GEORGIA DOT RESEARCH PROJECT 17-35

FINAL REPORT

ESTIMATED ECONOMIC AND TRANSPORTATION SYSTEM IMPACTS OF SELECTED GEORGIA DEPARTMENT OF TRANSPORTATION PROJECTS

OFFICE OF PERFORMANCE-BASED MANAGEMENT AND RESEARCH
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Final Report

ESTIMATED ECONOMIC AND TRANSPORTATION SYSTEM IMPACTS OF SELECTED GEORGIA DEPARTMENT OF TRANSPORTATION PROJECTS

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EXECUTIVE SUMMARY

Georgia changed its motor use fuel tax (MUFT) on July 1, 2015, from a 7 ½ cent excise tax per gallon coupled with a 3% sales tax on the wholesale price of gasoline and diesel fuel to an excise tax that was initially set at 26 cents and 29 cents on gasoline and diesel fuel, respectively. The excise tax rates have since been increased to 26.8 cents and 30 cents. This change resulted in an increase in state MUFT from about $1 billion in fiscal year (FY) 2015 to $1.6 billion in FY 2016 and nearly $1.8 billion in fiscal year (FY) 2018, allowing the Georgia Department of Transportation (GDOT) to make significant increases to the dollar value of road and bridge projects contracted annually.

In FY 2017, GDOT awarded contracts for 383 major construction and capital maintenance projects totaling $1,459,516,458, plus 259 routine maintenance projects for $105,512,335. GDOT made expenditures of $108,163,822 in design and engineering costs associated with these projects, bringing the total expenditure to $1.67 billion. In addition, $156,562,234 in Local Maintenance and Improvement Grants (LMIG) were made from the state's MUFT. These funds went directly to 688 county and municipal governments to help fund projects on roads and bridges maintained by local governments. According to GDOT officials, the majority of LMIG funds were expended for resurfacing.[1] Including the LMIG funds, total expenditures for FY 2017 for these purposes were $1,829,754,849.

This study measures the economic impact of these expenditures in terms of jobs, labor income, value added to the state's economy, and total economic output. Economic impacts were estimated using IMPLAN, an input-output county-level model of the US economy widely used for this type of research.

[1] Personal conversation with Mr. Marc Mastronardi, October 17, 2018.

Major findings:

- The new tax rates increased annual state MUFT revenue from approximately $1.0 billion to nearly $1.8 billion by FY 2018.
- $1.83 billion in total expenditures[2] resulted in $3.35 billion in total economic activity.
- GDOT projects in FY 2017 supported an estimated 21,428 jobs in Georgia with labor income of more than $1.02 billion.
- The jobs multiplier statewide for road and bridge construction and maintenance is 1.85 and ranges from 1.67 to 1.91 in the GDOT districts. Each direct employment job in the road and bridge construction and maintenance industry sectors supports nearly one (0.8) additional job in the state.
- The economic output multiplier effect for road and bridge construction and maintenance spending is 1.85 statewide, and ranges from 1.66 to 1.92 in the seven GDOT districts. Every $1 billion spent on road and bridge construction and maintenance results in another $850 million of economic activity in the state.
- The estimated value of benefits from transportation system efficiency improvements from 29 projects that enhanced capacity in metropolitan areas is $5.7 billion over the ten-year period 2019 to 2028. These benefits accrue from an estimated reduction in congestion, travel times, emissions, accidents, injuries, and fatalities, plus increased productivity.

[2] Includes $1.46 billion in construction and capital maintenance, $105 million in routine maintenance, $108 million in design and engineering expenditures, and $156 million in Local Maintenance and Improvement Grants.

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We extend our thanks and gratitude to Mr. Adam Winston at TREDIS for methodological help with the analysis of transportation system efficiency improvements, and to Ms. Kirsten Hughes for managing our account at TREDIS. Both have been helpful on a number of projects for several years.

INTRODUCTION

The motor use fuel tax (MUFT) in Georgia prior to July 1, 2015, consisted of an excise tax of 7½ cents per gallon on both gasoline and diesel fuels, plus a 3% state sales tax[3] and any local sales taxes. To facilitate collection of the tax and to reduce compliance costs, the tax was imposed at the rack, meaning that it was prepaid prior to delivery of fuel to the retailer. The prepaid sales tax amount was calculated using an estimated wholesale price per gallon for each fuel type set by the Georgia Department of Revenue (DOR). Using the estimated wholesale price, DOR set a cents-per-gallon sales tax rate to be collected along with the 7½ cent excise tax. The estimated price per gallon was set and made effective in January and July of each year for the subsequent six-month period. Table 1 shows these tax rates for fiscal year (FY) 2013, FY 2014, and FY 2015. Fiscal years for Georgia state government, including GDOT, begin on July 1 and end on June 30 the following calendar year. Fiscal years are labeled by the calendar year when they end, meaning FY 2017 began on July 1, 2016 and ended June 30, 2017.

During the 2015 legislative session, the Georgia General Assembly passed House Bill (HB) 170, which changed the method Georgia uses for taxing motor fuel effective July 1, 2015. The new method of taxation uses an excise tax only. The initial rates established on July 1, 2015, for gasoline and diesel fuel were 26 cents and 29 cents, respectively. The rate figures in Table 1 show a small increase over the last three years. The state no longer applies the state sales tax to motor fuel, but local sales taxes are still applied. DOR calculates the prepaid rates for local sales taxes using an estimated wholesale price per gallon established each January and July and imposes the tax at the rack following the established protocol.

[3] The 4% state sales tax was split, with 3% going to MUFT and 1% to the general fund.

Revenue collections under the new excise rates have produced a higher level of funding for road and bridge construction and maintenance than under the old tax system. State MUFT revenues were approximately $1 billion annually from FY 2013 through FY 2015 but increased to $1.6 billion in FY 2016 and to nearly $1.75 billion in FY 2017. Revenues were anticipated to approach $1.8 billion in FY 2018. In addition to state dollars, Georgia received $1.4 billion in federal funds in FY 2017 for road projects and anticipates $1.6 billion in FY 2018.[4]

The Georgia Department of Transportation (GDOT) contracted with the University of Georgia's Carl Vinson Institute of Government to conduct a study estimating the economic impact of the state's investment in major construction, capital maintenance, and routine maintenance during FY 2017. At the request of GDOT and Georgia House of Representatives Transportation Committee Chair Kevin Tanner, researchers at the Institute of Government estimated the impacts in regions of the state defined by GDOT district as well as by urban and rural areas. Additionally, the research team estimated the monetary value of transportation system efficiency improvements for projects that increase the capacity of the state's road system.

[4] The Governor's Budget Report, Fiscal year 2019, p. 279.

TABLE 1

Georgia Motor Use Fuel Tax Rates and Revenue, FY 2013 to FY 2018

Fiscal Year	Tax Rate Effective Date	Gasoline			Diesel			State MUFT Revenues**
		Excise Tax (Cents per Gallon)	Sales Tax* (Cents per Gallon)	Total	Excise Tax (Cents per Gallon)	Sales Tax* (Cents per Gallon)	Total	
FY 2013	1-Jul-12	7.5	9.1	16.6	7.5	10.7	18.2	$1,000,625,732
	1-Jan-13	7.5	9.0	16.5	7.5	10.9	18.4	
FY 2014	1-Jul-13	7.5	9.5	17.0	7.5	10.4	17.9	$1,006,493,364
	1-Jan-14	7.5	8.8	16.3	7.5	10.4	17.9	
FY 2015	1-Jul-14	7.5	8.8	16.3	7.5	10.4	17.9	$997,333,000
	1-Jan-15	7.5	8.8	16.3	7.5	10.4	17.9	
FY 2016	1-Jul-15	26.0	-	26.0	29.0	-	29.0	$1,605,915,000
	1-Jan-16	26.0	-	26.0	29.0	-	29.0	
FY 2017	1-Jul-16	26.0	-	26.0	29.0	-	29.0	$1,747,347,000
	1-Jan-17	26.3	-	26.3	29.4	-	29.4	
FY 2018	1-Jul-17	26.3	-	26.3	29.4	-	29.4	$1,768,350,000
	1-Jan-18	26.8	-	26.8	30.0	-	30.0	

*3% prepaid state tax rate
**FY 2018 estimate from Amended FY 2018 Budget in Brief
Sources: Georgia Department of Revenue, Governor's Office of Planning and Budget

DATA

The Georgia Department of Transportation (GDOT) provided data for 383 major road and bridge construction and capital maintenance projects totaling $1,459,516,458 that were contracted during FY 2017, and for 259 routine maintenance projects totaling $105,512,335 (see Table 2). Capital maintenance involves some level of reconstruction or repaving, whereas routine maintenance might include restriping, crack sealing, traffic control system repair, or vegetation removal. For purposes that will be discussed in the Methodology section, the Carl Vinson Institute of Government research team allocated amounts from each project to one or more of Georgia's 159 counties. The data provided for the 383 major projects included the location of each project, which allowed the researchers to determine the GDOT district and the county or counties involved. Where a project involved work in multiple counties and the data were sufficient to determine the amount of work done in each county, the amount was allocated accordingly. If this was not possible, the amount was allocated equally to those counties. For the 259 routine maintenance projects, GDOT provided specific proportions for allocating each project across multiple counties when more than one county was involved. In those cases, dollars were allocated according to GDOT's distribution. The distribution of project dollars in each of the seven GDOT districts is shown in Table 2. A distribution by county is provided in Appendix C.

TABLE 2

Distribution of FY 2017 Project Dollars across GDOT Districts

District	Major Construction and Capital Maintenance	Routine Maintenance	Total
District 1	$205,180,212	$18,567,210	$223,747,422
District 2	$131,303,608	$17,985,297	$149,288,905
District 3	$404,232,370	$10,863,040	$415,095,410
District 4	$270,183,653	$13,745,456	$283,929,109
District 5	$132,196,829	$9,595,950	$141,792,779
District 6	$165,702,523	$16,291,430	$181,993,953
District 7	$150,717,263	$18,463,952	$169,181,215
SUBTOTAL	**$1,459,516,458**	**$105,512,335**	**$1,565,028,793**
Design and Engineering			**$108,163,822**
Local Maintenance and Improvement Grants			**$156,562,234**
TOTAL			**$1,829,754,849**

Subtotals may not sum due to rounding.
Source: GDOT

Two other categories of expenditures were included in the analysis. Design and engineering expenditures associated with the construction and capital maintenance projects let and awarded in FY 2017 were $108,163,822. This work was performed largely by firms in the Atlanta area, but involved effort at various sites around the state. The second category is Local Maintenance and Improvement Grants (LMIG) made directly to 688 county and municipal governments. These funds are distributed according to a formula that uses population and the amount of the state's roads that each local government maintains. The total LMIG funds for FY 2017 were $156,562,234. The LMIG funds, as well as the design and engineering expenditures, were modeled as statewide expenditures. The total for all GDOT projects let and awarded in FY 2017 plus the design, engineering, and LMIG funds is $1,829,754,849. GDOT also made $171,728,468 in expenditures for right-of-way (ROW) acquisition associated with the projects that were let and awarded in FY 2017. The ROW acquisition expenditures

were omitted from the analysis used to determine economic impact because ROW acquisition transactions typically involve an exchange of assets by two parties.

METHODOLOGY

IMPLAN

To estimate the economic impacts of the construction and maintenance projects that GDOT let and awarded in FY 2017, the Institute of Government research team used IMPLAN (Economic Impact Analysis for Planning), a widely used and accepted county-based model of the US economy. Because the model uses data at the county level, a study region can be a single county, a group of counties, or the entire state. IMPLAN is an input-output model, meaning that it uses a baseline forecast of the economy and a user input in the form of a change, either positive or negative. IMPLAN estimates the overall change in economic activity resulting from the change. The economic measures reported by the model include the number of jobs supported; the labor income associated with those jobs; the value added (or lost) to the economy in the particular geographic region being studied; and the total economic output added (or lost) as a result of the change.

When firms produce goods and services, the inputs are labor, raw materials, and equipment. IMPLAN uses county-level data on 526 individual industry sectors, including one for new highway, road, and bridge construction and one for maintenance of highways, roads, and bridges. The model uses wage data from the US Bureau of Labor Statistics for each industry sector in the geographic region under study and data from the US Bureau of Economic Analysis, County Business Patterns (US Census) as well as other sources that indicate the presence and size of the industry sectors within the region.

IMPLAN uses data on the mix of raw materials a particular industry sector uses in its production. This so-called business spending pattern indicates which industry sectors provide the materials and the amounts used for a given amount of production. The model further estimates a percentage of those materials purchased locally based on the presence of the industries in the geographic region under study. For example, a firm engaged in road and bridge construction purchases a variety of raw materials, such as gravel, concrete, guardrail components, marking paint, and many other items. It also produces or purchases services including hauling, grading, transportation of materials, insurance, accounting, legal assistance, and a variety of human resource management activities. The amount of each input demanded is determined by the dollar value of the output produced, which is used to estimate the number of jobs supported by the activity.

The basic steps in modeling economic impacts using IMPLAN begin with creating a model for the specific geographic area being studied — the "study model." As noted above, this may be a single county or a group of counties. The study model provides a baseline for the economy in the defined geography. The next step is to create an input that defines the change to the economy and then have the model evaluate the impacts resulting from the change. Typically, the input is either the number of jobs, as when a new firm enters the local economy, or a given amount of economic output, or both. If only one of those is used, IMPLAN estimates the other. For example, modeling the impact of $10 million in highway construction work, IMPLAN estimates the number of jobs in that sector needed to produce that amount of output. These are called direct jobs, the people employed directly by the firm producing the output.

Using estimates of the raw materials required for the level of production, the model estimates the number of jobs supported at firms supplying materials to the highway construction firm. These are referred to as indirect jobs. Indirect jobs will also include those in the transportation sectors involved in delivering materials and providing other services. Thus, we have estimates of both direct jobs and indirect jobs for a specific amount of economic output in the road and bridge construction sector. IMPLAN also models the jobs supported through an induced effect when employees in the direct and indirect jobs spend their salaries and wages. These induced jobs are primarily in the service sectors including retail and restaurant employees, barbers, dry cleaners, grocers, and landscapers, but also professional service providers like physicians, dentists, accountants, and attorneys.

IMPLAN produces two measures of the overall impact on the economy of the study region. The first is called value added, which is the sum of labor income (reported separately also), business profits, and taxes collected on behalf of government. This estimate is often viewed as the dollars that remain in the local economy the longest. Total economic output is the other measure of overall economic impact and is similar to gross domestic product (GDP) as measured on a national level, which is the total value of goods and services. Total economic output, in contrast, is the value of goods and services produced in the study region as a result of the input to the model.

STUDY GEOGRAPHIES

GDOT Districts

The data provided by the GDOT allowed the Institute of Government research team to assign each project to a particular county, or when multiple counties were involved, to allocate an estimated proportion of the project to each county. The map in Figure 1 shows the seven GDOT districts.

Institute of Government researchers created a study model of each district to produce estimates of the impact of construction and maintenance projects in the district. IMPLAN estimated how much of the inputs (labor and materials) can be sourced within the local economy in the model. This local purchase percentage indicates the proportion of financial resources that stay within the local economy. The remaining proportion, called economic leakage, is used to obtain labor or materials not available locally. IMPLAN's local purchase percentages for construction projects in the GDOT districts were high. In fact, in three of the districts, the local purchase percentage for construction and capital maintenance projects was 100% (see Table 3). This indicates that all, or nearly all, of the labor, materials, and equipment needed for the projects in those districts could be sourced within the defined geography. For the routine maintenance projects, the local purchase percentage estimates were somewhat smaller. This is likely because of the data IMPLAN uses on the presence of that sector within each district. IMPLAN uses business location data from several sources at the US Department of Commerce including the Economic Census and County Business Patterns at the Bureau of the Census, and the Bureau of Labor Statistics at the US Department of Labor. These data indicate the extent to which more than 500 different industry sectors have a presence in each of the more than 3,000 US counties.

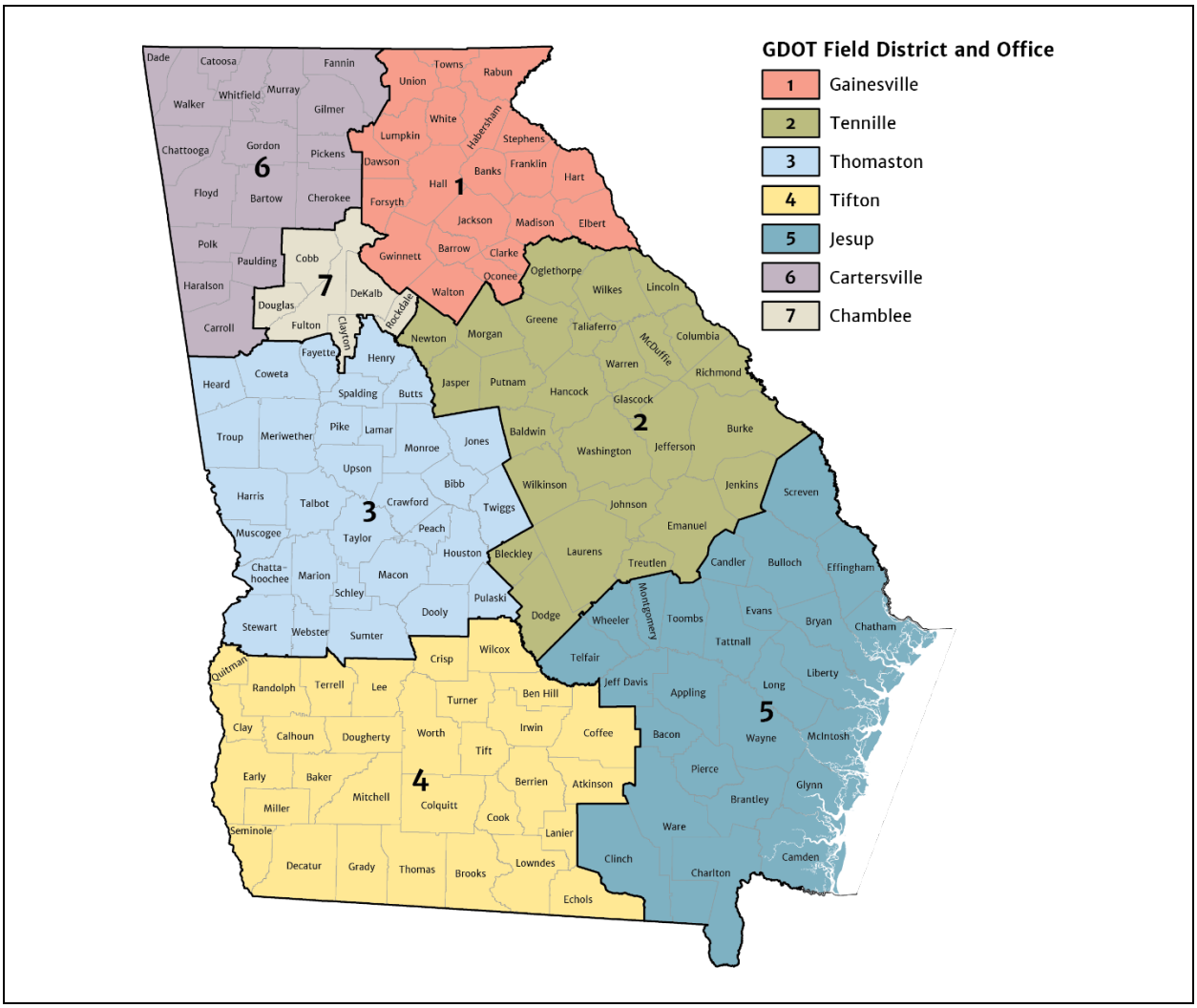

FIGURE 1

Georgia Department of Transportation Districts

Source: GDOT, Carl Vinson Institute of Government

For each of the district models, the research team created a second linked model for the remainder of the state. For example, the map in Figure 2 highlights District 1 in the northeastern part of the state. The second linked model covers the remainder of the state, comprising the other six districts. If a firm doing work in a given district does not always purchase all of the labor and materials needed for the project within that district, IMPLAN allows researchers to capture those remaining amounts through a linked geography, in this case the rest of the state. An input into the second geography for dollars not spent in District 1 captures the impact that those dollars have on the remainder of the state. Even so, some of those dollars eventually leak out of the state's economy as the local purchase percentage in the linked geography is sometimes less than 100%. In other words, for some projects, a portion of the materials must be purchased outside of Georgia. The same methodology was used for each of the remaining six districts. This methodology results in a pair of models for each district: one for the district and one for the remainder of the state. Using these two models, the research team could model the impact of the estimated spending both within the district and elsewhere in the state.

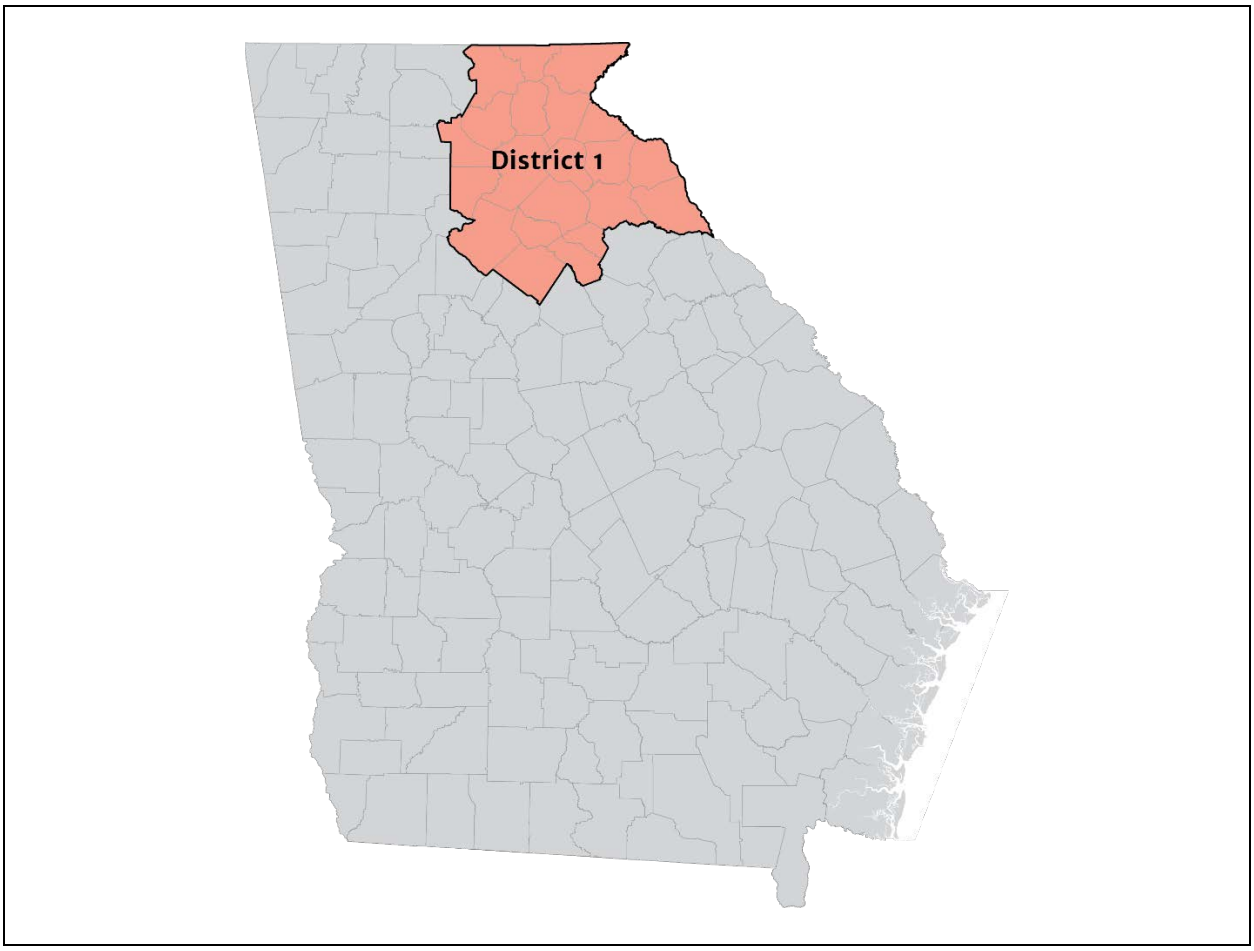

FIGURE 2

IMPLAN Modeling for GDOT District 1

Source: Carl Vinson Institute of Government

Economic Research Service Rural-Urban Commuting Areas

The analysis using the GDOT districts allows us to measure the economic impacts in large sections of the state. While District 7, which is completely within the Atlanta metropolitan area, is urban, the other districts contain a mix of urban and rural areas. To produce a better measure of the impact GDOT projects have in urban and rural areas, the Institute of Government research team created models using the rural-urban commuting areas (RUCAs) defined by the Economic Research Service (ERS) at the US Department of Agriculture (USDA). The RUCAs comprise census tracts that meet the USDA definitions for urban and rural areas based on population density and commuting pattern data from the 2010 US Census.[5] The map in Figure 3 shows the nine rural-urban commuting areas in Georgia: Albany, Athens, Atlanta, Augusta, Columbus, Macon–Warner Robins, Rome-Chattanooga, Statesboro-Savannah-Brunswick, and Valdosta. Each RUCA includes a county or counties where the urban center is located, plus portions of adjacent counties where significant numbers of residents commute into the urban center. For example, the Valdosta RUCA includes Lowndes County as well as portions or the entirety of Brooks, Echols, and Lanier counties. Because the data from GDOT and the IMPLAN model are both county based, the research team constructed models containing the primary counties in each urban center and additional counties with large proportions included in the RUCA. Complementary models of the remainder of the state for each RUCA were also created and used in the same manner as described for the GDOT district models. The map in Figure 4 shows the altered models that approximate the rural-urban commuting areas.

Dollar amounts from the various projects were assigned to one of the urban areas or to the rural area depicted in light blue in Figure 4. For 7 projects totaling $8,012,762 in expenditures, no counties were

[5] See catalog.data.gov/dataset/rural-urban-commuting-area-codes (accessed July 24, 2018).

specified, making it impossible to determine how much of the work was done in any one county or RUCA. The GDOT data for these projects allowed assignment to a GDOT district, but it was not possible to determine how much of the work was completed within one of the RUCAs. These projects are, therefore, assigned to the rural (non-RUCA) portion of the state for modeling purposes. None of the 7 projects were in District 7, the Atlanta metropolitan area, which is the only GDOT district that contains no area outside one of the RUCA boundaries.

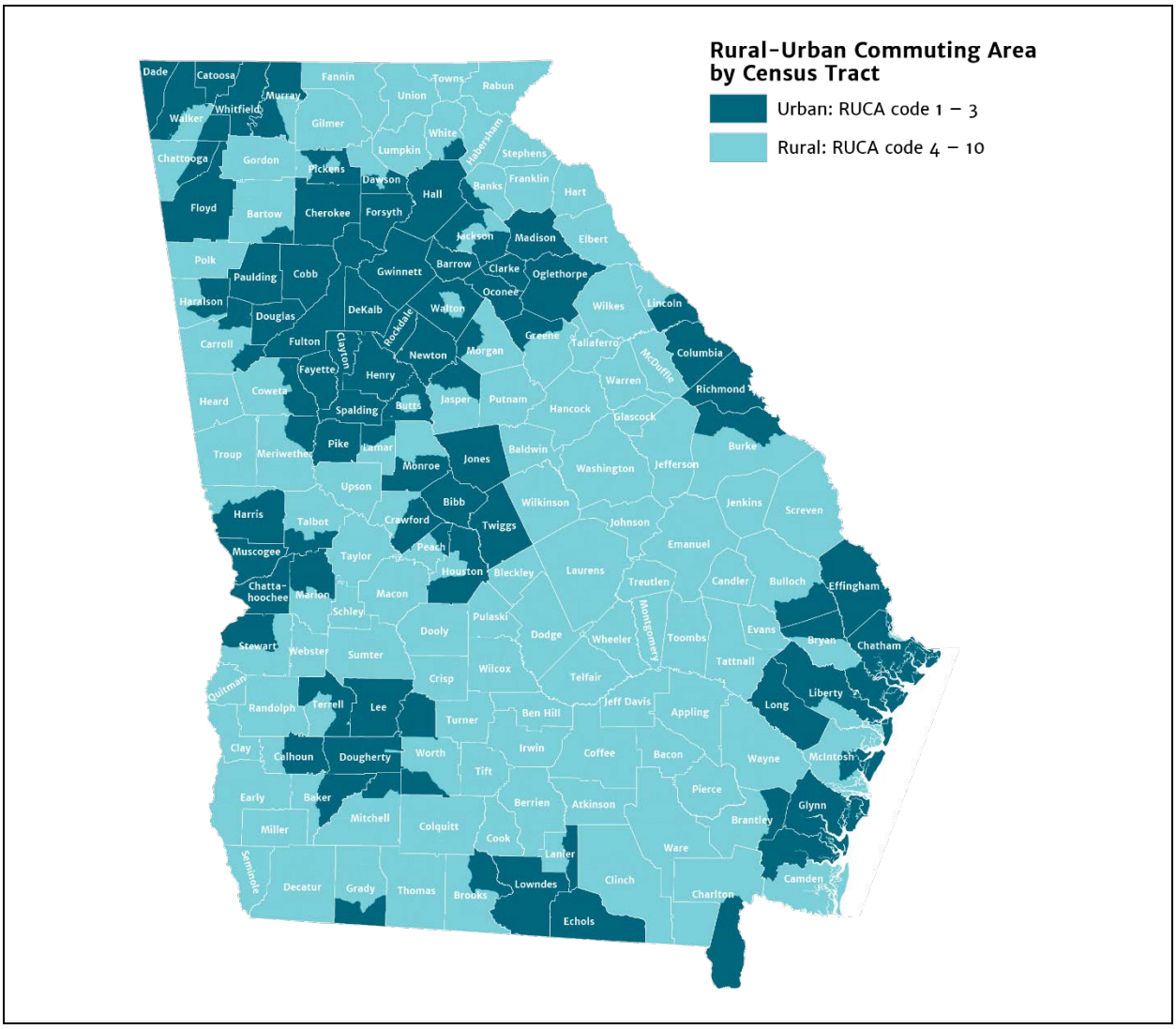

FIGURE 3

Economic Research Service Rural-Urban Commuting Areas (USDA)

Source: Economic Research Service (USDA), Carl Vinson Institute of Government

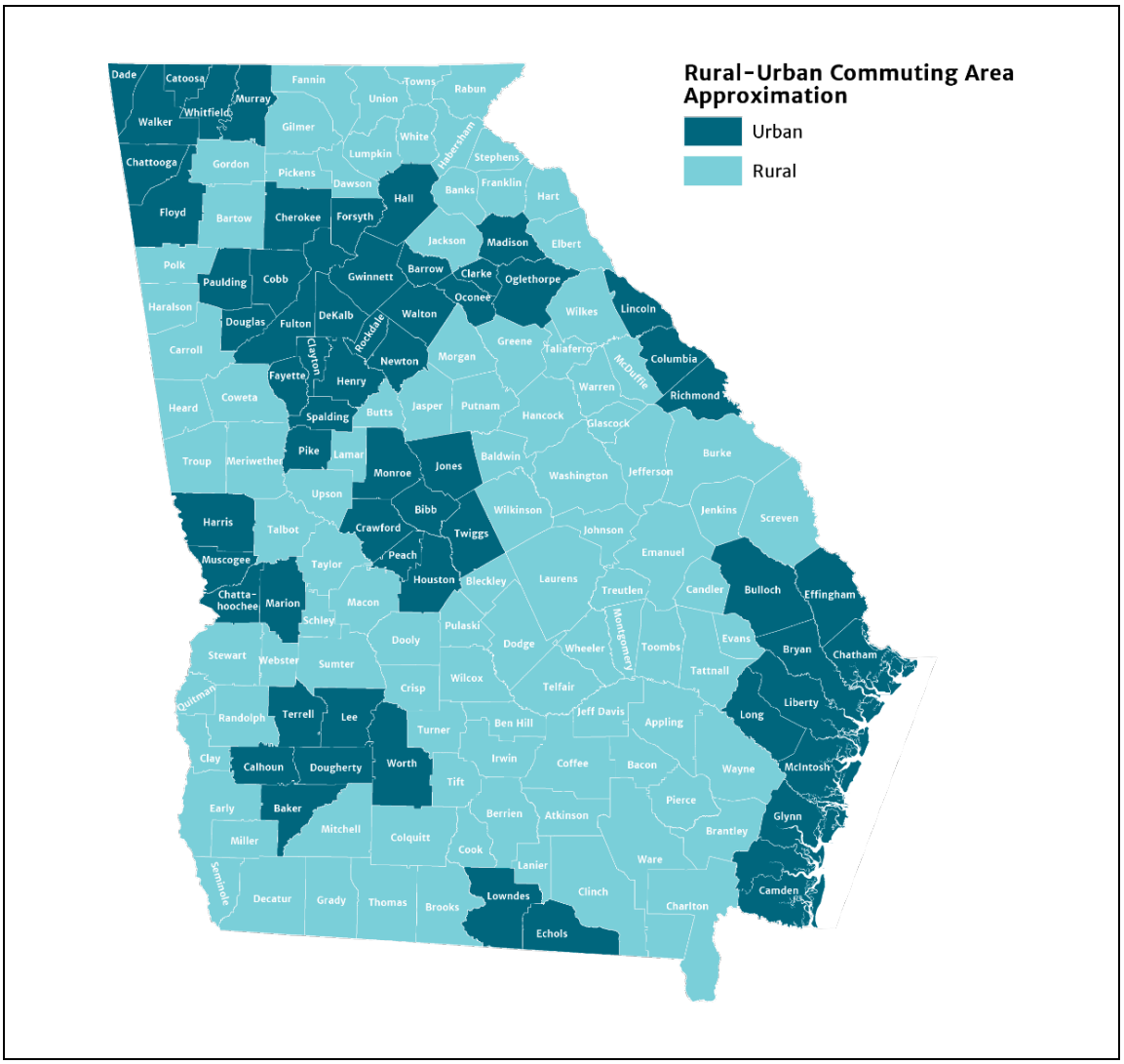

FIGURE 4

IMPLAN Modeling Regions Approximating ERS RUCAs

Source: Carl Vinson Institute of Government

The State of Georgia

As noted earlier, GDOT expended $108,163,822 in design and engineering costs for the work completed in FY 2017. This expenditure was modeled for the state as a whole even though much of the work and its impact was realized in the Atlanta metropolitan area.

A proportion of the state's MUFT revenue is set aside each year to provide Local Maintenance and Improvement Grants (LMIG) funds to municipal and county governments for maintenance projects on locally maintained roads and streets. The level of funding is determined by a formula using population and the proportion of the state's road system mileage each local government must maintain. In FY 2017 the total amount of LMIG funding was $156,562,234. GDOT officials estimate that 98 percent of this grant funding was used for resurfacing projects on county roads and city streets. The economic impact of these dollars was estimated for the entire state rather than for individual GDOT districts. The amount of funding, by county, sent to local governments in FY 2017 is included in Appendix C.

IMPLAN INPUTS

GDOT Districts

Using the IMPLAN local purchase percentage figures, estimates were calculated to allocate construction and capital maintenance expenditures to each region in each pair of models, that is, an amount expended in the GDOT district and an amount expended in the remainder of the state. The same was done for routine maintenance expenditures. These are the IMPLAN inputs and are shown in Table 3. Notice that the total amount for major construction and capital maintenance projects in Table 2 in the previous section was $1,459,516,458 while the total for the IMPLAN inputs is only $1,457,116,443. This decrease is due to the estimated economic leakage resulting from the local purchase percentage

estimates in the model. This leakage accounts for work completed by non-Georgia contractors and for materials sourced from vendors outside the state.

TABLE 3
IMPLAN Inputs for FY 2017 Project Dollars – GDOT Districts

	Major Construction and Capital Maintenance		Routine Maintenance		Total
	In District	Remainder of State	In District	Remainder of State	
District 1	$205,180,212	$0	$18,177,299	$323,432	$223,680,943
District 2	$130,844,046	$459,563	$9,391,922	$7,852,626	$148,548,157
District 3	$403,504,752	$727,618	$6,685,115	$3,709,162	$414,626,647
District 4	$269,724,341	$459,312	$9,653,434	$3,749,111	$283,586,198
District 5	$131,443,307	$753,522	$5,469,692	$3,938,926	$141,605,447
District 6	$165,702,523	$0	$16,105,708	$164,903	$181,973,133
District 7	$150,717,263	$0	$17,609,071	$675,698	$169,002,032
TOTAL	**$1,457,116,443**	**$2,400,015**	**$83,092,240**	**$20,413,858**	**$1,563,022,555**

Totals may not sum due to rounding.
Source: Estimated from GDOT data using IMPLAN local purchase percentages for defined geographies.

Economic Research Service Rural-Urban Commuting Areas

IMPLAN inputs for the geographic regions that approximate the ERS RUCAs are presented in Table 4. Because the RUCAs are smaller geographies than the GDOT districts, the economic leakage estimates for these areas are slightly different resulting in a total of $1,562,967,001 for inputs to the model compared to $1,563,022,555, a difference of $55,554. The construction and capital maintenance input of $432,843,009 for the non-RUCA area of the state (the rural area) includes $8.0 million for the 7 projects that were assigned to multiple unspecified counties within their respective GDOT districts. To the extent that some portion of these funds were for work within one of the RUCA counties, the impact for the rural area could be overstated. However, only GDOT District 7, the Atlanta metropolitan area, is wholly contained within an RUCA, and none of the 7 projects were in District 7. Assuming the projects were spread among all counties in their respective districts, the overstated amount would be negligible.

TABLE 4

IMPLAN Inputs for FY 2017 Project Dollars: Rural–Urban Commuting Areas

RUCA	Major Construction and Capital Maintenance		Routine Maintenance		Total
	In RUCA	Outside RUCA	In RUCA	Outside RUCA	
Rome-Chattanooga	$90,785,467	$27,244	$5,280,560	$312,629	$96,405,900
Atlanta	$408,397,141	$0	$37,289,655	$8,990	$445,695,786
Athens	$2,388,922	$1,913	$273,474	$436,275	$3,100,584
Augusta	$8,533,509	$70,553	$432,863	$529,905	$9,566,830
Macon–Warner Robins	$280,832,548	$1,439,588	$2,043,751	$2,545,284	$286,861,171
Columbus	$16,395,423	$162,265	$450,483	$751,994	$17,760,165
Albany	$34,763,487	$55,711	$262,199	$17,284	$35,098,681
Valdosta	$71,611,902	$309,261	$4,756,755	$908,276	$77,586,194
Statesboro-Savannah-Brunswick	$110,011,328	$887,188	$3,135,770	$2,490,702	$116,524,987
Remainder of State (Non-RUCA areas)*	$432,843,009	$0	$30,150,973	$11,372,720	$474,366,703
TOTAL	**$1,456,562,735**	**$2,953,723**	**$84,076,483**	**$19,374,060**	**$1,562,967,001**

*Includes impacts from $8.0 million in expenditures for 7 projects assigned to “all counties.”
Totals may not sum due to rounding.
Source: Estimated from GDOT data using IMPLAN local purchase percentages for defined geographies.

ESTIMATED ECONOMIC IMPACTS

The construction, capital maintenance, and routine maintenance projects let and awarded by GDOT in FY 2017 supported an estimated 17,985 jobs in Georgia for the year, with more than $824 million in labor income (see Table 5). Of this total, an estimated 9,988 direct jobs were supported in the road and bridge construction and maintenance sectors with an estimated $446 million in labor income. Approximately 3,965 jobs were supported indirectly at firms that provided materials, transportation services, and professional services to facilitate the work. The labor income of these direct and indirect

employees created economic demand for goods and services, thus supporting an additional 4,031 jobs in the retail and service sectors through an induced effect.

In terms of economic activity, the contracts let by GDOT produced a little more than $1.5 billion dollars in construction and maintenance activity plus nearly $1.3 billion in economic activity firms supplying material and providing services to the construction and maintenance sectors, and as a result of the induced effect. Overall, this resulted in $2.8 billion in economic output. The estimated value added to Georgia's economy (labor income, business profits, and taxes collected on behalf of government) was more than $1.3 billion.

Table 6 shows the estimated economic impacts from the design and engineering expenditures of $108,163,822. Design and engineering expenditures supported an estimated 664 jobs directly involved in producing these services for GDOT, plus 438 jobs indirectly in the sectors that supply and support the design and engineering services firms. Another 548 jobs were supported through an induced effect, for a total of 1,649 jobs with nearly $105 million in labor income.

Also included in Table 6 are estimated economic impacts from the Local Maintenance and Improvement Grants (LMIG) made to local governments. The projects funded with these grants supported an estimated 953 jobs in the road and bridge construction and maintenance sectors, and nearly 1,800 including the indirect and induced jobs, with more than $92 million in labor income. The total economic output from this work amounted to nearly $300 million.

Adding the impacts from design and engineering expenditures, and the LMIG funding to those from construction and maintenance activity associated with the 383 projects let and awarded by GDOT brings the number of direct jobs to 11,604 and the total number of jobs supported to 21,428 with just over $1 billion in labor income, and more than $3.3 billion in total economic output (see Table 7). The total value added to the Georgia economy is nearly $1.6 billion. Again, value added is the sum of estimated amounts for labor income, business profits, and taxes collected on behalf of government.

TABLE 5

Estimated Economic Impacts of GDOT Construction, Capital Maintenance, and Routine Maintenance Projects in Georgia

Economic Impacts of All Construction and Capital Maintenance Projects in Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	9,382.3	$417,190	$591,916	$1,456,908
Indirect Effect	3,719.6	$210,595	$364,706	$708,227
Induced Effect	3,777.3	$143,624	$273,956	$483,648
Total Effect	16,879.2	$771,408	$1,230,578	$2,648,783
Economic Impacts of All Routine Maintenance Projects in Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	605.8	$28,877	$41,665	$87,873
Indirect Effect	245.9	$13,728	$21,742	$39,841
Induced Effect	253.9	$10,459	$19,810	$34,057
Total Effect	1,105.7	$53,064	$83,217	$161,771
Economic Impacts of All Projects in Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	9,988.2	$446,066	$633,581	$1,544,781
Indirect Effect	3,965.5	$224,322	$386,448	$748,068
Induced Effect	4,031.2	$154,083	$293,766	$517,705
Total Effect	17,984.8	$824,471	$1,313,795	$2,810,554
Totals may not sum due to rounding. Source: IMPLAN, Carl Vinson Institute of Government				

TABLE 6

Estimated Economic Impacts of Statewide Design, Engineering, and LMIG Expenditures

Economic Impacts of All Design and Engineering Expenditures				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	663.5	$57,612	$56,801	$108,164
Indirect Effect	437.5	$23,731	$33,240	$55,037
Induced Effect	548.3	$23,584	$44,250	$75,514
Total Effect	1,649.3	$104,927	$134,291	$238,715
Economic Impacts of Local Maintenance and Improvement Grants				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Impact Type	Economic Output
Direct Effect	952.6	$48,534	$68,710	$156,562
Indirect Effect	360.6	$22,966	$39,955	$74,458
Induced Effect	480.5	$20,656	$38,760	$66,133
Total Effect	1,793.7	$92,157	$147,424	$297,153
Totals may not sum due to rounding. Source: IMPLAN, Carl Vinson Institute of Government				

TABLE 7

Estimated Economic Impacts of GDOT Construction, Capital Maintenance, Routine Maintenance, Design, and Engineering Services in Georgia

Economic Impacts of All Construction and Maintenance Projects in Georgia

Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	9,988.2	$446,066	$633,581	$1,544,781
Indirect Effect	3,965.5	$224,322	$386,448	$748,068
Induced Effect	4,031.2	$154,083	$293,766	$517,705
Total Effect	17,984.8	$824,471	$1,313,795	$2,810,554

Economic Impacts of Design and Engineering Services

Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	663.5	$57,612	$56,801	$108,164
Indirect Effect	437.5	$23,731	$33,240	$55,037
Induced Effect	548.3	$23,584	$44,250	$75,514
Total Effect	1,649.3	$104,927	$134,291	$238,715

Economic Impacts of Local Maintenance and Improvement Grants

Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	952.6	$48,534	$68,710	$156,562
Indirect Effect	360.6	$22,966	$39,955	$74,458
Induced Effect	480.5	$20,656	$38,760	$66,133
Total Effect	1,793.7	$92,157	$147,424	$297,153

Total Impacts from Construction, Maintenance, Design, Engineering Services, and LMIG Funds

Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	11,604.3	$552,212	$759,092	$1,809,507
Indirect Effect	4,763.6	$271,019	$459,643	$877,563
Induced Effect	5,060.0	$198,323	$376,776	$659,352
Total Effect	21,427.8	$1,021,555	$1,595,510	$3,346,422

Totals may not sum due to rounding.
Source: IMPLAN, Carl Vinson Institute of Government

Tables 8 and 9 present estimated multipliers for the impacts from the economic activity resulting from the construction, capital maintenance, and routine maintenance projects GDOT let and awarded in FY 2017 as well as the design and engineering services associated with those projects, and the LMIG expenditures. Table 8 shows jobs and economic output multipliers for each GDOT district. The multiplier is simply the ratio of the total to the direct input. The total of 11,604 direct jobs in the construction and maintenance sectors supported an additional 9,824 jobs indirectly and through an induced effect for a total of 21,428 jobs. The ratio is 1.85, meaning that the economic activity represented by one direct employment job supports nearly one additional job. The jobs multipliers within the GDOT districts for construction and maintenance activities range from 1.67 to 1.91. Design and engineering services has an estimated jobs multiplier of 2.49. The LMIG spending produced a jobs multiplier of 1.88.

For economic output, the multipliers are very similar because the districts are fairly large geographic regions and any variation in economic efficiency across counties is lost due to aggregation. Statewide, each $1.0 billion dollars in road and bridge construction and maintenance results in $1.85 billion in total economic activity. Design and engineering services has an estimated economic output multiplier of 2.21. The LMIG spending produced an economic output multiplier of 1.90.

Table 9 reports the jobs and economic output multipliers for the RUCAs and the rural area of the state. Because these geographic regions differ in terms of economic environment, workforce, wages, industry presence, population density, and other factors, their estimated multipliers also differ. The jobs multiplier for the urban areas (RUCAs) range from 1.59 to 2.14. The rural portion of the state has an estimated jobs multiplier of 1.74. The economic output multipliers range from 1.60 to 1.96 in the urban areas with 1.77 in the rural area. Including the design and engineering impacts increases the economic

output multiplier slightly over that estimated using the GDOT districts. The difference is due to variation in IMPLAN's local purchase percentage estimates for the different geographies.

TABLE 8

GDOT District Jobs, Economic Output, and Multipliers

	Jobs			Economic Output (000s of 2017 Dollars)		
	Direct	**Total**	**Multiplier**	**Direct**	**Total**	**Multiplier**
District 1	1,389.7	2,660.4	1.91	$223,077	$428,291	1.92
District 2	949.6	1,683.2	1.77	$142,931	$260,478	1.82
District 3	2,708.8	5,103.1	1.88	$410,693	$782,244	1.90
District 4	1,882.8	3,156.1	1.68	$279,935	$465,817	1.66
District 5	923.8	1,541.9	1.67	$138,329	$236,589	1.71
District 6	1,207.1	2,131.8	1.77	$181,770	$325,868	1.79
District 7	926.3	1,708.3	1.84	$168,045	$311,267	1.85
Design and Engineering	663.5	1,649.3	2.49	$108,164	$238,715	2.21
LMIG	952.6	1,793.7	1.88	$156,562	$297,153	1.90
Total State	11,604.2	21,427.8	1.85	$1,809,507	$3,346,422	1.85

Totals may not sum due to rounding.
Source: IMPLAN, Carl Vinson Institute of Government

TABLE 9

Rural–Urban Commuting Area Jobs, Economic Output, and Multipliers

	Jobs			Economic Output (000s of 2017 Dollars)		
	Direct	**Total**	**Multiplier**	**Direct**	**Total**	**Multiplier**
Rome-Chattanooga	699.6	1,115.4	1.59	$96,024	$160,418	1.67
Atlanta	2,580.7	5,049.4	1.96	$445,379	$874,200	1.96
Athens	16.6	35.6	2.14	$2,882	$5,444	1.89
Augusta	53.6	101.4	1.89	$9,208	$16,287	1.77
Macon–Warner Robins	1,856.6	3,592.4	1.93	$283,986	$553,147	1.95
Columbus	108.7	192.0	1.77	$17,236	$29,136	1.69
Albany	221.2	408.9	1.85	$35,024	$62,085	1.77
Valdosta	457.9	780.0	1.70	$76,369	$122,053	1.60
Statesboro-Savannah-Brunswick	727.0	1,256.1	1.73	$114,089	$195,228	1.71
Remainder of State (Non-RUCA areas)*	3,167.6	5,501.2	1.74	$464,218	$821,473	1.77
Design and Engineering	663.50	1,649.30	2.49	$108,164	$238,715	2.21
LMIG	952.6	1,793.7	1.88	$156,562	$297,153	1.90
Total State	11,505.6	21,475.4	1.87	$1,809,141	$3,375,339	1.87

*Includes impacts from $8.0 million in expenditures for 7 projects assigned to “all counties.”
Source: IMPLAN, Carl Vinson Institute of Government

ADDITIONAL BENEFITS OF TRANSPORTATION SYSTEM IMPROVEMENTS

In addition to the economic impacts from construction of road and bridge projects, some transportation system improvements reduce vehicle operating costs, improve travel time reliability, and reduce vehicle accidents, injuries, and deaths. GDOT transportation planners identified 27 projects from FY 2017 and the first half of FY 2018 that produced transportation system enhancements. While most projects simply maintain the existing roads or replace bridges that have reached the end of their useful service, these 27 projects increased capacity by adding additional lanes; building new interchanges to facilitate the flow of traffic; or widening roads to improve safety and flow. Businesses receive the benefit of improved productivity and logistics cost savings, while both employers and employees benefit from increased labor mobility. Benefits also accrue to society as improved traffic flow reduces vehicle operating costs and emissions. This section analyzes these benefits and produces estimates of their value.

Data used in the analyses comes from several sources, including the Georgia Department of Transportation and its transportation modeling consultants, HNTB Corporation, and data used by the Transportation Economic Development Impact System (TREDIS), a transportation system modeling software package. Many of the data sets used by TREDIS are from federal agencies within the US Department of Transportation. Appendix D provides a detailed discussion of the TREDIS model.

The GDOT/HNTB travel demand model analyzes transportation system capacity and efficiency under various scenarios. Results from the travel demand model indicate how transportation improvement projects affect overall system performance. The model estimates changes in automobile trips and freight trips, along with vehicle miles traveled (VMT) and vehicle hours traveled (VHT), for both “build” and “no-build” road improvement project scenarios. These alternative scenarios were used to calculate

the impacts of road improvement projects let and awarded by GDOT. As noted, GDOT's planning office identified 27 projects from FY 2017 and early FY 2018 that increased capacity. HNTB Corporation, acting on behalf of GDOT, estimated the number of traffic trips at the county level and their associated VMT and VHT for these projects, for the state of Georgia as a whole, as well as for a hypothetical scenario in which the projects were not built.

The Transportation Economic Development Impact System (TREDIS), a transportation economic suite developed by the TREDIS software group, was used to perform economic and transportation modeling. The tool uses a variety of data from sources including the US Department of Transportation, the US Department of Commerce, IMPLAN, the Environmental Systems Research Institute (ESRI), and Moody's Economy. ESRI is an international supplier of geographic information software. Moody's Economy provides economic, financial, and industry data. Federal agency sources include the Bureau of the Census, the Bureau of Labor Statistics, the Bureau of Transportation Statistics, and the Bureau of Economic Analysis. The TREDIS modeling system enables transportation planners and consultants to conduct economic development impact analyses for transportation investments such as highway improvement projects. Appendix D presents a more detailed overview of TREDIS, its data sources, and key assumptions.

Researchers at the Carl Vinson Institute of Government modeled the benefits of these transportation projects at the Rural-Urban Commuting Area (RUCA) level in order to achieve consistency with the IMPAN analysis conducted elsewhere in this study, as well as to reflect the fact that transportation system improvements are predominantly realized by drivers in and around metropolitan areas. Four of the nine RUCAs were found to receive significant benefits from the added capacity produced by 15

projects located within their boundaries: Atlanta, Augusta, Macon-Warner Robins, and Statesboro-Savannah-Brunswick. The 15 projects had a total investment of $475 million in the four urban areas as shown in Table 10. While the remaining 12 projects provided some system efficiency improvements in Columbus, Valdosta, and the Rome-Chattanooga RUCAs, the benefits were small and had little economic impact. Two of the RUCAs (Albany and Athens) had no added capacity projects in FY 2017 or early FY 2018.

TABLE 10
Number and Cost of Projects Producing Transportation System Efficiency Improvements in Selected RUCAs

RUCA	Number of Projects*	Investment (Millions of 2017 Dollars)
Atlanta	7	$139.5
Augusta	1	$11.0
Macon-Warner Robins	5	$236.4
Statesboro-Savannah-Brunswick	2	$88.5
Total	**15**	**$475.4**
Source: TREDIS, Carl Vinson Institute of Government *Includes two projects from the first half of FY2018		

The total value of benefits over ten years beginning in 2019 for the four RUCAs modeled in this section are shown in Table 11. These values represent the total, monetized value of benefits received from vehicle operating costs, business time and reliability costs, the value of personal time and reliability, safety cost savings, shipping and logistics costs, and social and environmental benefits. Table 15 presents benefits by type over the ten-year period.

TABLE 11
Value of Transportation System Efficiency Improvements, 2019 to 2028

RUCA	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	Total
	(Millions of 2018 Dollars)										
Atlanta	$43.2	$85.0	$125.5	$164.7	$202.6	$239.3	$274.7	$309.1	$342.3	$374.4	$2,160.8
Augusta	$1.2	$2.4	$3.6	$4.7	$5.8	$6.9	$8.0	$9.0	$10.0	$11.0	$62.6
Macon-Warner Robins	$32.1	$68.4	$109.7	$156.8	$210.8	$272.7	$344.0	$426.1	$520.9	$630.5	$2,772.0
Statesboro-Savannah-Brunswick	$13.5	$26.9	$39.9	$52.8	$65.4	$77.8	$90.0	$101.9	$113.7	$125.2	$707.1
Total	**$90.0**	**$182.7**	**$278.7**	**$379.0**	**$484.6**	**$596.7**	**$716.7**	**$846.1**	**$986.9**	**$1,141.1**	**$5,702.5**

Source: TREDIS, Carl Vinson Institute of Government
Totals may not sum due to rounding.

Environmental Benefits

Highway improvement projects that add capacity to existing roadways may speed traffic flow and offer alternative routes thereby reducing the number of miles driven, traffic congestion, and consequently, vehicle emissions. One way to look at the impact of road improvement projects on the environment is to monetize these benefits. TREDIS derives the costs associated with air pollutants from the National Highway Traffic Safety Administration's Corporate Average Fuel Economy (CAFE) standards and the costs associated with carbon dioxide emissions from the Office of Management and Budget publication, *Technical Update of the Social Cost of Carbon for Regulatory Analysis.* Table 12 summarizes the monetized impact of reduced emissions from passenger car trips, freight trips and passenger buses for a ten year period beginning in 2019, for each of the four RUCAs exhibiting significant system impacts.

TABLE 12

Monetized Value of Reduced Emissions Resulting from Transportation System Efficiency Improvements, 2019 to 2028

RUCA	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	Total
	(Millions of 2018 Dollars)										
Atlanta	$4.5	$9.0	$13.7	$18.4	$23.1	$28.1	$33.0	$38.1	$43.3	$48.5	$259.7
Augusta	$0.0	$0.0	$0.0	$0.0	$0.1	$0.1	$0.1	$0.1	$0.1	$0.1	$0.6
Macon-Warner Robins	$2.0	$4.4	$7.3	$10.7	$14.8	$19.6	$25.4	$32.2	$40.4	$50.0	$206.8
Statesboro-Savannah-Brunswick a	$0.4	$0.8	$1.1	$1.5	$1.9	$2.4	$2.8	$3.2	$3.7	$4.1	$21.8
Total	**$6.9**	**$14.2**	**$22.1**	**$30.6**	**$39.9**	**$50.2**	**$61.3**	**$73.6**	**$87.5**	**$102.7**	**$488.9**

Source: TREDIS, Carl Vinson Institute of Government
These benefits are included in the total estimated benefits in Table 11.
Totals may not sum due to rounding.

Life and Safety Improvements

Highway improvement projects that reduce miles traveled and traffic congestion, as well as incorporating updated safety features, result in safety improvements for all drivers. The result is an expected reduction in the number of accidents, fatalities, and injuries that would likely occur in the absence of these improvements. Table 13 presents the annual safety impacts as estimated by TREDIS. The monetized value of these safety improvements is shown in Table 15 for the ten years 2019 through 2028. These calculations are based on national averages of fatalities, property damage, and injury data maintained by the Bureau of Transportation Statistics. See Appendix D for additional information on these calculations and data sources.

TABLE 13

Total Fatalities, Injuries, and Accidents Avoided, 2019 to 2028

RUCA	Fatality Collisions	Injury Collisions	Property Damage Collisions	Total
Atlanta	53	3,443	8,542	12,038
Augusta	0	1	3	4
Macon-Warner Robins	6	242	2,723	2,971
Statesboro-Savannah-Brunswick	4	287	716	1,007
Total	**63**	**3,973**	**11,984**	**16,020**
Source: TREDIS, Carl Vinson Institute of Government				

Addition to Gross Regional Product

Gross regional product (GRP) is a monetary measure of the market value of all final goods and services produced in a region or subdivision of a country during a specified time period, typically quarterly or yearly. A metropolitan area's GRP (gross metropolitan product, GMP), is one of several measures of the size of its economy. Gross Regional Product may be influenced by several factors related to a region's transportation system, including the ability of workers to commute more easily to higher paying jobs, and the efficiency with which inputs to production and finished goods may be transported in and out of the region. TREDIS was used to estimate the contribution of added capacity highway improvements to GRP for each RUCA included in the analysis. The results are shown in Table 14 for the ten-year period beginning in 2019, following the completion of the projects.

TABLE 14
Transportation System Efficiency Improvement Contribution to Gross Regional Product, 2019 to 2028

RUCA	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	Total
	(Millions of 2018 Dollars)										
Atlanta	$22.0	$45.0	$68.0	$92.0	$117.0	$144.0	$170.0	$198.0	$227.0	$257.0	$1,340.0
Augusta	$0.5	$1.0	$1.0	$1.0	$1.0	$2.0	$2.0	$2.0	$3.0	$3.0	$16.5
Macon-Warner Robins	$9.0	$20.0	$33.0	$49.0	$67.0	$89.0	$116.0	$147.0	$185.0	$230.0	$945.0
Statesboro-Savannah-Brunswick	$3.0	$5.0	$8.0	$11.0	$14.0	$17.0	$20.0	$24.0	$27.0	$31.0	$160.0
Total	**$34.5**	**$71.0**	**$110.0**	**$153.0**	**$199.0**	**$252.0**	**$308.0**	**$371.0**	**$442.0**	**$521.0**	**$2,461.5**

Source: TREDIS, Carl Vinson Institute of Government

Note: These benefits are included in the total estimated benefits in Table 11.

Total Benefits

The benefits calculated by TREDIS include savings from more efficient vehicle operation and consumer surplus such as time saved or spent in more productive activities; environmental benefits from reduced emissions, largely from reduced trip times; greater business productivity from reduced trip times and a reduction in shipping costs; and those attributable to increased safety. Table 15 presents benefits from these 15 construction projects over ten years of operation by benefit type.

TABLE 15

Transportation System Efficiency Improvement Summary by Benefit Type
2019 to 2028

Year	Vehicle Operating Cost Savings Plus Consumer Surplus	Value of Reduced Emissions	Increase to Business Productivity and Reduced Shipping Costs	Benefits and Cost Savings from Increased Safety	Total
	(Millions of 2018 Dollars)				
2019	$35.9	$6.9	$8.1	$38.9	$90.0
2020	$73.8	$14.2	$17.7	$76.8	$182.7
2021	$113.8	$22.1	$29.1	$113.8	$278.7
2022	$156.4	$30.6	$42.1	$149.9	$379.0
2023	$202.2	$39.9	$57.4	$185.0	$484.6
2024	$251.8	$50.2	$75.3	$219.5	$596.7
2025	$306.3	$61.3	$96.1	$253.0	$716.7
2026	$366.6	$73.3	$120.3	$285.7	$846.1
2027	$433.5	$87.5	$148.6	$317.7	$986.9
2028	$508.4	$102.7	$181.4	$349.0	$1,141.1
Total	**$2,448.7**	**$488.9**	**$776.1**	**$1,989.3**	**$5,702.5**

Source: TREDIS, Carl Vinson Institute of Government

Totals may not sum due to rounding.

CONCLUSIONS

The increased motor use fuel tax revenue generated by the change to the rates Georgia imposes on gasoline and diesel fuels beginning July 2015 has provided significant additional financial resources to maintain and expand the road and bridge system in the state. This study measures the economic impact of the projects that the Georgia Department of Transportation planned and contracted for during FY 2017, the second fiscal year under the new tax rates.

The construction, capital maintenance, routine maintenance, and LMIG funded projects that were let and awarded during FY 2017 totaled more than $1.8 billion dollars including design and engineering costs, and Local Maintenance and Improvement Grants (see Table 2). These projects were funded with both state and federal motor use fuel tax revenues and supported an estimated 21,428 jobs in the state with more than $1 billion in labor income, producing a total of $3.35 billion in economic activity (see Table 7).

Each $1 billion investment in road and bridge projects supports approximately 11,840 jobs in Georgia. The number of additional jobs supported outside the state was not estimated in this analysis, but the finding is consistent with a report from the President's Council of Economic Advisors in 2011 that reported a $1 billion investment supported just over 13,000 nationally. The small difference between the national impact of 13,000 and the 11,840 found at the state level in this analysis suggests that the impacts from the GDOT expenditures are realized primarily in the state.

The multiplier effect of the projects contracted in FY 2017, a measure of job support and economic activity, is 1.85 statewide (see Table 8), which is in line with a 2014 report from the Federal Reserve Bank of San Francisco that indicated a national multiplier of 2.0 for road and bridge projects. The state multiplier is within two-tenths of the national multiplier. This also suggests that a great deal of economic activity associated with road and bridge construction and maintenance stays at home. Each dollar spent on these projects results in nearly one additional dollar of economic activity.

Officials at GDOT estimated that 27 construction and capital maintenance projects from FY 2017 and early FY 2018 produced transportation system efficiency improvements from increased capacity. We found that four RUCAs will realize significant benefits from 15 of these projects. The estimated benefits of $5.7 billion dollars over ten years result from reduced travel times and reduced emissions, safety improvements, and increased productivity. As GDOT continues to reduce the backlog of capital maintenance projects, a greater number of projects in the next few years would yield even greater system efficiency improvements (see Tables 11 and 15).

REFERENCES

1. President's Council of Economic Advisors, *A State by State Look at the American Jobs Act*, 2011.
2. Wilson, Daniel, "Estimating the Economic Impacts of Highway Infrastructure," Federal Reserve Bank of San Francisco, 2014.

Appendix A

Detailed Tables of Estimated Economic Impacts by GDOT District

Table A1
Estimated Economic Impacts of Construction Projects in GDOT District 1

District 1				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	1,266.4	$63,418	$88,394	$205,180
Indirect Effect	420.3	$24,390	$41,712	$76,664
Induced Effect	524.5	$20,200	$38,794	$67,553
Total Effect	2,211.2	$108,007	$168,900	$349,397
Rest of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	0.0	$0	$0	$0
Indirect Effect	120.1	$8,021	$14,753	$29,836
Induced Effect	93.9	$4,506	$8,610	$14,782
Total Effect	214.0	$12,527	$23,363	$44,619
State of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	1,266.4	$63,418	$88,394	$205,180
Indirect Effect	540.4	$32,411	$56,465	$106,501
Induced Effect	618.4	$24,706	$47,404	$82,335
Total Effect	2,425.2	$120,534	$192,263	$394,016

Totals may not sum due to rounding.
Source: IMPLAN, Carl Vinson Institute of Government

Table A2
Estimated Economic Impacts of Maintenance Projects in GDOT District 1

District 1				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	121.5	$5,878	$8,364	$17,628
Indirect Effect	45.1	$2,418	$3,711	$6,657
Induced Effect	49.6	$1,908	$3,665	$6,381
Total Effect	216.1	$10,203	$15,740	$30,666
Rest of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	1.8	$89	$131	$268
Indirect Effect	8.9	$570	$1,028	$2,028
Induced Effect	8.3	$399	$764	$1,313
Total Effect	19.0	$1,059	$1,923	$3,609
State of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	123.3	$5,967	$8,495	$17,896
Indirect Effect	54.1	$2,988	$4,739	$8,685
Induced Effect	57.8	$2,307	$4,429	$7,694
Total Effect	235.1	$11,262	$17,663	$34,275

Totals may not sum due to rounding.
Source: IMPLAN, Carl Vinson Institute of Government

TABLE A3
Estimated Economic Impacts of All Projects in GDOT District 1

District 1				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	1,387.9	$69,296	$96,758	$222,808
Indirect Effect	465.4	$26,807	$45,423	$83,321
Induced Effect	574.0	$22,108	$42,459	$73,934
Total Effect	2,427.4	$118,210	$184,640	$380,064

Rest of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	1.8	$89	$131	$268
Indirect Effect	129.0	$8,592	$15,782	$31,864
Induced Effect	102.2	$4,905	$9,374	$16,095
Total Effect	233.0	$13,586	$25,286	$48,228

State of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	1,389.7	$69,385	$96,889	$223,077
Indirect Effect	594.4	$35,399	$61,205	$115,185
Induced Effect	676.2	$27,013	$51,833	$90,029
Total Effect	2,660.4	$131,796	$209,927	$428,291

Totals may not sum due to rounding.
Source: IMPLAN, Carl Vinson Institute of Government

TABLE A4
Estimated Economic Impacts of Construction Projects in GDOT District 2

District 2				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	862.3	$35,959	$50,907	$130,391
Indirect Effect	225.1	$11,380	$19,936	$39,672
Induced Effect	241.6	$7,830	$15,490	$28,265
Total Effect	1,329.0	$55,170	$86,333	$198,329

Rest of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	2.8	$144	$203	$460
Indirect Effect	118.7	$8,137	$14,302	$27,702
Induced Effect	78.5	$3,707	$6,767	$11,633
Total Effect	200.0	$11,988	$21,273	$39,794

State of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	865.0	$36,102	$51,110	$130,851
Indirect Effect	343.8	$19,517	$34,238	$67,374
Induced Effect	320.1	$11,538	$22,258	$39,898
Total Effect	1,529.0	$67,157	$107,606	$238,123

Totals may not sum due to rounding.
Source: IMPLAN, Carl Vinson Institute of Government

TABLE A5
Estimated Economic Impacts of Maintenance Projects in GDOT District 2

District 2				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	36.3	$1,470	$2,136	$4,905
Indirect Effect	11.0	$512	$798	$1,507
Induced Effect	10.2	$331	$654	$1,196
Total Effect	57.5	$2,313	$3,588	$7,608

Rest of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	48.2	$2,404	$3,496	$7,176
Indirect Effect	22.4	$1,359	$2,171	$3,939
Induced Effect	26.0	$1,142	$2,136	$3,632
Total Effect	96.7	$4,905	$7,803	$14,747

State of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	84.6	$3,874	$5,632	$12,081
Indirect Effect	33.5	$1,871	$2,969	$5,446
Induced Effect	36.2	$1,473	$2,790	$4,828
Total Effect	154.2	$7,218	$11,391	$22,355

Totals may not sum due to rounding.
Source: IMPLAN, Carl Vinson Institute of Government

TABLE A6
Estimated Economic Impacts of All Projects in GDOT District 2

District 2				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	898.6	$37,429	$53,043	$135,296
Indirect Effect	236.2	$11,892	$20,734	$41,179
Induced Effect	251.8	$8,161	$16,145	$29,462
Total Effect	1,386.6	$57,482	$89,922	$205,937

Rest of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	51.0	$2,548	$3,699	$7,636
Indirect Effect	141.1	$9,496	$16,473	$31,641
Induced Effect	104.5	$4,850	$8,903	$15,264
Total Effect	296.7	$16,893	$29,075	$54,541

State of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	949.6	$39,976	$56,742	$142,931
Indirect Effect	377.3	$21,388	$37,207	$72,821
Induced Effect	356.4	$13,011	$25,048	$44,726
Total Effect	1,683.2	$74,375	$118,997	$260,478

Totals may not sum due to rounding.
Source: IMPLAN, Carl Vinson Institute of Government

TABLE A7
Estimated Economic Impacts of Construction Projects in GDOT District 3

District 3				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	2,653.1	$110,430	$158,209	$402,779
Indirect Effect	811.3	$38,764	$70,033	$142,317
Induced Effect	883.5	$28,734	$56,092	$103,900
Total Effect	4,347.9	$177,927	$284,333	$648,997

Rest of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	3.1	$159	$225	$507
Indirect Effect	370.0	$24,968	$40,508	$75,615
Induced Effect	284.1	$14,089	$25,262	$43,158
Total Effect	657.2	$39,216	$65,995	$119,280

State of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	2,656.2	$110,589	$158,434	$403,286
Indirect Effect	1,181.3	$63,732	$110,541	$217,932
Induced Effect	1,167.6	$42,822	$81,354	$147,058
Total Effect	5,005.0	$217,143	$350,329	$768,277

Totals may not sum due to rounding.
Source: IMPLAN, Carl Vinson Institute of Government

TABLE A8
Estimated Economic Impacts of Maintenance Projects in GDOT District 3

District 3				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	30.6	$1,207	$1,783	$4,114
Indirect Effect	10.3	$439	$733	$1,457
Induced Effect	9.8	$319	$622	$1,155
Total Effect	50.7	$1,965	$3,138	$6,725

Rest of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	22.0	$1,111	$1,613	$3,293
Indirect Effect	12.1	$758	$1,162	$2,076
Induced Effect	13.2	$598	$1,109	$1,874
Total Effect	47.4	$2,467	$3,884	$7,242

State of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	52.6	$2,318	$3,396	$7,407
Indirect Effect	22.5	$1,197	$1,895	$3,532
Induced Effect	23.0	$916	$1,731	$3,028
Total Effect	98.1	$4,432	$7,022	$13,967

Totals may not sum due to rounding.
Source: IMPLAN, Carl Vinson Institute of Government

TABLE A9
Estimated Economic Impacts of All Projects in GDOT District 3

District 3				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	2,683.7	$111,636	$159,992	$406,893
Indirect Effect	821.6	$39,203	$70,765	$143,774
Induced Effect	893.3	$29,052	$56,714	$105,055
Total Effect	4,398.5	$179,892	$287,471	$655,722
Rest of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	25.1	$1,271	$1,838	$3,800
Indirect Effect	382.1	$25,726	$41,670	$77,691
Induced Effect	297.3	$14,686	$26,371	$45,031
Total Effect	704.5	$41,683	$69,880	$126,522
State of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	2,708.8	$112,907	$161,830	$410,693
Indirect Effect	1,203.7	$64,929	$112,436	$221,465
Induced Effect	1,190.6	$43,739	$83,085	$150,086
Total Effect	5,103.1	$221,574	$357,351	$782,244

Totals may not sum due to rounding.
Source: IMPLAN, Carl Vinson Institute of Government

TABLE A10
Estimated Economic Impacts of Construction Projects in GDOT District 4

District 4				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	1,805.7	$70,906	$102,822	$269,260
Indirect Effect	515.2	$23,296	$38,576	$80,178
Induced Effect	511.7	$15,853	$31,278	$57,589
Total Effect	2,832.6	$110,054	$172,675	$407,027

Rest of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	2.8	$143	$203	$459
Indirect Effect	113.5	$8,381	$15,074	$28,700
Induced Effect	78.3	$3,785	$6,826	$11,973
Total Effect	194.6	$12,309	$22,103	$41,133

State of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	1,808.5	$71,049	$103,025	$269,720
Indirect Effect	628.7	$31,677	$53,649	$108,878
Induced Effect	590.0	$19,638	$38,104	$69,562
Total Effect	3,027.2	$122,364	$194,778	$448,160

Totals may not sum due to rounding.
Source: IMPLAN, Carl Vinson Institute of Government

TABLE A11
Estimated Economic Impacts of Maintenance Projects in GDOT District 4

District 4				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	51.2	$1,914	$2,875	$6,780
Indirect Effect	15.7	$626	$958	$1,864
Induced Effect	13.8	$428	$845	$1,556
Total Effect	80.7	$2,968	$4,678	$10,200

Rest of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	23.1	$1,152	$1,673	$3,435
Indirect Effect	11.8	$741	$1,185	$2,150
Induced Effect	13.3	$589	$1,097	$1,873
Total Effect	48.2	$2,482	$3,954	$7,457

State of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	74.3	$3,066	$4,547	$10,215
Indirect Effect	27.4	$1,367	$2,143	$4,013
Induced Effect	27.1	$1,018	$1,942	$3,429
Total Effect	128.9	$5,451	$8,632	$17,657

Totals may not sum due to rounding.
Source: IMPLAN, Carl Vinson Institute of Government

TABLE A12
Estimated Economic Impacts of All Projects in GDOT District 4

District 4				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	1,856.9	$72,819	$105,697	$276,040
Indirect Effect	530.9	$23,922	$39,534	$82,042
Induced Effect	525.5	$16,281	$32,123	$59,145
Total Effect	2,913.4	$113,023	$177,353	$417,227

Rest of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	25.9	$1,295	$1,875	$3,894
Indirect Effect	125.2	$9,121	$16,258	$30,850
Induced Effect	91.6	$4,375	$7,923	$13,846
Total Effect	242.7	$14,792	$26,057	$48,590

State of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	1,882.8	$74,115	$107,572	$279,935
Indirect Effect	656.1	$33,044	$55,792	$112,892
Induced Effect	617.2	$20,656	$40,046	$72,991
Total Effect	3,156.1	$127,814	$203,410	$465,817

Totals may not sum due to rounding.
Source: IMPLAN, Carl Vinson Institute of Government

TABLE A13
Estimated Economic Impacts of Construction Projects in GDOT District 5

District 5				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	870.7	$35,321	$50,438	$130,698
Indirect Effect	229.0	$12,327	$21,427	$42,627
Induced Effect	261.0	$9,231	$17,801	$31,417
Total Effect	1,360.7	$56,879	$89,666	$204,742

Rest of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	4.6	$236	$334	$754
Indirect Effect	54.9	$3,904	$6,817	$13,459
Induced Effect	34.7	$1,605	$2,931	$5,122
Total Effect	94.2	$5,745	$10,082	$19,335

State of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	875.3	$35,557	$50,772	$131,452
Indirect Effect	284.0	$16,231	$28,244	$56,087
Induced Effect	295.7	$10,836	$20,732	$36,539
Total Effect	1,455.0	$62,624	$99,748	$224,077

Totals may not sum due to rounding.
Source: IMPLAN, Carl Vinson Institute of Government

TABLE A14
Estimated Economic Impacts of Maintenance Projects in GDOT District 5

District 5				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	23.3	$911	$1,339	$3,118
Indirect Effect	6.6	$301	$492	$934
Induced Effect	6.7	$236	$454	$802
Total Effect	36.5	$1,447	$2,286	$4,854

Rest of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	25.2	$1,262	$1,834	$3,760
Indirect Effect	11.6	$715	$1,111	$2,011
Induced Effect	13.6	$592	$1,108	$1,887
Total Effect	50.4	$2,569	$4,053	$7,658

State of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	48.6	$2,173	$3,174	$6,878
Indirect Effect	18.2	$1,015	$1,602	$2,945
Induced Effect	20.2	$828	$1,563	$2,690
Total Effect	87.0	$4,016	$6,339	$12,512

Totals may not sum due to rounding.
Source: IMPLAN, Carl Vinson Institute of Government

TABLE A15
Estimated Economic Impacts of All Projects in GDOT District 5

District 5				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	894.0	$36,232	$51,777	$133,816
Indirect Effect	235.6	$12,627	$21,919	$43,561
Induced Effect	267.6	$9,467	$18,255	$32,219
Total Effect	1,397.3	$58,326	$91,952	$209,596

Rest of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	29.8	$1,498	$2,168	$4,513
Indirect Effect	66.5	$4,619	$7,928	$15,470
Induced Effect	48.3	$2,198	$4,039	$7,009
Total Effect	144.6	$8,315	$14,135	$26,993

State of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	923.8	$37,730	$53,945	$138,329
Indirect Effect	302.1	$17,246	$29,847	$59,031
Induced Effect	315.9	$11,664	$22,294	$39,228
Total Effect	1,541.9	$66,641	$106,086	$236,589

Totals may not sum due to rounding.
Source: IMPLAN, Carl Vinson Institute of Government

TABLE A16
Estimated Economic Impacts of Construction Projects in GDOT District 6

District 6				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	1,088.4	$48,300	$65,365	$165,703
Indirect Effect	268.2	$12,904	$23,474	$46,721
Induced Effect	286.9	$9,501	$18,919	$34,297
Total Effect	1,643.5	$70,705	$107,758	$246,721

Rest of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	0.0	$0	$0	$0
Indirect Effect	160.6	$10,782	$17,895	$32,524
Induced Effect	115.1	$5,534	$10,188	$17,316
Total Effect	275.7	$16,316	$28,083	$49,841

State of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	1,088.4	$48,300	$65,365	$165,703
Indirect Effect	428.8	$23,685	$41,369	$79,246
Induced Effect	402.0	$15,035	$29,107	$51,614
Total Effect	1,919.3	$87,020	$135,841	$296,562

Totals may not sum due to rounding.
Source: IMPLAN, Carl Vinson Institute of Government

TABLE A17
Estimated Economic Impacts of Maintenance Projects in GDOT District 6

District 6				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	117.7	$5,081	$6,952	$15,921
Indirect Effect	32.4	$1,299	$2,241	$4,463
Induced Effect	30.0	$992	$1,976	$3,582
Total Effect	180.1	$7,372	$11,169	$23,966

Rest of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	1.0	$49	$72	$146
Indirect Effect	18.6	$1,219	$1,805	$3,259
Induced Effect	12.9	$617	$1,138	$1,934
Total Effect	32.5	$1,885	$3,014	$5,339

State of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	118.6	$5,130	$7,023	$16,068
Indirect Effect	51.0	$2,518	$4,046	$7,722
Induced Effect	42.9	$1,609	$3,114	$5,516
Total Effect	212.6	$9,257	$14,183	$29,305

Totals may not sum due to rounding.
Source: IMPLAN, Carl Vinson Institute of Government

TABLE A18
Estimated Economic Impacts of All Projects in GDOT District 6

District 6				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	1,206.1	$53,381	$72,317	$181,624
Indirect Effect	300.6	$14,203	$25,715	$51,184
Induced Effect	316.9	$10,493	$20,895	$37,879
Total Effect	1,823.6	$78,077	$118,927	$270,688

Rest of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	1.0	$49	$72	$146
Indirect Effect	179.2	$12,001	$19,699	$35,783
Induced Effect	128.0	$6,151	$11,326	$19,250
Total Effect	308.2	$18,201	$31,097	$55,180

State of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	1,207.1	$53,430	$72,388	$181,770
Indirect Effect	479.9	$26,203	$45,414	$86,968
Induced Effect	444.9	$16,644	$32,221	$57,129
Total Effect	2,131.8	$96,277	$150,023	$325,868

Totals may not sum due to rounding.
Source: IMPLAN, Carl Vinson Institute of Government

TABLE A19
Estimated Economic Impacts of Construction Projects in GDOT District 7

District 7				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	822.5	$52,174	$74,816	$150,717
Indirect Effect	264.9	$20,393	$34,548	$58,644
Induced Effect	359.8	$18,142	$33,296	$53,243
Total Effect	1,447.2	$90,710	$142,660	$262,604

Rest of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	0.0	$0	$0	$0
Indirect Effect	47.6	$2,949	$5,652	$13,565
Induced Effect	23.6	$907	$1,701	$3,400
Total Effect	71.3	$3,856	$7,353	$16,965

State of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	822.5	$52,174	$74,816	$150,717
Indirect Effect	312.6	$23,342	$40,200	$72,209
Induced Effect	383.4	$19,049	$34,997	$56,642
Total Effect	1,518.5	$94,565	$150,013	$279,568

Totals may not sum due to rounding.
Source: IMPLAN, Carl Vinson Institute of Government

TABLE A20
Estimated Economic Impacts of Maintenance Projects in GDOT District 7

District 7

Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	100.0	$6,182	$9,159	$16,794
Indirect Effect	33.7	$2,456	$3,777	$6,195
Induced Effect	43.1	$2,172	$3,986	$6,374
Total Effect	176.8	$10,810	$16,923	$29,363

Rest of Georgia

Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	3.9	$167	$239	$534
Indirect Effect	5.6	$316	$571	$1,303
Induced Effect	3.6	$135	$254	$499
Total Effect	13.1	$617	$1,065	$2,336

State of Georgia

Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	103.9	$6,349	$9,399	$17,328
Indirect Effect	39.3	$2,772	$4,348	$7,498
Induced Effect	46.7	$2,307	$4,241	$6,873
Total Effect	189.8	$11,428	$17,987	$31,699

Totals may not sum due to rounding.
Source: IMPLAN, Carl Vinson Institute of Government

TABLE A21
Estimated Economic Impacts of All Projects in GDOT District 7

District 7				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	922.5	$58,357	$83,975	$167,511
Indirect Effect	298.6	$22,849	$38,326	$64,839
Induced Effect	402.9	$20,314	$37,282	$59,616
Total Effect	1,624.0	$101,520	$159,583	$291,966

Rest of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	3.9	$167	$239	$534
Indirect Effect	53.2	$3,265	$6,222	$14,868
Induced Effect	27.2	$1,041	$1,955	$3,899
Total Effect	84.3	$4,473	$8,417	$19,301

State of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	926.3	$58,523	$84,215	$168,045
Indirect Effect	351.9	$26,114	$44,548	$79,707
Induced Effect	430.1	$21,356	$39,238	$63,515
Total Effect	1,708.3	$105,993	$168,000	$311,267

Totals may not sum due to rounding.
Source: IMPLAN, Carl Vinson Institute of Government

TABLE A22
Estimated Economic Impacts of All Projects in Georgia

Economic Impacts of All Construction Projects in Georgia

Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	9,382.3	$417,190	$591,916	$1,456,908
Indirect Effect	3,719.6	$210,595	$364,706	$708,227
Induced Effect	3,777.3	$143,624	$273,956	$483,648
Total Effect	16,879.2	$771,408	$1,230,578	$2,648,783

Economic Impacts of All Maintenance Projects in Georgia

Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	605.8	$28,877	$41,665	$87,873
Indirect Effect	245.9	$13,728	$21,742	$39,841
Induced Effect	253.9	$10,459	$19,810	$34,057
Total Effect	1,105.7	$53,064	$83,217	$161,771

Economic Impacts of All Projects in Georgia

Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	9,988.2	$446,066	$633,581	$1,544,781
Indirect Effect	3,965.5	$224,322	$386,448	$748,068
Induced Effect	4,031.2	$154,083	$293,766	$517,705
Total Effect	17,984.8	$824,471	$1,313,795	$2,810,554

Totals may not sum due to rounding.
Source: IMPLAN, Carl Vinson Institute of Government
This table does not include impacts from design and engineering, or LMIG expenditures.

Appendix B

Detailed Tables of Estimated Economic Impacts by Rural-Urban Commuting Areas

TABLE B1
Estimated Economic Impacts of Construction Projects in the Albany Rural-Urban Commuting Area

Albany RUCA				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	219.4	$9,688	$14,475	$34,708
Indirect Effect	72.8	$2,844	$4,841	$10,366
Induced Effect	76.2	$2,508	$4,774	$8,719
Total Effect	368.5	$15,040	$24,089	$53,793
Rest of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	0.3	$17	$24	$56
Indirect Effect	21.1	$1,542	$2,793	$5,396
Induced Effect	15.6	$758	$1,345	$2,381
Total Effect	37.0	$2,317	$4,162	$7,832
State of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	219.8	$9,705	$14,499	$34,764
Indirect Effect	93.9	$4,386	$7,634	$15,762
Induced Effect	91.8	$3,266	$6,119	$11,099
Total Effect	405.5	$17,357	$28,251	$61,625

Totals may not sum due to rounding.
Source: IMPLAN, Carl Vinson Institute of Government

TABLE B2
Estimated Economic Impacts of Maintenance Projects in the Albany Rural-Urban Commuting Area

Albany RUCA				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	1.7	$72	$113	$244
Indirect Effect	0.6	$23	$35	$72
Induced Effect	0.6	$19	$36	$66
Total Effect	2.9	$114	$184	$382

Rest of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	0.1	$5	$8	$16
Indirect Effect	0.2	$12	$20	$39
Induced Effect	0.2	$7	$13	$23
Total Effect	0.4	$24	$41	$77

State of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	1.8	$77	$121	$260
Indirect Effect	0.8	$35	$55	$111
Induced Effect	0.7	$26	$49	$89
Total Effect	3.4	$138	$225	$459

Totals may not sum due to rounding.
Source: IMPLAN, Carl Vinson Institute of Government

TABLE B3
Estimated Economic Impacts of All Projects in the Albany Rural-Urban Commuting Area

Albany RUCA

Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	221.2	$9,760	$14,588	$34,953
Indirect Effect	73.5	$2,867	$4,876	$10,438
Induced Effect	76.8	$2,527	$4,810	$8,785
Total Effect	371.5	$15,154	$24,273	$54,175

Rest of Georgia

Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	0.4	$23	$32	$71
Indirect Effect	21.2	$1,554	$2,813	$5,435
Induced Effect	15.7	$765	$1,358	$2,403
Total Effect	37.4	$2,341	$4,203	$7,909

State of Georgia

Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	221.6	$9,782	$14,620	$35,024
Indirect Effect	94.7	$4,420	$7,689	$15,873
Induced Effect	92.5	$3,292	$6,168	$11,188
Total Effect	408.9	$17,495	$28,476	$62,085

Totals may not sum due to rounding.
Source: IMPLAN, Carl Vinson Institute of Government

TABLE B4
Estimated Economic Impacts of Construction Projects in the Athens Rural-Urban Commuting Area

Athens RUCA

Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	15.8	$647	$928	$2,387
Indirect Effect	4.6	$220	$390	$740
Induced Effect	4.5	$160	$300	$528
Total Effect	24.9	$1,028	$1,618	$3,655

Rest of Georgia

Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	0.0	$1	$1	$2
Indirect Effect	2.6	$173	$284	$592
Induced Effect	1.8	$85	$152	$264
Total Effect	4.4	$259	$437	$858

State of Georgia

Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	15.8	$648	$929	$2,389
Indirect Effect	7.1	$393	$674	$1,332
Induced Effect	6.3	$245	$452	$792
Total Effect	29.2	$1,286	$2,055	$4,513

Totals may not sum due to rounding.
Source: IMPLAN, Carl Vinson Institute of Government

TABLE B5
Estimated Economic Impacts of Maintenance Projects in the Athens Rural-Urban Commuting Area

Athens RUCA				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	0.7	$29	$43	$99
Indirect Effect	0.2	$9	$16	$30
Induced Effect	0.2	$7	$13	$23
Total Effect	1.2	$45	$72	$152

Rest of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	2.7	$131	$191	$394
Indirect Effect	1.1	$69	$108	$196
Induced Effect	1.4	$59	$111	$189
Total Effect	5.2	$260	$410	$779

State of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	3.4	$160	$234	$493
Indirect Effect	1.4	$78	$124	$226
Induced Effect	1.6	$66	$124	$212
Total Effect	6.3	$305	$482	$932

Totals may not sum due to rounding.
Source: IMPLAN, Carl Vinson Institute of Government

TABLE B6
Estimated Economic Impacts of All Projects in the Athens Rural-Urban Commuting Area

Athens RUCA				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	16.6	$676	$971	$2,486
Indirect Effect	4.8	$230	$405	$770
Induced Effect	4.7	$167	$314	$551
Total Effect	26.0	$1,073	$1,690	$3,807

Rest of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	2.7	$132	$192	$396
Indirect Effect	3.7	$242	$392	$788
Induced Effect	3.2	$145	$263	$453
Total Effect	9.5	$519	$847	$1,637

State of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	19.2	$808	$1,163	$2,882
Indirect Effect	8.5	$472	$798	$1,558
Induced Effect	7.8	$312	$576	$1,004
Total Effect	35.6	$1,591	$2,537	$5,444

Totals may not sum due to rounding.
Source: IMPLAN, Carl Vinson Institute of Government

TABLE B7
Estimated Economic Impacts of Construction Projects in the Atlanta Rural-Urban Commuting Area

Atlanta RUCA				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	2,344.8	$135,510	$192,078	$408,397
Indirect Effect	846.8	$59,940	$102,964	$181,907
Induced Effect	1,291.4	$60,588	$112,676	$185,053
Total Effect	4,483.0	$256,038	$407,718	$775,357

Rest of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	0.0	$0	$0	$0
Indirect Effect	72.1	$4,184	$8,327	$20,245
Induced Effect	35.9	$1,408	$2,721	$5,803
Total Effect	108.0	$5,592	$11,048	$26,048

State of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	2,344.8	$135,510	$192,078	$408,397
Indirect Effect	918.9	$64,123	$111,290	$202,152
Induced Effect	1,327.3	$61,997	$115,398	$190,856
Total Effect	4,591.0	$261,630	$418,766	$801,406

Totals may not sum due to rounding.
Source: IMPLAN, Carl Vinson Institute of Government

TABLE B8
Estimated Economic Impacts of Maintenance Projects in the Atlanta Rural-Urban Commuting Area

Atlanta RUCA				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	235.9	$13,230	$19,277	$37,276
Indirect Effect	88.6	$5,882	$9,205	$15,779
Induced Effect	126.0	$5,907	$10,985	$18,040
Total Effect	450.4	$25,018	$39,467	$71,096

Rest of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	0.0	$2	$2	$5
Indirect Effect	5.3	$267	$510	$1,220
Induced Effect	2.7	$111	$214	$473
Total Effect	8.0	$380	$726	$1,699

State of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	235.9	$13,232	$19,279	$37,282
Indirect Effect	93.9	$6,149	$9,714	$17,000
Induced Effect	128.7	$6,018	$11,200	$18,513
Total Effect	458.4	$25,398	$40,193	$72,794

Totals may not sum due to rounding.
Source: IMPLAN, Carl Vinson Institute of Government

TABLE B9
Estimated Economic Impacts of All Projects in the Atlanta Rural-Urban Commuting Area

Atlanta RUCA

Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	2,580.7	$148,740	$211,355	$445,673
Indirect Effect	935.4	$65,821	$112,168	$197,686
Induced Effect	1,417.3	$66,495	$123,662	$203,093
Total Effect	4,933.4	$281,056	$447,185	$846,453

Rest of Georgia

Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	0.0	$2	$2	$5
Indirect Effect	77.3	$4,451	$8,836	$21,466
Induced Effect	38.6	$1,519	$2,936	$6,276
Total Effect	116.0	$5,972	$11,774	$27,747

State of Georgia

Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	2,580.7	$148,741	$211,357	$445,679
Indirect Effect	1,012.8	$70,272	$121,005	$219,152
Induced Effect	1,456.0	$68,014	$126,597	$209,369
Total Effect	5,049.4	$287,028	$458,959	$874,200

Totals may not sum due to rounding.
Source: IMPLAN, Carl Vinson Institute of Government

TABLE B10
Estimated Economic Impacts of Construction Projects in the Augusta Rural-Urban Commuting Area

Augusta RUCA

Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	52.3	$2,559	$3,638	$8,464
Indirect Effect	13.3	$742	$1,284	$2,353
Induced Effect	17.5	$659	$1,217	$2,124
Total Effect	83.1	$3,961	$6,139	$12,941

Rest of Georgia

Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	0.4	$22	$31	$71
Indirect Effect	5.8	$408	$720	$1,480
Induced Effect	3.7	$172	$315	$552
Total Effect	9.9	$602	$1,067	$2,102

State of Georgia

Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	52.8	$2,581	$3,669	$8,534
Indirect Effect	19.1	$1,151	$2,004	$3,834
Induced Effect	21.2	$831	$1,533	$2,676
Total Effect	93.0	$4,562	$7,205	$15,044

Totals may not sum due to rounding.
Source: IMPLAN, Carl Vinson Institute of Government

TABLE B11
Estimated Economic Impacts of Maintenance Projects in the Augusta Rural-Urban Commuting Area

Augusta RUCA				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	1.3	$61	$90	$186
Indirect Effect	0.4	$17	$27	$47
Induced Effect	0.4	$16	$29	$51
Total Effect	2.0	$94	$145	$283

Rest of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	3.3	$162	$236	$488
Indirect Effect	1.4	$84	$132	$240
Induced Effect	1.7	$72	$136	$232
Total Effect	6.4	$318	$504	$960

State of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	4.6	$224	$326	$674
Indirect Effect	1.7	$100	$159	$287
Induced Effect	2.1	$88	$165	$282
Total Effect	8.4	$412	$649	$1,243

Totals may not sum due to rounding.
Source: IMPLAN, Carl Vinson Institute of Government

TABLE B12
Estimated Economic Impacts of All Projects in the Augusta Rural-Urban Commuting Area

Augusta RUCA

Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	53.6	$2,621	$3,727	$8,650
Indirect Effect	13.6	$759	$1,310	$2,400
Induced Effect	17.9	$675	$1,246	$2,175
Total Effect	85.1	$4,054	$6,284	$13,225

Rest of Georgia

Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	3.7	$184	$267	$558
Indirect Effect	7.2	$492	$852	$1,721
Induced Effect	5.3	$244	$451	$783
Total Effect	16.3	$920	$1,571	$3,062

State of Georgia

Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	57.3	$2,805	$3,994	$9,208
Indirect Effect	20.8	$1,251	$2,163	$4,121
Induced Effect	23.2	$919	$1,697	$2,958
Total Effect	101.4	$4,975	$7,855	$16,287

Totals may not sum due to rounding.
Source: IMPLAN, Carl Vinson Institute of Government

TABLE B13
Estimated Economic Impacts of Construction Projects in the Columbus Rural-Urban Commuting Area

Columbus RUCA				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	107.5	$4,299	$6,324	$16,235
Indirect Effect	28.0	$1,355	$2,415	$4,573
Induced Effect	23.1	$817	$1,558	$2,770
Total Effect	158.5	$6,470	$10,297	$23,579

Rest of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	1.0	$50	$71	$161
Indirect Effect	13.1	$878	$1,386	$2,580
Induced Effect	8.7	$408	$728	$1,257
Total Effect	22.8	$1,336	$2,185	$3,998

State of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	108.5	$4,349	$6,394	$16,396
Indirect Effect	41.1	$2,233	$3,801	$7,153
Induced Effect	31.7	$1,225	$2,287	$4,027
Total Effect	181.3	$7,806	$12,483	$27,576

Totals may not sum due to rounding.
Source: IMPLAN, Carl Vinson Institute of Government

TABLE B14
Estimated Economic Impacts of Maintenance Projects in the Columbus Rural-Urban Commuting Area

Columbus RUCA

Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	1.2	$45	$69	$160
Indirect Effect	0.3	$14	$23	$43
Induced Effect	0.2	$9	$17	$30
Total Effect	1.8	$68	$109	$233

Rest of Georgia

Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	4.6	$227	$330	$680
Indirect Effect	1.9	$116	$181	$327
Induced Effect	2.3	$100	$188	$320
Total Effect	8.8	$443	$699	$1,327

State of Georgia

Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	5.8	$272	$398	$840
Indirect Effect	2.3	$130	$205	$370
Induced Effect	2.6	$109	$205	$350
Total Effect	10.6	$511	$808	$1,560

Totals may not sum due to rounding.
Source: IMPLAN, Carl Vinson Institute of Government

TABLE B15
Estimated Economic Impacts of All Projects in the Columbus Rural-Urban Commuting Area

Columbus RUCA

Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	108.7	$4,343	$6,393	$16,395
Indirect Effect	28.3	$1,369	$2,438	$4,617
Induced Effect	23.3	$825	$1,575	$2,800
Total Effect	160.3	$6,538	$10,406	$23,811

Rest of Georgia

Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	5.6	$277	$400	$841
Indirect Effect	15.1	$994	$1,567	$2,906
Induced Effect	11.0	$508	$916	$1,577
Total Effect	31.7	$1,779	$2,884	$5,325

State of Georgia

Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	114.3	$4,620	$6,793	$17,236
Indirect Effect	43.4	$2,363	$4,006	$7,523
Induced Effect	34.3	$1,334	$2,491	$4,377
Total Effect	192.0	$8,317	$13,290	$29,136

Totals may not sum due to rounding.
Source: IMPLAN, Carl Vinson Institute of Government

TABLE B16
Estimated Economic Impacts of Construction Projects in the Macon–Warner Robins Rural-Urban Commuting Area

Macon-Warner Robins RUCA

Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	1,850.2	$76,248	$108,847	$279,395
Indirect Effect	600.1	$29,668	$50,385	$99,852
Induced Effect	644.5	$21,818	$42,142	$76,035
Total Effect	3,094.8	$127,734	$201,373	$455,282

Rest of Georgia

Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	8.7	$448	$634	$1,440
Indirect Effect	249.2	$17,274	$30,561	$60,739
Induced Effect	198.7	$9,655	$17,016	$29,716
Total Effect	456.6	$27,377	$48,211	$91,895

State of Georgia

Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	1,858.9	$76,695	$109,480	$280,834
Indirect Effect	849.4	$46,942	$80,946	$160,591
Induced Effect	843.1	$31,473	$59,157	$105,751
Total Effect	3,551.4	$155,111	$249,584	$547,177

Totals may not sum due to rounding.
Source: IMPLAN, Carl Vinson Institute of Government

TABLE B17
Estimated Economic Impacts of Maintenance Projects in the Macon–Warner Robins Rural-Urban Commuting Area

Macon-Warner Robins RUCA				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	6.4	$251	$369	$858
Indirect Effect	2.3	$107	$165	$311
Induced Effect	2.2	$75	$144	$261
Total Effect	11.0	$433	$678	$1,430

Rest of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	15.5	$766	$1,113	$2,293
Indirect Effect	6.6	$396	$630	$1,145
Induced Effect	8.0	$346	$647	$1,102
Total Effect	30.0	$1,508	$2,390	$4,540

State of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	21.9	$1,017	$1,482	$3,152
Indirect Effect	9.0	$503	$795	$1,455
Induced Effect	10.1	$421	$791	$1,363
Total Effect	41.0	$1,941	$3,068	$5,970

Totals may not sum due to rounding.
Source: IMPLAN, Carl Vinson Institute of Government

TABLE B18
Estimated Economic Impacts of All Projects in the Macon–Warner Robins Rural–Urban Commuting Area

Macon-Warner Robins RUCA

Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	1,856.6	$76,498	$109,216	$280,253
Indirect Effect	602.5	$29,776	$50,549	$100,162
Induced Effect	646.7	$21,893	$42,286	$76,296
Total Effect	3,105.7	$128,167	$202,051	$456,712

Rest of Georgia

Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	24.2	$1,213	$1,747	$3,733
Indirect Effect	255.9	$17,670	$31,191	$61,884
Induced Effect	206.6	$10,002	$17,663	$30,818
Total Effect	486.7	$28,885	$50,601	$96,435

State of Georgia

Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	1,880.8	$77,712	$110,962	$283,986
Indirect Effect	858.4	$47,445	$81,741	$162,046
Induced Effect	853.3	$31,894	$59,949	$107,115
Total Effect	3,592.4	$157,052	$252,652	$553,147

Totals may not sum due to rounding.
Source: IMPLAN, Carl Vinson Institute of Government

TABLE B19
Estimated Economic Impacts of Construction Projects in the Rome–Chattanooga Rural–Urban Commuting Area

Rome–Chattanooga RUCA

Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	658.4	$22,326	$30,092	$90,757
Indirect Effect	137.8	$6,870	$11,874	$22,433
Induced Effect	128.7	$4,591	$9,075	$15,983
Total Effect	924.9	$33,787	$51,041	$129,172

Rest of Georgia

Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	0.2	$8	$12	$27
Indirect Effect	72.1	$4,918	$8,164	$15,156
Induced Effect	48.3	$2,285	$4,126	$7,050
Total Effect	120.6	$7,211	$12,302	$22,234

State of Georgia

Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	658.6	$22,334	$30,104	$90,784
Indirect Effect	209.9	$11,787	$20,038	$37,589
Induced Effect	177.0	$6,876	$13,201	$23,033
Total Effect	1,045.5	$40,998	$63,343	$151,406

Totals may not sum due to rounding.
Source: IMPLAN, Carl Vinson Institute of Government

TABLE B20
Estimated Economic Impacts of Maintenance Projects in the Rome-Chattanooga Rural-Urban Commuting Area

Rome-Chattanooga RUCA				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	41.2	$1,338	$1,820	$4,957
Indirect Effect	10.1	$405	$679	$1,322
Induced Effect	7.7	$274	$543	$955
Total Effect	59.0	$2,018	$3,041	$7,234

Rest of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	1.9	$95	$138	$283
Indirect Effect	5.1	$343	$510	$941
Induced Effect	3.9	$178	$324	$554
Total Effect	10.9	$616	$972	$1,779

State of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	43.1	$1,433	$1,957	$5,240
Indirect Effect	15.3	$748	$1,189	$2,263
Induced Effect	11.5	$452	$867	$1,509
Total Effect	69.9	$2,634	$4,013	$9,012

Totals may not sum due to rounding.
Source: IMPLAN, Carl Vinson Institute of Government

TABLE B21
Estimated Economic Impacts of All Projects in the Rome-Chattanooga Rural-Urban Commuting Area

Rome-Chattanooga RUCA

Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	699.6	$23,664	$31,912	$95,714
Indirect Effect	148.0	$7,275	$12,553	$23,754
Induced Effect	136.4	$4,866	$9,617	$16,938
Total Effect	983.9	$35,805	$54,082	$136,406

Rest of Georgia

Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	2.1	$103	$150	$311
Indirect Effect	77.2	$5,261	$8,674	$16,097
Induced Effect	52.2	$2,463	$4,450	$7,604
Total Effect	131.5	$7,827	$13,274	$24,012

State of Georgia

Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	701.7	$23,767	$32,061	$96,024
Indirect Effect	225.2	$12,536	$21,227	$39,852
Induced Effect	188.5	$7,328	$14,068	$24,542
Total Effect	1,115.4	$43,631	$67,356	$160,418

Totals may not sum due to rounding.
Source: IMPLAN, Carl Vinson Institute of Government

TABLE B22
Estimated Economic Impacts of Construction Projects in the Statesboro-Savannah-Brunswick Rural-Urban Commuting Area

Statesboro-Savannah-Brunswick RUCA				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	714.5	$30,173	$43,268	$109,131
Indirect Effect	186.0	$10,532	$18,293	$34,917
Induced Effect	223.0	$8,133	$15,516	$26,808
Total Effect	1,123.5	$48,837	$77,077	$170,855
Rest of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	5.4	$277	$391	$887
Indirect Effect	46.9	$3,306	$5,763	$11,672
Induced Effect	29.1	$1,343	$2,489	$4,391
Total Effect	81.4	$4,926	$8,644	$16,951
State of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	719.8	$30,449	$43,659	$110,018
Indirect Effect	232.9	$13,837	$24,056	$46,589
Induced Effect	252.1	$9,476	$18,005	$31,199
Total Effect	1,204.9	$53,763	$85,720	$187,806

Totals may not sum due to rounding.
Source: IMPLAN, Carl Vinson Institute of Government

TABLE B23
Estimated Economic Impacts of Maintenance Projects in the Statesboro-Savannah-Brunswick Rural-Urban Commuting Area

Statesboro-Savannah-Brunswick RUCA				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	12.5	$508	$752	$1,707
Indirect Effect	3.6	$169	$274	$504
Induced Effect	3.7	$136	$259	$448
Total Effect	19.8	$813	$1,285	$2,659

Rest of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	15.9	$791	$1,149	$2,364
Indirect Effect	7.1	$435	$679	$1,235
Induced Effect	8.4	$364	$682	$1,164
Total Effect	31.4	$1,590	$2,511	$4,763

State of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	28.5	$1,299	$1,901	$4,071
Indirect Effect	10.7	$604	$954	$1,739
Induced Effect	12.1	$500	$941	$1,612
Total Effect	51.2	$2,403	$3,796	$7,422

Totals may not sum due to rounding.
Source: IMPLAN, Carl Vinson Institute of Government

TABLE B24
Estimated Economic Impacts of All Projects in the Statesboro-Savannah-Brunswick Rural-Urban Commuting Area

Statesboro-Savannah-Brunswick RUCA

Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	727.0	$30,681	$44,019	$110,838
Indirect Effect	189.5	$10,701	$18,567	$35,421
Induced Effect	226.7	$8,269	$15,775	$27,255
Total Effect	1,143.3	$49,650	$78,361	$173,514

Rest of Georgia

Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	21.3	$1,068	$1,541	$3,251
Indirect Effect	54.1	$3,741	$6,442	$12,907
Induced Effect	37.5	$1,707	$3,171	$5,555
Total Effect	112.8	$6,516	$11,154	$21,714

State of Georgia

Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	748.3	$31,749	$45,560	$114,089
Indirect Effect	243.6	$14,441	$25,009	$48,328
Induced Effect	264.2	$9,976	$18,946	$32,810
Total Effect	1,256.1	$56,166	$89,516	$195,228

Totals may not sum due to rounding.
Source: IMPLAN, Carl Vinson Institute of Government

TABLE B25
Estimated Economic Impacts of Construction Projects in the Valdosta Rural-Urban Commuting Area

Valdosta RUCA

Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	431.7	$21,120	$31,488	$71,302
Indirect Effect	109.8	$4,935	$8,732	$17,515
Induced Effect	132.8	$4,111	$8,353	$14,976
Total Effect	674.4	$30,166	$48,573	$103,793

Rest of Georgia

Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	1.9	$96	$136	$309
Indirect Effect	30.4	$2,154	$3,938	$7,468
Induced Effect	19.2	$872	$1,598	$2,803
Total Effect	51.6	$3,121	$5,672	$10,581

State of Georgia

Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	433.6	$21,216	$31,623	$71,611
Indirect Effect	140.3	$7,088	$12,670	$24,983
Induced Effect	152.1	$4,983	$9,951	$17,780
Total Effect	725.9	$33,287	$54,245	$114,374

Totals may not sum due to rounding.
Source: IMPLAN, Carl Vinson Institute of Government

TABLE B26
Estimated Economic Impacts of Maintenance Projects in the Valdosta Rural-Urban Commuting Area

Valdosta RUCA				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	26.2	$1,233	$1,930	$3,931
Indirect Effect	7.2	$275	$448	$828
Induced Effect	7.7	$238	$485	$869
Total Effect	41.2	$1,747	$2,862	$5,628

Rest of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	5.6	$275	$400	$826
Indirect Effect	3.7	$235	$387	$711
Induced Effect	3.7	$160	$299	$513
Total Effect	12.9	$670	$1,085	$2,051

State of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	31.8	$1,508	$2,330	$4,757
Indirect Effect	10.9	$510	$835	$1,539
Induced Effect	11.4	$399	$783	$1,382
Total Effect	54.1	$2,417	$3,947	$7,679

Totals may not sum due to rounding.
Source: IMPLAN, Carl Vinson Institute of Government

TABLE B27
Estimated Economic Impacts of All Projects in the Valdosta Rural-Urban Commuting Area

Valdosta RUCA

Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	457.9	$22,354	$33,418	$75,233
Indirect Effect	117.1	$5,210	$9,180	$18,343
Induced Effect	140.5	$4,349	$8,838	$15,845
Total Effect	715.5	$31,913	$51,435	$109,421

Rest of Georgia

Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	7.5	$371	$535	$1,135
Indirect Effect	34.1	$2,388	$4,326	$8,179
Induced Effect	22.9	$1,032	$1,896	$3,317
Total Effect	64.5	$3,791	$6,757	$12,631

State of Georgia

Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	465.4	$22,725	$33,953	$76,369
Indirect Effect	151.2	$7,598	$13,505	$26,523
Induced Effect	163.4	$5,382	$10,734	$19,162
Total Effect	780.0	$35,704	$58,192	$122,053

Totals may not sum due to rounding.
Source: IMPLAN, Carl Vinson Institute of Government

TABLE B28
Estimated Economic Impacts of Construction Projects in the Rural Areas (Non-RUCA)*

Rural Areas (Non-RUCA)				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	3,000.9	$112,911	$156,289	$432,843
Indirect Effect	713.7	$32,207	$57,835	$118,973
Induced Effect	662.8	$19,764	$41,189	$76,822
Total Effect	4,377.3	$164,881	$255,313	$628,638

Rest of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	0.0	$0	$0	$0
Indirect Effect	435.5	$30,177	$50,583	$94,722
Induced Effect	279.5	$13,499	$24,512	$41,329
Total Effect	714.9	$43,676	$75,095	$136,052

State of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	3,000.9	$112,911	$156,289	$432,843
Indirect Effect	1,149.1	$62,384	$108,418	$213,696
Induced Effect	942.2	$33,263	$65,702	$118,151
Total Effect	5,092.2	$208,557	$330,409	$764,690

*Includes impacts from $8.0 million in expenditures for 7 projects assigned to “all counties.”
Totals may not sum due to rounding.
Source: IMPLAN, Carl Vinson Institute of Government

TABLE B29
Estimated Economic Impacts of Maintenance Projects in the Rural Areas (Non-RUCA)

Rural Areas (Non-RUCA)				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	166.7	$6,034	$8,499	$21,207
Indirect Effect	45.1	$1,865	$3,059	$6,021
Induced Effect	36.4	$1,089	$2,267	$4,241
Total Effect	248.3	$8,989	$13,825	$31,469

Rest of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	66.6	$3,481	$5,087	$10,168
Indirect Effect	47.4	$3,069	$4,740	$8,508
Induced Effect	46.7	$2,138	$3,956	$6,638
Total Effect	160.7	$8,688	$13,783	$25,314

State of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	233.3	$9,515	$13,586	$31,375
Indirect Effect	92.5	$4,935	$7,799	$14,529
Induced Effect	83.1	$3,227	$6,223	$10,879
Total Effect	409.0	$17,677	$27,608	$56,783

Totals may not sum due to rounding.
Source: IMPLAN, Carl Vinson Institute of Government

TABLE B30
Estimated Economic Impacts of All Projects in the Rural Areas (Non-RUCA)*

Rural Areas (Non-RUCA)				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	3,167.6	$118,945	$164,788	$454,050
Indirect Effect	758.8	$34,072	$60,894	$124,995
Induced Effect	699.2	$20,853	$43,456	$81,062
Total Effect	4,625.6	$173,870	$269,138	$660,107

Rest of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	66.6	$3,481	$5,087	$10,168
Indirect Effect	482.9	$33,246	$55,323	$103,230
Induced Effect	326.2	$15,637	$28,468	$47,967
Total Effect	875.7	$52,365	$88,879	$161,366

State of Georgia				
Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	3,234.2	$122,426	$169,875	$464,218
Indirect Effect	1,241.7	$67,318	$116,217	$228,225
Induced Effect	1,025.4	$36,490	$71,925	$129,030
Total Effect	5,501.2	$226,234	$358,017	$821,473

*Includes impacts from $8.0 million in expenditures for 7 construction projects assigned to “all counties.”
Totals may not sum due to rounding.
Source: IMPLAN, Carl Vinson Institute of Government

TABLE B31
Estimated Economic Impacts of All GDOT Projects in the RUCAs*

Economic Impacts of All Construction Projects

Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	6,412.6	$303,488	$432,436	$1,023,728
Indirect Effect	2,512.6	$151,941	$263,114	$499,986
Induced Effect	2,902.6	$120,372	$226,103	$387,212
Total Effect	11,827.8	$575,801	$921,652	$1,910,926

Economic Impacts of All Maintenance Projects

Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	376.7	$19,222	$28,028	$56,768
Indirect Effect	145.9	$8,858	$14,028	$24,990
Induced Effect	180.8	$8,079	$15,124	$25,312
Total Effect	703.4	$36,158	$57,181	$107,071

Economic Impacts of All Projects

Impact Summary		(000s of 2017 Dollars)		
Impact Type	Employment (Jobs)	Labor Income	Value Added	Economic Output
Direct Effect	6,789.3	$322,710	$460,464	$1,080,497
Indirect Effect	2,658.5	$160,799	$277,142	$524,976
Induced Effect	3,083.4	$128,451	$241,227	$412,525
Total Effect	12,531.2	$611,959	$978,833	$2,017,997

*This table does not include impacts in the rural area reported in Tables B28, B29, and B30, or the impacts of design and engineering expenditures, and Local Maintenance and Improvement Grants.
Totals may not sum due to rounding.
Source: IMPLAN, Carl Vinson Institute of Government

Appendix C

Number of FY 2017 Projects and Expenditure Dollars by County*

County	Major Construction and Capital Maintenance Projects		Routine Maintenance Projects		Local Grants** (LMIG)	Total Expenditures
	Number	Expenditures	Number	Expenditures		
Appling	5	$3,210,100.79	1	$446,950	$1,055,613	$4,712,664
Atkinson	3	$1,396,908.14	0	$0	$443,718	$1,840,626
Bacon	1	$242,309.10	2	$163,702	$575,548	$981,560
Baker	1	$2,184,487.99	0	$0	$289,199	$2,473,687
Baldwin	5	$3,653,223.64	2	$301,670	$680,305	$4,635,199
Banks	4	$6,530,663.47	1	$48,485	$491,718	$7,070,867
Barrow	3	$5,253,757.87	1	$901,066	$992,882	$7,147,706
Bartow	8	$47,105,570.62	10	$2,423,965	$1,587,665	$51,117,201
Ben Hill	17	$17,659,062.62	0	$0	$458,915	$18,117,977
Berrien	7	$7,540,296.76	1	$66,242	$797,328	$8,403,867
Bibb	11	$257,694,458.01	4	$1,652,853	$1,878,081	$261,225,392
Bleckley	6	$26,644,596.47	3	$733,533	$444,858	$27,822,987
Brantley	2	$2,456,066.04	1	$205,553	$625,816	$3,287,435
Brooks	6	$9,681,498.54	0	$0	$709,630	$10,391,128
Bryan	9	$9,213,387.39	2	$635,018	$574,418	$10,422,824
Bulloch	4	$4,009,746.25	3	$1,255,926	$1,707,232	$6,972,905
Burke	7	$11,646,089.36	2	$797,855	$975,119	$13,419,064
Butts	3	$1,945,908.12	2	$230,320	$507,833	$2,684,062
Calhoun	2	$3,254,635.80	0	$0	$275,294	$3,529,930
Camden	7	$50,479,607.14	0	$0	$789,869	$51,269,477
Candler	2	$44,026.47	4	$1,522,559	$445,269	$2,011,855
Carroll	12	$8,832,201.70	4	$915,080	$1,870,264	$11,617,545
Catoosa	5	$42,453,749.50	6	$896,416	$767,137	$44,117,303
Charlton	2	$1,608,038.24	1	$231,625	$380,835	$2,220,498
Chatham	7	$17,948,359.84	7	$2,556,543	$2,858,960	$23,363,862
Chattahoochee	1	$266,313.10	0	$0	$144,960	$411,273
Chattooga	2	$2,906,020.00	2	$92,460	$599,555	$3,598,035
Cherokee	6	$9,566,498.15	4	$3,227,603	$2,721,010	$15,515,111
Clarke	0	$0	1	$194,500	$1,249,657	$1,444,157
Clay	1	$3,004,016.80	0	$0	$225,470	$3,229,487
Clayton	4	$26,577,867.37	4	$2,425,099	$2,509,016	$31,511,982
Clinch	1	$2,047,633.60	0	$0	$458,193	$2,505,827
Cobb	18	$28,243,871.85	5	$566,741	$6,768,366	$35,578,979
Coffee	3	$1,139,165.53	1	$3,446	$1,347,532	$2,490,144
Colquitt	8	$12,351,852.10	0	$0	$1,279,983	$13,631,835
Columbia	3	$4,772,744.34	1	$116,474	$1,511,817	$6,401,035
Cook	2	$2,577,038.06	3	$87,303	$565,816	$3,230,157
Coweta	3	$1,613,478.74	0	$0	$1,945,393	$3,558,872
Crawford	4	$5,032,607.78	2	$661,243	$401,876	$6,095,727
Crisp	5	$32,705,468.05	5	$1,941,809	$734,122	$35,381,399
Dade	3	$3,435,471.58	5	$1,793,808	$357,415	$5,586,695

County	Major Construction and Capital Maintenance Projects		Routine Maintenance Projects		Local Grants** (LMIG)	Total Expenditures
	Number	Expenditures	Number	Expenditures		
Dawson	1	$4,143,174.96	1	$912,408	$393,230	$5,448,813
Decatur	2	$5,791,648.22	1	$361,415	$927,424	$7,080,487
DeKalb	17	$47,760,081.72	11	$2,436,491	$7,771,403	$57,967,976
Dodge	3	$2,726,572.31	2	$611,724	$908,098	$4,246,394
Dooly	1	$803,722.50	0	$0	$690,782	$1,494,504
Dougherty	10	$10,373,026.48	2	$163,096	$1,298,482	$11,834,604
Douglas	5	$2,957,881.83	0	$0	$1,626,774	$4,584,656
Early	0	$0	0	$0	$603,526	$603,526
Echols	3	$3,486,400.99	2	$2,210,079	$178,475	$5,874,955
Effingham	3	$11,537,198.43	3	$852,894	$1,009,537	$13,399,630
Elbert	1	$353,831.18	0	$0	$685,070	$1,038,901
Emanuel	10	$3,553,843.88	2	$382,270	$1,143,550	$5,079,664
Evans	11	$2,209,674.51	2	$225,121	$346,356	$2,781,151
Fannin	2	$881,044.10	6	$807,341	$635,112	$2,323,497
Fayette	2	$28,255,159.04	0	$0	$1,417,872	$29,673,032
Floyd	4	$35,981,228.64	4	$521,086	$1,449,734	$37,952,049
Forsyth	10	$25,002,852.36	2	$331,592	$2,227,346	$27,561,790
Franklin	3	$7,171,530.93	4	$1,636,856	$597,313	$9,405,700
Fulton	28	$38,028,571.42	37	$12,122,295	$7,143,998	$57,294,865
Gilmer	2	$728,157.66	1	$396,500	$681,184	$1,805,841
Glascock	0	$0	1	$184,100	$199,886	$383,986
Glynn	2	$4,813,534.80	2	$254,936	$1,023,703	$6,092,174
Gordon	2	$728,157.66	3	$318,262	$947,856	$1,994,275
Grady	1	$3,847,341.48	0	$0	$811,774	$4,659,116
Greene	3	$4,627,943.26	6	$1,014,559	$555,428	$6,197,930
Gwinnett	12	$42,409,221.10	11	$3,642,744	$7,787,687	$53,839,652
Habersham	3	$3,444,192.04	1	$674,323	$827,281	$4,945,796
Hall	17	$92,182,940.20	24	$8,435,814	$2,294,012	$102,912,766
Hancock	1	$613,669.00	1	$199,625	$538,206	$1,351,500
Haralson	5	$4,836,052.52	5	$764,168	$727,511	$6,327,731
Harris	2	$4,976,900.61	3	$1,147,686	$774,777	$6,899,363
Hart	1	$1,167,556.97	0	$0	$749,486	$1,917,043
Heard	0	$0	0	$0	$431,509	$431,509
Henry	2	$11,679,445.66	3	$943,685	$2,587,821	$15,210,952
Houston	5	$1,758,769.49	1	$819,350	$1,296,169	$3,874,289
Irwin	8	$3,978,768.49	0	$0	$601,279	$4,580,048
Jackson	4	$7,040,372.75	5	$1,517,376	$1,105,619	$9,663,368
Jasper	1	$343,744.00	6	$2,311,555	$547,566	$3,202,865
Jeff Davis	0	$0	0	$0	$633,048	$633,048
Jefferson	2	$1,110,799.53	0	$0	$704,635	$1,815,435
Jenkins	0	$0	2	$669,371	$475,698	$1,145,069
Johnson	5	$2,749,898.48	2	$425,918	$484,520	$3,660,337
Jones	2	$9,101,524.25	0	$0	$627,776	$9,729,300
Lamar	3	$1,706,126.66	2	$269,501	$462,707	$2,438,335
Lanier	5	$3,120,465.08	1	$95,758	$292,939	$3,509,163
Laurens	21	$3,010,402.64	6	$1,797,211	$1,585,363	$6,392,977
Lee	4	$6,297,175.41	1	$57,394	$581,832	$6,936,401

County	Major Construction and Capital Maintenance Projects		Routine Maintenance Projects		Local Grants** (LMIG)	Total Expenditures
	Number	Expenditures	Number	Expenditures		
Liberty	4	$8,749,098.58	0	$0	$751,830	$9,500,929
Lincoln	0	$0	1	$503,200	$330,176	$833,376
Long	1	$1,772,640.94	1	$204,731	$380,365	$2,357,737
Lowndes	8	$68,434,762.24	9	$3,545,220	$1,681,600	$73,661,582
Lumpkin	1	$324,712.32	0	$0	$576,595	$901,307
Macon	5	$4,964,952.44	1	$256,650	$537,356	$5,758,959
Madison	1	$1,408,989.49	1	$193,655	$750,309	$2,352,953
Marion	3	$5,293,214.62	1	$134,280	$398,260	$5,825,755
McDuffie	7	$8,308,292.55	2	$88,554	$516,256	$8,913,102
McIntosh	2	$2,374,942.33	0	$0	$344,368	$2,719,310
Meriwether	4	$3,670,000.65	0	$0	$755,570	$4,425,570
Miller	4	$3,195,767.86	1	$3,446	$407,880	$3,607,094
Mitchell	7	$19,785,214.67	4	$824,330	$840,440	$21,449,985
Monroe	5	$3,092,941.84	2	$516,448	$638,818	$4,248,208
Montgomery	0	$0	0	$0	$538,172	$538,172
Morgan	3	$4,627,943.26	3	$487,815	$591,079	$5,706,837
Murray	2	$728,157.66	1	$72,870	$686,384	$1,487,411
Muscogee	3	$6,021,260.06	0	$0	$1,951,969	$7,973,229
Newton	12	$40,744,268.03	6	$1,011,346	$1,462,963	$43,218,577
Oconee	1	$981,845.49	0	$0	$628,473	$1,610,318
Oglethorpe	0	$0	3	$367,924	$564,972	$932,896
Paulding	5	$503,078.23	2	$281,674	$1,812,824	$2,597,576
Peach	4	$5,591,834.57	1	$130,305	$886,927	$6,609,066
Pickens	5	$1,709,051.47	4	$1,126,545	$601,623	$3,437,219
Pierce	2	$3,660,531.13	0	$0	$862,238	$4,522,769
Pike	2	$1,405,164.51	1	$27,497	$464,873	$1,897,535
Polk	0	$0	4	$393,456	$848,250	$1,241,706
Pulaski	3	$3,498,712.93	2	$575,774	$351,359	$4,425,846
Putnam	1	$391,758.00	4	$1,381,166	$579,284	$2,352,208
Quitman	0	$0	1	$390,000	$153,233	$543,233
Rabun	1	$1,218,984.15	0	$0	$522,209	$1,741,193
Randolph	1	$2,106,613.09	2	$1,270,200	$451,945	$3,828,758
Richmond	4	$3,831,317.59	2	$388,860	$2,107,831	$6,328,009
Rockdale	4	$7,148,988.43	2	$924,765	$1,020,631	$9,094,385
Schley	1	$1,446,139.97	0	$0	$215,631	$1,661,771
Screven	0	$0	1	$236,258	$720,121	$956,379
Seminole	0	$0	0	$0	$404,155	$404,155
Spalding	1	$155,088.20	1	$26,166	$981,403	$1,162,657
Stephens	2	$1,355,423.06	0	$0	$578,039	$1,933,462
Stewart	1	$1,575,024.89	0	$0	$343,968	$1,918,993
Sumter	4	$29,521,792.01	0	$0	$787,582	$30,309,374
Talbot	2	$4,069,682.45	0	$0	$405,701	$4,475,384
Taliaferro	1	$522,404.69	4	$1,244,793	$177,589	$1,944,787
Tattnall	3	$86,778.83	1	$39,565	$946,737	$1,073,081
Taylor	4	$3,003,052.02	2	$477,070	$461,635	$3,941,757
Telfair	1	$739,803.29	0	$0	$543,765	$1,283,569
Terrell	3	$6,605,708.34	0	$0	$453,172	$7,058,881

County	Major Construction and Capital Maintenance Projects		Routine Maintenance Projects		Local Grants** (LMIG)	Total Expenditures
	Number	Expenditures	Number	Expenditures		
Thomas	5	$19,931,373.27	0	$0	$1,029,019	$20,960,392
Tift	3	$3,000,123.06	5	$1,947,663	$893,605	$5,841,391
Toombs	0	$0	0	$0	$716,328	$716,328
Towns	2	$4,217,079.35	0	$0	$291,380	$4,508,459
Treutlen	2	$391,667.65	3	$706,572	$332,889	$1,431,129
Troup	5	$4,878,102.92	5	$1,870,354	$1,101,619	$7,850,076
Turner	1	$1,857,436.01	3	$512,215	$468,021	$2,837,672
Twiggs	0	$0	3	$1,088,193	$370,312	$1,458,505
Union	0	$0	1	$78,392	$671,839	$750,231
Upson	0	$0	1	$35,665	$653,800	$689,465
Walker	5	$2,843,835.33	3	$1,028,973	$1,174,882	$5,047,691
Walton	1	$522,404.69	0	$0	$1,263,088	$1,785,493
Ware	2	$588,275.58	1	$219,020	$960,783	$1,768,079
Warren	2	$1,830,206.81	6	$1,362,540	$346,296	$3,539,042
Washington	4	$3,413,183.95	0	$0	$896,814	$4,309,998
Wayne	1	$365,839.17	2	$545,549	$1,023,206	$1,934,594
Webster	1	$1,210,992.01	0	$0	$216,116	$1,427,108
Wheeler	4	$2,470,444.26	0	$0	$420,144	$2,890,588
White	1	$450,680.00	0	$0	$449,354	$900,034
Whitfield	2	$2,464,247.87	3	$1,219,785	$1,426,899	$5,110,932
Wilcox	3	$2,644,348.67	1	$205,000	$541,169	$3,390,517
Wilkes	1	$1,473,955.67	3	$587,100	$517,571	$2,578,627
Wilkinson	0	$0	2	$309,562	$443,699	$753,261
Worth	6	$6,104,163.46	2	$60,840	$941,800	$7,106,803

Source: GDOT

Totals may not sum due to rounding.

*In the GDOT data, $8,012,762 for 7 construction projects were assigned to all counties. These projects are not included in this table.

**The amount for each county includes amounts sent to municipal governments in the county. For municipal governments that span more than one county, the amount was divided evenly among those counties.

Appendix D

TREDIS Overview[6]

General Information About TREDIS

The Transportation Economic Development Impact System (TREDIS) provides economic impact analysis and benefit-cost analysis for transportation projects and programs, covering all modes: road, rail, aviation, marine, and bicycles. TREDIS generates information needed for project and program decision-making and for communication with government leaders, legislators, funding agencies, and the public.

TREDIS is a predictive impact model that uses information about future travel patterns, market access, and construction spending to estimate the costs, benefits, and economic impacts that flow from them. As such, results are based on *comparisons* between two alternative futures. These comparisons are built around a specific future snapshot year or "analysis year" that is used to project differences in benefits, costs, and economic activity in that year. In most cases, the comparison will be between two policy options such as "build a new facility" or "do not build the new facility." This approach means that TREDIS results are shown as differences in benefits, costs, and economic activity between the "build" and "no-build" scenarios in a given year (relative to the analysis year).

TREDIS uses an extensive database of information on the current characteristics of study area(s) and modes. This database is described below. For US applications, economic patterns are typically supplied by IMPLAN. Production is measured by four variables:

- *Output* – These are final sales, or total revenues, by industry. Depending on the industry, sales can be to any combination of other businesses, households, or the federal/state/local government.
- *Value Added* – This metric describes the value of goods sold by an industry over and above the value of goods purchased by it. It is generally used as a broad measure of value creation by an industry, including wage income, employee benefits, profits, and tax payments. Summed across all industries, total regional value added is precisely the gross regional product.
- *Income* – This is total compensation (including benefits) to all employees of an industry, including business owners (proprietors).
- *Employment* – This is the total head count of workers in an industry, including self-employed workers, railroad workers, and agricultural workers. Because employment is measured as employee head count, it is important to note that a single individual with two part-time jobs is counted twice, regardless of which industries those jobs are in. Therefore, the job count is typically higher than full-time-equivalent employment.

Beyond these industry metrics, IMPLAN data are used in a number of other places in TREDIS. These default data include the following:

- *Economic Multipliers* – These are region-specific factors that translate a direct economic change into total economic impacts, including indirect (inter-industry supply-chain) effects and induced (wage spending) effects. In IMPLAN, multiplier impacts are applied with source and target

[6] For a complete list of the sources and references cited in this appendix, please see the TREDIS web site at http://tredis.com/

industry detail, meaning that it is possible to determine the effect of direct spending in one sector (e.g. construction) on another (e.g. retail).

- *Industry Make/Use Tables* – These are region-specific factors that indicate which commodities a single industry uses to produce its final goods, as well as which commodities are made by the industry. As such, they translate industry activity to commodity activity, which is used in TREDIS' Freight Module as well as in determining which industries are impacted by projects affecting freight modes.
- *Tax Receipts* – For Tax Module subscribers, IMPLAN is used to determine how changes in economic activity lead to changes in federal and state/local tax revenues. These are based on the current pattern of transfer payments in IMPLAN's social accounting structure.

The TREDIS forecasting module is typically supplied with Moody's Economy Dot Com (MEDC) projections, which include employment and value added forecasts for each TREDIS industry. For simplicity, economic projections are shown in TREDIS as indexes from the base year for each region.

Moody's state and county forecasts are ultimately based on its US national economic model. This national forecast is combined with state, metro, and county data to allocate growth forecasts down to subnational regions. The benefit to this approach is geographic consistency: employment and value added always aggregates up (from counties to states and from states to national) without double-counting.

Allocations of employment and value added to states and counties are made based on the same government data sources used by IMPLAN to develop current economic characteristics. These sources include the Bureau of Labor Statistics (BLS), the Current Employment Survey (CES), the Quarterly Census of Employment and Wages (QCEW), and the Bureau of Economic Analysis (BEA).

Description of Assumptions for Selected TREDIS Variables

A. **Crew wages** are drawn from the BLS National Compensation Survey (issued May 2011) for applicable transport occupations, with 43.7 percent added for fringe benefits (national average in those occupations). Values for truck drivers, bus drivers, and train engineers are based on published BLS values for those occupations, plus fringe benefits. These values have been adjusted to reflect 2011 dollars using the Consumer Price Index (CPI). Values for aviation are based on weighted averages of $36.99/hr. for flight attendants and $94.74/hr. for pilots, plus fringe benefits. Values for marine (ferry or freighter) are based on weighted averages of $12.71 for sailors and $30.68 for ship engineers, plus fringe benefits. Source: http://www.bls.gov/ncs/ncswage2010.pdf

B. **Default crew size** for car, bus, and rail modes are drawn from typical values for New York City, San Francisco, and Chicago, as reported in Chester, Mikhail, Institute of Transportation Studies, UC Berkeley, 2008. Vehicle occupancy rates are estimated at 1.025 for single-unit trucks, and 1.12 for combination trucks, based on guidance from FHWA's Highway Economic Requirement System (HERS) – State Version (see FHWA, Highway Economic Requirements System-State Version, Technical Report, Federal Highway Administration, Washington, DC, 2005.). The default crew size for all trucks is a weighted average based on an estimated mix of truck vehicles. Default crew sizes for aircraft are drawn from "Economic Values

for FAA Investment and Regulatory Decisions, A Guide," US Federal Aviation Administration, Washington, DC, 2007 (produced by GRA Incorporated with Aviation Specialists Group, Inc. and Data Base Products). The default crew size for all aircraft is a weighted average based on an estimated mix of aircraft types.

C. **Values of time** are generally consistent with methods for valuing *user travel time benefits* as followed by the Highway Economic Requirements System (HERS) and BCA.Net software, as well as the Center for Urban Transportation Research (CUTR) and the US Department of Transportation (USDOT). However, values have also been updated to reflect 2011 wage rates (average of all occupations, not just transport occupations), based on BLS wage data. Also, additional long-term business costs (beyond the user value of travel time) have been added in the form of fringe benefit costs for "on-the-clock travel" and wage premiums paid by employers for commuting in higher-cost congested areas. As a result, car/light truck "on-the-clock" travel time is calculated as a business cost valued at 100 percent of the national average wage rate plus 30 percent fringe benefits. Both commuting and personal travel time are treated as a non-money user benefit with a value set at 50% of the wage rate (no fringe added). For economic impact analysis only, there is an additional allowance for the effect of higher commuting cost on employer cost in the form of a wage rate premium valued at another 50 percent of the wage rate per hour without fringe (per research by Zax et al.). For public transit, the wider range reflects possible variation in riding conditions, as noted by CUTR: "*Transit travel time should be valued at 25–35 percent of prevailing wage under comfortable conditions (when sitting), but can be significantly higher for crowded transit vehicles (100% of wage rate) or for waiting under unpleasant conditions (up to175% of wage rate)*." For out-of-vehicle transit time, TREDIS uses 100 percent of the wage rate but allows for a wider range of values. In the TREDIS v4.0 release, these values have been updated according to wage growth. Specifically, a growth rate was applied that corresponds to the growth in all full-time worker hourly wages from 2007 to 2011, as reported by the National Compensation Survey.

D. **The costs of travel time variability** (non-recurring delay) is calculated using the concept of "buffer time," which is defined as the additional schedule time needed to ensure an on-time arrival 95 percent of the time (19 out of every 20 trips) versus the average travel time. For example, if a weekday commute normally (i.e., on average) takes 30 minutes to complete but unplanned congestion causes 5 percent of trips (about one per month) to take 45 minutes, then the commuter must schedule 45 minutes for the trip on the average day to ensure an on-time arrival (even though it is likely to only take 30 minutes). This trip therefore requires 15 minutes of "buffer time." For passenger travel, buffer time has been shown to be valued similarly to travel time unless a schedule constraint exists (see CUTR). For freight trucks, the value of buffer time can vary widely for carrier types and commodity, but is generally higher than passenger travel (relative to travel time). USDOT reports that the value of reliability can vary from 20 percent to 250 percent of the "standard" delay. As with the Value of Time factors, values have been updated according to wage growth.

E. **Typical passenger loadings** for car, bus, and rail modes are drawn from typical values for New York City, San Francisco, and Chicago, as reported in Chester, Mikhail, Institute of Transportation Studies, UC Berkeley, 2008. Passengers (excluding crew) on all trucks are estimated to be zero. Passenger capacity and load rates for cargo, regional jet, commercial airliner, and jumbo jet aircraft are drawn from the Bureau of Transportation Statistics' TranStats "Air Carrier Statistics (Form 41 Traffic)- All Carriers" database for aviation, and data from the Seat Guru website was used to determine passenger seating

(see http://www.seatguru.com/) . Specific aircraft types were selected to represent each aircraft category, and 2011 data were used. Air taxi and general aviation passengers are estimated using "Economic Values for Federal Aviation Administration (FAA) Investment and Regulatory Decisions, A Guide," US Federal Aviation Administration, Washington, DC, 2007 (produced by GRA Incorporated with Aviation Specialists Group, Inc. and Data Base Products). The default passenger count for all aircraft is a weighted average based on an estimated mix of aircraft types.

F. **Freight logistics cost** is estimated on the basis of values assigned for recurring travel time delay from the Highway Economic Analysis Tool (HEAT) documentation, based on literature review and additional research by Cambridge Systematics and the Economic Development Research Group (EDR Group). These logistics cost values, added to crew cost and vehicle operating cost, yield total freight costs per hour in line with Texas A&M Transportation Institute (TTI) congestion studies.

G. **Typical cargo loadings** for truck types are drawn from mean payload weights for different truck configurations as collected by the Vehicle Inventory and Use System (2002). The value for single-unit trucks is based on mean payload weights for straight truck and straight truck plus trailer groups, while the value of combination trucks is based on mean payload weights for truck and trailer combination groups (see load.htm). Data for rail are from the Association of American Railroads; data for water transport are based on 1,000 twenty-foot equivalent units (TEUs) per ship at 14 tons per TEU from InfoMare and the Port Authority of New York and New Jersey; data for air transport are from Bureau of Transportation Statistics. Capacity and load factor data for air cargo aircraft were drawn from "Economic Values for FAA Investment and Regulatory Decisions, A Guide," US Federal Aviation Administration, Washington, DC, 2007 (produced by GRA Incorporated with Aviation Specialists Group, Inc. and Data Base Products) (see note C for link). Air cargo aircraft were assumed to be two-engine wide-bodied aircraft.

H. **Vehicle operating cost per mile: for free flow conditions** for cars is an average of small, medium, and large cars and sport utility vehicles (SUVs) as defined by the American Automobile Association. Vehicle operating costs per mile for trucks were calculated by multiplying estimated gallons per mile according to the Federal Highway Administration's Highway Statistics Series 2010 Data by applicable gasoline or diesel prices, and then adding in American Trucking Research Institute (ATRI) 2011 data on costs per mile for truck/trailer lease or purchase payments, repair and maintenance, truck insurance premiums, permits and licenses, tires, and tolls. ATRI supplementary data were held constant for all truck types. Diesel prices were drawn from 2011 figures from the US Energy Information Administration "Weekly Retail Gasoline and Diesel Prices." The default value for all trucks is a weighted average based on an estimated mix of truck types.

I. **Vehicle operating cost per mile: for congested road conditions** is based on auto fuel consumption estimates from the US Environmental Protection Agency (EPA) and truck fuel consumption estimates from Berwick and Farooq (2003), using an assumption of stop-and-go travel conditions (as defined by EPA) and with a long-term (30-year) fuel cost of $4.00 per gallon.

J. **Per hour operating cost** is to be used for modes where vehicle operating cost is most easily measurable on a time-basis (air and marine). The operating cost/hour for water freight cost/mile ranges from $242/hour for 11,000 ton vessel to $491/hour for 265,000 ton vessel; the default represents a 90,000 ton vessel. Per hour operating costs for air freight, regional jets, commercial airliners, and jumbo jets are based on estimated fuel costs per hour plus a fixed amount for maintenance, aircraft ownership, and other costs based on 2011 data from Airlines for America. Per hour operating costs for general aviation and air taxi aircraft are based on estimated fuel costs per hour plus a fixed per-hour cost estimate developed using data from "Economic Values for FAA Investment and Regulatory Decisions, A Guide," US Federal Aviation Administration, Washington, DC, 2007 (produced by GRA Incorporated with Aviation Specialists Group, Inc. and Data Base Products) except for general aviation aircraft. The default per hour operating cost for all aircraft is a weighted average based on an estimated mix of types.

K. Estimates of **typical passenger vehicle gallons per mile** are based on EPA data (see http://www.epa.gov/oms/climate/documents/420f11041.pdf).Vehicle gallons consumed per mile (free flow): Data for trucks are drawn from Table MV-1 from the 2010 FHWA Highway Statistics Series (http://www.fhwa.dot.gov/policyinformation/statistics/2010/vm1.cfm).

L. Data for **vehicle gallons consumed per hour (free flow)** for cargo, regional jet, commercial airliner, and jumbo jet aircraft were drawn from the Bureau of Transportation Statistics' TranStats "Air Carrier Financial Reports (Form 41 Financial Data)" database for aviation. Specific aircraft types were selected to represent each aircraft category and 2011 data were used. Data for general aviation and air taxi aircraft were drawn from the FAA's General Aviation and Part 135 Activity Surveys for Calendar Year 2010. A specific aircraft group was selected to represent air taxi aircraft.

M. **Accident costs** are derived from the following sources: total fatality cost including both money costs and social value of lost life (lifetime earnings) is from "Treatment of the Economic Value of a Statistical Life in Departmental Analysis – 2011 Interim Adjustment," USDOT, Memorandum to Modal Administrators, July 29, 2011.
(http://www.dot.gov/sites/dot.dev/files/docs/Value_of_Life_July_29_2011.pdf)

N. **Values for injury and property damage** are drawn from Blincoe, L. et al. (2002). *The Economic Cost of Motor Vehicle Crashes, 2000* (Table 2) were updated from 2000 dollars to 2008 dollars by the CPI change (25%). The difference between total fatality valuation and fatality cost is attributed to social valuation of lost life. Values have been converted to current dollars using CPI estimates for all urban consumer average prices.

O. **Accident rates for car, truck, and air modes** are from the Bureau of Transportation Statistics. For conversion purposes, general aviation and air taxi aircraft are assumed to travel at an average speed of 150 miles per hour.

P. **Environmental costs** per VMT can include a wide variety of air pollution, water pollution, noise pollution, and land quality/use impacts. However, the default values shown here include only costs associated with air pollutants defined by the Clean Air Act (NOx - nitrogen oxides, SO_2 - sulfur dioxide, PM - particulate matter and VOC - volatile organic compounds) plus greenhouse gases.

Q. **For the Clean Air Act pollutants**, the total cost per VMT is estimated to be 1.1c for cars and 3.9c for large trucks (source: FHWA: *1997 Federal Highway Cost Allocation Study Final Report Addendum*, Federal Highway Administration, USDOT, 2000, Table 12). For greenhouse gases, the total cost per VMT is estimated to be 1.7c for cars and 2.4c for trucks based on Littman (Todd Littman: "Climate Change Emission Valuation for Transportation Economic Analysis," Victoria Transport Policy Institute (VTPI), 2009 and drawn from *Transportation Energy Data Book*, Oak Ridge National Laboratory, 2008). Also shown in Table 5.10.7-2 of Littman: Transportation Cost and Benefit Analysis II – Air Pollution Costs, Victoria Transport Policy Institute, updated 2009. Note that some studies have derived values based on changing market values for emission credits; these sources have been used to derive estimates as high as 5c per VMT for cars and 26c/VMT for trucks.

R. **Mix of truck vehicles** is defined using the following vehicle categories as described in the 2010 edition of FHWA's Highway Statistics Series.
(See http://www.fhwa.dot.gov/policyinformation/statistics/2010/vm1.cfm).

S. **Mix of aircraft vehicles** is determined using the ratio of air carrier aircraft to general aviation aircraft based on BTS's National Transportation Statistics for 2010. An estimate for air taxi aircraft as a portion of total general aviation aircraft was developed using data on general aviation aircraft reporting air taxi activity in "Economic Values for FAA Investment and Regulatory Decisions, A Guide," US Federal Aviation Administration, Washington, DC, 2007 (produced by GRA Incorporated with Aviation Specialists Group, Inc. and Data Base Products). The mix of the portions of air carrier aircraft made up by commercial airliners, regional jets, jumbo jets, and air cargo aircraft was developed using categories and aircraft count data from "Economic Values for FAA Investment and Regulatory Decisions, A Guide," US Federal Aviation Administration, Washington, DC, 2007 (produced by GRA Incorporated with Aviation Specialists Group, Inc. and Data Base Products).