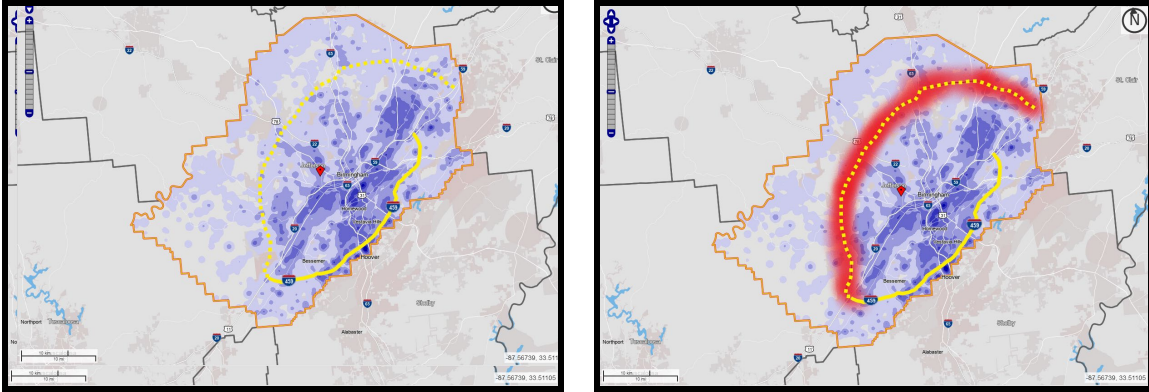# Potential Economic Development Impacts of the Birmingham Northern Beltline

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by

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Contents

Executive Summary

- This report presents the economic and fiscal impacts of several potential economic development scenarios associated with building the Birmingham Northern Beltline (BNB). It can be seen as a companion to another report titled "Updated Socioeconomic Indirect and Cumulative Impact Components of the Birmingham Northern Beltline" that has among its conclusions the point that the BNB presents a strong economic development opportunity for its corridor, Jefferson County, the Birmingham-Hoover metropolitan area, and the State of Alabama because the BNB could enable development in the northern Jefferson County area similar to what I-459 has done for the southern area, which in turn will benefit the balance of the county, metro area, and state. The potential comes from additional population and business growth that makes building the BNB prudent and worthwhile. However, estimating the range of the BNB's economic development potential is beyond the scope of the other report, hence this one. The objective is to account for uncertainty of what the future holds by showing a range of what the BNB can do for its corridor, county, metro area, and the state based on the effects that I-459 has had on its corridor.

- The BNB is a 52.5-mile interstate highway that will cost $2.902 billion (in 2019 dollars) to build over roughly 30 years. It is a part of Corridor X1 of the Appalachian Development Highway System. The BNB begins at I-20/59 on the southwest side of Jefferson County and loops from where I-459 joins I-20/59 to I-59 on the northeast side of the county, northeast of Birmingham and south of Argo. Corridor X1 continues the loop all the way to I-20.

- I-459 is the most appropriate reference for this study because it (i) is in the same unique county, metro area, and state economies and (ii) is similarly part of a loop around a node (the Birmingham area), unlike I-20 or I-22 which are strings that link nodes. Comparing socioeconomic conditions in 1970 to those in 2019 for the I-459 Corridor, a 6-mile-wide swath split equally on each side of the highway, reveals population and income growth rates that are used to exemplify the development that is likely when the BNB is built. We use the experience of I-459 over the 1970-2019 period to present economic and fiscal impacts of nine different scenarios for the BNB in year 2064 in both year 2019 and current (i.e., year 2064) dollars. 2064 provides a similar 50-year timeline for the BNB since its construction began in 2014.

- Socioeconomic data on the I-459 corridor show a 63 percent population increase (annual rate of 1.00 percent) and median family income rising from $9,819 in 1970 to $79,922 in 2019 (annual rate of 4.37 percent) together with poverty reduction from about 13.6 percent to 10.1 percent. Over the same period, Alabama had annual growth rates of 0.72 percent for population and 5.58 percent for per capita personal income (PCPI). Three annual growth rates each for population (0.72%, 1.00%, and 1.10%) and PCPI (4.37%, 5.58%, and 6.00%) are used to generate the nine scenarios presented.

- The most conservative scenario for 2064 that combines the two lowest annual growth rates of 0.72 percent for population and 4.37 percent for PCPI produces economic output impacts of $3.962 billion for the state, $3.620 billion for the metro area, and $2.988 billion for the county. The $2.902 billion cost of building the BNB is less than the year 2064 most conservative scenario output impacts, which means that the BNB construction cost is also less than the year 2064 economic output impact for all scenarios. The most optimistic scenario for 2064 combines the two highest annual growth rates of 1.10 percent for population and 6.00 percent for PCPI

produces economic output impacts of $13.228 billion for the state, $12.088 billion for the metro area, and $9.976 billion for the county.

- Building the BNB is clearly good for Alabama, the Birmingham-Hoover metro area, and Jefferson County. All the scenarios considered indicate that the BNB is worthwhile and will more than pay for itself. The fiscal impacts, in particular, show that local (at least county-level) contribution to the cost of building the highway is prudent as are state and federal contributions. Even the most conservative scenario makes a compelling case for building the BNB and also for Jefferson County (and perhaps the other counties and municipalities in the Birmingham-Hoover metropolitan area) to consider investing in its construction. The I-459 Corridor experience over the 1970 to 2019 period shows that BNB will have economic and fiscal benefits that spill over from the corridor to Jefferson County, the Birmingham-Hoover metro area, and the State of Alabama.

Potential Economic Development Impacts of the Birmingham Northern Beltline

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Introduction

This report presents the economic and fiscal impacts of several potential economic development scenarios associated with building the Birmingham Northern Beltline (BNB) in Jefferson County, Alabama. The case is made by comparing socioeconomic conditions in 1970 to those in 2019 for the I-459 Corridor to reveal actual population and income growth rates that are used to determine the development that is likely to occur when the BNB is built. For this report, a highway corridor is a 6-mile-wide swath split equally on each side of the highway. Population and income growth rates for the I-459 Corridor and Alabama together with expert opinion on realistic ranges of those growth rates are used to consider several scenarios of development that the BNB is expected to facilitate.

For each scenario, year 2064 economic and fiscal impacts of the BNB are determined and presented; work began on the BNB in 2014. Three growth rates each for population and per capita personal income (PCPI) are considered and the impacts presented in both year 2019 and current dollars (i.e., year 2064 dollars) assuming a similar inflation experience for the BNB to year 2064 as for I-459 from 1970 to 2019. Impacts in current dollars show what monetary values will actually be like in 2064. The objective is to account for uncertainty of what the future holds by showing a range of what the BNB can do for its corridor, county, metro area, and the state based on the effects that I-459 has had on its corridor. Increases in population and PCPI result in new personal income for the BNB Corridor. Impacts of spending the expected new personal income on the State of Alabama, the Birmingham-Hoover metro area, and Jefferson County are presented for each scenario. Reflecting the geography, the statewide economic impacts for Alabama include the metro area economic impacts which in turn include the county economic impacts. However, fiscal impacts are jurisdiction-based so that state taxes are separate from local (county and municipality) taxes. The impact methodology is detailed in the Appendix.

This report can be considered as a companion to another report titled "Updated Socioeconomic Indirect and Cumulative Impact Components of the Birmingham Northern Beltline" that has among its conclusions the point that the BNB presents a strong economic development opportunity for its corridor, Jefferson County, the Birmingham-Hoover metropolitan area, and the State of Alabama because the BNB could enable development in the northern Jefferson County area similar to what I-459 has done for the southern area, which in turn will benefit the balance of the county, metro area, and state. In that report the potential comes from additional population and business growth that makes building the BNB prudent and worthwhile. However, estimating the range of the BNB's economic development potential is beyond the scope of the other report, hence this one. Graphically, the BNB's economic development potential can be seen by looking at Figures 1 and 2 which show the Jefferson County labor shed with I-459 (solid yellow line) and the BNB (dashed yellow line), but with the BNB corridor highlighted only in Figure 2. A labor shed shows where workers work and live in an area and the related commuting activity to and from work, with more or denser activity shown as darker.

The two figures show that the northern part of the county where the BNB will be built has very light activity and is therefore less dense while the southern part where I-459 is has more activity and is denser. So, it is reasonable to infer that the BNB will greatly facilitate development for northern Jefferson County similar to what I-459 to the south has done. Actually, the BNB seems to have greater development potential because of its larger area of influence. The growth that I-459 has

Figure 1. Jefferson County Labor Shed with I-459 and BNB
Note: Density increases with blue shade; the darkest blue areas indicate the highest density areas.
Source: U.S. Census Bureau and Center for Business and Economic Research, The University of Alabama.
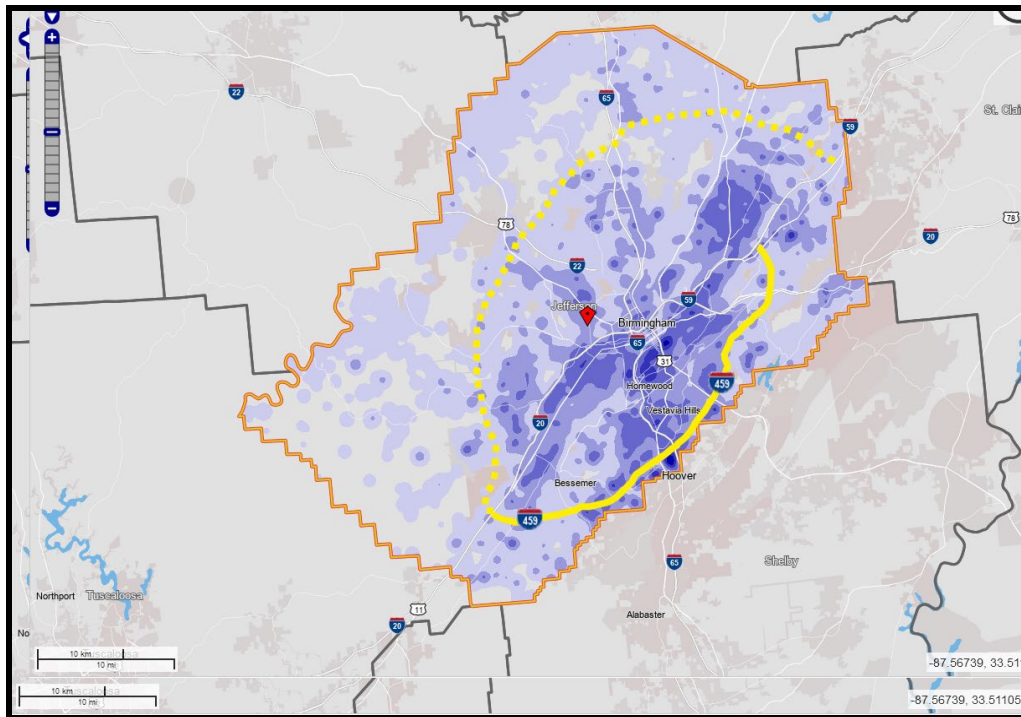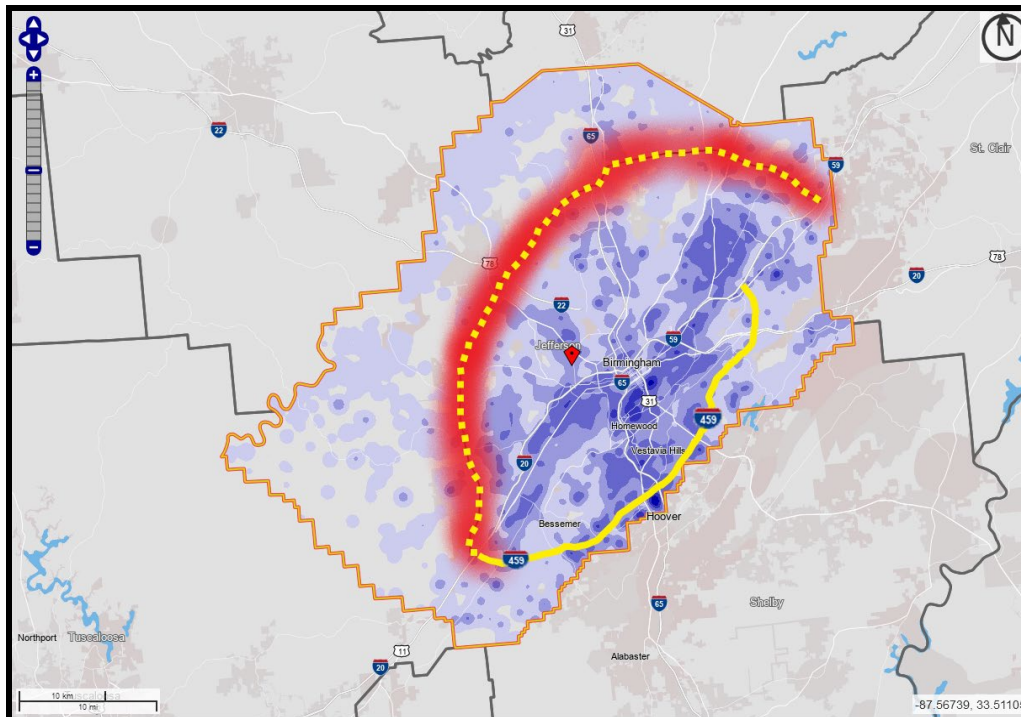

Figure 2. Jefferson County Labor Shed with I-459, BNB, and BNB Corridor
Note: Density increases with blue shade; the darkest blue areas indicate the highest density areas. Birmingham Northern Beltline
corridor shown in red around the highway.
Source: U.S. Census Bureau and Center for Business and Economic Research, The University of Alabama.

achieved for southern Jefferson County has not required development activity all along its length and development is continuing. Similarly, development will not be required along the entire length of the BNB for its economic development opportunities to be realized and development will continue beyond 2064. Smart development planning can facilitate and enable optimal balancing of considerations for (i) economic opportunities that increase prosperity and reduce poverty, (ii) health and safety, (iii) the natural environment, and (iv) transportation network improvements to travel safety, travel times, air quality, market access, congestion and traffic flow, which will benefit all users (freight, commercial, and passenger vehicles) directly and indirectly.

Table 1 compares selected socioeconomic data on the BNB and I-459 corridors for 2019 at the block group level. The BNB is longer; it begins at I-20/59 on the southwest side of Jefferson County and extends to I-59 on the northeast side of the county. I-459 lies to the south of the county and is about six-tenths the length of the BNB, but its corridor has more than triple the number of census block groups, population, and households in its corridor. The I-459 corridor also has nearly six times the number of block groups with 0.0 percent estimated unemployment and more than double the maximum median household income. This comparison shows that constructing the BNB presents strong economic development opportunities that have the potential of making the northern Jefferson County area grow like the southern area, which in turn will benefit the balance of the county, the metro area, and the state. Table 2 shows selected socioeconomic data for the I-459 corridor by census tract. Data limitations for 1970 did not permit similar analysis at the block group level that is shown in Table 1 and thus make the findings in this report conservative.

Table 1. Selected Socioeconomic Data on Northern Beltline and I-459 Corridors

	Northern Beltline Corridor	I-459 Corridor
Length (miles)	52.5	32.8
Number of block groups	102	376
Population	165,843	561,245
Households	61,112	220,735
Block groups with 0% unemployment	13.0	75.0
Percent of households with 0% unemployment	12.7	19.9
Percent of Households with <$15K income	10.0	10.8
Minimum median household income	$23,889	$11,588
Maximum median household income	$116,417	$239,196

Source: U.S. Census Bureau 2019 Estimates; and Center for Business and Economic Research, The University of Alabama.

Table 2 enables an existing conditions review of the I-459 corridor, which is a socioeconomic assessment of the area using selected economic and demographic variables. The specific variables are population, number of households, median family income, and percentage of households with income below selected thresholds.

Table 2. I-459 Corridor Selected Data, 1970 and 2019

Census Tract	Population			Households			Median Family Income				Percent of Households with Income			
	1970	ACS 2019 (5-Year Estimates)	Numeric Change	1970	ACS 2019 (5-Year Estimates)	Numeric Change	1970	1970 (inflation adjusted)[a]	ACS 2019 (5-Year Estimates)[b]	Numeric Change	1970-- below $15,000	1970-- below $2,000	1970-- below $3,000	ACS 2019 (5-Year Estimates) -- below $15,000
59.03	4,852	6,118	1,266	1,481	2,207	726	$11,693	$72,289	$55,714	-$16,575	75.9	6.0	8.9	14.7
100.01	4,535	4,940	405	1,435	1,889	454	$9,630	$59,535	$41,406	-$18,129	85.9	7.5	10.7	10.5
100.02	3,932	4,406	474	1,248	1,671	423	$9,656	$59,696	$57,043	-$2,653	85.7	7.2	10.3	10.5
102	5,772	2,813	-2,959	2,123	908	-1,215	$5,584	$34,522	--	--	96.7	34.1	42.6	17.1
104.01	4,563	3,842	-721	1,481	1,297	-184	$7,875	$48,685	$37,964	-$10,721	90.7	18.3	27.1	27.4
104.02	3,358	2,478	-880	1,090	778	-312	$7,911	$48,908	$52,269	$3,361	90.5	18.1	26.8	11.1
108.05	6,617	7,215	598	2,116	2,724	608	$14,754	$91,213	$154,063	$62,850	56.9	6.6	8.4	4.3
111.07	4,344	11,749	7,405	1,313	3,966	2,653	$8,705	$53,817	$94,929	$41,112	87.9	13.7	19.1	4.7
111.08	748	4,853	4,105	228	1,946	1,718	$8,583	$53,062	$95,962	$42,900	89.0	14.2	20.2	7.1
111.09	649	4,243	3,594	198	1,589	1,391	$8,583	$53,062	$110,551	$57,489	89.0	14.2	20.2	4.7
111.1	1,221	5,428	4,207	380	1,900	1,520	$8,336	$51,535	$97,417	$45,882	92.4	15.8	23.6	8.6
112.05	2,097	2,142	45	617	819	202	$10,286	$63,591	$71,442	$7,851	87.5	5.5	8.9	6.5
112.06	1,971	5,406	3,435	596	2,068	1,472	$7,729	$47,783	$77,284	$29,501	95.1	18.6	22.3	5.6
112.08	671	4,106	3,435	202	1,470	1,268	$8,794	$54,367	$76,208	$21,841	87.2	13.4	18.4	6.0
113.01	2,502	3,468	966	787	1,235	448	$7,091	$43,838	$66,477	$22,639	96.5	23.9	30.9	13.8
113.02	3,191	6,587	3,396	1,003	2,381	1,378	$7,091	$43,838	$81,500	$37,662	96.5	23.9	30.9	6.0
116	2,751	3,656	905	920	1,411	491	$7,616	$47,084	$80,861	$33,777	95.3	18.4	25.9	15.0
117.03	4,406	9,548	5,142	1,361	3,971	2,610	$9,698	$59,956	$81,505	$21,549	87.1	6.9	10.7	12.5
117.04	1,759	4,060	2,301	493	1,470	977	$8,474	$52,389	$81,453	$29,064	91.2	12.0	14.9	8.7
117.05	5,766	7,626	1,860	1,781	2,841	1,060	$9,696	$59,943	$77,098	$17,155	87.1	7.0	10.7	9.3
117.06	1,839	2,366	527	536	865	329	$8,067	$49,872	$56,850	$6,978	93.6	16.0	19.3	11.1
120.01	3,977	4,039	62	1,228	1,595	367	$8,880	$54,899	$68,576	$13,677	90.8	12.3	16.2	7.6
121.03	5,816	4,147	-1,669	1,775	1,561	-214	$8,470	$52,364	$62,121	$9,757	91.2	15.0	19.3	17.4
121.04	4,548	2,446	-2,102	1,365	901	-464	$8,441	$52,185	$62,500	$10,315	91.3	13.7	17.2	11.3

Table 2. I-459 Corridor Selected Data, 1970 and 2019 (continued)

Census Tract	Population			Households			Median Family Income				Percent of Households with Income			
	1970	ACS 2019 (5-Year Estimates)	Numeric Change	1970	ACS 2019 (5-Year Estimates)	Numeric Change	1970	1970 (inflation adjusted)[a]	ACS 2019 (5-Year Estimates)[b]	Numeric Change	1970-- below $15,000	1970-- below $2,000	1970-- below $3,000	ACS 2019 (5-Year Estimates) -- below $15,000
123.02	4,742	4,026	-716	1,446	1,418	-28	$8,653	$53,495	$67,760	$14,265	88.9	12.0	17.2	9.1
123.04	886	2,456	1,570	262	901	639	$9,285	$57,402	$80,840	$23,438	87.6	10.4	14.7	6.9
123.05	3,692	7,434	3,742	1,097	2,813	1,716	$9,272	$57,322	$82,891	$25,569	88.3	11.7	15.9	3.0
124.02	2,682	2,597	-85	858	1,144	286	$9,518	$58,843	$50,469	-$8,374	84.0	9.2	13.7	20.6
124.03	5,279	3,211	-2,068	1,672	1,152	-520	$10,139	$62,682	$58,289	-$4,393	81.6	6.6	10.7	10.6
125	8,973	3,908	-5,065	2,761	1,422	-1,339	$7,016	$43,375	$47,667	$4,292	94.3	20.2	29.4	19.5
126.02	3,039	2,894	-145	1,012	1,271	259	$8,488	$52,475	$52,543	$68	90.3	15.1	21.3	7.6
127.01	3,085	3,727	642	992	1,341	349	$8,145	$50,355	$69,808	$19,453	89.8	15.0	19.8	11.8
127.03	522	6,255	5,733	174	2,277	2,103	$9,233	$57,081	$191,972	$134,891	78.3	7.2	10.0	5.4
128.03	1,927	4,471	2,544	613	2,391	1,778	$13,857	$85,668	$93,810	$8,142	60.4	6.9	8.8	4.7
129.07	2,643	4,811	2,168	844	2,169	1,325	$14,639	$90,502	$82,650	-$7,852	56.9	4.3	7.0	3.4
129.08	1,292	5,516	4,224	413	2,022	1,609	$14,639	$90,502	$47,614	-$42,888	56.9	4.3	7.0	9.3
129.1	2,221	3,934	1,713	710	1,992	1,282	$14,970	$92,549	$124,129	$31,580	55.7	4.8	7.2	6.8
129.11	4,586	5,506	920	1,466	1,824	358	$14,970	$92,549	$177,917	$85,368	55.7	4.8	7.2	1.7
129.12	973	4,663	3,690	310	2,288	1,978	$14,639	$90,502	$49,712	-$40,790	56.9	4.3	7.0	10.4
138.01	7,208	2,096	-5,112	2,021	792	-1,229	$6,593	$40,760	$44,167	$3,407	96.3	22.2	33.6	26.3
139.01	2,506	1,525	-981	730	593	-137	$8,649	$53,470	$50,147	-$3,323	91.3	14.1	18.9	22.8
139.02	2,449	2,205	-244	738	799	61	$9,178	$56,741	$64,022	$7,281	88.3	10.2	13.8	10.8
140.01	3,355	3,681	326	1,012	1,436	424	$9,200	$56,877	$71,300	$14,423	89.9	14.6	18.7	8.8
140.02	2,910	3,681	771	878	1,195	317	$9,194	$56,840	$90,917	$34,077	89.9	14.7	18.7	4.7
141.04	3,162	3,237	75	831	1,318	487	$8,350	$51,622	$56,176	$4,554	85.4	14.7	15.8	14.8
141.05	828	4,769	3,941	227	1,837	1,610	$8,322	$51,449	$68,339	$16,890	87.0	14.4	17.1	8.0
142.03	3,339	13,851	10,512	1,043	5,450	4,407	$8,136	$50,299	$93,904	$43,605	93.6	12.4	17.8	5.0
142.04	2,219	9,888	7,669	685	3,662	2,977	$8,207	$50,738	$111,250	$60,512	91.8	13.9	20.7	2.0

Table 2. I-459 Corridor Selected Data, 1970 and 2019 (continued)

Census Tract	Population			Households			Median Family Income				Percent of Households with Income			
	1970	ACS 2019 (5-Year Estimates)	Numeric Change	1970	ACS 2019 (5-Year Estimates)	Numeric Change	1970	1970 (inflation adjusted)[a]	ACS 2019 (5-Year Estimates)[b]	Numeric Change	1970-- below $15,000	1970-- below $2,000	1970-- below $3,000	ACS 2019 (5-Year Estimates) -- below $15,000
143.01	1,613	2,510	897	468	1,200	732	$7,420	$45,872	$52,969	$7,097	95.2	18.8	25.1	18.8
144.08	914	3,289	2,375	266	1,592	1,326	$14,515	$89,736	$69,281	-$20,455	53.8	2.2	4.3	6.5
144.09	1,178	2,951	1,773	343	1,151	808	$14,515	$89,736	$105,694	$15,958	53.8	2.2	4.3	5.6
144.1	2,436	5,210	2,774	710	2,013	1,303	$14,514	$89,729	$132,659	$42,930	53.8	2.2	4.3	5.9
144.13	4,239	9,914	5,675	1,235	3,547	2,312	$14,515	$89,736	$146,862	$57,126	53.8	2.2	4.3	4.1
405.01	--	11,271	--	--	3,886	--	--	--	$83,216	--	--	--	--	8.0
507	--	8,634	--	--	3,065	--	--	--	$55,639	--	--	--	--	19.4
Total	166,781	271,803	105,022	51,577	103,424	51,847	--	--	--	--	--	--	--	--
Percent Change	--	--	63.0%	--	--	100.5%	--	--	--	--	--	--	--	--
Average	3,147	4,942	1,606	973	1,880	847	$9,819	$60,704	$79,922	$19,118	79.6	11.6	16.6	10.1

Note: 1970 Decennial Census data has been geographically standardized and weighted to fit year 2010 census tract boundaries. Inflation is adjusted to 2019 dollars.
Source: U.S. Census Bureau 2019 Estimates; and Center for Business and Economic Research, The University of Alabama.

Table 3 shows additional data on population, personal income, per capita personal income (PCPI) and median family income that were collected and analyzed together with the I-459 corridor data to generate average annual growth rates for determining year 2064 scenarios for the BNB corridor. The main sources of data for the review and scenarios are the U.S. Census Bureau and U.S. Bureau of Economic Analysis (BEA).

Table 3. Data for Determining Population and Income Growth Rates for Scenarios

	1970	2019	Average Annual Growth
U.S. Personal income (millions of dollars)	855,525	18,402,004	6.46%
U.S. Population (persons)	203,798,722	328,329,953	0.98%
U.S. Per capita personal income (dollars)	4,198	56,047	5.43%
U.S. Median family income (dollars)	10,061	68,703	4.00%
Alabama Personal income (millions of dollars)	10,628	215,930	6.34%
Alabama Population (persons)	3,449,846	4,907,965	0.72%
Alabama Per capita personal income (dollars)	3,081	43,996	5.58%
Alabama Median family income (dollars)	7,623	51,734	3.99%
I-459 Corridor Population (persons)	166,781	271,803	1.00%
I-459 Corridor Median family income (dollars)	9,819	79,922	4.37%

We used growth rates in the table above to set up the year 2064 scenarios for the BNB corridor by considering three annual growth rates each for population and per capita income (Table 4). For the scenarios, the low and mid population growth rates are set at those for Alabama (0.72%) and the I-459 corridor (1.00%), respectively. The low PCPI growth rate is at the I-459 corridor median family income growth rate of 4.37 percent and the mid PCPI growth rate is at the Alabama PCPI growth rate of 5.58 percent. Even though PCPI is the relevant data needed for the analyses, the I-459 corridor median family income growth rate is used because it provides a reasonable minimum income growth rate. The high population (1.10%) and PCPI (6.00%) growth rates are set using expert judgment.

Table 4. Data for Determining Population and Income Growth Rates for Scenarios

Annual population growth		0.72%	1.00%	1.10%
Scenarios	2019	2064 low	2064 mid	2064 high
BNB Corridor Population	165,843	229,245	259,711	271,331
Increase in population	-	63,402	93,868	105,488
Annual PCPI growth		4.37%	5.58%	6.00%
Scenarios	2019	2064 low	2064 mid	2064 high
Alabama PCPI (2019 $)	43,996	56,639	94,909	113,661
Alabama PCPI (Current $)	43,996	301,771	505,675	605,588

Scenario Analyses

The socioeconomic data on the I-459 Corridor in Table 2 show a 63 percent population increase (annual rate of 1.00 percent) and median family income (MFI) rising from $9,819 in 1970 to $79,922 in 2019 (annual rate of 4.37 percent) together with poverty reduction from about 13.6 percent to 10.1 percent. Over the same period, Alabama had annual growth rates of 0.72 percent for population and 5.58 percent for PCPI. High end annual growth rates of 1.10 percent for population and 6.0 percent for PCPI were used in combination with the corresponding rates for the I-459 Corridor and Alabama to generate the scenarios. The annual growth rates in percentages considered were 0.72 (low), 1.00 (mid), and 1.10 (high) for population and 4.37 (low), 5.58 (mid), and 6.00 (high) for PCPI. These enabled determination of the increases in personal income for the BNB corridor upon which the impacts are based. The impacts are presented in both 2019 dollars and current (i.e., year 2064) dollars, assuming a similar inflation experience for the BNB to 2064 as for I-459 from 1970 to 2019. The 1970-2019 inflation factor is 6.1823 which translates into an annual rate of 3.79 percent or 5.3280 over 45 years for the 2019-2064 period. Since the 3.79 percent is below the actual annual PCPI growth rates over the 1970-2019 period, we presume that the 4.37-6.00 percent PCPI growth rate range for the scenarios also exceeds future inflation. However, we acknowledge the possibility (no matter how minute) of future inflation exceeding or equaling the PCPI growth range. The nine scenarios generated from the three annual growth rates each for population and PCPI are as shown below.

> 2064 Scenario 1: Low population (0.72%) and low PCPI (4.37%) annual growth rates
> 2064 Scenario 2: Low population (0.72%) and mid PCPI (5.58%) annual growth rates
> 2064 Scenario 3: Low population (0.72%) and high PCPI (6.00%) annual growth rates
> 2064 Scenario 4: Mid population (1.00%) and low PCPI (4.37%) annual growth rates
> 2064 Scenario 5: Mid population (1.00%) and mid PCPI (5.58%) annual growth rates
> 2064 Scenario 6: Mid population (1.00%) and high PCPI (6.00%) annual growth rates
> 2064 Scenario 7: High population (1.10%) and low PCPI (4.37%) annual growth rates
> 2064 Scenario 8: High population (1.10%) and mid PCPI (5.58%) annual growth rates
> 2064 Scenario 9: High population (1.10%) and high PCPI (6.00%) annual growth rates

While presenting the picture for 2064, it is important to note that the post-build impacts will continue with use of the highway and therefore the 2064 picture is only one snapshot. Additionally, the impacts presented in this report may slightly understate actual impacts because (i) RIMS II impact multipliers are for industries and households, not recent individual economic activities that can have effects above the industry/household average, and (ii) the actual impacts will also depend on future changes in the structure of the state, metro area, and county economies, all of which are expected to grow. One key assumption is that there will not be changes to tax law and rates that significantly affect the results. The economic impacts of focus in this report are output, value-added, earnings (wages and salaries), and employment. Output refers to total or gross business activity often measured by revenues or sales. This overall business activity impact includes the contribution to gross domestic product (GDP) or value-added; GDP is the value of goods and services produced on a value-added basis. The contribution to GDP is overall business activity less business-to-business transactions that are also called intermediate transactions. Earnings impacts are part of value-added and are the wages and salaries of the workers recognized by the employment impact.

For each scenario, the appropriate growth rates are applied to the year 2019 population and PCPI to determine what the BNB Corridor population and PCPI will be in 2064. The increase in population multiplied by the year 2064 PCPI determines how much new personal income is available to be

spent by residents of the corridor. The economic and fiscal impacts of the spending of the new personal income are determined for each scenario. Ranking the scenarios from lowest to highest year 2064 output impact expressed in 2019 dollars is as follows:

2064 Scenario 1: $3.962 billion (state), $3.620 billion (metro), $2.988 billion (county) [**Lowest**]
2064 Scenario 4: $5.866 billion (state), $5.360 billion (metro), $4.423 billion (county)
2064 Scenario 7: $6.592 billion (state), $6.024 billion (metro), $4.971 billion (county)
2064 Scenario 2: $6.639 billion (state), $6.067 billion (metro), $5.007 billion (county)
2064 Scenario 3: $7.951 billion (state), $7.265 billion (metro), $5.996 billion (county)
2064 Scenario 5: $9.829 billion (state), $8.982 billion (metro), $7.412 billion (county)
2064 Scenario 8: $11.046 billion (state), $10.094 billion (metro), $8.330 billion (county)
2064 Scenario 6: $11.771 billion (state), $10.756 billion (metro), $8.877 billion (county)
2064 Scenario 9: $13.228 billion (state), $12.088 billion (metro), $9.976 billion (county) [**Highest**]

Scenario 1 is the most conservative because it has the two lowest annual growth rates for population and PCPI and Scenario 9 is the most optimistic because it has the two highest annual growth rates. In between those two scenarios is a mix of the other scenarios. The results show that all the scenarios have economic and fiscal impacts that spill over from the BNB Corridor to the county, metro area, and state. The $2.9 billion cost of building the BNB is less than the year 2064 output impact for the state, metro area, and county for the most conservative and lowest impact Scenario 1. This means that the BNB construction cost is less than the year 2064 output impact for all the scenarios and that building the BNB is clearly good for Alabama, the Birmingham-Hoover metro area, and Jefferson County. The results also indicate that BNB will more than pay for itself. The fiscal impacts, in particular, show that local (at least county-level) contribution to the cost of building the highway is prudent as are state and federal contributions.

The remainder of this section shows detailed results for each scenario. Since the cost of building the BNB is in 2019 dollars, the discussions focus on the impacts expressed in 2019 dollars for easy comparison and understanding. However, impacts expressed in 2064 dollars are provided as well. For example, in the case of Scenario 1, the BNB corridor population increases by 63,402 and the PCPI rises to $56,639 in 2019 dollars resulting in new personal income of about $3.6 billion. In current or year 2064 dollars, the PCPI reaches $301,771 because of the effect of inflation and the increase in personal income is $19.1 billion; the resultant economic and fiscal impacts are therefore even larger. For the optimistic Scenario 9, the BNB corridor population increases by 105,488 and the PCPI rises to $113,661 in 2019 dollars resulting in new personal income of about $12.0 billion; in 2064 dollars the PCPI reaches $605,588 and the increase in personal income is roughly $63.9 billion.

2064 Scenario 1. Low population (0.72%) and low PCPI (4.37%) annual growth rates

The BNB Corridor population rises by 63,402 to 229,245 and PCPI reaches $56,639 in year 2019 dollars, which provides an increase in personal income of $3.6 billion. Statewide impacts of the new spending will be about $4.0 billion in gross business activity or output, of which $2.3 billion is contribution to GDP that includes $1.2 billion in earnings to Alabama workers in 36,620 jobs. Nearly $232.0 million in state and local (county and municipality) taxes will be generated; $80.5 million state income tax, $41.2 million state sales tax, $7.7 million state property tax, $51.5 million local sales tax, and $51.0 million local property tax. The metro area will see impacts of $3.6 billion in output, $2.2 billion GDP contribution, $1.1 billion in earnings for 33,884 jobs, and $208.8 million in state and local taxes comprising $72.5 million state income tax, $37.1 million state sales tax, $6.9 million state property tax, $46.4 million local sales tax, and $45.9 million local property tax. The county will have $3.0 billion in output, $1.8 billion contribution to GDP, $657.3 million in earnings for 21,370 jobs, $64.4 million state income tax, $33.0 million state sales tax, $6.2 million state property tax, $41.2 million local sales tax, and $40.8 million local property tax.

2064 Scenario 1 Economic and Fiscal Impacts

BNB Corridor Population	229,245
Increase in population from 2019	63,402
Alabama per capita income (2019 $)	56,639
Increase in BNB Corridor personal income (2019 $)	3,591,035,817
Alabama per capita income (Current $)	301,771
Increase in BNB Corridor personal income (Current $)	19,133,038,261

	2064 Impacts (2019 Dollars)		
Input Data	**Alabama**	**B-H Metro**	**Jefferson County**
Increased personal income	$3,591,035,817	$3,591,035,817	$3,591,035,817
Economic Impacts (direct and indirect)			
Output (gross business sales)	$3,961,989,817	$3,620,379,710	$2,987,741,800
Contribution to GDP	$2,255,529,597	$2,175,244,296	$1,801,263,566
Earnings (wages and salaries)	$1,198,328,652	$1,064,690,819	$657,303,196
Employment (jobs)	36,620	33,884	21,370
Fiscal Impacts (direct and indirect)			
State taxes			
Individual income (II)	$80,534,811	$72,481,329	$64,427,848
Sales	$41,210,729	$37,089,656	$32,968,584
Property	$7,698,060	$6,928,254	$6,158,448
Combined state II, sales, and property	$129,443,600	$116,499,240	$103,554,880
Local (city and county) taxes -- statewide			
Sales	$51,513,412	$46,362,071	$41,210,729
Property	$51,026,619	$45,923,957	$40,821,295
Combined local sales and property	$102,540,030	$92,286,027	$82,032,024
Total state and local taxes	**$231,983,630**	**$208,785,267**	**$185,586,904**

	2064 Impacts (Current or 2064 Dollars)		
Input Data	**Alabama**	**B-H Metro**	**Jefferson County**
Increased personal income	$19,133,038,261	$19,133,038,261	$19,133,038,261
Economic Impacts (direct and indirect)			
Output (gross business sales)	$21,109,481,113	$19,289,382,517	$15,918,687,833
Contribution to GDP	$12,017,461,332	$11,589,701,262	$9,597,131,992
Earnings (wages and salaries)	$6,384,694,868	$5,672,672,515	$3,502,111,323
Employment (jobs)	36,620	33,884	21,370
Fiscal Impacts (direct and indirect)			
State taxes			
Individual income (II)	$429,089,458	$386,180,512	$343,271,566
Sales	$219,570,760	$197,613,684	$175,656,608
Property	$41,015,261	$36,913,734	$32,812,208
Combined state II, sales, and property	$689,675,478	$620,707,930	$551,740,382
Local (city and county) taxes -- statewide			
Sales	$274,463,449	$247,017,105	$219,570,760
Property	$271,869,816	$244,682,834	$217,495,853
Combined local sales and property	$546,333,265	$491,699,939	$437,066,612
Total state and local taxes	**$1,236,008,743**	**$1,112,407,869**	**$988,806,995**

Note: Rounding effects may be present.
Source: U.S. Bureau of Economic Analysis; U.S. Bureau of Labor Statistics; Alabama Department of Revenue; and Center for Business and Economic Research, The University of Alabama.

2064 Scenario 2. Low population (0.72%) and mid PCPI (5.58%) annual growth rates

The BNB Corridor population rises by 63,402 to 229,245 and PCPI reaches $94,909 in year 2019 dollars, which provides an increase in personal income of about $6.0 billion. Statewide impacts of the new spending will be about $6.6 billion in gross business activity or output, of which $3.8 billion is contribution to GDP that includes $2.0 billion in earnings to Alabama workers in 61,363 jobs. About $388.7 million in state and local (county and municipality) taxes will be generated; $135.0 million state income tax, $69.1 million state sales tax, $12.9 million state property tax, $86.3 million local sales tax, and $85.5 million local property tax. The metro area will see impacts of $6.1 billion in output, $3.6 billion GDP contribution, $1.8 billion in earnings for 56,779 jobs, and $349.9 million in state and local taxes comprising $121.5 million state income tax, $62.2 million state sales tax, $11.6 million state property tax, $77.7 million local sales tax, and $77.0 million local property tax. The county will have $5.0 billion in output, $3.0 billion contribution to GDP, $1.1 billion in earnings for 35,809 jobs, $108.0 million state income tax, $55.2 million state sales tax, $10.3 million state property tax, $69.1 million local sales tax, and $68.4 million local property tax.

2064 Scenario 2 Economic and Fiscal Impacts

BNB Corridor Population	229,245
Increase in population from 2019	63,402
Alabama per capita income (2019 $)	94,909
Increase in BNB Corridor personal income (2019 $)	6,017,467,986
Alabama per capita income (Current $)	505,675
Increase in BNB Corridor personal income (Current $)	32,061,068,471

	2064 Impacts (2019 Dollars)		
Input Data	**Alabama**	**B-H Metro**	**Jefferson County**
Increased personal income	$6,017,467,986	$6,017,467,986	$6,017,467,986
Economic Impacts (direct and indirect)			
Output (gross business sales)	$6,639,072,429	$6,066,639,296	$5,006,533,364
Contribution to GDP	$3,779,571,642	$3,645,038,251	$3,018,361,942
Earnings (wages and salaries)	$2,008,029,067	$1,784,093,294	$1,101,437,340
Employment (jobs)	61,363	56,779	35,809
Fiscal Impacts (direct and indirect)			
State taxes			
Individual income (II)	$134,951,493	$121,456,344	$107,961,194
Sales	$69,056,467	$62,150,820	$55,245,173
Property	$12,899,573	$11,609,615	$10,319,658
Combined state II, sales, and property	$216,907,532	$195,216,779	$173,526,026
Local (city and county) taxes -- statewide			
Sales	$86,320,583	$77,688,525	$69,056,467
Property	$85,504,868	$76,954,381	$68,403,894
Combined local sales and property	$171,825,451	$154,642,906	$137,460,361
Total state and local taxes	**$388,732,983**	**$349,859,685**	**$310,986,387**

	2064 Impacts (Current or 2064 Dollars)		
Input Data	**Alabama**	**B-H Metro**	**Jefferson County**
Increased personal income	$32,061,068,471	$32,061,068,471	$32,061,068,471
Economic Impacts (direct and indirect)			
Output (gross business sales)	$35,372,976,844	$32,323,053,202	$26,674,808,968
Contribution to GDP	$20,137,557,107	$19,420,763,219	$16,081,831,945
Earnings (wages and salaries)	$10,698,778,549	$9,505,648,786	$5,868,457,973
Employment (jobs)	61,363	56,779	35,809
Fiscal Impacts (direct and indirect)			
State taxes			
Individual income (II)	$719,021,532	$647,119,379	$575,217,226
Sales	$367,932,843	$331,139,558	$294,346,274
Property	$68,728,921	$61,856,029	$54,983,137
Combined state II, sales, and property	$1,155,683,296	$1,040,114,966	$924,546,637
Local (city and county) taxes -- statewide			
Sales	$459,916,053	$413,924,448	$367,932,843
Property	$455,569,924	$410,012,931	$364,455,939
Combined local sales and property	$915,485,977	$823,937,379	$732,388,782
Total state and local taxes	**$2,071,169,273**	**$1,864,052,346**	**$1,656,935,418**

Note: Rounding effects may be present.

Source: U.S. Bureau of Economic Analysis; U.S. Bureau of Labor Statistics; Alabama Department of Revenue; and Center for Business and Economic Research, The University of Alabama.

2064 Scenario 3. Low population (0.72%) and high PCPI (6.00%) annual growth rates

The BNB Corridor population rises by 63,402 to 229,245 and PCPI reaches $113,661 in year 2019 dollars, which provides an increase in personal income of $7.2 billion. Statewide impacts of the new spending will be about $8.0 billion in gross business activity or output, of which $4.5 billion is contribution to GDP that includes $2.4 billion in earnings to Alabama workers in 73,487 jobs. About $465.5 million in state and local (county and municipality) taxes will be generated; $161.6 million state income tax, $82.7 million state sales tax, $15.4 million state property tax, $103.4 million local sales tax, and $102.4 million local property tax. The metro area will see impacts of $7.3 billion in output, $4.4 billion GDP contribution, $2.1 billion in earnings for 67,998 jobs, and $419.0 million in state and local taxes comprising $145.5 million state income tax, $74.4 million state sales tax, $13.9 million state property tax, $93.0 million local sales tax, and $92.2 million local property tax. The county will have $6.0 billion in output, $3.6 billion contribution to GDP, $1.3 billion in earnings for 42,884 jobs, $129.3 million state income tax, $66.2 million state sales tax, $12.4 million state property tax, $82.7 million local sales tax, and $81.9 million local property tax.

2064 Scenario 3 Economic and Fiscal Impacts

BNB Corridor Population	229,245
Increase in population from 2019	63,402
Alabama per capita income (2019 $)	113,661
Increase in BNB Corridor personal income (2019 $)	7,206,414,021
Alabama per capita income (Current $)	605,588
Increase in BNB Corridor personal income (Current $)	38,395,772,756

	2064 Impacts (2019 Dollars)		
Input Data	**Alabama**	**B-H Metro**	**Jefferson County**
Increased personal income	$7,206,414,021	$7,206,414,021	$7,206,414,021
Economic Impacts (direct and indirect)			
Output (gross business sales)	$7,950,836,589	$7,265,300,718	$5,995,736,466
Contribution to GDP	$4,526,348,647	$4,365,233,819	$3,614,737,273
Earnings (wages and salaries)	$2,404,780,359	$2,136,598,808	$1,319,062,022
Employment (jobs)	73,487	67,998	42,884
Fiscal Impacts (direct and indirect)			
State taxes			
Individual income (II)	$161,615,539	$145,453,985	$129,292,431
Sales	$82,700,812	$74,430,731	$66,160,650
Property	$15,448,302	$13,903,472	$12,358,641
Combined state II, sales, and property	$259,764,652	$233,788,187	$207,811,722
Local (city and county) taxes -- statewide			
Sales	$103,376,015	$93,038,414	$82,700,812
Property	$102,399,129	$92,159,216	$81,919,303
Combined local sales and property	$205,775,144	$185,197,630	$164,620,115
Total state and local taxes	**$465,539,796**	**$418,985,817**	**$372,431,837**

	2064 Impacts (Current or 2064 Dollars)		
Input Data	**Alabama**	**B-H Metro**	**Jefferson County**
Increased personal income	$38,395,772,756	$38,395,772,756	$38,395,772,756
Economic Impacts (direct and indirect)			
Output (gross business sales)	$42,362,056,082	$38,709,521,071	$31,945,282,933
Contribution to GDP	$24,116,384,868	$23,257,965,092	$19,259,319,615
Earnings (wages and salaries)	$12,812,669,369	$11,383,798,111	$7,027,962,245
Employment (jobs)	73,487	67,998	42,884
Fiscal Impacts (direct and indirect)			
State taxes			
Individual income (II)	$861,087,564	$774,978,808	$688,870,051
Sales	$440,629,913	$396,566,922	$352,503,931
Property	$82,308,549	$74,077,694	$65,846,839
Combined state II, sales, and property	$1,384,026,027	$1,245,623,424	$1,107,220,821
Local (city and county) taxes -- statewide			
Sales	$550,787,392	$495,708,652	$440,629,913
Property	$545,582,543	$491,024,289	$436,466,034
Combined local sales and property	$1,096,369,934	$986,732,941	$877,095,948
Total state and local taxes	**$2,480,395,961**	**$2,232,356,365**	**$1,984,316,769**

Note: Rounding effects may be present.
Source: U.S. Bureau of Economic Analysis; U.S. Bureau of Labor Statistics; Alabama Department of Revenue; and Center for Business and Economic Research, The University of Alabama.

2064 Scenario 4. Mid population (1.00%) and low PCPI (4.37%) annual growth rates

The BNB Corridor population rises by 93,868 to 259,711 and PCPI reaches $56,639 in year 2019 dollars, which provides an increase in personal income of $5.3 billion. Statewide impacts of the new spending will be about $5.9 billion in gross business activity or output, of which $3.3 billion is contribution to GDP that includes $1.8 billion in earnings to Alabama workers in 54,216 jobs. About $343.5 million in state and local (county and municipality) taxes will be generated; $119.2 million state income tax, $61.0 million state sales tax, $11.4 million state property tax, $76.3 million local sales tax, and $75.5 million local property tax. The metro area will see impacts of $5.4 billion in output, $3.2 billion GDP contribution, $1.6 billion in earnings for 50,166 jobs, and $309.1 million in state and local taxes comprising $107.3 million state income tax, $54.9 million state sales tax, $10.3 million state property tax, $68.6 million local sales tax, and $68.0 million local property tax. The county will have $4.4 billion in output, $2.7 billion contribution to GDP, $973.1 million in earnings for 31,638 jobs, $95.4 million state income tax, $48.8 million state sales tax, $9.1 million state property tax, $61.0 million local sales tax, and $60.4 million local property tax.

2064 Scenario 4 Economic and Fiscal Impacts

BNB Corridor Population	259,711
Increase in population from 2019	93,868
Alabama per capita income (2019 $)	56,639
Increase in BNB Corridor personal income (2019 $)	5,316,550,037
Alabama per capita income (Current $)	301,771
Increase in BNB Corridor personal income (Current $)	28,326,577,751

	2064 Impacts (2019 Dollars)		
Input Data	**Alabama**	**B-H Metro**	**Jefferson County**
Increased personal income	$5,316,550,037	$5,316,550,037	$5,316,550,037
Economic Impacts (direct and indirect)			
Output (gross business sales)	$5,865,749,656	$5,359,993,846	$4,423,369,631
Contribution to GDP	$3,339,325,078	$3,220,462,210	$2,666,781,499
Earnings (wages and salaries)	$1,774,132,747	$1,576,281,135	$973,141,319
Employment (jobs)	54,216	50,166	31,638
Fiscal Impacts (direct and indirect)			
State taxes			
Individual income (II)	$119,232,269	$107,309,042	$95,385,816
Sales	$61,012,732	$54,911,459	$48,810,185
Property	$11,397,023	$10,257,321	$9,117,619
Combined state II, sales, and property	$191,642,025	$172,477,822	$153,313,620
Local (city and county) taxes -- statewide			
Sales	$76,265,915	$68,639,323	$61,012,732
Property	$75,545,215	$67,990,693	$60,436,172
Combined local sales and property	$151,811,129	$136,630,016	$121,448,903
Total state and local taxes	**$343,453,154**	**$309,107,838**	**$274,762,523**

	2064 Impacts (Current or 2064 Dollars)		
Input Data	**Alabama**	**B-H Metro**	**Jefferson County**
Increased personal income	$28,326,577,751	$28,326,577,751	$28,326,577,751
Economic Impacts (direct and indirect)			
Output (gross business sales)	$31,252,713,232	$28,558,046,357	$23,567,712,689
Contribution to GDP	$17,791,923,485	$17,158,622,140	$14,208,611,400
Earnings (wages and salaries)	$9,452,578,995	$8,398,425,638	$5,184,896,791
Employment (jobs)	54,216	50,166	31,638
Fiscal Impacts (direct and indirect)			
State taxes			
Individual income (II)	$635,269,512	$571,742,561	$508,215,610
Sales	$325,075,825	$292,568,242	$260,060,660
Property	$60,723,339	$54,651,005	$48,578,671
Combined state II, sales, and property	$1,021,068,676	$918,961,808	$816,854,941
Local (city and county) taxes -- statewide			
Sales	$406,344,781	$365,710,303	$325,075,825
Property	$402,504,891	$362,254,402	$322,003,913
Combined local sales and property	$808,849,672	$727,964,705	$647,079,737
Total state and local taxes	**$1,829,918,348**	**$1,646,926,513**	**$1,463,934,678**

Note: Rounding effects may be present.

Source: U.S. Bureau of Economic Analysis; U.S. Bureau of Labor Statistics; Alabama Department of Revenue; and Center for Business and Economic Research, The University of Alabama.

2064 Scenario 5. Mid population (1.00%) and mid PCPI (5.58%) annual growth rates

The BNB Corridor population rises by 93,868 to 259,711 and PCPI reaches $94,909 in year 2019 dollars, which provides an increase in personal income of $8.9 billion. Statewide impacts of the new spending will be $9.8 billion in gross business activity or output, of which $5.6 billion is contribution to GDP that includes $3.0 billion in earnings to Alabama workers in 90,848 jobs. About $575.5 million in state and local (county and municipality) taxes will be generated; $199.8 million state income tax, $102.2 million state sales tax, $19.1 million state property tax, $127.8 million local sales tax, and $126.6 million local property tax. The metro area will see impacts of $9.0 billion in output, $5.4 billion GDP contribution, $2.6 billion in earnings for 84,062 jobs, and $518.0 million in state and local taxes comprising $179.8 million state income tax, $92.0 million state sales tax, $17.2 million state property tax, $115.0 million local sales tax, and $113.9 million local property tax. The county will have $7.4 billion in output, $4.5 billion contribution to GDP, $1.6 billion in earnings for 53,015 jobs, $159.8 million state income tax, $81.8 million state sales tax, $15.3 million state property tax, $102.2 million local sales tax, and $101.3 million local property tax.

2064 Scenario 5 Economic and Fiscal Impacts

BNB Corridor Population	259,711
Increase in population from 2019	93,868
Alabama per capita income (2019 $)	94,909
Increase in BNB Corridor personal income (2019 $)	8,908,897,397
Alabama per capita income (Current $)	505,675
Increase in BNB Corridor personal income (Current $)	47,466,603,914

	2064 Impacts (2019 Dollars)		
Input Data	**Alabama**	**B-H Metro**	**Jefferson County**
Increased personal income	$8,908,897,397	$8,908,897,397	$8,908,897,397
Economic Impacts (direct and indirect)			
Output (gross business sales)	$9,829,186,499	$8,981,695,816	$7,412,202,635
Contribution to GDP	$5,595,678,455	$5,396,500,964	$4,468,702,935
Earnings (wages and salaries)	$2,972,899,062	$2,641,360,808	$1,630,684,580
Employment (jobs)	90,848	84,062	53,015
Fiscal Impacts (direct and indirect)			
State taxes			
Individual income (II)	$199,796,493	$179,816,844	$159,837,195
Sales	$102,238,512	$92,014,661	$81,790,810
Property	$19,097,895	$17,188,105	$15,278,316
Combined state II, sales, and property	$321,132,900	$289,019,610	$256,906,320
Local (city and county) taxes -- statewide			
Sales	$127,798,140	$115,018,326	$102,238,512
Property	$126,590,469	$113,931,422	$101,272,376
Combined local sales and property	$254,388,610	$228,949,749	$203,510,888
Total state and local taxes	**$575,521,510**	**$517,969,359**	**$460,417,208**

	2064 Impacts (Current or 2064 Dollars)		
Input Data	**Alabama**	**B-H Metro**	**Jefferson County**
Increased personal income	$47,466,603,914	$47,466,603,914	$47,466,603,914
Economic Impacts (direct and indirect)			
Output (gross business sales)	$52,369,904,099	$47,854,473,878	$39,492,214,457
Contribution to GDP	$29,813,773,919	$28,752,556,274	$23,809,248,523
Earnings (wages and salaries)	$15,839,605,726	$14,073,169,966	$8,688,287,180
Employment (jobs)	90,848	84,062	53,015
Fiscal Impacts (direct and indirect)			
State taxes			
Individual income (II)	$1,064,515,685	$958,064,117	$851,612,548
Sales	$544,726,778	$490,254,100	$435,781,422
Property	$101,753,579	$91,578,221	$81,402,863
Combined state II, sales, and property	$1,710,996,042	$1,539,896,438	$1,368,796,834
Local (city and county) taxes -- statewide			
Sales	$680,908,472	$612,817,625	$544,726,778
Property	$674,474,001	$607,026,601	$539,579,201
Combined local sales and property	$1,355,382,473	$1,219,844,226	$1,084,305,978
Total state and local taxes	**$3,066,378,515**	**$2,759,740,663**	**$2,453,102,812**

Note: Rounding effects may be present.

Source: U.S. Bureau of Economic Analysis; U.S. Bureau of Labor Statistics; Alabama Department of Revenue; and Center for Business and Economic Research, The University of Alabama.

2064 Scenario 6. Mid population (1.00%) and high PCPI (6.00%) annual growth rates

The BNB Corridor population rises by 93,868 to 259,711 and PCPI reaches $113,661 in year 2019 dollars, which provides an increase in personal income of $10.7 billion. Statewide impacts of the new spending will be $11.8 billion in gross business activity or output, of which $6.7 billion is contribution to GDP that includes $3.6 billion in earnings to Alabama workers in 108,799 jobs. About $689.2 million in state and local (county and municipality) taxes will be generated; $239.3 million state income tax, $122.4 million state sales tax, $22.9 million state property tax, $153.0 million local sales tax, and $151.6 million local property tax. The metro area will see impacts of $10.8 billion in output, $6.5 billion GDP contribution, $3.2 billion in earnings for 100,672 jobs, and $620.3 million in state and local taxes comprising $215.3 million state income tax, $110.2 million state sales tax, $20.6 million state property tax, $137.7 million local sales tax, and $136.4 million local property tax. The county will have $8.9 billion in output, $5.4 billion contribution to GDP, $2.0 billion in earnings for 63,490 jobs, $191.4 million state income tax, $98.0 million state sales tax, $18.3 million state property tax, $122.4 million local sales tax, and $121.3 million local property tax.

2064 Scenario 6 Economic and Fiscal Impacts

BNB Corridor Population	259,711
Increase in population from 2019	93,868
Alabama per capita income (2019 $)	113,661
Increase in BNB Corridor personal income (2019 $)	10,669,139,124
Alabama per capita income (Current $)	605,588
Increase in BNB Corridor personal income (Current $)	56,845,171,553

	2064 Impacts (2019 Dollars)		
Input Data	**Alabama**	**B-H Metro**	**Jefferson County**
Increased personal income	$10,669,139,124	$10,669,139,124	$10,669,139,124
Economic Impacts (direct and indirect)			
Output (gross business sales)	$11,771,261,195	$10,756,321,232	$8,876,723,751
Contribution to GDP	$6,701,286,284	$6,462,754,816	$5,351,640,185
Earnings (wages and salaries)	$3,560,291,726	$3,163,247,334	$1,952,879,225
Employment (jobs)	108,799	100,672	63,490
Fiscal Impacts (direct and indirect)			
State taxes			
Individual income (II)	$239,272,773	$215,345,496	$191,418,218
Sales	$122,439,048	$110,195,143	$97,951,238
Property	$22,871,303	$20,584,173	$18,297,043
Combined state II, sales, and property	$384,583,124	$346,124,811	$307,666,499
Local (city and county) taxes -- statewide			
Sales	$153,048,809	$137,743,929	$122,439,048
Property	$151,602,524	$136,442,271	$121,282,019
Combined local sales and property	$304,651,333	$274,186,200	$243,721,067
Total state and local taxes	**$689,234,457**	**$620,311,011**	**$551,387,566**

	2064 Impacts (Current or 2064 Dollars)		
Input Data	**Alabama**	**B-H Metro**	**Jefferson County**
Increased personal income	$56,845,171,553	$56,845,171,553	$56,845,171,553
Economic Impacts (direct and indirect)			
Output (gross business sales)	$62,717,277,774	$57,309,677,812	$47,295,182,732
Contribution to GDP	$35,704,452,252	$34,433,556,631	$28,513,538,051
Earnings (wages and salaries)	$18,969,233,747	$16,853,781,291	$10,404,940,201
Employment (jobs)	108,799	100,672	63,490
Fiscal Impacts (direct and indirect)			
State taxes			
Individual income (II)	$1,274,845,297	$1,147,360,767	$1,019,876,237
Sales	$652,355,226	$587,119,703	$521,884,181
Property	$121,858,300	$109,672,470	$97,486,640
Combined state II, sales, and property	$2,049,058,823	$1,844,152,940	$1,639,247,058
Local (city and county) taxes -- statewide			
Sales	$815,444,032	$733,899,629	$652,355,226
Property	$807,738,223	$726,964,401	$646,190,578
Combined local sales and property	$1,623,182,255	$1,460,864,030	$1,298,545,804
Total state and local taxes	**$3,672,241,078**	**$3,305,016,970**	**$2,937,792,862**

Note: Rounding effects may be present.

Source: U.S. Bureau of Economic Analysis; U.S. Bureau of Labor Statistics; Alabama Department of Revenue; and Center for Business and Economic Research, The University of Alabama.

2064 Scenario 7. High population (1.10%) and low PCPI (4.37%) annual growth rates

The BNB Corridor population rises by 105,488 to 271,331 and PCPI reaches $56,639 in year 2019 dollars, which provides an increase in personal income of $6.0 billion. Statewide impacts of the new spending will be $6.6 billion in gross business activity or output, of which $3.8 billion is contribution to GDP that includes $2.0 billion in earnings to Alabama workers in 60,927 jobs. About $386.0 million in state and local (county and municipality) taxes will be generated; $134.0 million state income tax, $68.6 million state sales tax, $12.8 million state property tax, $85.7 million local sales tax, and $84.9 million local property tax. The metro area will see impacts of $6.0 billion in output, $3.6 billion GDP contribution, $1.8 billion in earnings for 56,376 jobs, and $347.4 million in state and local taxes comprising $120.6 million state income tax, $61.7 million state sales tax, $11.5 million state property tax, $77.1 million local sales tax, and $76.4 million local property tax. The county will have $5.0 billion in output, $3.0 billion contribution to GDP, $1.1 billion in earnings for 35,554 jobs, $107.2 million state income tax, $54.9 million state sales tax, $10.2 million state property tax, $68.6 million local sales tax, and $67.9 million local property tax.

2064 Scenario 7 Economic and Fiscal Impacts

BNB Corridor Population	271,331
Increase in population from 2019	105,488
Alabama per capita income (2019 $)	56,639
Increase in BNB Corridor personal income (2019 $)	5,974,696,128
Alabama per capita income (Current $)	301,771
Increase in BNB Corridor personal income (Current $)	31,833,180,020

	2064 Impacts (2019 Dollars)		
Input Data	**Alabama**	**B-H Metro**	**Jefferson County**
Increased personal income	$5,974,696,128	$5,974,696,128	$5,974,696,128
Economic Impacts (direct and indirect)			
Output (gross business sales)	$6,591,882,238	$6,023,517,931	$4,970,947,179
Contribution to GDP	$3,752,706,638	$3,619,129,503	$2,996,907,578
Earnings (wages and salaries)	$1,993,756,098	$1,771,412,049	$1,093,608,379
Employment (jobs)	60,927	56,376	35,554
Fiscal Impacts (direct and indirect)			
State taxes			
Individual income (II)	$133,992,264	$120,593,038	$107,193,812
Sales	$68,565,617	$61,709,055	$54,852,493
Property	$12,807,883	$11,527,095	$10,246,307
Combined state II, sales, and property	$215,365,764	$193,829,188	$172,292,611
Local (city and county) taxes -- statewide			
Sales	$85,707,021	$77,136,319	$68,565,617
Property	$84,897,104	$76,407,393	$67,917,683
Combined local sales and property	$170,604,125	$153,543,712	$136,483,300
Total state and local taxes	**$385,969,889**	**$347,372,900**	**$308,775,911**

	2064 Impacts (Current or 2064 Dollars)		
Input Data	**Alabama**	**B-H Metro**	**Jefferson County**
Increased personal income	$31,833,180,020	$31,833,180,020	$31,833,180,020
Economic Impacts (direct and indirect)			
Output (gross business sales)	$35,121,547,516	$32,093,302,577	$26,485,205,777
Contribution to GDP	$19,994,420,371	$19,282,721,417	$15,967,523,098
Earnings (wages and salaries)	$10,622,732,173	$9,438,083,116	$5,826,745,271
Employment (jobs)	60,927	56,376	35,554
Fiscal Impacts (direct and indirect)			
State taxes			
Individual income (II)	$713,910,764	$642,519,687	$571,128,611
Sales	$365,317,595	$328,785,835	$292,254,076
Property	$68,240,399	$61,416,359	$54,592,319
Combined state II, sales, and property	$1,147,468,758	$1,032,721,882	$917,975,006
Local (city and county) taxes -- statewide			
Sales	$456,646,993	$410,982,294	$365,317,595
Property	$452,331,756	$407,098,580	$361,865,405
Combined local sales and property	$908,978,749	$818,080,874	$727,182,999
Total state and local taxes	**$2,056,447,507**	**$1,850,802,756**	**$1,645,158,005**

Note: Rounding effects may be present.

Source: U.S. Bureau of Economic Analysis; U.S. Bureau of Labor Statistics; Alabama Department of Revenue; and Center for Business and Economic Research, The University of Alabama.

2064 Scenario 8. High population (1.10%) and mid PCPI (5.58%) annual growth rates

The BNB Corridor population rises by 105,488 to 271,331 and PCPI reaches $105,488 in year 2019 dollars, which provides an increase in personal income of $10.0 billion. Statewide impacts of the new spending will be $11.0 billion in gross business activity or output, of which $6.3 billion is contribution to GDP that includes $3.3 billion in earnings to Alabama workers in 102,095 jobs. About $646.8 million in state and local (county and municipality) taxes will be generated; $224.5 million state income tax, $114.9 million state sales tax, $21.5 million state property tax, $143.6 million local sales tax, and $142.3 million local property tax. The metro area will see impacts of $10.1 billion in output, $6.1 billion GDP contribution, $3.0 billion in earnings for 94,469 jobs, and $582.1 million in state and local taxes comprising $202.1 million state income tax, $103.4 million state sales tax, $19.3 million state property tax, $129.3 million local sales tax, and $128.0 million local property tax. The county will have $8.3 billion in output, $5.0 billion contribution to GDP, $1.8 billion in earnings for 59,578 jobs, $179.6 million state income tax, $91.9 million state sales tax, $17.2 million state property tax, $114.9 million local sales tax, and $113.8 million local property tax.

2064 Scenario 8 Economic and Fiscal Impacts

BNB Corridor Population	271,331
Increase in population from 2019	105,488
Alabama per capita income (2019 $)	94,909
Increase in BNB Corridor personal income (2019 $)	10,011,747,170
Alabama per capita income (Current $)	505,675
Increase in BNB Corridor personal income (Current $)	53,342,587,328

Input Data	2064 Impacts (2019 Dollars)		
	Alabama	B-H Metro	Jefferson County
Increased personal income	$10,011,747,170	$10,011,747,170	$10,011,747,170
Economic Impacts (direct and indirect)			
Output (gross business sales)	$11,045,960,653	$10,093,557,447	$8,329,773,646
Contribution to GDP	$6,288,378,398	$6,064,544,336	$5,021,892,381
Earnings (wages and salaries)	$3,340,920,031	$2,968,340,011	$1,832,550,202
Employment (jobs)	102,095	94,469	59,578
Fiscal Impacts (direct and indirect)			
State taxes			
Individual income (II)	$224,529,691	$202,076,722	$179,623,753
Sales	$114,894,817	$103,405,335	$91,915,854
Property	$21,462,060	$19,315,854	$17,169,648
Combined state II, sales, and property	$360,886,568	$324,797,911	$288,709,254
Local (city and county) taxes -- statewide			
Sales	$143,618,521	$129,256,669	$114,894,817
Property	$142,261,350	$128,035,215	$113,809,080
Combined local sales and property	$285,879,872	$257,291,885	$228,703,897
Total state and local taxes	**$646,766,440**	**$582,089,796**	**$517,413,152**

Input Data	2064 Impacts (Current or 2064 Dollars)		
	Alabama	B-H Metro	Jefferson County
Increased personal income	$53,342,587,328	$53,342,587,328	$53,342,587,328
Economic Impacts (direct and indirect)			
Output (gross business sales)	$58,852,876,599	$53,778,472,470	$44,381,032,657
Contribution to GDP	$33,504,479,101	$32,311,891,255	$26,756,641,804
Earnings (wages and salaries)	$17,800,421,391	$15,815,315,106	$9,763,827,184
Employment (jobs)	102,095	94,469	59,578
Fiscal Impacts (direct and indirect)			
State taxes			
Individual income (II)	$1,196,294,157	$1,076,664,741	$957,035,325
Sales	$612,159,567	$550,943,610	$489,727,654
Property	$114,349,853	$102,914,868	$91,479,883
Combined state II, sales, and property	$1,922,803,577	$1,730,523,219	$1,538,242,862
Local (city and county) taxes -- statewide			
Sales	$765,199,459	$688,679,513	$612,159,567
Property	$757,968,452	$682,171,607	$606,374,762
Combined local sales and property	$1,523,167,911	$1,370,851,120	$1,218,534,329
Total state and local taxes	**$3,445,971,488**	**$3,101,374,339**	**$2,756,777,190**

Note: Rounding effects may be present.

Source: U.S. Bureau of Economic Analysis; U.S. Bureau of Labor Statistics; Alabama Department of Revenue; and Center for Business and Economic Research, The University of Alabama.

2064 Scenario 9. High population (1.10%) and high PCPI (6.00%) annual growth rates

The BNB Corridor population rises by 105,488 to 271,331 and PCPI reaches $113,661 in year 2019 dollars, which provides an increase in personal income of $12.0 billion. Statewide impacts of the new spending will be $13.2 billion in gross business activity or output, of which $7.5 billion is contribution to GDP that includes $4.0 billion in earnings to Alabama workers in 122,267 jobs. About $774.6 million in state and local (county and municipality) taxes will be generated; $268.9 million state income tax, $137.6 million state sales tax, $25.7 million state property tax, $172.0 million local sales tax, and $170.4 million local property tax. The metro area will see impacts of $12.1 billion in output, $7.3 billion GDP contribution, $3.6 billion in earnings for 113,134 jobs, and $697.1 million in state and local taxes comprising $242.0 million state income tax, $123.8 million state sales tax, $23.1 million state property tax, $154.8 million local sales tax, and $153.3 million local property tax. The county will have $10.0 billion in output, $6.0 billion contribution to GDP, $2.2 billion in earnings for 71,349 jobs, $215.1 million state income tax, $110.1 million state sales tax, $20.6 million state property tax, $137.6 million local sales tax, and $136.3 million local property tax.

2064 Scenario 9 Economic and Fiscal Impacts

BNB Corridor Population	271,331
Increase in population from 2019	105,488
Alabama per capita income (2019 $)	113,661
Increase in BNB Corridor personal income (2019 $)	11,989,892,651
Alabama per capita income (Current $)	605,588
Increase in BNB Corridor personal income (Current $)	63,882,146,133

	2064 Impacts (2019 Dollars)		
Input Data	**Alabama**	**B-H Metro**	**Jefferson County**
Increased personal income	$11,989,892,651	$11,989,892,651	$11,989,892,651
Economic Impacts (direct and indirect)			
Output (gross business sales)	$13,228,448,562	$12,087,867,202	$9,975,590,685
Contribution to GDP	$7,530,851,574	$7,262,791,831	$6,014,130,154
Earnings (wages and salaries)	$4,001,027,178	$3,554,831,887	$2,194,629,951
Employment (jobs)	122,267	113,134	71,349
Fiscal Impacts (direct and indirect)			
State taxes			
Individual income (II)	$268,892,816	$242,003,534	$215,114,253
Sales	$137,596,016	$123,836,414	$110,076,813
Property	$25,702,586	$23,132,328	$20,562,069
Combined state II, sales, and property	$432,191,418	$388,972,277	$345,753,135
Local (city and county) taxes -- statewide			
Sales	$171,995,020	$154,795,518	$137,596,016
Property	$170,369,696	$153,332,726	$136,295,757
Combined local sales and property	$342,364,716	$308,128,244	$273,891,772
Total state and local taxes	**$774,556,134**	**$697,100,521**	**$619,644,907**

	2064 Impacts (Current or 2064 Dollars)		
Input Data	**Alabama**	**B-H Metro**	**Jefferson County**
Increased personal income	$63,882,146,133	$63,882,146,133	$63,882,146,133
Economic Impacts (direct and indirect)			
Output (gross business sales)	$70,481,171,829	$64,404,154,527	$53,149,945,583
Contribution to GDP	$40,124,375,986	$38,696,153,719	$32,043,284,500
Earnings (wages and salaries)	$21,317,472,165	$18,940,143,726	$11,692,988,028
Employment (jobs)	122,267	113,134	71,349
Fiscal Impacts (direct and indirect)			
State taxes			
Individual income (II)	$1,432,660,881	$1,289,394,793	$1,146,128,705
Sales	$733,111,551	$659,800,396	$586,489,241
Property	$136,943,377	$123,249,039	$109,554,701
Combined state II, sales, and property	$2,302,715,808	$2,072,444,227	$1,842,172,646
Local (city and county) taxes -- statewide			
Sales	$916,389,438	$824,750,495	$733,111,551
Property	$907,729,712	$816,956,741	$726,183,769
Combined local sales and property	$1,824,119,150	$1,641,707,235	$1,459,295,320
Total state and local taxes	**$4,126,834,958**	**$3,714,151,462**	**$3,301,467,967**

Note: Rounding effects may be present.

Source: U.S. Bureau of Economic Analysis; U.S. Bureau of Labor Statistics; Alabama Department of Revenue; and Center for Business and Economic Research, The University of Alabama.

Conclusions

As noted earlier, upon completion the BNB will provide many benefits that will lead to economic development opportunities by stimulating additional development, especially of sites, infrastructure, and amenities. Its expansion of the transportation network will benefit all users (freight, commercial, and passenger vehicles) directly and indirectly. The boost to development yields additional jobs, income, and tax revenues that are presented in this report. Even the most conservative scenario of the nine scenarios presented makes a compelling case for building the BNB and also for Jefferson County (and perhaps the other counties and municipalities in the Birmingham-Hoover metropolitan area) to consider investment in its construction. The analysis demonstrates that the BNB has the potential to increase income, reduce poverty rates, and have economic and fiscal benefits that spill over from the corridor to Jefferson County, the Birmingham-Hoover metro area, and the State of Alabama.

Appendix

Methodology: Economic Impact Analysis

The economic and fiscal impacts presented in this report are determined using a model that combines an Alabama-specific economic structure and fiscal component with multipliers from the Regional Input-Output Modeling System (RIMS II), an input-output model developed and maintained by the U.S. Department of Commerce's Bureau of Economic Analysis (BEA). Also incorporated in the model are consumer expenditure data from the U.S. Bureau of Labor Statistics (BLS) and tax data from the Alabama Department of Revenue (ADOR). The economic impacts focus on output, value-added, earnings (wages and salaries), and employment. Output refers to total or gross business sales and contains value-added, which is the contribution to GDP, or the value of goods and services produced on a value-added basis. Earnings impacts are part of value-added and are the wages and salaries of the workers recognized by the employment impact. It is important to note that earnings impact can in some cases be larger than the value-added impact, especially when large amounts of imports are used or in assembly operations with few area suppliers. Because of the nature of this study, multipliers for the households sector shown below are most appropriate and used for the analysis. All multipliers change with economic structure, time, and geographic definition.

Multipliers -- Households	Alabama	Birmingham-Hoover MSA	Jefferson County
Final Demand Output	1.1033	1.1762	1.0400
Final Demand Earnings	0.3337	0.3459	0.2288
Final Demand Employment (jobs/per $million)	10	11	7
Final Demand Value-added (GDP)	0.6281	0.7067	0.6270

Source: U.S. Bureau of Economic Analysis.

The output, value-added, earnings, and employment multipliers are defined as follows. Output multipliers represent the total dollar change in output that occurs in all industries for each additional dollar of output delivered to final demand (final consumption) by the activity or industry under study. Value-added multipliers are similarly defined except that they represent the total dollar change in value-added across all industries. Earnings multipliers represent the total dollar change in earnings of households employed by all industries for each additional dollar of payroll expenditure (or each dollar of output delivered to final demand) by the activity or industry whose economic impact is being estimated. Employment multipliers represent the total change in the number of jobs in all industries for each direct job (or for each million dollars of output delivered to final demand) by the activity or industry whose economic impact is being estimated. Construction phase employment impact refers to the total one-time number of jobs over the entire construction period and are thus job-years, unlike the annual post-build use phase employment impact which are ongoing jobs per year. The distinction is demonstrated with the following example: 10 jobs per year for three (3) years equals 30 job-years.

The fiscal impacts are conservative because they are derived from earnings impacts and cover just income, sales, and property taxes; fees and taxes not considered include utility taxes, building permit fees, driver license and auto registration fees, and taxes on rental/leasing, insurance premiums, and lodgings. Fiscal impacts are derived from the relationships between personal income and component

tax collections allowing for the fact that not all spending is sales or income taxable. Spending on sales taxable items constitute 42.4 percent of income, based on BLS consumer expenditure data. Sales tax rates used are 4.0 percent for the state and 5.0 percent for local (combined county and city) jurisdictions statewide; local sales tax rates vary between 3.0 to 7.0 percent but are usually at 5.0 percent. Property taxes are determined using assessment and millage rates published by the Alabama Department of Revenue as well as the ratio of state property tax receipts to state individual income tax receipts.

Economic impact analysis measures the effects of a specific economic activity or event on a specified geographic area. Examples include the economic impact on an area (e.g., state or county) of a proposed interstate highway or industrial plant, an existing industry, closing a military installation, or expanding an existing industrial facility. Federal laws and state and local regulations sometimes require economic impact studies prior to the implementation of a particular policy (relocation of an economic activity, change in tax policy, changes in zoning ordinance, providing incentives, etc.). Impact studies are designed to provide information for instituting policies to facilitate positive economic impacts and/or mitigate potential negative impacts. Economic impact analysis is therefore an important decision-making tool which can enhance the quality of decisions made, as well as the decision-making process in both public and private sectors. The analysis typically focuses on one or more of the major economic indicators: output, value-added, employment, and income. The purpose of an impact study usually determines which socioeconomic variable(s) should be monitored. In this study, the primary focus is on all four major indicators and the consequent changes in selected taxes (income, property, and sales) from building the BNB.

Economic impacts comprise direct and indirect impacts. Direct impacts are those that are most obvious and include the wages and salaries of the employees who work directly for a firm or industry, as well as all other expenditures of the firm or industry, including taxes and distributed profits. Indirect economic impacts, often referred to as the "ripple" or "multiplier" effects, occur because of the additional demands arising from new income and expenditures for inputs and products related to the activity under study. New income creates demand for consumer products and services and their associated indirect impacts are often called induced impacts. Indirect and induced impacts may spark demand for the output of the firm, industry, or activity under study. For example, constructing the BNB creates direct and indirect effects on other industries through purchases of products and services for the main contractor's own use (e.g., subcontractor services and materials and equipment suppliers) and for its workers as consumers. These other industries and their workers in turn make purchases from other vendors in the state and the region, and so forth. To meet this additional demand, the other industries have to increase their production and sometimes payrolls with purchases of inputs that may also include the services of the contractors and subcontractors. All of this results in further development of the economy. The total economic impacts of the activity or organization being studied are the combined direct, indirect, and induced impacts. The ratio of the total economic impact to the direct effect is the multiplier that can be used to summarize the economic effects of the activity or organization on the geographic area(s) of focus.

Economic relationships do not obey strict geographic boundaries; workers and their incomes and industry purchases flow across these boundaries, enabled by transportation, communication, and other technology. Thus, a portion of the indirect effects of purchases/expenditures may occur beyond the boundaries of the specified region. Such occurrences are called *leakages*, as opposed to *linkages* (supplier-purchaser relationships) within the region. In general, a small geographic area will have a small *absolute* economic impact due to a high likelihood of leakage. A large region will have a

larger absolute economic impact, but a smaller *relative* economic impact of an individual firm, industry, or activity on that area. The closure of one plant within a state, for example, may have only a small relative impact even if the plant employs thousands of workers; the absolute impact could be very large. The important point is that the effect or size of the economic impact is influenced by the size of the study area. If the area is too broadly defined, the relative impact will be small. If narrowly defined, the relative impact will be large.

Several methodological approaches are used in estimating economic impacts. These include the construction of econometric, economic base, computable general equilibrium (CGE), and input-output (I-O) models. Econometric and CGE models can be very costly and time-consuming to build. Economic base models require a very detailed set of information that is sometimes not available. The other methodological approaches generate slightly smaller multipliers than I-O models because of assumptions on factors such as input substitution and optimization behavior by economic agents.

The I-O modeling framework is used in this study. The technique generates multipliers for the economic activity of interest by focusing on economic interactions among all industries and all other economic transactions in the specified region. Interindustry relationships exist in two directions: backward (suppliers and other upstream linkages and leakages), and forward (distributors, retailers, customers or users, and other downstream linkages and leakages). The number and strength of these backward and forward linkages and leakages determines the multiplier effects of the activity's industry. In general, products and services that require a small number of inputs and little additional processing (little value addition) will have smaller multiplier effects than complex products that require lots of inputs and extensive processing.

The nature of the product or service and technology largely determine the degree of interindustry linkages and leakages (and thus the overall impact), and the specific impact on a region depends upon the degree to which these interindustry relationships are localized. Technology determines inputs and economics determines the geographic source of supply and destination of products or services. Inputs purchased outside the economic impact study area constitute a leakage of potential impact—activities of local firms that have little or no economic impact—and provide opportunities for "localizing" such impact. Identifying leakage can provide valuable planning information for economic development. An activity's maximum impact on a specific area is obtained when all interindustry linkages occur within the area. A system-wide view is required because different firms and industries have different linkages. The I-O technique permits the incorporation of such system-wide perspectives.

For the purposes of this study, linkages between the households sector and all their suppliers and/or customers must be traced. This task is facilitated by BEA's RIMS II, which provides multipliers for every state, region, county, and metropolitan area in the nation. The RIMS II I-O model provides data on each industry that reflect the value of inputs used per dollar of output in the production of that industry's output, represented in a tabular format. For example, data for the construction industry show the value of each input per dollar of product produced (or service provided). Rows reflect output produced by specific industries using inputs (represented in columns) from other industries and thus a balance is compelled. I-O models are based on a table of transaction balances that ensures economy-wide accounting consistency. Total payments equal total receipts for each producing sector and aggregate final demand equals aggregate value added. Demand for a particular input causes supply from its source industry which in turn creates demand for the materials that are used to produce the particular input, and so on. The round-by-round effects converge, and I-O

methodology captures the total effect of the rounds of spending with the multiplier. RIMS II multipliers for an economy account for all linkages and leakages of that economy.

Multipliers are determined mathematically from I-O tables that are constructed from observed and reported data for the economic area of interest. The economy is divided into a number of producing industries that sell and purchase goods and services to and from each other creating *interindustry* flows that are key data. Sector goods and services are purchased by domestic consumers (households), international customers (exports), government (federal, state, and local), and for private investment purposes. These purchases are for direct use and termed *final demand*. For an economy with *n* sectors, if X_i represents total output for sector *i*, Y_i represents final demand for sector *i* products, and z_{ij} represents inter-industry flows (with *j* representing sectors as well), then

$$X_i = \sum_{j=1}^{n} z_{ij} + Y_i \qquad (1)$$

If a_{ij} represents the I-O technical coefficients where $a_{ij} = z_{ij} / X_j$ so that sectors use inputs in fixed proportions (the constant returns to scale Leontief production function), then the above equation becomes

$$X_i = \sum_{i=1}^{n} a_{ij} X_i + Y_i \qquad (2)$$

The standard formulation of the basic I-O model and its application, in matrix notation is:

Transactions balance: $X = AX + Y$ $\qquad$ (3)

Solving for X: $\qquad X = (I - A)^{-1} Y$ $\qquad$ (4)

For a change in Y: $\qquad \Delta X = (I - A)^{-1} \Delta Y$ $\qquad$ (5)

where X is the gross output column vector, A is the matrix of fixed I-O coefficients, Y is the final demand column vector, and I is the identity matrix. This model enables determination of the output given changes in final demand levels (consumption, investment, government, or net exports). The Leontief inverse, $(I - A)^{-1}$, provides the I-O multipliers used to determine impacts. The elements of the matrix are really very useful and important. Each captures in a single number, an entire series of direct and indirect effects. Gross output requirements are translatable into employment coefficients in a diagonal matrix that is used together with the Leontief inverse to generate employment impacts. Similar manipulations generate value-added and income or earnings multipliers.