufacturing	365,798,584	82,779,041	1,910.1
TCPU	106,812,972	30,096,923	655.6
Trade	181,250,009	80,853,991	3,534.4
FIRE	132,364,113	24,389,550	735.7
Services	223,355,476	116,159,344	4,079.3
Government	189,210,873	177,734,853	5,686.6
Other	30,488,085	0	0.0
TOTAL	2,056,794,635	768,554,071	24,360.4

Notes: All figures are in terms of 2002 dollars. TCPU stands for Transportation, Communications and Public Utilities, FIRE stands for Finance, Insurance and Real Estate, and Trade includes Retail and Wholesale Trade. Elements may not sum to the listed total because of rounding.

SCDOT will not be able to continue to rely on bond issuance at this level indefinitely into the future. Without another source of revenue, the level of activities of SCDOT will need to be pared, which will have negative consequences for the South Carolina economy. The negative ramifications will be felt in terms of the output, earnings, employment, and tax revenue impacts presented in this section, as well as in the hindrance of the longer-term economic development and growth impacts that will be explored in the next section of this report.

Transportation investment in South Carolina is low relative to both national and regional averages. Figures 12 through 14 illustrate how South Carolina's highway system expenditures stacks up against the national average and other states in the southeast using a consistent set of data provided by the U.S. Census Bureau and the Federal Highway Administration. Figure 12 shows that South Carolina's highway spending on a per capita basis was lower than the national average and every other state in the eight-state region. During fiscal year 1998-99, highway spending from all sources of revenue amounted to $266 per person in South Carolina—78 percent of the national average of $341 per person.

Figure 12. State and Local Highway Spending Per Capita From All Revenue Sources

State	Spending
WV	$463.37
VA	$394.29
US	$341.11
FL	$334.55
NC	$328.33
GA	$318.04
TN	$308.04
AL	$285.69
SC	$266.10

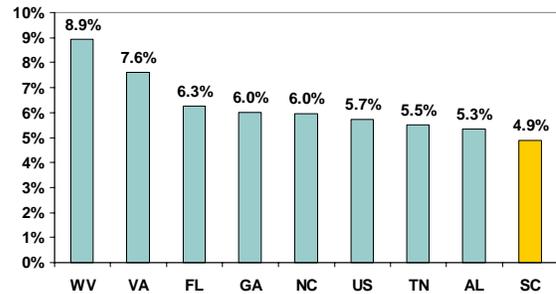Source: U.S. Census Bureau, State and Local Government Finances FY 98-99.

Figure 13 reveals South Carolina's highway spending also lags behind when considered as a percentage of total government expenditures. During FY 1998-99, state and local highway spending in South Carolina represented 4.9 percent of all state and local expenditures. The national average was 5.7 percent, and no other state in the region allocated less than 5.3 percent of total state and local expenditures to the highway system.

While these statistics are telling, they do not account for the relative sizes of the highway systems in these areas. Figure 14 compares these same areas in terms of highway expenditures per 1,000 vehicle miles. During FY 1998-99, South Carolina state and local governments spent a total of 22.7 cents per 1,000 vehicle miles of highways. This is based on Census Bureau data showing that state and local governments together spent roughly $1 billion on highways, and FHWA data estimating a total of approximately 45.5 billion vehicle miles in South Carolina annually. Meanwhile, the national average for all states was 33.8 cents per 1,000 vehicle miles. The only other state in the region to spend less on the highway system relative to vehicle miles was Alabama with spending of 22.1 cents per 1,000 vehicle miles.

The low level of highway investment in South Carolina is also apparent when looking only at state-source investment levels, as in Figure 15.

Looking at this from another angle, however, suggests that with a larger and more sustainable revenue base, SCDOT will be able to maintain and increase its level of transportation investment over time. This would translate into an even greater level of economic benefits that can be realized by South Carolina. Increased funding of SCDOT would allow the short-term output, earnings, and employment benefits to increase, and the improved transportation network would also be an important ingredient in achieving South Carolina's longer-term goals for economic development and growth.

Figure 13. State and Local Highway Spending as a Percentage of Total Government Spending

Source: U.S. Census Bureau, State and Local Government Finances FY 98-99.

Figure 14. State and Local Highway Spending per 1,000 Vehicle Miles
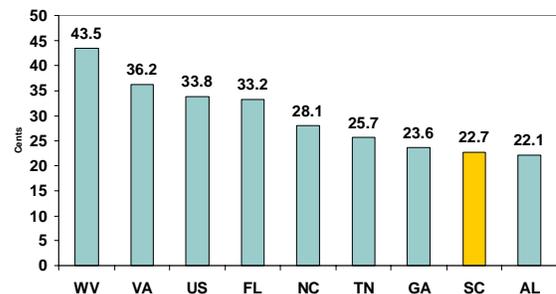
Source: U.S. Census Bureau, State and Local Government Finances FY 98-99.

Figure 15. State-Source Highway Investment Per Person
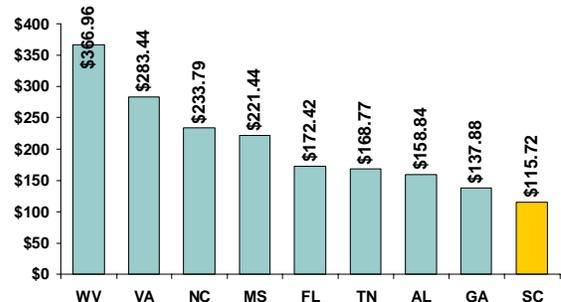
Source: *Federal Highway Statistics—2000.*

4. Long-Term Impacts of Transportation Investments

In addition to the short-term, measurable economic impacts arising from SCDOT expenditures on highway construction, maintenance, and other operations, there are many important longer-term economic benefits. These long-term benefits reach well beyond the boost the economy receives from, for example, a highway construction project. However, these other broad economic impacts also are inherently immeasurable or difficult to estimate quantitatively. Yet, an extensive literature exists examining many economic aspects of transportation investments.
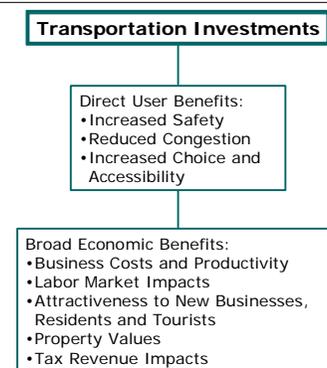
There are several identifiable ways in which transportation investments directly affect end-users. For example, the construction and maintenance of a reliable highway system is able to offer increased safety, reduced congestion and travel time, reduced travel costs, and increased transportation accessibility.

These direct effects on the users of South Carolina's transportation system in turn entail a variety of identifiable—though difficult or impossible to measure—economic benefits. These broad, longer-term economic benefits include positive impacts on business costs, business productivity, individual property values, economic development, and more. Figure 16 illustrates the relationship among transportation investments and services, direct user benefits, and the range of economic benefits. The purpose of this section is to explore these aspects of transportation investment in more detail.

Figure 16. Relationship of SCDOT Activities to Benefits

Transportation Investments

Direct User Benefits:
• Increased Safety
• Reduced Congestion
• Increased Choice and Accessibility

Broad Economic Benefits:
• Business Costs and Productivity
• Labor Market Impacts
• Attractiveness to New Businesses, Residents and Tourists
• Property Values
• Tax Revenue Impacts

The Direct User Benefits of Transportation Investments

The State of South Carolina benefits economically from the transportation investments and services provided by SCDOT via the impact of those services on end users. SCDOT's operations affect the citizens of South Carolina in three major ways:

1. Increased Safety
2. Reduced Congestion and Travel Time
3. Increased Transportation Choice and Accessibility

Safety

A study commissioned by the NHTSA found that during 2000 nearly 42,000 people were killed and another 5.3 million were injured in motor vehicle crashes throughout the United States.[3] South Carolina, with roughly 1.5 percent of the U.S. population, accounts for about 2.5 percent of total U.S. vehicle fatalities. A total of 27.6 million vehicles were damaged in these incidents nationwide. The economic loss due to these vehicle crashes was estimated to total $230.6 billion. This loss amounts to roughly 2.3 percent of total U.S. Gross Domestic Product. On average, this $230.6 billion amounts to a loss of $819 per person in the U.S.

That study also estimated the total economic cost of vehicle crashes in South Carolina at $3.3 billion in 2000. This amounts to an average per person cost of $831. While this average cost is only slightly higher than the national

average, the fact that South Carolina's per capita income level is lower than that for the United States implies that these costs of vehicle crashes are much larger in relative terms. In South Carolina, the per person crash cost was 3.4 percent of per capita income compared with a national average of 2.8 percent. Only four states had costs due to vehicle crashes that were larger than South Carolina's relative to the overall size of the state economy.

These economic costs are born by various groups. The breakdown of financial responsibility for the economic cost of motor vehicle crashes is shown in Figure 17. Households, businesses, and governments at all levels feel the economic burden of vehicle accidents. About 75 percent of the costs are incurred by parties not directly involved in the accident, primarily through insurance premiums, taxes, and travel delays. The opportunity cost of this economic loss is similarly shared by all groups of society, as this money could preferably support public funding in other areas and other types of private household and business activity.

Figure 17. Sharing the Burden of Vehicle Crash Costs

- ☐ Federal Government
- ☐ State/Local Governments
- ☐ Private Insurers
- ☐ Individual Victims
- ☐ Third Parties*
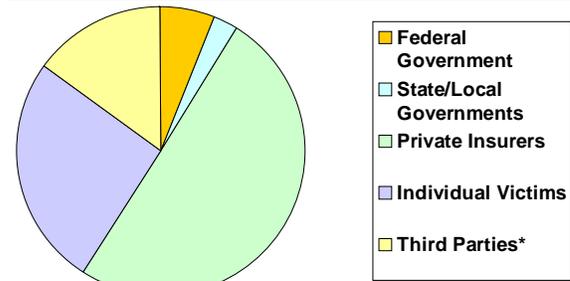
*Charities, health care providers, uninvolved motorists.
Source: "Economic Impact of Motor Vehicle Crashes 2000," NHTSA.

The high incidence of crashes in South Carolina contributes to higher-than-average insurance costs in the state. South Carolina has the 16th highest average insurance premium in the nation, when measured relative to per capita income. Crashes in South Carolina also lead to direct costs for SCDOT as the result of claims and lawsuits against the agency regarding the condition of the state's highway system. Between 1999 and 2001, a total of 3,196 claims and lawsuits were brought against SCDOT resulting in judgments and settlements in excess of $10 million.

SCDOT is involved in many different activities that are able to directly improve traffic safety. Direct investments in the highway system through construction and maintenance projects work to enhance the safety of the transportation system. Other safety enhancements come from projects including railroad crossing improvements, hazard elimination, and intersection improvements. These projects have been among the results of a reorganization of SCDOT's Safety Office that involved identifying and targeting the leading causes of crashes, injuries, and fatalities.[4]

To illustrate the effectiveness of highway improvements in promoting safety, SCDOT released a set of "Before and After" crash statistics.[5] This report looks at specific highway improvements undertaken by SCDOT during the 1990s and examines crash-related statistics during a three year period prior to the improvements and a three year period after the improvements. These specific instances of highway investments included improving alignment, replacing bridges, adding turning lanes, and widening shoulders, among others. In these particular cases, the number of crashes was reduced from 371 to 178, fatalities fell from 24 to 1, and injuries declined from 104 to 48.

SCDOT also operates various safety campaigns to educate the public on the causes and costs of traffic accidents, and ways to improve traffic safety. Among the more high-profile campaigns has been SCDOT's *Highways or Dieways,* challenging motorists to drive safely and responsibly.

Reduced Congestion and Travel Time

Traffic congestion is the source of untold frustration and lost time for all types of trips: commuting, recreational, social, and business-related. An inefficient transportation system and traffic congestion impose costs in the form of both lost time and money on households and businesses.

Congestion adds to the costs of motor carriers and other businesses shipping goods on the highway system. Companies may also accrue additional costs if they must keep larger inventories to guard against unexpected delays, or if they must hire more drivers or purchase more vehicles to make the same number of deliveries in a single day. Congestion results in higher delivery costs that can then be passed on in the form of higher consumer prices.

An hour of truck operation costs about $60, or $1 per minute.[6] Traffic congestion can quickly increase the cost of shipping and doing business, especially in a state like South Carolina that is the home to both many large manufacturing firms that rely on trucking and substantial port facilities that also rely heavily on the highway system.

The negative effects of congestion are bigger on industries that rely on skilled labor or specialized inputs and large, transportation-based market area to obtain those inputs. Congestion effectively contracts the market area for inputs, bidding up their costs, thus increasing production costs. Congestion may shrink business market areas and reduce (or eliminate) the "agglomeration economies" of operating in larger urban areas.[7]

Congestion buildup can negatively impact the attractiveness of a state in terms of economic development. Because of the costs of congestion for businesses, working through increased shipping costs and difficulties accessing labor markets, potential businesses may look to other locations that offer lower congestion costs.

Congestion can certainly harm South Carolina's tourist industry as well. It is vital that the state's transportation network keep pace with the demand for the highway system's services from visitors to the state. SCDOT's completion of the Conway Bypass and work on the Carolina Bays Parkway, both in the Grand Strand region, are examples of meeting current and future tourism demand. The reductions in congestion offered by these projects will help maintain the Grand Strand's attractiveness as a tourist destination. Without these kinds of improvements, the highway infrastructure supporting the state's tourism destinations can degrade to the point where these areas can lose their competitive edge to other—less congested— destinations.

In 1996, SHEP—the State Highway Emergency Program—was established for the purpose of relieving congestion on the state's urban interstates. The response of SHEP to interstate incidents helps reduce the time lost due to congestion because of accidents and disabled vehicles.

Improvements in the state's highway system designed to reduce congestion and increase efficiency will provide South Carolina with good connectivity among markets within the state and between South Carolina and other states. Transportation investments have the ability to reduce many types of costs and can result in increased productivity. These improvements will help South Carolina's efforts in attracting businesses, residents, and tourists to the state.

Increased Transportation Choice and Accessibility

Investments in the transportation system help bring more transportation choices and improved accessibility to the population. This works to reduce the costs involved with connecting local markets, whether for labor or goods and services. In other words, a larger transportation network, offering more choices and easy access, makes the process of connecting businesses and households to available labor and product markets more efficient.

The provision of mass transit services has the ability to improve congestion in urban areas as populations continue to reside further and further from where they work. Greater access to an efficient transportation network is also very important in rural areas. Many rural areas of South Carolina are faced with high levels of unemployment as manufacturing plants have closed over the years without new industry to hire the displaced workers. One way to reduce these unemployment levels is to make it easier for those workers to get to the areas that do have available jobs.

Similar to the effects of reducing congestion and travel time, by adding to the transportation infrastructure through greater choice and accessibility, it is easier for both businesses and households to access labor and product markets. By facilitating market interaction, transportation investments can reduce transportation costs and help those markets operate more efficiently.

The Broad Economic Benefits of Transportation Investments

The direct user benefits of transportation investments and transportation services lead to many identifiable economic benefits. Here, the following benefits are discussed in more detail:

1.   Business Costs and Productivity
2.   Labor Market Impacts
3.   Attractiveness to New Businesses, Residents and Tourists
4.   Property Values
5.   Tax Revenue Impacts

Business Costs and Productivity

The user benefits discussed in the previous section lead to monetary benefits for both users and nonusers of the transportation system in South Carolina. Decreased travel time, decreased congestion, and increased safety all work to reduce direct transportation costs. As transportation costs are held down, households benefit in the form of lower prices on goods and services. Lower transportation costs and transportation accessibility enlarges labor and product market access. This reduces the cost of obtaining production inputs. This also reduces the cost associated with supplying final goods and services in product markets.

Overall, these reductions in costs help markets operate more efficiently. This efficiency gain can free up resources that otherwise would need to be used to cover transportation costs, whether in the form of direct shipping costs, vehicle crash costs, or the value of time lost due to congestion. By freeing these resources, businesses could instead allocate this capital and labor towards more productive uses. That is, greater investment in the transportation system can reduce many kinds of costs associated with safety, congestion, and accessibility problems. These cost reductions can in turn allow markets to operate more efficiently and can lead to greater productivity in the South Carolina economy in general.

Why does this matter? The path toward long-term gains in South Carolina's position relative to other states in terms of incomes and living standards must follow the growth of productivity in South Carolina. Only by realizing productivity gains can workers realize higher wages. Thus, SCDOT investments in the state's transportation network can help the state enjoy productivity gains that can foster long-term economic growth and work to improve living standards across the state.

Labor Market Impacts

Transportation investments allow individuals to benefit from increased employment options as their range of feasible commuting is expanded. At the same time, the supply of labor to area employers increases as more potential employees fall within their commuting range. As a result, labor markets would operate more efficiently, and more jobs could potentially be created and retained in South Carolina.

Transportation investments and services also promote economic development by increasing employment opportunities among transportation disadvantaged workers. This can be the case in rural South Carolina by improving and expanding the state's highway system. Both rural and urban areas stand to benefit from projects devoted to providing mass transit services and other forms of public transportation. Thus, transportation investments can improve local labor market conditions for households by bringing more available jobs within a feasible commuting range. Businesses also benefit by seeing this commuting range grow thereby increasing the available labor supply.

Attractiveness to New Businesses, Residents, and Tourists

An efficient transportation system not only benefits existing businesses in terms of lower production and operating costs, but also is a vital ingredient in South Carolina's economic development. Upgrading the level and quality of transportation services and access can be an important factor in attracting new business to the state or for encouraging business expansion within the state. New highways, roads or other transportation improvements can spur economic development in the area where those improvements took place.

Long term business growth in a region is affected by many factors including the size of the region's product and labor markets, the relative cost of doing business in the region, and the region's proximity or access to raw materials or other inputs. Transportation investments can have a positive impact on all of these factors. In addition, new roads and transportation services may expand opportunities for multi-modal connections—including road/rail/sea/airport connections for either passenger travel or freight shipments that can further complement economic development. Transportation system improvements can also work to expand instate supplier networks and encourage business location by firms requiring close proximity to, and low transportation costs with, its suppliers.

All of these improvements can have a variety of market expansion impacts, including expansion of customer market areas for retail and personal service businesses, expansion of labor market attraction areas for businesses, expansion of "just-in-time" (one day delivery) service areas. Thus, they can attract new residents as well as businesses because of new job opportunities and the user benefits of an efficient transportation system.

Indeed, the economic development benefits of transportation investments are likely substantial. Though nearly impossible to quantify, it is generally agreed that providing adequate transportation infrastructure is among the most critical aspects of an economic development strategy. As the competition between states in attracting business investment continues to grow, it is becoming increasingly important for states to identify areas in which they have a competitive advantage. An efficient transportation system is certainly one such factor that can provide an edge to a

particular state. Thus, from an economic development view, it is vital that South Carolina continues to upgrade and add to its existing transportation network.

An important piece of the South Carolina economy is tourism. Tourist activity in South Carolina can clearly be affected by the efficiency of the state's transportation system. The relationship between transportation and tourism is circular. The level of tourism is in part determined by the quality of the state's transportation system. As the tourist industry in South Carolina continues to grow, it places further demands on the transportation system, and so on.

By meeting the needs for current and future tourism levels, SCDOT through its highway investments is able to both stimulate the economy in the short run, and ensure that the highway infrastructure is adequate for supporting the expected growth in tourism into the future. This is vital to the longer-term health of the South Carolina economy, as tourism will likely always be a very important component of the overall economy.

Property Values

Transportation investments can have a positive impact on property values in several ways. In a direct sense, the quality and accessibility of transportation services is among the factors that affect residential location decisions. Neighborhood characteristics, the quality of local schools, and the proximity to an individual's workplace are among the other major factors that work to determine where people live.

When several areas are similar in terms of these various attributes, the quality of the transportation system can be a key factor. Therefore, transportation investments can work to attract residents to an area. These improvements do not have to be major projects. For example, adding turn lanes or widening existing roads can make an area more attractive to potential residents. Transportation investments that attract residents help stimulate housing sector activity in the area and can drive up local property values.

Improvements in congestion and reduced travel time that result from transportation investment can reduce the travel costs associated with living in particular areas. This can provide another boost to property values in the local area. Also, the overall benefits in terms of economic development and business location that arise from transportation investments can stimulate the demand for housing in a local economy. Therefore, property values can be positively influenced by transportation investments via their overall impact on economic activity.

Tax Revenue Impacts

The short-term fiscal benefits have already been estimated at $91.6 million each year for state government. However, the long-term economic benefits that arise from transportation investments mentioned above will result in additional fiscal benefits to South Carolina's state and local governments. At the state level, the increased employment and business activity resulting from the economic development impacts will produce additional individual income, corporate income, and sales tax revenues, as well as increases in other miscellaneous charges and fees used to fund state government.

It should be noted that there will also be additional costs incurred by state government in enhancing the transportation system and that a full model weighing possible costs and benefits is impossible to construct with any accuracy. However, it will be the case that there will be benefit to state revenues arising from the transportation network's role in economic development. This positive impact cannot be ignored.

Local governments also enjoy positive impacts on tax revenues due to transportation system investments. Localities in South Carolina rely heavily on the property tax as a source of revenue. Transportation investments contribute to business and residential location decisions. This overall impact on economic development will work to add to the local government's tax base. New and expanding businesses will result in an increase in the value of assessed nonresidential property, as well as new residential development.

Likewise, transportation enhancements that work to, for example, reduce travel times associated with particular communities can effectively prop up property values in those communities. This increase in property values will then translate into increased property tax revenues for the local governments.

Overall, improvements to South Carolina's transportation network benefit both the state and local tax bases in South Carolina. Through its overall impact on economic development and property values, highway system expenditures can help boost the flow of revenue used to fund South Carolina state government, as well as counties, cities, and school districts across the state.

5. Conclusion

Strong infrastructure is among the most critical ingredients in achieving South Carolina's goals of raising productivity and prosperity. The stated goal of economic development in South Carolina is to see the state close the gap with the U.S. in terms of per capita incomes and living standards. On a statewide, regional, and localized basis, improving the stock of infrastructure is a first step towards these development goals. A critical component of the economy's infrastructure is its transportation system.

Only by making the necessary transportation investments will South Carolina be able to successfully attain its economic development aims. There are certainly many other pieces to the development puzzle that must be addressed, such as education and health care. Yet the role of transportation enhancements must not be ignored.

The numerous economic benefits arising from transportation investments feed directly into the state's short- and long-term goals of providing employment and income to residents, and seeing growth in living standards over time. Without adequate funding for its transportation system, South Carolina is in danger of losing these economic benefits today and tomorrow. If the state's transportation infrastructure fails to meet the growing demand for transportation services in the future, South Carolina will suffer in terms of missed opportunities for enhancing living standards across the state.

The converse is also true. With an adequate and consistent funding source, the South Carolina Department of Transportation can maintain and increase its level of investment in South Carolina's transportation network. A reliable and growing source of funding for SCDOT will allow it to expand its important projects and programs, ranging from highway construction and maintenance to safety promotion efforts and environmental concerns. Providing support to these programs will be a critical step toward allowing the South Carolina economy achieve sustained and substantial growth in living standards.

Endnotes

[1] These results indicate that every $1 million of spending on highway construction and maintenance in South Carolina supports 21.1 jobs. A study by the U.S. Department of Transportation (USDOT)concludes that for each $1 million of federal spending on highway construction nationwide, 47.5 jobs are generated. The results presented in the current study rely on an input-output model tailored specifically to the South Carolina economy and using South Carolina specific data. Due to general differences in methodology, the resulting multipliers from this study should not be directly compared with those offered by USDOT.

[2] Recall, the concept of economic output commonly used in impact analysis refers to aggregate spending on all goods and services by businesses and households as opposed to the concept embodied in measures such as Gross State Product which captures just the value of all *final* goods and services. Therefore, there is no reliable counterpart for this concept of total output for South Carolina in general.

[3] "The Economic Impact of Motor Vehicle Crashes 2000," U.S. Department of Transportation's National Highway Traffic Safety Administration.

[4] SCDOT, Annual Accountability Report: Fiscal Year 1999-2000.

[5] SCDOT, "Highway Improvements Save Lives: SCDOT Releases 'Before and After' Crash Statistics."

[6] "Transportation Cornerstone Florida: Moving Florida's Economy into the 21st Century," Florida Chamber of Commerce Foundation, Inc. http://www.flchamber.com/home/transportation_cornerstone.asp

[7] G. Weisbrod, D. Vary, & G. Treyz, 2001, *Economic Implications of Congestion*, Transportation Research Board—National Research Council. National Cooperative Highway Research Program Report 463.

Appendix
Input-Output Analysis

Input-Output Analysis

Input-output (I-O) analysis is the basis for economic impact models. Input-output country tables are found throughout the world.[1] Variants of the U.S. input-output table are available for all counties in the United States. They are constructed with data on detailed inter-industry flows throughout the local economy, and information on demand and total output. One of the major virtues of I-O is that industry, or sectoral impacts can be calculated.

The employment and income multipliers that derive from input-output analysis are the basis for most economic impact analysis. But multiplier analysis is often misused or misunderstood in cost-benefit studies.

The basis for multiplier analysis is the input-output table. An I-O table is an accounting relationship, with each industry represented as both a column and a row in a matrix. In simple terms is a set of recipes for production in a given economy. The table provides data on industry demands from all other industries (the backward linkages are depicted in the columns of the table for each industry) and suppliers to all other industries (depicted across the rows of the table for each industry). The table also includes final demands and total output for the economy.

To measure the total impact of a new project in an economy, changes in all demands from other industries (the upstream linkages) must be determined. For example, a $10 million highway construction project expansion provides an initial impact of $10 million on the local economy. This is an example of a direct impact. Clearly, this construction project will require concrete, steel, construction workers, and so forth. The money spent on these materials and services comprises the indirect expenditures, or the indirect impacts. The mechanism used to measure total indirect expenditures is the (I-O) table. Table A.1 gives a simplified, two-vector version of an input-output table.

Table A.1
Hypothetical Input - Output Table

	Construc-tion	Manu facturing	Final Demand	Total Output	Construc-tion	Manu-facturing	Final Demand	Total Output
Construction	200	100	700	1000	Z_{11}	Z_{12}	F_1	X_1
Manufacturing	400	500	1100	2000	Z_{21}	Z_{22}	F_2	X_2

where Z_{ij} = inter-industry flow from sector i to sector j
F_i = final demand of industry I
X_i = total output of industry i

Most input-output tables would have dozens, if not hundreds, of sectors, but in this simplified economy, the only two sectors are construction and manufacturing. Using hypothetical data is presented in Table A.1. In this example, the manufacturing sector delivers to final demand $1,100 worth of goods. Final demand is the finished product that is used by a consumer. The interindustry flows are interpreted in the following manner: Manufacturing provides $400 worth of goods to the construction sector and $500 to itself. From the column of manufacturing data, we can see that to produce the $1100 of final goods, the manufacturing sector used $500 worth of its own output and $100 of output from the construction sector. These demands are termed intermediate demands, goods to be used in the production of other goods delivered to final demand. The total output of manufacturing is the row total, or $2000. The row entries are the inputs to the column sector.

Dividing the interindustry flows by the total output (from Table A.1) produces the technical coefficients matrix (Table A.2). This is the set of "recipes" for production. An illustrative interpretation of these technical coefficients shows that it takes $0.20 worth of construction output and $0.40 worth of manufacturing output to produce $1.00 worth of construction output.

	Construction	Manufacturing	Construction	Manufacturing			
Construction	$\dfrac{200}{1000}$	$\dfrac{100}{2000}$	.2	.05		a_{11}	a_{12}
			=		=		
Manufacturing	$\dfrac{400}{1000}$	$\dfrac{500}{2000}$	.4	.25		a_{21}	a_{22}

The process follows a general matrix algebra notation often used in multiplier analysis. The total output from each sector is the sum of the intermediate demands and the final demands, or

$$X_1 = Z_{11} + Z_{12} + F_1$$

$$X_2 = Z_{21} + Z_{22} + F_2,$$

which can be put into a matrix form as $X = Z + F$.

The direct coefficients table is used to calculate the multipliers for each industry. The multipliers are derived from the (Leontief) inverse of the direct coefficients in Table A.3. Table A.3 displays the inverse, or multipliers.

Table A.3
Leontief Inverse

$$(I-A)^{-1} = \begin{bmatrix} 1.2931 & 0.0862 \\ 0.6897 & 1.3793 \end{bmatrix}$$

Since total output equals the sum of the inter-industry flows and the final demand, one can derive the following equation:

$$X = Z + F \text{ , where } Z = AX.$$

This may be solved as $X = (I - A)^{-1} F$.

The basis for multiplier analysis is given in Table A.3. The term $(I-A)^{-1}$, called the Leontief inverse, provides a powerful tool in quantifying economic effects. The numerical result of $(I-A)^{-1}$ in our example is found in Figure 3.3.

To understand these numbers, consider what will happen to this economy should the demand for construction increase by $100. Obviously, to meet this demand, the construction sector will have to produce an extra $100 of output. Additionally, from the I-O table one can see that construction uses construction services in its own production process. From the **A** matrix, we see that to produce $1 worth of output, it takes $.20 worth of construction production as an input. Thus, $20 worth of construction will be needed as an input to increase output by $100 and, to produce that $20 worth, an additional amount given by (.2 X $20) will be used as an input. Further, construction will demand (0.4 X $100) from the manufacturing sector. The Leontief inverse is an effective tool for calculating the result of this round-by-round process. From the example in Figure 3.3, we see that a $100 increase in the demand for construction output requires a total increase of about $129 in construction output and an increase of $69 in manufacturing output. Thus the $(I-A)^{-1}$ matrix contains all of the direct and indirect effects of a change in final demand. The total economic impact is given by the column sums of the Leontief inverse. In our example, we find that the total economic impact of a $1 change in construction demand is $1.98; that is, the $1 gets multiplied by $1.98.

The multiplier derived from this example of the I-O model incorporates both the direct and indirect impacts. By adding to this simple model a row for payments to labor by the firm (wages) and a column of expenditure patterns (the marginal propensity to consume each type of product), the multipliers derived from the Leontief inverse will incorporate the direct,

indirect, and induced impacts. The induced impacts are additional expenditures resulting from increased earnings by local residents as a result of the increase in final demand.

By slight modifications of the above simple model, multipliers may be determined to analyze the total output impact, earnings impact, and jobs impact. Typically in impact analysis the analyst need only refer to an existing I-O table to determine the impact of any incremental change in final demand in an economy.

The data from an I-O table also provide quantitative measures of upstream and downstream linkages. The terms upstream and downstream become intuitive when one looks at the I-O table. A change in output by the construction sector requires increased production by all of its suppliers. This is upstream linkage. On the other hand, increased output in the construction sector also means additional amounts of this product that are available to be used as inputs in other sectors. This is the downstream linkage. The output multiplier described above is a measure of the downstream linkage. The downstream linkage is usually measured by transposing the standard I-O table into a supply-side I-O table and then calculating the Leontief inverse.[2] The upstream linkage measures the strength of the supplier relationship while the downstream linkage measures the strength of the market for selling the product as an input. Often the downstream linkage also includes the concept of marketing directly to the consumer in addition to sales to other firms as an input.

In the United States, as many countries, the federal government produces a detailed I-O table. Multipliers, as described above, are calculated from this table by IMPLAN so that it is fairly straightforward to estimate the impact of any change in final demand in the United States.

IMPLAN modeling software contains all the necessary information on sectoral linkages to estimate the total economic impact of a specified change in the final demand for the output of any given industry. This detailed information on the linkages between sectors is available at the national, state, and county levels. Overall, these data fully describe the relationships between 528 disaggregated sectors, covering manufacturing, services, retail trade, and so on.

Therefore, IMPLAN provides models that are well-suited to estimating the economic impacts of a construction project, given information on the cost of the project. This primary information is used in conjunction with the South Carolina-specific economic model provided by IMPLAN to estimate the ongoing employment, income, and output impacts of the SCDOT's operations.

Appendix Endnotes
[1] The approach used in I-O models may be traced to Quesnay's *Tableau Economique* in 1758. Wassily Leontief, the first to win a Nobel prize for an applied general equilibrium model, is credited with developing the analytical framework for I-O analysis, which is also termed interindustry analysis. I-O models have been used extensively in the analysis of both national and regional economies.
[2] See Miller and Blair (1985) for a detailed explanation of the mathematics involved in calculating these linkage measures.