



LET'S MOVE 
NASHVILLE
Metro's Transportation Solution

Economic Impacts Memorandum

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Introduction

Investment in transit infrastructure can impact economic activity and support or create jobs in an economy. Transit infrastructure capital investments support short-term construction jobs during the development and construction of an infrastructure project, providing a short-term stimulus to a local economy. While important, this short-term impact is only one of many ways that transit spending can impact the local economy.

In addition to short-term impacts, sustained economic growth from operations and maintenance (O&M) spending and productivity impacts are also major contributors to transit-related jobs and growth. Productivity impacts occur as a result of reductions in costs to businesses and households associated with improved access to transit. Transit systems can improve the productivity of businesses by increasing access to and the reliability of labor markets and skills. Transit systems can improve the productivity of a household by reducing transit costs, saving time, and improving access to jobs and other necessities.

While the economic impacts of these types of benefits are not discussed in this report, other memos quantify the value of some of these types of transit benefits, including travel time savings, reduced travel costs, and mobility benefits to businesses and households. This report evaluates the short-term economic impact to Davidson County of the capital investment of the new transit infrastructure.

Background

Metro is currently in the planning and development stages for several proposed multimodal transit and transportation infrastructure improvements, as first proposed in the *25-year nMotion Strategic Transit Plan* (September 2016) and the *nMotion High Capacity Briefing Book* (August 2017) and now more fully articulated by *Let's Move Nashville's* proposed *Nashville Transit Improvement Program* (TIP). The TIP includes a combination of Light Rail Transit (LRT) and Rapid Bus infrastructure, as well as local bus improvements to provide a robust, countywide, multimodal transportation network for residents, businesses and visitors. While funding and planning for these two transit improvements will occur in tandem, this report will treat them as two separate components: (1) Rail improvements including the 5 LRT corridors, the downtown tunnel and the Music City Star (MCS) commuter rail improvements along with (2) the *Bus Program* project, which includes development of the 4 Rapid Bus corridors and the expansion and improvements to the Metropolitan Transit Authority's (MTA) existing local bus network.

General Methodology

This report evaluates the short-term impacts to the economy of Davidson County, Tennessee from the development and construction of the transit projects that make up the proposed system. Short-term economic impacts from infrastructure investments may include jobs, wages, output, value-added, and increased tax revenues. These metrics are more fully defined in the sections below. The main objective of an economic impact analysis is to determine the effect of a change in the demand for goods and services on the level of economic activity in a given area. For example, this demand change can be the result of decisions made by the government to invest in transit infrastructure, firms investing in new assets, or households increasing their spending due to lower transportation costs.

Background on IMPLAN® Model

IMPLAN®, an input-output based regional economic assessment modeling system developed and maintained by the IMPLAN® Group LLC, was used to measure the economic impacts associated with transit and other transportation investments in the City of Nashville and Davidson County. IMPLAN® consists of a software package and data files that are updated annually. The IMPLAN® data files include transaction information (intra-regional and import/export) on 536 distinct industrial sectors (corresponding to four- and five-digit North American Industry Classification System [NAICS] codes) and data on more than 20 different economic variables, including employment, output, and value added. For this study, the IMPLAN® system is populated with the most recent data available and used to estimate the direct, indirect, and induced impacts, explained below, associated with active transportation. The total economic impact is the sum of these direct, indirect and induced effects for the project being evaluated.

- **Direct (Direct Spending):** Direct economic impacts refer to the economic activity occurring as a result of direct spending by businesses or agencies located in the study area. An example of direct spending would be the project owner purchasing materials and services from suppliers for construction activities. For the construction spending, this direct spending includes the purchase of services and materials for the planning and construction of the TIP, including architecture and engineering services, construction management, hauling and paving services and materials, equipment rental services, utility services, cleaning and excavation services, landscaping services, etc. The jobs that are created or supported by the direct capital spending for these services will be employees and proprietors of businesses offering these services.

Likewise, direct spending to support O&M of the TIP will include labor and materials to support the increased demand for O&M. This includes, but is not limited to, drivers and operators of transit facilities, custodial workers, planners and other employees of the transit departments, security providers, ticketing providers and machine and system maintenance providers.

- **Indirect (Business to Business Spending):** Indirect economic impacts refer to the economic activity resulting from purchases by local suppliers to directly affected businesses or agencies (e.g., spending by suppliers on office rent, equipment, etc.). Indirect spending will occur in industries that support construction or O&M activities and will include industries such as retail services, vehicle maintenance and repair services, employment services, utilities, accounting and financial services, advertising and public relations services, and real estate and office rental.
- **Induced (Consumer to Business Spending):** Induced economic impacts represent the increase in economic activity, over and above the direct and indirect effects, associated with increased labor income that accrue to workers (of the contractor and all suppliers, in our example) and is spent on household goods and services purchased from businesses within the study area (e.g., employees of construction contractors and their suppliers spend money to buy groceries or take their families to dinner). Industries and jobs that are supported by this spending are those that provide services to consumers and include

restaurants, grocery stores, retail, real estate and residential rental agencies, healthcare providers, recreation, childcare services, utilities, gas stations and rideshare services.

Description of Economic Impact Output

Typically, economic impacts are measured in terms of industry output, “value added,” employment, and tax revenue, as is the case when using IMPLAN®. While output is the broadest measure of economic activity and refers to the total volume of sales, “value added” is the value a company adds to a product or service. It is measured as the difference between the amount a company spends to acquire that product and its value at the time that product is sold to other users. Thus, value added can be thought of as a measure of the contribution to the gross domestic product (GDP) made by an establishment or an industry. The total value added within a region is equivalent to the gross regional product and includes employee compensation, proprietary income, other property type income (e.g., rents) and indirect business taxes (e.g., sales tax).

With respect to employment, two impact metrics are calculated: (1) labor income and (2) jobs. Labor income includes employee compensation and proprietary income. Employee compensation, in turn, consists of wage and salary payments as well as benefits (health, retirement, etc.) and employer paid payroll taxes (employer side of social security, unemployment taxes, etc.). Proprietary income consists of payments received by self-employed individuals (such as doctors and lawyers) and unincorporated business owners. The job impact measures the number of jobs created for a full year. These impacts should not be interpreted as full-time equivalent (FTE) as they reflect the mix of full- and part-time jobs that is typical for each industry. Strictly speaking, they should not be interpreted as permanent jobs either, but rather as job-years. A job-year can be defined as one person employed for one year, whether part-time or full-time. All economic impacts described in this analysis are presented in 2017 dollars, and numbers may not sum throughout due to rounding.

Economic Impacts of Light Rail Transit Capital Expenditures

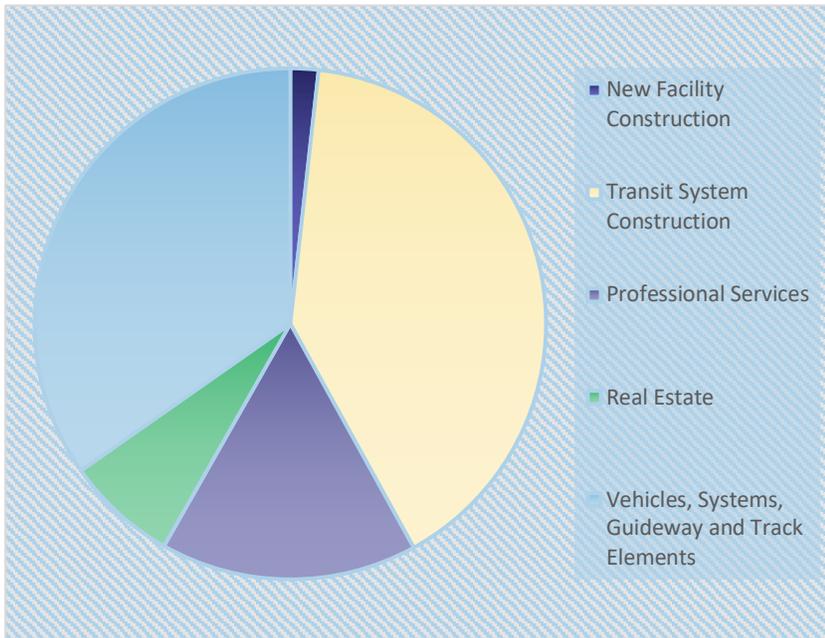
The total capital cost to develop the LRT Corridor Transit System, is estimated to be \$4.362 billion in 2017 dollars (**Table 1**). The total capital cost is broken down by LRT corridor and includes cost allocated into different categories, such as vehicle purchases, systems, guideway and track elements, stations, site work and construction of stops and terminals, construction of new support facilities, land acquisition and improvements, and professional services (**Figure 1**). Planning of the proposed LRT corridors is expected to begin in 2018 and continue through Project Development, Design and Construction through the middle of 2032. The first corridor is expected to begin service in 2026, and the final corridor is projected to begin service in late 2032.

Table 1. LRT Project Capital Costs 2018 to 2032 (2017 dollars in millions)

Corridor or Project	Mode	Total Capital Cost
Charlotte	Light Rail	\$697
Downtown Tunnel	Light Rail and Rapid Bus	\$936
Gallatin Pike	Light Rail	\$789
Murfreesboro	Light Rail	\$828
Music City Star	Commuter Rail	\$30
Nolensville	Light Rail	\$666
Northwest Corridor	Light Rail	\$252
O&M Facility - Primary	Light Rail	\$100
O&M Facility - Secondary	Light Rail	\$64
Total		\$4,362

Source: Transit Improvement Plan (2017), Project Costs (12/13/2017)

Figure 1. LRT Concept Estimate



Because the spending categories in **Figure 1** have different types of services and products, each category was modeled separately before being aggregated into an overall economic impact for Davidson County. IMPLAN's analysis-by-parts (ABP) methodology was used to prevent double-counting.

Source: Wilmot Inc. (2015), IMPLAN® online (2015)

Local companies and the local labor force will contribute significantly to supplying goods and services during the construction and operation of these new transportation facilities. However, it is presumed that the vehicles (buses and trains) will be manufactured elsewhere since the IMPLAN® model does not include bus or train car manufacturing capacity local to Nashville. In order to generate conservative estimates of impacts, some potentially local capital expenditures were excluded from the economic model. For example, while it is possible that local companies have the capability to supply other key technologies, including fare collection, signaling and communications technology, it is presumed that these more specialized technology-driven services will be largely sourced outside of the study area. To the extent that these excluded services are ultimately sourced from businesses within Davidson County, the estimates of economic impact presented in this study are understated.

Table 2. Economic Impact of LRT Project Capital Costs Estimate 2018 to 2032 (2017 dollars in millions)

Impact Type	Employment	Labor Income (\$)	Value Added (\$)	Output (\$)
Direct Effect	23,310	\$1,747	\$2,052	\$3,716
Indirect Effect	6,387	\$404	\$617	\$992
Induced Effect	7,832	\$476	\$746	\$1,194
Total Effect	37,530	\$2,627	\$3,415	\$5,902

Source: Wilmot Inc. (2015), IMPLAN® online (2015)

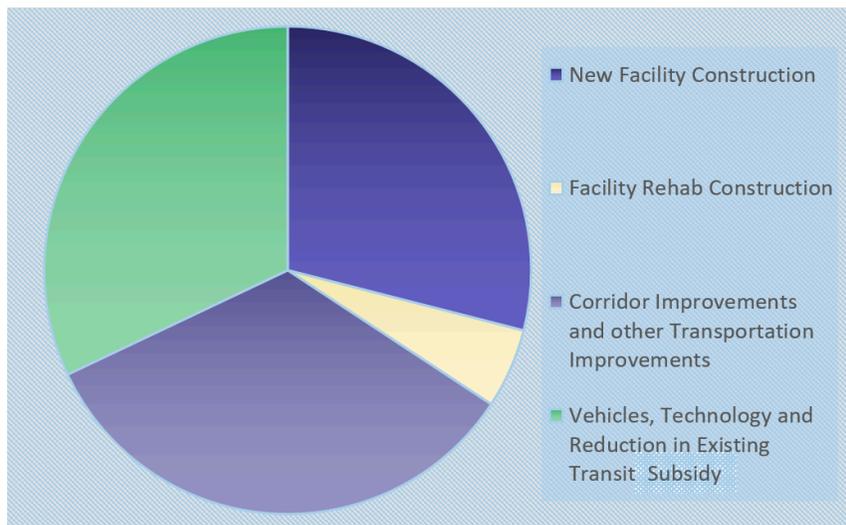
In total, the development and construction of the LRT projects will support approximately 37,530 full and part-time jobs in Davidson County. The Study Team estimates that approximately 23,310 jobs will be directly associated with project development while the remaining jobs will take the form of indirect (business-to-business transactions) and induced (household spending) impacts (**Table 2**).

The LRT projects will also support \$5.902 billion in sales of goods and services by county businesses during the development period, leading to a gross regional product of \$3.415 billion. Note that these impacts are expected to transpire over the course of the projects' development and construction phases, and should not be considered annual, but rather the total impacts over 14 years of construction and development for the LRT transit system.

Economic Impacts of Bus Program Capital Expenditures

The total capital cost for the development and construction portions of the the Bus Program is estimated to be nearly \$992 million (**Table 3**). The total capital costs are allocated into different improvement categories assigned by MTA, each of which includes construction of a number of new facilities: 12 neighborhood transit centers, 7 mini-transit hubs, a secondary transit hub, a new bus maintenance facility and additional passenger waiting shelters. This estimate also includes rehabbing of the existing facilities, improvements to existing roadways and corridors, and a reduction to the existing transit subsidy (**Figure 2**).¹ The anticipated system improvements and expansions of the local bus network will begin in 2018 and continue through 2023.

Figure 2. Bus Program Capital Cost Estimate 2018 - 2032



Source: Wilmot Inc. (2015), IMPLAN® online (2015)

¹ The Low Income Fare Subsidy will provide free or reduced fares to Nashvillians who are living in poverty, living with a disability, senior citizens or under the age of 18.

Table 3. Bus Program Project Costs: 2018 to 2032 (2017 dollars in millions)

Bus Program Cost Categories	Mode	Total Capital Cost
Make Service Easier To Use	Bus	\$29
Improve Existing System	Bus	\$288
Improve Access to Transit	Bus	\$9
Make Service More Comfortable	Bus	\$83
Develop a Network of Regional Transit Centers	Bus	\$145
Bordeaux	Rapid Bus	\$45
Dickerson	Rapid Bus	\$42
Hillsboro	Rapid Bus	\$42
West End	Rapid Bus	\$104
Shift of Existing MTA Coverage	Other	\$90
Other Transportation Improvements	Other	\$114
Total		\$992

Source: Transit Improvement Plan (2017), Summary of Capital and Operating Costs for 2018 to 2032 (12/13/2017)

Similar to the LRT analysis, each Bus Program spending category was modeled separately before being aggregated into overall economic impact for Davidson County. As with the LRT analysis, care was taken to avoid double counting.

As mentioned previously, not all goods and services required to make the transportation improvements envisioned for Metro are available in the region. The Study Team presumes that these costs, including the purchase of buses or other specialized technology, cannot be sourced within the study area and excluded them from the economic impact analysis. To the extent that these services are ultimately sourced from businesses within Davidson County, the estimates of economic impact presented in this study are not comprehensive and likely conservative.

Table 4. Economic Impact of Bus Program Capital Cost Estimate (2017 dollars in millions)

Impact Type	Employment	Labor Income (\$)	Value Added (\$)	Output (\$)
Direct Effect	4,554	\$313	\$338	\$668
Indirect Effect	1,161	\$81	\$120	\$195
Induced Effect	1,509	\$92	\$144	\$230
Total Effect	7,224	\$485	\$601	\$1,092

Source: Wilmot Inc. (2015), IMPLAN® online (2015)

In total, the Bus Program development and construction will support approximately 7,224 full and part-time jobs in Davidson County. It is estimated that approximately 4,554 jobs will be directly associated with the project while the remaining jobs will take the form of indirect (business-to-business transactions) and induced (household spending) impacts (**Table 4**).

The Bus Program development and construction will also support approximately \$1.092 billion in augmented sales of goods and services by county businesses during the project period leading to a gross regional product of \$601 million (**Table 4**). Note that these impacts are expected to transpire over the course of the project’s development and construction phases, and should not be considered annual, but rather the total impacts over 14 years of construction and development for the Bus Program.

Economic Impacts of the Nashville Transit Improvement Program Capital Costs 2018-2032

The total capital investment for the TIP is estimated to be over \$5.354 billion in 2017 dollars, spent over 14 years of the project’s development and construction. This total includes the \$992 million (**Table 3**) in the Bus Program and the \$4.362 billion (**Table 1**) for the LRT projects. Over the life of the program, the transit system development and expansion will support an estimated 44,753 local jobs, represented in job-years², associated with more than \$3.112 billion in labor income for Davidson County. This spending will contribute an estimated \$4.016 billion to the gross regional product (GRP) for Davidson County over the life of the project (**Table 5**).

Table 5. Economic Impact of Nashville Transit Improvement Program Capital Costs 2018 to 2032 (2017 dollars in millions)

Impact Type	Employment	Labor Income (\$)	Value Added (\$)	Output (\$)
Direct Effect	27,864	\$2,060	\$2,390	\$4,383
Indirect Effect	7,549	\$484	\$736	\$1,187
Induced Effect	9,341	\$568	\$890	\$1,424
Total Effect	44,753	\$3,112	\$4,016	\$6,994

Source: Wilmot Inc. (2015), IMPLAN® online (2015)

² Job years: one person employed for one year, whether part-time or full-time.

Economic Impact of All Operations and Maintenance 2018-2032

During the development and construction of the TIP, spending in O&M will begin as service begins. During this period, O&M costs estimated at \$724 million (**Table 6 and 7**) will include operations of expanded local bus network, development and operations of rapid bus corridors and the beginning of O&M of LRT when the corridors begin revenue service. Bus system operating costs are estimated to be \$576 million and LRT will account for the remaining \$148 million in O&M spending from 2018-2032.

Each of these cost categories were modeled to identify the increase in economic impact and job creation resulting from the increased spending to support expanded transit O&M. Each of the line items in **Table 6** and **Table 7** were included in this spending category, with the exception of the Subsidy for Low-Income Passengers, because this item does not result in direct spending in the transit industry. This spending category has benefits to low-income transit passengers, which is discussed in other memos.

Table 6. LRT Project Operations and Maintenance Costs: 2018 to 2032 (2017 dollars in millions)

Corridor or Project	Mode	Total Costs
Gallatin Pike	Light Rail	\$44
Murfreesboro	Light Rail	\$23
Charlotte	Light Rail	\$29
Nolensville*	Light Rail	\$0
Northwest Corridor	Light Rail	\$28
Downtown Tunnel	Light Rail and Rapid Bus	\$20
Music City Star	Commuter Rail	\$4
Total		\$148

Source: Transit Improvement Plan, Summary of Capital and Operating Costs to 2018 to 2032 (12/13/2017)

* Nolensville Pike LRT is scheduled to open in 2032 with its first full year of operating costs incurring in 2033.

Table 7. Bus Program Operations and Maintenance Costs: 2018 to 2032 (2017 dollars in millions)

Bus Program Cost Categories	Mode	Total Costs
Make Service Easier To Use	Bus	\$11
Improve Existing System	Bus	\$403
Improve Access to Transit	Bus	\$116
Make Service More Comfortable	Bus	\$1
Develop a Network of Regional Transit Centers	Bus	\$10
4 Rapid Bus Corridors*	Bus	\$0
Subsidy for Low-Income Passengers	Other	\$35
Total		\$576

Source: Transit Improvement Plan (2017), Summary of Capital and Operating Costs to 2018 to 2032 (12/13/2017)

During the development and construction period, O&M spending will support an estimated 9,273 local jobs, represented in job-years, associated with more than \$557 million in labor income for Davidson County (**Table 8**). This includes longer-term jobs associated directly with the O&M of the transit system, as well as indirect (business-to-business transactions) and induced (household spending) impacts.

Table 8. Economic Impacts of Operations and Maintenance Spending 2018-2032 (2017 dollars in millions)¹

Impact Type	Employment	Labor Income (\$)	Value Added (\$)	Output (\$)
Direct Effect	6,414	\$375	\$482	\$668
Indirect Effect	1,121	\$76	\$110	\$189
Induced Effect	1,738	\$105	\$165	\$265
Total Effect	9,273	\$557	\$757	\$1,121

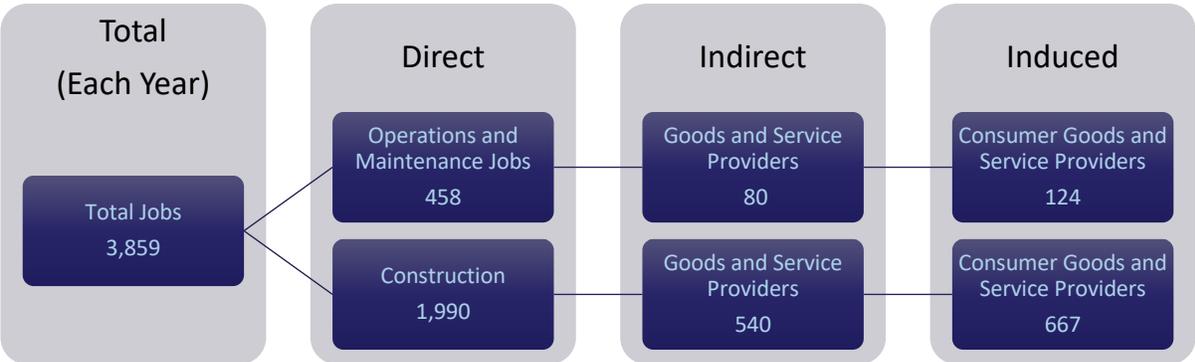
Source: Wilmot Inc. (2015), IMPLAN® online (2015)

* The operating and maintenance costs for Rapid Bus corridors are included in the costs for improvement of the existing system.

Annual Jobs Created from Transit Infrastructure Expenditures

Including both capital and O&M jobs, there will be an estimated 3,859 jobs created each year through the infrastructure expenditures of the TIP. This total includes direct, indirect and induced jobs for both the capital and O&M spending categories (**Figure 3**).

Figure 3. Breakdown of Annual Jobs Supported by Transit Infrastructure Expenditures each year.



Conclusion

This memo estimates the short-term economic impacts of transit investment in development and construction of the Nashville Transit Improvement Program, as well as the longer-term economic impacts estimated to result from sustained increases in O&M of the proposed TIP. It is estimated that the \$5.354 billion in capital spending for the TIP will result in a total of \$4.016 billion in value added to Davidson County’s economy. Additionally, it is estimated that the \$724 million spent on O&M for the TIP will result in a total of \$757 million in value added to the local economy. The TIP will support an estimated 54,026 local jobs, in job years, over the 14 years of the project’s development and construction (**Table 9**). While this memo estimates the economic impacts resulting from capital spending and O&M spending of the TIP through 2032, there are benefits related to the construction and development of the TIP that will occur in years beyond those considered in this analysis.

Table 9. Summary of Economic Impact: 2018-2032 (2017 dollars in millions)

Impact Type	Employment	Labor Income (\$)	Value Added (\$)	Output (\$)
Capital Cost	44,753	\$3,112	\$4,016	\$6,994
Operations and Maintenance Cost	9,273	\$557	\$757	\$1,121
Total Effect	54,026	\$3,669	\$4,773	\$8,115
Annual Total Effect*	3,859	\$262	\$341	\$580

Source: Wilmot Inc. (2015), IMPLAN® online (2015)

* The annual total effect describes total economic impact per year for 14 years.