# Appendix H – Market Street Study: Estimating the Economic Impact of the North Carolina Research Campus

# ESTIMATING THE ECONOMIC IMPACT OF THE NORTH CAROLINA RESEARCH CAMPUS

Kannapolis, North Carolina

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# EXECUTIVE SUMMARY

Competition to develop the next biotechnology cluster is intense, and winning will depend on several factors as well as a good deal of luck. In the city of Kannapolis, North Carolina, many factors are coming together to achieve that goal. The North Carolina Research Campus (NCRC) is being built in Kannapolis and will be dedicated to biotechnology research. Much more than just a research campus, the NCRC will be a mixed use development with a hotel, retail stores, civic center, residential housing, and a specialized secondary school for girls, in addition to world-class laboratory and research facilities.

The NCRC enjoys considerable private funding through the generosity of David Murdock, including an estimated $200 million venture capital fund and a one-of-a-kind 950 MHz nuclear magnetic resonance (NMR) spectrometer. The state-of-the-art facilities, the university research labs, the core lab, venture capital fund, and world-class equipment create a strong starting point for developing a biotechnology cluster. The combined commitment of major research universities (University of North Carolina-Chapel Hill, North Carolina State University, and Duke University) to this project is unprecedented.

With such potential, the city of Kannapolis recognized the need to plan for what could be significant growth. As part of that planning process, the city contracted with *Market Street Services* to conduct an economic impact assessment of the campus and its potential for developing a biotechnology cluster in the region. *Market Street Services* partnered with the *Economic Impact Group* (EIG) to conduct the study. This report contains the findings of that study along with the methods and data used to estimate the potential economic impact of the NCRC.

## Economic Impact Analysis

An economic impact analysis estimates the effects of change in economic activity brought about by a specific project or event. New investments affect the economy by creating jobs and new business activity as business expenditures and household disposable income flow through the local economy.

The results of economic impact analysis provide information on the jobs and income that the NCRC could potentially generate through its direct jobs, as well as through its indirect and induced impacts.

## Study Region

Every economic impact analysis is specific to a geographic area, whether one county, a multi-county region, a state, a group of states, or the nation. The same industry can be analyzed in all of these geographies and will produce a different impact in each.

This is because the economy in each region is different. Typically, as the region grows in size, it becomes larger, more diverse, and more complex, thus offering more opportunity for within-region purchasing and less leakage. In this study, the IMPLAN[1] model was run using a set of *direct* impacts that describe the NCRC in each of three regions—the NorthEast Medical Center (NEMC) service territory, a region containing Cabarrus and its five adjacent counties which we call the "study region," and the state of North Carolina.[2]

The Charlotte metropolitan area (MSA) is made up of Anson, Cabarrus, Gaston, Mecklenburg, and Union counties in North Carolina and York County, South Carolina and was initially considered for the study region. However, significant impacts are not likely to expand into counties in the MSA farthest from Cabarrus—Gaston and Anson counties in North Carolina and York County in South Carolina. Commuting pattern data from the 2000 Census show that only 1.3 percent of jobs in Cabarrus are held by commuters from any of these three counties. And for Cabarrus residents that commute to jobs, none commute to jobs in Anson County and less than half of a percent commute to jobs in either Gaston or York counties.

⇒ **Therefore, the study region for this report consists of Cabarrus County and the five counties adjacent to it – Iredell, Mecklenburg, Rowan, Stanly, and Union.**

## Determining Direct Impacts

Because the NCRC is under construction and therefore not yet in operation, the economic impact analysis must be based on estimates of direct impacts—that is, the jobs and payroll associated with all the job-generating activities at the campus. These include the research labs, private-sector biotechnology companies, retail space, hotel, and other facilities that hire people and pay wages.

Based on interviews with key individuals associated with the NCRC, the buildout schedule and construction data, other biotechnology centers, and secondary data on square-feet-per-job from a national survey of buildings, the project team was able to construct a table of direct impacts for the NCRC. Based on the buildout schedule, each component of the campus was assigned to a year corresponding to its first year of full operation. The research labs are scheduled to be built in stages beginning in 2007 and finishing in 2012. All other components were assumed to be built and open for full operation in a single year. Finally, total direct jobs and wages for each

[1] IMPLAN is an input-output model sold by the Minnesota Implan Group (MIG). The model has become an industry standard and is used extensively for this type of analysis throughout the United States.
[2] The NEMC region is composed of parts of Iredell and Mecklenburg counties; all of Cabarrus, Rowan, and Stanly counties; and one zip code in Union County, North Carolina. A 25-year demographic forecast, based on the economic impact assessment was conducted for each zip code in this region. Details of these results are in a previous report, "Demographic Impacts in the Northeast Medical Center Service Territory from the Economic Impact of the North Carolina Research Campus in Kannapolis, N.C."

component were estimated, assuming that each component would be fully occupied one year after construction is complete.

The NCRC has the potential to have agglomeration effects which result in new businesses in the region that locate there to take advantage of the output of the public and private research conducted on the campus. To estimate this impact, the project team examined existing biotechnology clusters with high location quotients (a measure of the concentration of an industry in an area).[3] It is assumed that, with the unusual strengths and resources of the NCRC, a biotechnology cluster in Cabarrus and Rowan counties has the potential to reach the 90th percentile nationally for small- and medium-sized MSAs, in terms of biotechnology employment concentration (location quotient). From this, a target location quotient for the region was estimated which in turn resulted in an estimate of total biotechnology jobs 20 years out from the completion of the NCRC. These agglomeration jobs were considered to consist of manufacturing firms in the *Drugs and Pharmaceuticals* industry.

Table E-1 shows the results of the direct jobs and income estimated for the NCRC and the agglomeration jobs. Each year shows the estimate of jobs and income added to the region, with agglomeration effects beginning in 2014. The last column shows 2032 as the end year, which is the 25-year study period after the first impact in 2008. Using these direct jobs, the IMPLAN model could then be used to estimate the total potential economic impact of the campus.

⇒ Jobs at the NCRC are estimated to reach 5,535 by the completion of the build-out in 2013. The NCRC biotech jobs are expected to attract an additional 9,291 biotech jobs to Cabarrus and Rowan Counties by 2032 due to agglomeration effects.

⇒ The result is 14,826 direct NCRC and agglomeration jobs by 2032, of which 13,980 are in biotechnology.

**Table E-1: Summary of Direct & Agglomeration Jobs and Income Added Annually, 2008-2032**

**(Income in Millions)**

| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014-2032 |
|---|---|---|---|---|---|---|---|
| Jobs | 2,219 | 1,143 | 639 | 546 | 494 | 494 | 489 |
| Income | $135 | $65 | $34 | $31 | $30 | $30 | $36 |

## Economic Impact Results

With the direct impacts estimated, a complete economic impact analysis could be performed. The IMPLAN model produces the *indirect* and *induced* impacts from each new "injection" of direct jobs from 2008 through 2013, and for the

[3] The IMPLAN model does not inherently predict agglomeration effects.
[5] Minnesota IMPLAN Group can be accessed at the following URL: www.implan.com

agglomeration jobs added each year from 2014 through 2032. The sum of direct, induced, and indirect impacts produces the estimate of total impacts.

All of the NCRC jobs occur in Kannapolis, but the agglomeration jobs were assumed to be located in both Cabarrus and Rowan counties. The induced and indirect jobs had to be allocated to counties in the study region because they will occur throughout the region. Place of residence for those holding direct, induced, and indirect jobs was then determined based on historical commuting patterns. Furthermore, it was assumed that the indirect and induced jobs would be phased in over a three-year period. From this distribution of jobs, households and population growth could be calculated as well.

All of these calculations and assumptions resulted in an estimate of jobs in each county of the study region, for years 1, 3, 5, 10, 15, 20, and 25, corresponding to 2008, 2010, 2012, 2017, 2022, 2027, and 2032, as shown in Table E-2.

**Table E-2: Cumulative Job Impacts with Phasing of Multiplier Impacts**

| Year | Cabarrus | Iredell | Mecklenburg | Rowan | Stanly | Union | Total |
|---|---|---|---|---|---|---|---|
| 2008 | 2,219 | 0 | 0 | 0 | 0 | 0 | 2,219 |
| 2010 | 4,111 | 105 | 912 | 73 | 30 | 49 | 5,280 |
| 2012 | 5,273 | 221 | 1,921 | 154 | 63 | 100 | 7,732 |
| 2017 | 7,348 | 490 | 4,289 | 1,004 | 140 | 175 | 13,445 |
| 2022 | 9,437 | 948 | 8,359 | 2,176 | 270 | 256 | 21,447 |
| 2027 | 11,526 | 1,406 | 12,428 | 3,348 | 401 | 338 | 29,448 |
| 2032 | 13,616 | 1,865 | 16,498 | 4,520 | 531 | 420 | 37,450 |

⇒ By 2032, the total impacts from NCRC are estimated to be 37,450 jobs in the study region, of which about one-third (13,616) will be in Cabarrus County. Total annual income associated with these jobs is estimated to be $2.1 billion.

⇒ At the state level, the total job impacts from NCRC are estimated to reach 49,422 jobs and $2.4 billion in annual personal income by 2032.

## Summary Impacts

The method of estimating the demographic impacts for the NEMC region were also applied to the study region to create county-level population and household estimates. The household estimates are based on the population figures and a constant ratio of population to households from the 2000 Census. It should be noted that population and household estimates are based on historic data that do not reflect future location decisions impacted by patterns of housing development.

Table E-3 summarizes the impacts of population, households, and jobs for each county in the study region. From these numbers, it is clear that the **NCRC has the potential to become a major economic engine for the region**.

⇒ NCRC jobs will result in population and household growth. By 2032, Cabarrus County could add about 26,000 new residents as a result of the NCRC and Rowan is estimated to add about 14,000 new residents.

**Table E-3: Cumulative Population, Household, and Job Change Estimates for the Study Region**

| | 2008 | 2010 | 2012 | 2017 | 2022 | 2027 | 2032 |
|---|---|---|---|---|---|---|---|
| **Cabarrus** | | | | | | | |
| Population | 2,614 | 5,080 | 6,827 | 10,693 | 15,246 | 20,705 | 26,324 |
| Households | 1,086 | 2,110 | 2,836 | 4,442 | 6,333 | 8,601 | 10,935 |
| Jobs | 2,219 | 4,111 | 5,273 | 7,348 | 9,437 | 11,526 | 13,616 |
| **Iredell** | | | | | | | |
| Population | 75 | 368 | 679 | 1,504 | 2,908 | 4,577 | 6,436 |
| Households | 33 | 161 | 297 | 659 | 1,273 | 2,004 | 2,818 |
| Jobs | 0 | 105 | 221 | 490 | 948 | 1,406 | 1,865 |
| **Mecklenburg** | | | | | | | |
| Population | 483 | 2,189 | 3,974 | 8,462 | 16,151 | 25,282 | 35,456 |
| Households | 217 | 981 | 1,781 | 3,792 | 7,238 | 11,329 | 15,889 |
| Jobs | 0 | 912 | 1,921 | 4,289 | 8,359 | 12,428 | 16,498 |
| **Rowan** | | | | | | | |
| Population | 609 | 1,287 | 1,812 | 3,949 | 6,903 | 10,385 | 14,161 |
| Households | 260 | 550 | 774 | 1,687 | 2,948 | 4,435 | 6,048 |
| Jobs | 0 | 73 | 154 | 1,004 | 2,176 | 3,348 | 4,520 |
| **Stanly** | | | | | | | |
| Population | 206 | 459 | 664 | 1,143 | 1,802 | 2,587 | 3,417 |
| Households | 91 | 204 | 294 | 507 | 799 | 1,147 | 1,515 |
| Jobs | 0 | 30 | 63 | 140 | 270 | 401 | 531 |
| **Union** | | | | | | | |
| Population | 43 | 254 | 479 | 985 | 1,781 | 2,728 | 3,777 |
| Households | 16 | 94 | 178 | 365 | 660 | 1,012 | 1,401 |
| Jobs | 0 | 49 | 100 | 175 | 256 | 338 | 420 |
| **Study Region** | | | | | | | |
| Population | 4,030 | 9,637 | 14,434 | 26,737 | 44,791 | 66,263 | 89,571 |
| Households | 1,703 | 4,100 | 6,160 | 11,452 | 19,251 | 28,528 | 38,606 |
| Jobs | 2,219 | 5,280 | 7,732 | 13,445 | 21,447 | 29,448 | 37,450 |

Cabarrus County currently has about 50,000 jobs and Rowan County about 42,000 jobs. The NCRC is expected to add another 13,616 jobs in Cabarrus and another 4,520 jobs in Rowan, by 2032. For the study region, total jobs are expected to rise by 37,450 in 2032. These are significant increases although they are estimated to take 25 years to occur.

Achieving this level of job creation and planning for the subsequent population change will take a coordinated effort by local governments and the economic

development community in the region. A concerted effort will be required to lure biotechnology companies to the region based on the assets of the NCRC and its potential to create world-class research in the life sciences. If that effort is successful, then these estimates of job and population growth will likely occur. Details on key issues that need to be addressed to plan for the NCRC and maximize its potential area discussed in a companion document, the *SWOT Analysis: Preparing for the North Carolina Research Campus*.

# SECTION 1: INTRODUCTION

The city of Kannapolis contracted with *Market Street Services* to conduct an economic impact analysis of the North Carolina Research Campus (NCRC) being built in Kannapolis, N.C. *Market Street Services*' partner, *Economic Impact Group* (EIG), conducted the economic impact study.

Competition to develop the next biotechnology cluster is intense and winning will depend on several factors as well as a good deal of luck. Fortunately, the NCRC enjoys considerable private funding through the generosity of David Murdock including an estimated $200 million venture capital fund and a one-of-a-kind 950 MHz nuclear magnetic resonance (NMR) spectrometer. The state-of-the-art facilities, the university research labs, the core lab, venture capital fund, and world-class equipment create a strong starting point for developing a biotechnology cluster. The combined commitment of major research universities (University of North Carolina-Chapel Hill, North Carolina State University, and Duke University) to this project is unprecedented.

The study design was focused on the economic impact of the NCRC on several different regions. These are (1) Cabarrus and the five counties contiguous to Cabarrus which comprise the study region; (2) the service territory of the NorthEast Medical Center (NEMC) which includes all of Cabarrus, Rowan, and Stanly counties, and sections of Iredell, Mecklenburg, and Union counties; and (3) the whole state of North Carolina. A baseline analysis was conducted for each geographic region that confined the impacts to the economic activities at the NCRC. An agglomeration analysis was included to estimate the economic impacts from a biotechnology cluster forming over a 20-year horizon, after completion of the NCRC.

A detailed demographic forecast by zip code was conducted for the NEMC region for their facility planning purposes based on the economic impacts of the NCRC in the region. This analysis was conducted first because of a tight deadline required by the NEMC and included a methodology for allocating the impacts to each county in the NEMC region. Thus, this analysis also provides the impact estimates for the Cabarrus/Rowan two-county region. The details of the NEMC service territory analysis are contained in an earlier report titled, "Demographic Impacts in the Northeast Medical Center Service Territory from the Economic Impact of the North Carolina Research Campus in Kannapolis, N.C."

The remainder of this report consists of the following sections. Section 2 contains a discussion of definitions, methods, and geography as background to understanding the results that follow. Section 3 presents the steps taken to define the characteristics of the NCRC that help in estimating the facility's *direct* impacts. Section 4 discusses the economic impact results from running IMPLAN for each region. And, Section 5

presents an overview of the economic, demographic, and growth trends of the study region with respect to growth patterns in the Charlotte MSA.

# SECTION 2: DEFINITIONS, METHODS, & GEOGRAPHY

The foundation of economic impact analysis is economic base theory which says that economic growth occurs when there is an increase in the flow of money into an area through the export of goods and services. The *direct* impact of that economic activity is commonly measured in terms of the number of jobs and amount of income the activity represents. However, the direct activity is just the beginning of total economic impact.

The money that flows into the region is used to purchase materials and/or labor used in the creation of the exported goods and services. Some of these are purchased locally, while others are purchased outside the region. To the extent that materials and/or labor are purchased locally, they represent an increase in local employment and income, and therefore, have additional economic impact beyond the direct impacts. To the extent that material and/or labor is purchased outside the region, it is said to have leaked out of the local economy and has no additional local economic impact. Inter-industry purchasing within the region represent the *indirect* impacts.

The third and final component of the economic impact is a result of the spending decisions by employees. Like the purchase of material inputs by firms, the employees spend some of their income locally and some leaks out of the region. Expenditures in the region generate an additional increase in local employment and income. These impacts represent the *induced* impact of the initial economic activity. The sum of all three impacts is referred to as the total impacts.

- **Direct impacts**: the revenue, payroll (income), and employment associated with the new economic activity in the region. For example, when a new business locates in an area, the employees it hires, the payroll it pays to these employees, and its annual sales are all direct impacts.
- **Indirect impacts**: increases in output (business revenues), employment, and payroll of businesses in the study region due to inter-industry purchases. The purchasing by the facility representing the direct impacts begins the rounds of supply-chain purchasing.
- **Induced impacts**: increases in output (business revenues), employment, and payroll of businesses in the study region due to employee expenditures. The spending by the direct employees begins the rounds of expenditures by all the increases in payroll.
- **Total impacts**: sum of the direct, indirect, and induced impacts. The ratio of "total" to "direct" yields the multiplier.

These terms are used throughout this report as the results of the analyses are presented. All three types of impacts will be shown as well as the multiplier for jobs and income. Output or business revenues is the third metric economic impact

models produce but total output from such an analysis inherently includes double counting and is not useful in gauging the true impact of a new business or group of businesses like the NCRC. Therefore, output will not be included in the impact tables.

The economic impact analysis in this study was conducted using the nationally recognized model, IMPLAN, from the Minnesota IMPLAN Group.[5] IMPLAN is an input-output model configurable for any multi-county region, state, or single county. However, sub-county area models cannot be created because of data limitations. Generally, economic impacts are greater the larger the geographic area because the economy contained in the region gets larger, offering more opportunities for inter-industry purchasing and less leakage from the regional economy. IMPLAN creates a national transaction matrix based on the National Bureau of Economic Analysis Benchmark Input-Output Model and uses annual data from other federal agencies to update its regional (state and county) databases.

## Geography Matters

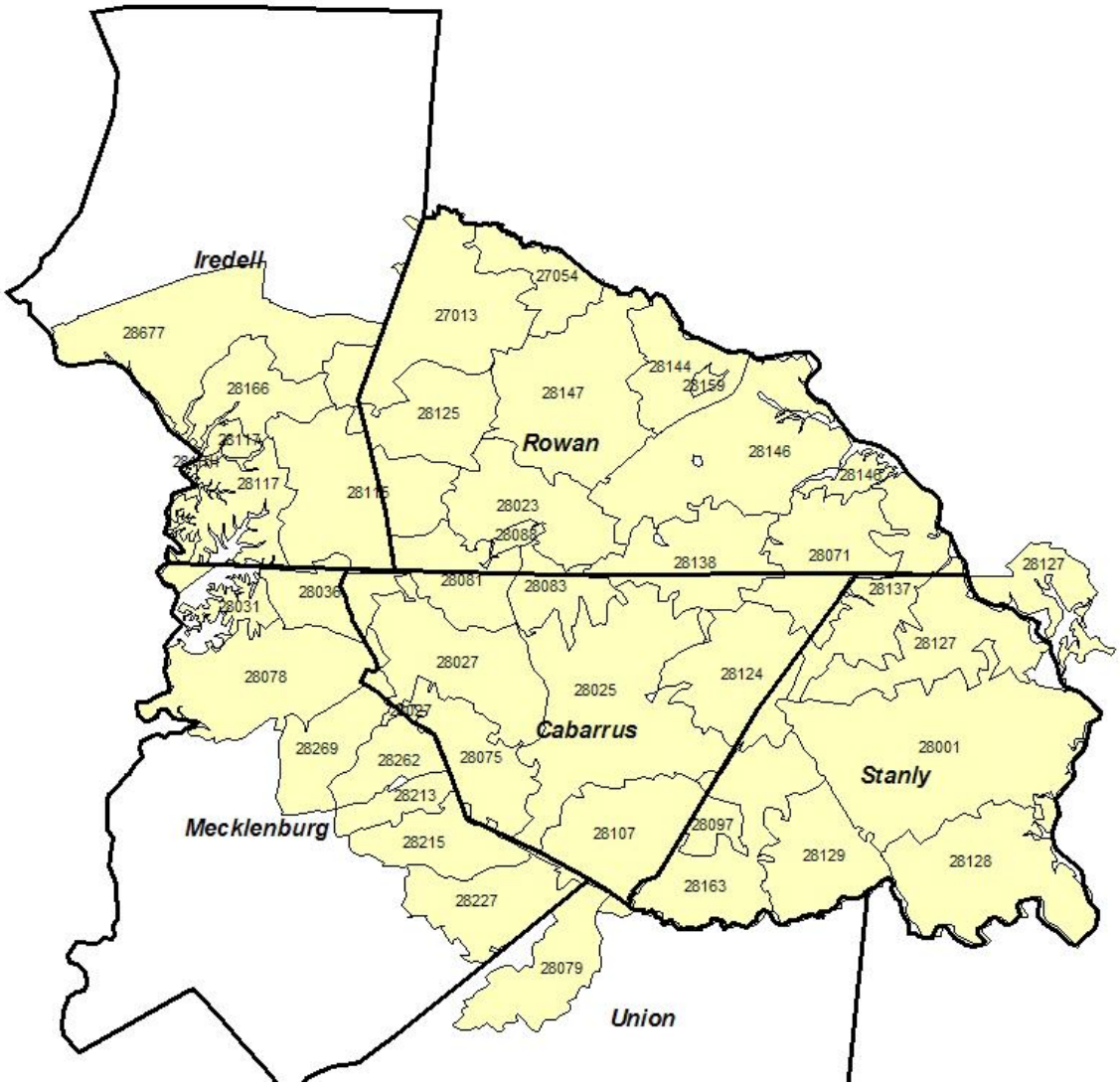
Every economic impact analysis is specific to a geographic area, whether one county, a multi-county region, a state, a group of states, or the nation. The same industry can be analyzed in all of these geographies and will produce a different impact in each. This is because the economy in each region is different. Typically, as the region grows in size, it becomes larger, more diverse, and more complex, thus offering more opportunity for within-region purchasing and less leakage. In this study, the IMPLAN model was run using a set of direct impacts that describe the NCRC in each of three regions—the NorthEast Medical Center (NEMC) service territory, a region containing Cabarrus and its five adjacent counties which we call the "study region," and the whole of North Carolina.

NEMC Region

The NEMC region is composed of parts of Iredell and Mecklenburg counties; all of Cabarrus, Rowan, and Stanly counties; and one zip code in Union County, North Carolina. Figure 1 shows a map of the NEMC region. These zip codes differ from the list received from the NEMC by eliminating post office boxes. Only "geographic" zip codes, that is, those that describe geographic areas, are included in this analysis.

Because the impact model has to consist of whole counties, the *impact region* contained all of Mecklenburg and all of Iredell counties. The one zip code in Union county was too small to warrant inclusion of Union County in the impact region. Therefore, demographic impacts for zip code 28079 in Union County result from commuting patterns and not directly from the economic impacts. Given that only a subset of zip codes in Mecklenburg and Iredell counties are included in the NEMC region, the impacts derived from the entire impact region had to be reduced.

**Figure 1: NEMC Service Territory**




Study Region

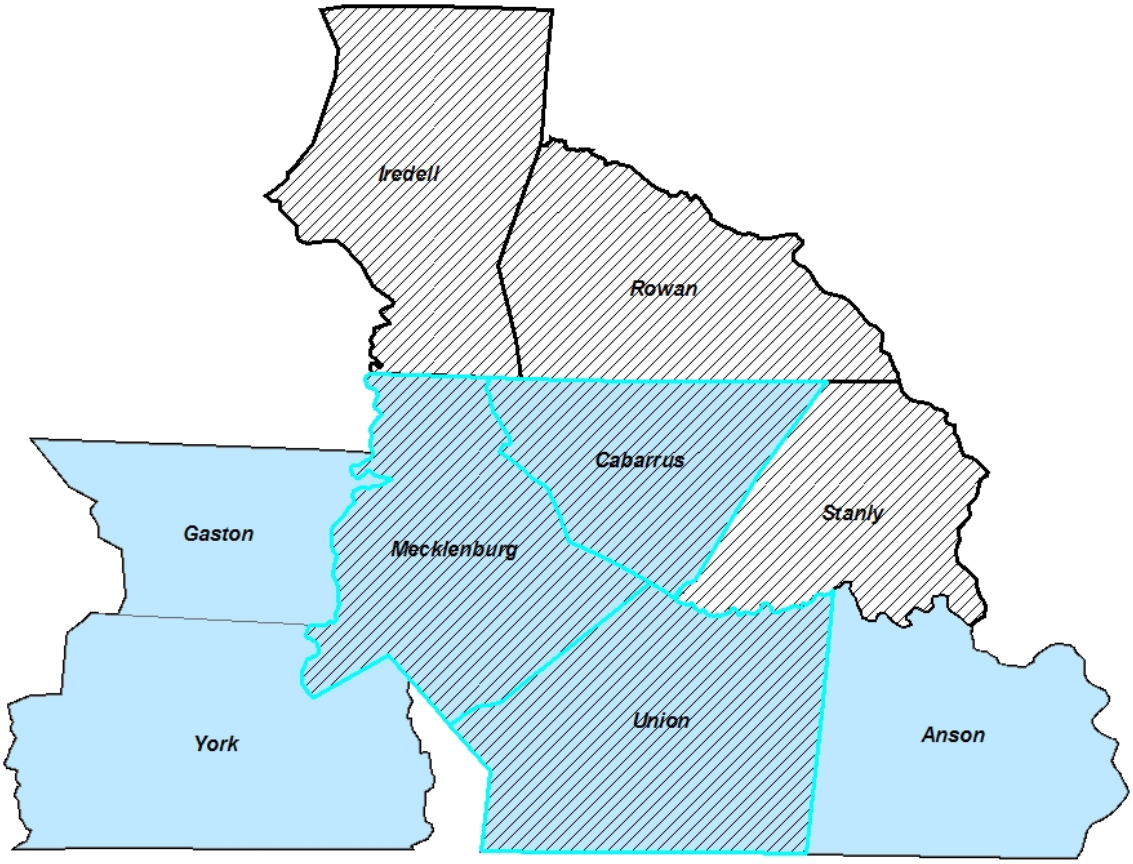
The Charlotte metropolitan area (MSA) includes Anson, Cabarrus, Gaston, Mecklenburg, and Union counties in North Carolina and York County, South Carolina. Figure 2 shows a map of this region. Because the region consists of whole counties, it was not necessary to adjust the impact results for this region to encompass parts of counties as happened with the NEMC region.

Although economic impacts were estimated for the MSA per the contract's work statement, these impacts are of little help in understanding how the NCRC will impact its neighbors. For that, the five counties contiguous to Cabarrus plus Cabarrus County make more sense as a study region. Significant impacts are not

likely to expand beyond this region into the remaining counties in the MSA—Gaston and Anson counties in North Carolina and York County in South Carolina. Commuting pattern data from the 2000 Census show that only 1.3 percent of jobs in Cabarrus are held by commuters from any of these three counties.[6] And for Cabarrus residents that commute to jobs, none commute to jobs in Anson County and less than half of a percent commute to jobs in either Gaston or York counties.

For these reasons, the project team decided on a study region comprising Cabarrus and its five adjacent counties, three of which are included in the Charlotte MSA. In Figure 2 below, the counties shaded blue make up the Charlotte MSA, and counties with the cross-hatch pattern comprise the study region. Results for the study region are also shown for each county within the study region, so that impacts on Cabarrus and Rowan can be seen.

**Figure 2: MSA Region and Study Region Combined**




[6] However, it should be noted that any significant development patterns or economic changes (such as the relocation of the Lowes headquarters to Mooresville in Iredell County) can affect commuting patterns and resulting economic relationships between counties.

# SECTION 3: DIRECT IMPACTS OF THE NCRC

Because the NCRC is under construction and therefore not yet in operation, the economic impact analysis must be based on estimates of direct impacts—that is, the jobs and payroll associated with all the job-generating activities at the campus. These include the research labs, private-sector biotechnology companies, retail space, hotel, and other facilities that hire people and pay wages.

The project team contacted various people associated with components of the NCRC project to obtain estimates of the jobs and payroll each expected for their particular component. This was only partially successful because most individuals could not provide detailed estimates of jobs and payroll. Instead, the team obtained a recent national survey of a large number of facilities that matched the types proposed for the NCRC. This database contained square foot estimates along with existing jobs for the space. From this, ratios of square-feet-to-jobs were estimated.

The team also obtained the build-out schedule of the NCRC showing each component of the campus along with its projected square footage and estimated year of occupancy. These data along with the survey estimates of jobs per square foot were used to derive estimates of the number of jobs that would be required for each component of the NCRC. These estimates implicitly assume that each component – laboratory, retail business, medical center, or theater – will be fully occupied one year after the build-out schedule indicates each component will be completed and ready for occupancy.

Initial estimates of the number of biotech research jobs published in articles about the NCRC claimed a total of 5,000 such jobs as the potential for the campus. Given the importance of this estimate, the research team made an effort to estimate a square-foot-per-job ratio from calling established, similar facilities. Estimates were obtained from the Scripps Institute in California and in Florida, the Piedmont Triad Research Park in North Carolina, the Colorado Biosciences Park in Colorado, and the Research Triangle Park in North Carolina. The square-foot-per-job ratios from these sources ranged from a low of 256 to a high of 1,000, but most estimates were in the 300 to 400 range. Given the amount of square footage planned for the university labs, the core lab, and the private-sector companies planners hope to recruit to the campus, a figure of 5,000 jobs results in a square-foot-per-job ratio of 322. The research team was unable to document the 5,000 jobs figure, so it was decided to use the ratio figure for the Scripps Institute in California as it appears to be similar to what the NCRC aspires to be and it has been established for a long period of time. That figure is 343 square-feet-per-job which results in a job estimate of 4,689 at the NCRC.

The average wages and salaries for each component were obtained from the IMPLAN model for the region. Every industry in the IMPLAN model contains regional

information on jobs, payroll, and output. Therefore, it is possible to look up average wages and salaries for any industry in the region. For the medical office building that will house the NEMC facility (and the Cabarrus Family Medicine and LabCorp operations), the average wage was estimated from data received from the NEMC. And, for the research lab jobs, a 2004 figure of the average wages for the *Research, Testing, and Medical Labs* bioscience sector in North Carolina was used[7].

Table 1 contains all of the direct impacts for the NCRC by component and by year of occupancy based on the build-out schedule. The direct impacts in each year, starting with 2008, were put into IMPLAN to estimate the economic impact from these direct jobs and wages at the NCRC facilities.

[7] This figure came from the Biotechnology Industry Organization report "Growing the Nation's Bioscience Sector: State Bioscience Initiatives 2006," prepared by Battelle Technology Partnership Practice and SSTI, April 2006.

**Table 1: Direct Impacts for the NCRC Economic Impact Analysis**

| | New in 2008 | New in 2009 | New in 2010 | New in 2011 | New in 2012 | New in 2013 | Build-out Total | Total Income |
|---|---|---|---|---|---|---|---|---|
| Research Labs | 2,219 | 494 | 494 | 494 | 494 | 494 | 4,689 | $284,823,927 |
| *Average wage* | *$60,743* | *$60,743* | *$60,743* | *$60,743* | *$60,743* | *$60,743* | *$60,743* | |
| Greenhouses | | 10 | | | | | 10 | $529,350 |
| *Average wage* | | *$52,935* | | | | | *$52,935* | |
| Medical offices | | 528 | | | | | 528 | $30,381,120 |
| *Average wage* | | *$57,540* | | | | | *$57,540* | |
| Hotel | | 52 | | | | | 52 | $1,235,364 |
| *Average wage* | | *$23,757* | | | | | *$23,757* | |
| Theater | | | 16 | | | | 16 | $323,632 |
| *Average wage* | | | *$20,227* | | | | *$20,227* | |
| Daycare Center | | 9 | | | | | 9 | $126,396 |
| *Average wage* | | *$14,044* | | | | | *$14,044* | |
| Wellness Center | | 50 | | | | | 50 | $2,392,000 |
| *Average wage* | | *$47,840* | | | | | *$47,840* | |
| General Retail | | | 53[8] | | | | 53 | $1,230,236 |
| *Average wage* | | | *$23,212* | | | | *$23,212* | |
| Community College | | | 59 | | | | 59 | $1,646,336 |
| *Average wage* | | | *$27,904* | | | | *$27,904* | |
| Girls High School | | | | 52 | | | 52 | $1,434,524 |
| *Average wage* | | | | *$27,587* | | | *$27,587* | |
| Civic Building | | | 17 | | | | 17 | $578,782 |
| *Average wage* | | | *$34,046* | | | | *$34,046* | |
| **Total Direct** | **2,219** | **1,143** | **639** | **546** | **494** | **494** | **5,535** | **$324,701,667** |
| ***Average wage*** | | | | | | | ***$58,663*** | |

## NCRC Agglomeration/Cluster Potential

Since Michael Porter[9] began writing about industry competitiveness and clustering and how important it is in understanding how regional economies work, local economic development agencies and chambers of commerce have strived to create clusters in their own local economies. The industry cluster concept has been known

[8] The actual number of retail jobs at NCRC is estimated to be 198. For the impact analysis, the direct number of retail jobs was reduced to 53, which reflects the retail "margin", or the portion that has true local economic impact (assuming that all goods sold in NCRC retail establishments are produced outside of the region).

[9] Currently runs the Institute for Strategy and Competitiveness at Harvard University.

for a long time by economists as industry agglomeration and one of its oldest examples is the automobile industry in and around Detroit, Michigan.

Biotechnology industry clustering or agglomeration is something the creators of the NCRC are hoping will occur in and around Cabarrus and Rowan counties. The NCRC's equipment, researchers, venture capital fund, and numerous bioscience technology companies could make this happen. In this study, we have attempted to estimate what that might mean in terms of additional jobs over the 20 years following the completion of the NCRC. A working assumption for this estimation is that all agglomeration jobs will be off-campus and primarily consist of manufacturing in the *Drugs and Pharmaceuticals* industry.

To place a reasonable estimate on the number of jobs created in the Cabarrus-Rowan County area due to the agglomeration effect of firms attracted by the other firms and resources available at the NCRC is a difficult task. Many cities and regions in the nation are trying to become biotech or life sciences "hot spots" and are building research parks or similar facilities to encourage such development. Some attempts have been very successful, some have not, and some places have become biotechnology clusters without any policy initiatives by the local government to create such development. Thus, the forecasts of agglomeration effects associated with the NCRC should be taken as rough approximations which have much larger error bounds than do the estimated impacts of the NCRC project itself.

To estimate an approximate value of the agglomeration affect of the NCRC, location quotients[10] (LQ) for biotechnology were collected for a wide variety of U.S. cities and metropolitan statistical areas (MSA) recognized as biotechnology clusters.[11] Researchers focused on small and medium sized MSAs to approximate the Cabarrus-Rowan region.[12] A small MSA has under 75,000 jobs and a medium MSA has between 75,000 and 250,000 jobs. Together Cabarrus and Rowan County are currently at the low end of the medium MSA category with about 92,000 existing jobs.

A location quotient measures the ratio of local jobs in a particular sector relative to total local employment compared to the ratio of national jobs in that sector to total national employment. Thus, if a MSA has a location quotient equal to 2 it has twice as large a proportion of jobs in that sector as the national average. For the computation of location quotients, three sectors from the Battelle report were used to

[10] Location quotients are measures of industry concentration in a geographic region. A value greater than 1.0 indicates the industry is concentrated in the region and probably exports some of its product/service, a value of 1.0 means the region is meeting local demand, and a value less than 1.0 means that the region must import the product/service because of insufficient supply from the industry.
[11] LQs were obtained from the Battelle 2006 report cited above.
[12] See p. 19, 23, and 33 in the Battelle report for a list of MSAs with high LQs in biotech. (http://www.bio.org/local/battelle2006/main_report.pdf). Small and medium-size MSAs with high LQs in biotech sub-sectors include Idaho Falls, ID; Durham, NC; Morgantown, WV; Norwich-New London, CT; Decatur; IL; and Lakeland, FL.

define biotechnology: agricultural feedstock and chemicals; drug and pharmaceutical manufacturing; and research, testing, and medical laboratories. A fourth sector used by Battelle in its definition of biosciences in the United States is medical devices and equipment. However, according to the report, there is not a significant presence of this industry in North Carolina. The three selected bioscience sectors all have a significant presence in one or more MSAs in North Carolina.

The next step was to estimate how successful the Cabarrus-Rowan region would be at forming a biotechnology cluster around the NCRC. We chose to be optimistic due to the unusual strengths of the NCRC[13] and assumed that the cluster has the potential to reach the 90th percentile nationally for small- and medium-sized MSAs (meaning, it would be more successful than 90 percent of the MSAs in these size categories). The location quotient for the 90th percentile is 10.33 for small MSAs and 11.50 for medium MSAs. It was also assumed that agglomeration would begin in 2013 (after the space in the NCRC is filled according to the build-out schedule) and would take 20 years to reach complete fruition in the year 2033.

The following steps complete the process of estimating the annual new direct jobs attributed to agglomeration affects:

1. To use a location quotient statistic as the target for determining the potential number of agglomeration jobs, a forecast of total jobs in the two-county region had to be estimated for 2033. This was accomplished by forecasting population to 2033 based on Cabarrus and Rowan counties' 2000 to 2005 annual compound growth rate and then multiplying the result by the current ratio of jobs-to-population. The final calculation resulted in 159,478 jobs. This figure represents the denominator for the two-county location quotient.
2. Then, using the figure for total jobs in 2033 from step 1, the number of biotechnology jobs required to reach the location quotient targets was estimated. For a location quotient of 10.33 this calculation results in 13,610 biotechnology jobs and to reach a location quotient of 11.5 this calculation results in 15,303 jobs. The average of these two estimates is 14,457 which is the estimate of total biotechnology jobs in the two-county region in 2033.
3. From this is subtracted the biotechnology jobs attributed to the NCRC to arrive at the final estimate of agglomeration (or off-campus) biotechnology jobs attracted to the two-county area by the NCRC, 9,769. On an annual basis this adds 488.45 biotechnology jobs to the two-county region every year through 2033. (Total agglomeration jobs then add up to 9,780 over the 20-year period, when annual impacts are rounded to 489.)

These agglomeration jobs are split two-thirds to Cabarrus County and one-third to Rowan County based on an understanding of local growth patterns. In addition, these

[13] A large venture capital fund, state-of-the art facilities, collocation of major research universities, and one-of-a-kind equipment.

jobs are considered to be direct jobs in the drugs and pharmaceutical bioscience manufacturing sector and located off-campus. The regional average wage for these manufacturing jobs is $73,000. Table 2 shows a summary of the NCRC direct jobs and income for the years 2008 through 2013 from Table 1 along with the biotechnology jobs and income estimated from the agglomeration analysis for each year over the 19-year period 2014 through 2032, with 2032 being the end of the 25-year study period. The result is 14,826 direct NCRC and agglomeration jobs by 2032, of which 13,980 are in biotechnology.[14]

**Table 2: Summary of Direct & Agglomeration Jobs and Income Added Annually, 2008-2032**

**(Income in Millions)**

| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014-2032 |
|---|---|---|---|---|---|---|---|
| Jobs | 2,219 | 1,143 | 639 | 546 | 494 | 494 | 489 |
| Income | $135 | $65 | $34 | $31 | $30 | $30 | $36 |

[14] Total direct jobs through 2033 (26-year period) are estimated to be 15,315 direct NCRC and agglomeration jobs, of which 14,469 are in biotechnology.

# SECTION 4: ECONOMIC IMPACT OF THE NCRC

With the direct impacts completed, a complete economic impact analysis could be performed with the IMPLAN model. The model produces the indirect and induced impacts from each new "injection" of direct jobs from 2008 through 2013, and for the agglomeration jobs added each year from 2014 through 2032.[15] Although agglomeration impacts are expected to continue through 2033, the impact analysis focuses on the first 25 years from when impacts begin, or from 2008 to 2032.

## Allocating Jobs Throughout the Study Region

All direct jobs at the NCRC, by definition, are located in Cabarrus County and, therefore, do not have to be allocated to other counties. The agglomeration affect direct jobs were split between Cabarrus and Rowan counties because these jobs will all be located off campus and could land in either county. However, given the current level of development in each county, it was assumed that two-thirds of the agglomeration jobs would end up in Cabarrus and one-third in Rowan.

Table 3 shows the output from IMPLAN using 2008 as an example. Here, 2,219 direct biotechnology jobs generate another 537 indirect jobs and 981 induced jobs. The retail sector gets the most jobs among all the non-biotech industries. Accumulated jobs impacts for years 3, 5, 10, 15, 20, and 25 are shown in Appendix A.

Indirect and induced jobs, like those shown in Table 3, were allocated to each county in the region based on the mix and size of economic sectors in each county. Therefore, if a county currently has a large share of retail jobs, it would get a proportionately large share of retail jobs generated by induced and indirect impacts. In every year up to 2013, the induced jobs are greater than the indirect jobs, which is consistent with how the biotechnology industry impacts a regional economy. Like many other "industries of the mind," the biotechnology industry depends mostly on talented labor and less so on equipment (except for some unique equipment which can be very expensive but is very unlikely to be supplied from within the region because the industry is just beginning). Therefore, employee spending of wages and salaries generates the most impact which is what induced impacts capture. In 2013 when the agglomeration jobs begin, the indirect jobs become greater than the induced jobs because manufacturing typically experiences more inter-industry purchasing.

[15] Agglomeration jobs are considered to be part of the "direct" impacts in the IMPLAN model.

**Table 3: Example of IMPLAN Economic Impact Output for Study Region - 2008**

| Industrial Sector | Direct | Indirect | Induced | Total |
|---|---|---|---|---|
| Ag, Forestry, Fish and Hunting | | 2 | 5 | 7 |
| Mining | | | | |
| Utilities | | 4 | 4 | 8 |
| Construction | | 30 | 7 | 37 |
| Manufacturing | | 50 | 33 | 83 |
| Wholesale Trade | | 21 | 35 | 55 |
| Transportation and Warehousing | | 33 | 27 | 60 |
| Retail Trade | | 18 | 245 | 264 |
| Information | | 13 | 10 | 23 |
| Finance and Insurance | | 14 | 35 | 49 |
| Real Estate and Rental | | 57 | 35 | 92 |
| Professional, Scientific, and Technical Services | 2,219 | 71 | 25 | 2,315 |
| Management of Companies | | 3 | 4 | 7 |
| Administrative and Waste Services | | 154 | 26 | 180 |
| Educational Services | | 0 | 29 | 29 |
| Health & Social Services | | 0 | 166 | 166 |
| Arts, Entertainment, and Recreation | | 7 | 37 | 44 |
| Accommodation and Food Services | | 26 | 135 | 161 |
| Other Services | | 27 | 114 | 142 |
| Government | | 6 | 8 | 14 |
| **Total** | **2,219** | **537** | **981** | **3,738** |

*Totals may not add due to rounding*

Based on commuting patterns from the 2000 census, workers will likely be distributed throughout the study region. Therefore, the induced impacts from expenditures of their income will also be disbursed throughout the region. Furthermore, any inter-industry purchasing (indirect impacts) was assumed to be distributed throughout the region based on the strength of each county's specific industry sectors. This results in most of the indirect and induced jobs going to Mecklenburg County (see Table 4).

Table 4 shows the results of allocating direct, indirect, and induced jobs to the counties in the study region. The indirect and induced jobs are assumed not to show up until one-year after the direct jobs are in place. Over the period 2008 through 2032, the direct jobs sum to 14,826, the indirect jobs sum to 13,879, and the induced jobs sum to 10,967 for a total job impact of 39,673. This results in a job multiplier of about 2.6, meaning that every NCRC and agglomeration job creates an additional 1.6 jobs in the study region. For Cabarrus County, 13,796 total jobs were estimated, primarily because of the direct jobs at the NCRC and the direct agglomeration jobs. The job multiplier for Cabarrus County is about 1.2 – smaller than the study region because its economy is smaller.

For the NEMC region, the results had to be reduced from the study region impacts in Table 4 because only portions of Mecklenburg and Iredell counties are included in the NEMC region. This was done using current population estimates for the zip codes in each county contained in the NEMC region relative to the whole county. Unfortunately, no employment-based, zip-code level data were available to perform

this allocation. Refer to the interim report for the NEMC demographic impacts for details.

**Table 4: Economic Impacts of the NCRC on the Study Region - Jobs**

**Direct Impacts with Agglomeration Estimates**

| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | | 2032 | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| Cabarrus | 2,219 | 1,143 | 639 | 546 | 494 | 494 | 328 | ..... | 328 | 11,760 |
| Iredell | 0 | 0 | 0 | 0 | 0 | 0 | 0 | ..... | 0 | 0 |
| Mecklenburg | 0 | 0 | 0 | 0 | 0 | 0 | 0 | ..... | 0 | 0 |
| Rowan | 0 | 0 | 0 | 0 | 0 | 0 | 161 | ..... | 161 | 3,066 |
| Stanly | 0 | 0 | 0 | 0 | 0 | 0 | 0 | ..... | 0 | 0 |
| Union | 0 | 0 | 0 | 0 | 0 | 0 | 0 | ..... | 0 | 0 |
| **Total** | **2,219** | **1,143** | **639** | **546** | **494** | **494** | **489** | ..... | **489** | **14,826** |

**Indirect Impacts**

| | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | | 2032 | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| Cabarrus | 38 | 22 | 10 | 9 | 8 | 8 | 47 | ..... | 47 | 982 |
| Iredell | 38 | 22 | 10 | 9 | 8 | 8 | 51 | ..... | 51 | 1,064 |
| Mecklenburg | 409 | 236 | 111 | 94 | 91 | 91 | 500 | ..... | 500 | 10,532 |
| Rowan | 26 | 16 | 7 | 6 | 6 | 6 | 45 | ..... | 45 | 921 |
| Stanly | 10 | 6 | 3 | 2 | 2 | 2 | 14 | ..... | 14 | 291 |
| Union | 17 | 4 | 5 | 4 | 4 | 4 | 3 | ..... | 3 | 89 |
| **Total** | **537** | **306** | **145** | **123** | **120** | **120** | **659** | ..... | **659** | **13,879** |

**Induced Impacts**

| | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | | 2032 | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| Cabarrus | 93 | 47 | 24 | 22 | 21 | 21 | 44 | ..... | 44 | 1,055 |
| Iredell | 87 | 43 | 22 | 20 | 19 | 19 | 41 | ..... | 41 | 984 |
| Mecklenburg | 671 | 335 | 169 | 156 | 149 | 149 | 314 | ..... | 314 | 7,594 |
| Rowan | 60 | 30 | 15 | 14 | 13 | 13 | 28 | ..... | 28 | 678 |
| Stanly | 26 | 13 | 7 | 6 | 6 | 6 | 12 | ..... | 12 | 292 |
| Union | 44 | 19 | 11 | 10 | 10 | 10 | 14 | ..... | 14 | 364 |
| **Total** | **981** | **487** | **248** | **228** | **218** | **218** | **452** | ..... | **452** | **10,967** |

**Total Impacts**

| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | | 2032 | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| Cabarrus | 2,219 | 1,274 | 708 | 580 | 524 | 523 | 357 | ..... | 418 | 13,796 |
| Iredell | 0 | 124 | 66 | 32 | 29 | 28 | 28 | ..... | 92 | 2,048 |
| Mecklenburg | 0 | 1,080 | 571 | 280 | 250 | 240 | 240 | ..... | 814 | 18,126 |
| Rowan | 0 | 86 | 46 | 22 | 20 | 19 | 181 | ..... | 234 | 4,666 |
| Stanly | 0 | 36 | 19 | 9 | 8 | 8 | 8 | ..... | 26 | 583 |
| Union | 0 | 61 | 23 | 16 | 15 | 14 | 14 | ..... | 16 | 453 |
| **Total** | **2,219** | **2,662** | **1,432** | **938** | **846** | **832** | **827** | ..... | **1,601** | **39,673** |

Table 5 shows total annual income generated by all the jobs shown in Table 4, for years 1, 3, 5, 10, 15, 20, and 25 (corresponding to 2008, 2010, 2012, 2017, 2022, 2027, and 2032). The last column shows the income multiplier in each year. The multiplier grows to a maximum of 2.1 because of the additional agglomeration jobs which have a higher income multiplier than the average of all jobs at the NCRC facility. Total annual income generated in the study region in the last year of the simulation is $2.1 billion.

**Table 5: Annual Income from Job Impacts - Study Region**
**(Millions)**

| Year | Direct | Indirect | Induced | Total | Multiplier |
|---|---|---|---|---|---|
| 2008 | $135 | $22 | $31 | $188 | 1.4 |
| 2010 | $233 | $40 | $54 | $328 | 1.4 |
| 2012 | $295 | $50 | $69 | $413 | 1.4 |
| 2017 | $467 | $195 | $133 | $795 | 1.7 |
| 2022 | $646 | $370 | $204 | $1,220 | 1.9 |
| 2027 | $824 | $545 | $276 | $1,645 | 2.0 |
| 2032 | $1,002 | $720 | $347 | $2,070 | 2.1 |

## Phasing in the Multiplier Impacts

Another limitation of economic impact models is that they don't provide a time path for the indirect and induced impacts. These generally take time to take effect as markets adjust to the infusion of economic activity represented by the direct impacts. Therefore, the indirect and induced impacts were assumed to be phased in over a three year period.[16] Also, it is assumed that the indirect and induced multiplier jobs do not begin to show up until 2009, one year after the first direct jobs in 2008. Phasing in these jobs extends the injection of new jobs beyond 2032 which is why the totals in year 2032 in Table 6 are less than the total jobs impact shown in Table 4.

[16] This assumption is based on experience with other, more sophisticated models. Using more years for the average adjustment to injections of new jobs, would push jobs further out on the timeline and move population impacts further into the future.

**Table 6: Cumulative Job Impacts with Phasing of Multiplier Impacts**

| Year | Cabarrus | Iredell | Mecklenburg | Rowan | Stanly | Union | Total |
|---|---|---|---|---|---|---|---|
| 2008 | 2,219 | 0 | 0 | 0 | 0 | 0 | 2,219 |
| 2009 | 3,405 | 41 | 356 | 28 | 12 | 20 | 3,863 |
| 2010 | 4,111 | 105 | 912 | 73 | 30 | 49 | 5,280 |
| 2011 | 4,735 | 179 | 1,555 | 125 | 51 | 82 | 6,726 |
| 2012 | 5,273 | 221 | 1,921 | 154 | 63 | 100 | 7,732 |
| 2013 | 5,798 | 250 | 2,177 | 174 | 72 | 114 | 8,586 |
| 2014 | 6,155 | 278 | 2,421 | 355 | 80 | 128 | 9,418 |
| 2015 | 6,532 | 327 | 2,850 | 553 | 94 | 143 | 10,500 |
| 2016 | 6,930 | 398 | 3,475 | 770 | 114 | 158 | 11,845 |
| 2017 | 7,348 | 490 | 4,289 | 1,004 | 140 | 175 | 13,445 |
| 2018 | 7,766 | 581 | 5,103 | 1,239 | 166 | 191 | 15,046 |
| 2019 | 8,184 | 673 | 5,917 | 1,473 | 192 | 207 | 16,646 |
| 2020 | 8,602 | 765 | 6,731 | 1,707 | 218 | 224 | 18,246 |
| 2021 | 9,019 | 856 | 7,545 | 1,942 | 244 | 240 | 19,847 |
| 2022 | 9,437 | 948 | 8,359 | 2,176 | 270 | 256 | 21,447 |
| 2023 | 9,855 | 1,040 | 9,173 | 2,411 | 297 | 273 | 23,047 |
| 2024 | 10,273 | 1,131 | 9,987 | 2,645 | 323 | 289 | 24,648 |
| 2025 | 10,691 | 1,223 | 10,801 | 2,879 | 349 | 306 | 26,248 |
| 2026 | 11,109 | 1,315 | 11,614 | 3,114 | 375 | 322 | 27,848 |
| 2027 | 11,526 | 1,406 | 12,428 | 3,348 | 401 | 338 | 29,448 |
| 2028 | 11,944 | 1,498 | 13,242 | 3,582 | 427 | 355 | 31,049 |
| 2029 | 12,362 | 1,590 | 14,056 | 3,817 | 453 | 371 | 32,649 |
| 2030 | 12,780 | 1,681 | 14,870 | 4,051 | 479 | 387 | 34,249 |
| 2031 | 13,198 | 1,773 | 15,684 | 4,285 | 505 | 404 | 35,850 |
| 2032 | 13,616 | 1,865 | 16,498 | 4,520 | 531 | 420 | 37,450 |

## Economic Impact on North Carolina

Another IMPLAN model was built for the entire state of North Carolina to estimate the impact of the NCRC on the state's economy. The direct impacts for this model would be the same as those for the study region with one minor exception. Of the 2,219 research/laboratory jobs in 2008, some are going to be state funded because of the presence of various university-based research labs such as the University of North Carolina-Chapel Hill's Institute for Excellence in Nutrition.

From the perspective of the study region, state-funded jobs and income represent "new" economic activity to the region, and were included in the direct impact for the study region. However, from a statewide perspective, state-funded jobs are not "new" economic activity. If the state takes money from its citizens in the form of taxes and gives it back in the form of income, it can not be considered new economic activity. Therefore, we adjusted the laboratory jobs in 2008 down to 1,708 from the initial

2,219 to adjust for this "re-circulation" of taxpayer money.[17] However, all the other direct impacts are the same as they were for the study region model (see Table 1) including the agglomeration jobs which begin in 2014.

As was the case with the study-region impacts, the estimates for years 10, 15, 20, and 25 include not only the baseline build-out of the NCRC, but also the agglomeration jobs that can be expected in the state as a result of the NCRC. The same detailed, industry-level impact tables provided for the study area can be found in Appendix A for the state analysis. Tables A-7 through A-12 in Appendix A show the state employment impact for years 3, 5, 10, 15, 20, and 25 and Table 7 summarizes the impact to state personal income for the same years. By 2032, the total impact of the NCRC in the state will be 49,422 jobs and over $2.4 billion in annual personal income (2006 dollars).

**Table 7: Annual Income from Job Impacts - North Carolina**
**(Millions)**

| Year | Direct | Indirect | Induced | Total | Multiplier |
|---|---|---|---|---|---|
| 2008 | $104 | $16 | $29 | $149 | 1.4 |
| 2010 | $202 | $33 | $57 | $292 | 1.4 |
| 2012 | $264 | $42 | $74 | $380 | 1.4 |
| 2017 | $436 | $242 | $163 | $841 | 1.9 |
| 2022 | $615 | $485 | $264 | $1,364 | 2.2 |
| 2027 | $793 | $728 | $365 | $1,887 | 2.4 |
| 2032 | $971 | $972 | $466 | $2,410 | 2.5 |

Because some of the research/laboratory jobs and income were eliminated for the state impact analysis, the impacts start out less than for the study region. However, as the agglomeration jobs enter in 2014, the larger economic region of the state begins to produce larger overall impacts which are reflected in the income impacts shown in Table 7 relative to the figures in Table 5.

[17] The 1,708 jobs were calculated using the square-foot-per-job figure (343) described in Section 3 and assuming that the wages of half of employees in the Duke, UNC-Chapel Hill, and NC State laboratories (350,000 square feet combined) would be paid for using state dollars.

# SECTION 5: GROWTH PATTERNS IN THE STUDY REGION

This section discusses the economic and demographic characteristics of the study region and its counties. Based on interviews with real estate firms, elected officials, business owners, and others, the findings in this section provide an overview of where the growth, especially household and public school enrollment, is most likely to occur in the study region.

## Population

Charlotte-Mecklenburg County is the county with the largest population in North Carolina. This population has grown from 695,454 at the 2000 Census to an estimated 796,372 in 2005. During this period, the fastest growing surrounding county has been Union, which grew from 123,675 in 2000 to 162,929 by 2005. Union County has spent most of the past decade in the top twenty on lists of the fastest growing counties in the U.S. During this same time span, the northern and northeastern counties of the Charlotte region have not grown as rapidly, with Cabarrus, Iredell, and Rowan counties adding about the same number of people as Union County, to a base that was more than three times as large. Rowan County's population has been virtually unchanged, creeping upward from 130,340 in 2000 to 135,099 in 2005. Iredell County added about 18,000 in the same period (from 122,660 to 140,924), while Cabarrus County added about 19,000 (going from 131,063 to 150,244). However, the trend of growth to the southeast dominating the outward march of the Charlotte-Gastonia-Concord MSA is about to change.

Even before the arrival of the North Carolina Research Campus (NCRC), the region's growth pattern was shifting. Traffic congestion and higher housing prices in Union County were creating considerable incentives for people to live and buy homes in Cabarrus, Iredell, and Rowan Counties. Planned road improvements that will ease the commute into Charlotte from the north also play into this changing pattern of population growth. At the time the NCRC was announced Cabarrus and Rowan counties already had well over 5,000 future single family homes either permitted or planned (the city of Kannapolis alone had about 4,000 units in the pipeline).[18] Cabarrus County has over 11,000 approved lots outside of the Kannapolis city limits (these are not necessarily planned for development, but no rezoning is needed to build on them). This shows that population growth was expected in the area regardless of the NCRC. Now, the NCRC is likely to increase the projected population growth rate for these three counties by approximately two-thirds, especially in Cabarrus and Rowan counties.

The NCRC will affect future population growth through two main impacts. First, the jobs created directly and indirectly by the NCRC will lead to many new residents of

[18] Source: City of Kannapolis, Rowan County, and Cabarrus County.

Cabarrus and Rowan Counties: roughly 8,600 new people by 2012 and just under 40,500 by 2032. This is about two-thirds more population growth than these counties likely would have experienced without the NCRC. Second, the announcement of the future investment in the NCRC has increased the attractiveness of the local real estate market. Since the closing of the mill, many people have been somewhat reluctant to buy real estate in and around Kannapolis. However, now people are eager to buy local real estate due to their expectations that prices will appreciate when the new jobs increase demand for local houses. This increase in the attractiveness of Cabarrus and Rowan real estate is occurring at the same time as the natural growth of the Charlotte suburbs is reaching the Kannapolis area. Together, these factors suggest a housing and population boom for Cabarrus and Rowan Counties (and to a lesser extent for Iredell). Thus, the presence of the NCRC and its associated growth will increase the residential growth in the surrounding counties by changing the perception of the area to one of a vibrant, growing, high-tech center.

## Income and Businesses

Charlotte-Mecklenburg County differs in its industry makeup from the other counties in the study region as Table 8 illustrates. In Charlotte-Mecklenburg County manufacturing is only about 7 percent of all jobs where in the other counties manufacturing is far higher, ranging from 13 percent in Cabarrus County to 25 percent in Stanly County. This is typical of an MSA where the core county has expanded its service sector and diminished the importance of manufacturing which has moved to the exurban counties. Of the other counties, they all have similar job distributions across industries. Manufacturing has the most jobs in all but Cabarrus County where retail edges out manufacturing with 16 percent of jobs.

**Table 8: Job Distribution by 2-Digit NAICS Industry - 2005**

| NAICS 2-Digit Industries | Cabarrus | Iredell | Mecklen-burg | Rowan | Stanly | Union | North Carolina |
|---|---|---|---|---|---|---|---|
| 11 Ag, Forestry, Fish & Hunting | 0.2% | 0.6% | 0.2% | 0.5% | 0.7% | 1.3% | 0.8% |
| 21 Mining | 0.1% | 0.0% | 0.0% | 0.5% | 0.1% | 0.0% | 0.1% |
| 22 Utilities | 0.2% | 0.2% | 0.4% | 0.5% | 0.3% | 0.3% | 0.4% |
| 23 Construction | 7.2% | 6.0% | 6.2% | 4.8% | 6.3% | 16.4% | 6.0% |
| 31-33 Manufacturing | 13.3% | 20.1% | 6.7% | 24.3% | 25.0% | 22.6% | 14.8% |
| 42 Wholesale Trade | 4.7% | 5.8% | 6.8% | 3.9% | 3.2% | 4.7% | 4.4% |
| 44-45 Retail trade | 15.8% | 13.8% | 10.4% | 9.5% | 11.6% | 9.6% | 11.7% |
| 48-49 Transportation & Warehousing | 2.6% | 3.9% | 5.8% | 6.7% | 0.9% | 2.4% | 3.5% |
| 51 Information | 1.0% | 0.6% | 4.6% | 0.6% | 0.3% | 0.6% | 2.0% |
| 52 Finance & insurance | 1.6% | 1.6% | 9.7% | 1.6% | 1.8% | 1.3% | 3.7% |
| 53 Real estate & rental | 1.0% | 0.9% | 1.9% | 0.6% | 0.6% | 0.8% | 1.3% |
| 54 Professional- scientific & tech svcs | 3.0% | 2.5% | 6.2% | 1.7% | 1.1% | 2.7% | 4.2% |
| 55 Management of companies | 1.9% | 0.6% | 3.8% | 3.5% | 0.7% | 0.2% | 1.6% |
| 56 Administrative & waste services | 5.7% | 4.8% | 7.8% | 2.9% | 2.9% | 5.4% | 5.9% |
| 61 Educational svcs | 7.4% | 7.7% | 5.3% | 8.7% | 10.7% | 10.1% | 8.9% |
| 62 Health & social services | 13.8% | 12.4% | 9.2% | 13.9% | 14.2% | 7.2% | 12.7% |
| 71 Arts- entertainment & recreation | 3.8% | 3.3% | 1.4% | 1.0% | 0.5% | 0.8% | 1.3% |
| 72 Accomodation & food services | 9.9% | 7.9% | 7.9% | 6.6% | 8.0% | 6.0% | 8.1% |
| 81 Other services | 2.5% | 3.1% | 2.9% | 2.7% | 3.0% | 2.6% | 2.6% |
| 92 Government & Unidentified NAICs | 4.1% | 3.8% | 2.9% | 5.3% | 8.0% | 4.8% | 6.0% |
| **Total Jobs in 2005** | 61,186 | 60,188 | 520,844 | 48,225 | 19,571 | 50,425 | 3,857,071 |

Source: The Employment Security Commission of North Carolina web site.

Information; finance and insurance; real estate and rental; professional, scientific, and technical services; and management of companies combined are a large percentage of jobs in Charlotte-Mecklenburg County at 26 percent (boosted by Charlotte's position as a national financial and banking center). Of the other five counties in the study region, Cabarrus has the next largest share of jobs in this combined category at 9 percent. The state average for this combined category is 13 percent. This is noteworthy because the professional, scientific, and technical services industry is where the biotechnology research/laboratory jobs at the NCRC will be classified. These jobs will boost Cabarrus County's share of this industry to a little over 10 percent from its current 3 percent (holding all other jobs at their 2005 levels).

Overall, these employment patterns show a job base with a healthy degree of diversity in the study region. Manufacturing is a strong sector, but the region is not overly-dependent on it although more so than the state average. Nearly 10 percent of jobs in

Mecklenburg County are in the finance and insurance sector, reflecting Charlotte's importance as a banking center (second only to New York City). The balance in the local economy has contributed to a very low unemployment rate. Cabarrus County has an unemployment rate of only 2.9 percent, Rowan 4.1 percent, Iredell 2.7 percent, and Mecklenburg 3.7 percent. All of these are below the national average and show essentially full employment. In turn, this leads to a pretty good picture of household income in the area.

The median family income from 1999 (the latest available at county level) is $53,692 in Cabarrus County, $44,242 in Rowan, $49,078 in Iredell, $60,608 in Mecklenburg, and $56,197 in Union (shown in the table below). These compare quite favorably to North Carolina's statewide median family income figure of $46,335, with only Rowan and Stanly counties trailing the state average and not by much. Looking at income distribution in these counties (again in 1999), we find it to be pretty even. Mecklenburg has the highest percentage of families with incomes over $100,000 per year (17.2%). Rowan and Stanly are on the low end of percentages for this high income class at 5.9 percent and 7.2 percent, respectively. On the low end of the income scale, Rowan also stands out somewhat with 23.9% of its families earning below $20,000 per year. Overall, these figures indicate solid income earning with good potential to support further retail growth as the area's population and employment base expand following construction of the NCRC.

**Table 9: Median Family Income Distribution - 1999**

| | Cabarrus | Iredell | Mecklen-burg | Rowan | Stanly | Union |
|---|---|---|---|---|---|---|
| Median family income | $53,692 | $49,078 | $60,608 | $44,242 | $43,596 | $56,197 |
| % families < $20,000 | 17.1% | 20.3% | 15.0% | 23.9% | 16.2% | 14.7% |
| % families > $100,000 | 11.4% | 9.2% | 17.2% | 5.9% | 7.2% | 13.6% |

## Commuting Patterns

To get a better picture of growth patterns in the region, current commuting patterns were studied using 2000 data from the U.S. Census Bureau (latest available). The data in Table 10 show very little cross-county commuting. The only significant commuting flows (above 10% of a county's workforce) are from Rowan and Mecklenburg to Cabarrus County, with the next highest being a 7 percent flow from Cabarrus to Rowan County. This data makes clear that people in this region tend to live and work in the same county (within county flows range from a low of 61% for Cabarrus to a high of 83% for Stanly). These data provide some information as to what to expect in housing growth patterns as new jobs locate in the Kannapolis area.

**Table 10: Commuting Patterns in the Study Region**

| From | To: Cabarrus | Iredell | Mecklenburg | Rowan | Stanly | Union |
|---|---|---|---|---|---|---|
| Cabarrus | 61.5% | 1.6% | 4.8% | 7.3% | 3.2% | 1.2% |
| Iredell | 1.6% | 76.0% | 2.0% | 3.5% | 0.4% | 0.5% |
| Mecklenburg | 11.8% | 5.0% | 69.3% | 2.3% | 2.4% | 10.7% |
| Rowan | 14.3% | 3.6% | 1.0% | 73.5% | 2.4% | 0.4% |
| Stanly | 4.5% | 0.2% | 0.7% | 1.4% | 83.0% | 1.4% |
| Union | 1.0% | 0.2% | 5.2% | 0.2% | 0.9% | 71.6% |
| In Region | 94.7% | 86.6% | 83.0% | 88.2% | 92.3% | 85.7% |
| Outside Region | 5.3% | 13.4% | 17.0% | 11.8% | 7.7% | 14.3% |

Source: United States Census Bureau, 2000.

## Future Growth Patterns

As discussed earlier in this section, Kannapolis had about 4,000 homes permitted or planned at the time the North Carolina Research Campus was announced. Some of the new people moving to the area due to employment related to the NCRC will buy some of those homes, but, in general, those homes were planned on the assumption of Charlotte-generated growth (that is, people who would be commuting to Charlotte/northern-Mecklenburg. With the addition of the NCRC, another 11,000 new residential units will likely be needed within commuting distance of the NCRC over the next ten years, 6,000 of which are likely to be somewhere in Rowan and Cabarrus Counties. This is in addition to any houses needed to satisfy new demand that is not associated with the growth in the biotech sector.

Projections of future residential growth patterns were formed from discussions with a number of real estate agents, developers, home builders, and area planners and confirmed by an onsite visit to the area. Current patterns of planned development in the area also help to form projections of the future growth.

Given where current residential development is already planned, future planned road improvements such as the Kannapolis Parkway and widening of Highway 73 to the west which will allow easier access to North Mecklenburg, most of the future residential growth is projected to occur in and around western and northwestern Kannapolis. More of the residential development will occur in Cabarrus County than in Rowan County because Cabarrus will get almost all of the new growth related to Charlotte's expansion. However, on a proportional basis, the change in growth will be greater in Rowan County because it has been almost stable in terms of population for the last 10 to 15 years. Thus, Rowan County might go from an annual population growth of less than 1 percent to a growth rate of 1.5 percent in the first few years of the NCRC hiring phase, while Cabarrus County will likely accelerate from its near 3 percent annual population growth to 4.5 to 5 percent growth during the first three years of operation of the NCRC.

Two areas that seem ripe for rapid residential growth are (1) the area west of Concord around Poplar Tent Road and (2) the west side of Kannapolis and just outside the city to the west. These areas have current development in the target price ranges for many of the new NCRC employees and plenty of room for more development. Both areas will also be able to offer easy commutes to North Mecklenburg, making them more attractive to two-job families.

Also, more cross-county commuting is expected between Cabarrus and Iredell due to the relocation of Lowe's Home Improvement headquarters to Mooresville in the southern part of Iredell County. About 11,000 jobs are expected at the headquarters at full employment. There are currently about 2,000 employees at the headquarters, many of whom are still commuting from the old headquarters in North Wilkesboro, over an hour away. It is likely that many will move closer to the new headquarters, creating greater housing demand in Iredell and nearby areas. Spillover residential growth is expected along the Highway 3 corridor between downtown Kannapolis and Mooresville.

Some growth (beyond what would occur anyway) is also likely to occur in the Huntersville-Cornelius-Davidson area near and around Lake Norman, but given the amount of land already developed there and the available supply of suitable land closer to the NCRC, only a small percentage of the residential demand is likely to go to these areas. Similarly, the university area on the north side of Charlotte will also likely receive some new residents connected to the NCRC, but not enough to be a noticeable increase in local demand.

As the suburbs of North Mecklenburg reach farther into Cabarrus and Iredell Counties and then into Rowan County, more urban-type residential development is likely to occur. This trend will be strengthened by the demand from those employed at the NCRC, many of whom are likely to be from urban areas and have more urban tastes. One clear outcome of these two housing demand drivers will be more *new urbanism* development. These neighborhoods, also called *new traditional* or *smart growth* development, will have higher residential densities, a mix of single family detached, townhouses, cluster houses, and multifamily residences, retail components mixed in, and many neighborhood amenities such as parks, trails, and common green areas. The Afton Village development on Poplar Tent Road (west of Concord) and the Kellswater Bridge development off Boy Scout Camp Road are examples of this type of development that is already in place in Cabarrus County. With the arrival of scientists at the NCRC, demand for similar developments will greatly increase. There will still be demand for traditional, larger-lot, single family houses, but the percentage of residences in Cabarrus, Rowan, and Iredell Counties that can be classified as new urbanism should greatly increase during the next ten years.

At least one-half of the new housing demand generated by the NCRC will be from families earning $60,000 per year or more, meaning they will mostly desire homes in the $180,000 to $300,000 range. Cabarrus, Rowan, and Iredell County offer

plenty of options within this range, although the lower end of the range is somewhat more prevalent at this time. To fill this demand and to meet demand from more senior scientists and administrators who are likely to be shopping in the $300,000 to $700,000 range, expect new neighborhoods in the $250,000 to $400,000 range to be especially common. There will be a smaller number of new developments to fill the demand for $500,000+ houses, such as the new development planned for the Kannapolis Country Club area. A completely new high-end golf community built somewhere in the Kannapolis area would not be surprising at all, along with some high-price, zero-maintenance neighborhoods where any yards around houses are completely maintained by a single contracted service which all residents pay for through monthly association dues.

New retail growth will also be triggered by the presence of the NCRC and the thousands of new mid- to high-income residents that come with it. Much of this new retail growth is likely to occur along I-85 in areas around the Cabarrus County-Rowan County line and along the new Kannapolis Parkway area to the west where many of the new homes will be built. Retail development will be a combination of standard strip centers and more elaborate and high-end lifestyle centers with department stores such as Macys as anchor tenants.

In summary, the new residential growth will be higher-priced on average than existing development (although not greatly), will bring an increase in the new urbanism development already starting to be seen in the area, and will be focused in the areas west, northwest, and north of the NCRC. The vast majority of the population growth from the opening of the NCRC will be in Cabarrus and Rowan Counties, followed by Iredell, and with only a small percentage choosing areas such as the university area of North Mecklenburg. This growth will be a noticeable increase from the already increasing residential growth that is arriving from Mecklenburg County now.

## School Impacts

Public schools are by far the most expensive local government service, so particular attention is paid in this report to the impact of the increased employment and population on the three local school systems. Cabarrus and Rowan Counties each have a county school system. Kannapolis City Schools is a separate public school system that handles about 45 percent of the students from inside the Kannapolis city limits and is jointly funded by the two counties.

Cabarrus County spends $1,734 per pupil from local funds for students in the county school system, Rowan County spends $1,591 per pupil, and the Kannapolis City School System spends $1,597 per pupil. These expenditures are supported essentially by revenues raised from county property taxes, so that is the revenue source that must increase to cover the projected increase in school expenditures that will occur with the influx of new students. Cabarrus County charges a tax rate of 62.89 cents

per $100 of assessed property value, while Rowan County charges a tax rate of 63 cents.

To use the tax rates and the school expenditures to analyze the impact on schools, the proportion of those taxes that go to the schools is needed. In Cabarrus County 51 percent of the property tax revenue goes to the schools (the calculation depends somewhat on the classification of some school debt payments); in Rowan County, 62 percent of property taxes are dedicated to schools.

Finally, the number of school children that will be added with the increase in employment and subsequent population growth has to be determined. The team's projections are for the two counties to add approximately 8,600 people in the next five years and about 40,500 people by 2032. A significant percentage of this increase in population will be children, with an estimated 2,300 new public school pupils enrolled between the three school systems by 2012, due to the NCRC. There are currently over 47,000 students in the three school districts, so this would be a 5 percent increase—noticeable, but not overwhelming, especially spread over five years.

To compute the fiscal impact on a per new pupil basis, the first step is to estimate the number of public school pupils per household. Using the demographic projections already constructed, the number of public schoolchildren in Rowan and Cabarrus counties is estimated to be 2,300 (1,830 in Cabarrus, 470 in Rowan, with some of each of those being in the Kannapolis City Schools). The number of new households associated with the NCRC in each county is estimated to be 3,000 in Cabarrus by 2012 and 695 in Rowan. That implies that Cabarrus will have 0.61 pupils per household, and Rowan will have 0.675.

The next step is to determine the amount of school spending per household. This is simply the expenditures per pupil times the pupils per household. For Cabarrus the figure is $1,058 per household, and for Rowan the value is $1,074. Next, using the percent of property tax revenue devoted to public school education and the county's tax rate, the amount of property needed to pay for one student can be computed. For Cabarrus, this value is $329,863. For Rowan, the value of property needed is $274,961.

What these values represent is the amount of assessed property value needed to pay for one new pupil in each county's school system. If the new families that move in to these counties due to the NCRC buy houses that have average assessed values equal to these dollar figures, the fiscal impact to the schools will be neutral (the new population will exactly pay its way for public education). Such a scenario is possible, although it is more likely that the average assessed value of the homes purchased will be somewhat, but not greatly less than, these figures. If the average new home price is lower than these values, the difference must be made up from another revenue source. The first such source is new business development that comes with the new population growth. New businesses will be built (shopping, restaurants, input

suppliers, etc.) in the vicinity to support the NCRC and to satisfy the new residents. All this development will generate school tax revenues and yet send no children to school.

With the associated business development and the reasonably high home prices that these relatively high-wage workers will be demanding, it is fairly likely that the fiscal impact on the schools will be neutral or only slightly negative. If the impact is negative after accounting for associated new business development, then the counties will be forced to raise new revenues to cover the shortfall. Overall, due to the high wages in the majority of the new employment and the correspondingly high-valued homes that can be expected to be purchased, the fiscal impact on the public schools in the area should be manageable.

# SECTION 6: SUMMARY

The NCRC has the potential to create thousands of new jobs, many in the biotechnology and life sciences industry, in study region comprising Cabarrus County and its five adjacent counties. This report has described the methods used to estimate a large array of data required for estimation of these job impacts. A nationally recognized economic impact model was used to expand the direct impacts – the jobs at the NCRC and the potential agglomeration jobs – and estimate what is normally referred to as the multiplier-effect jobs. Adding up all of these jobs provides the study's estimate of total new jobs in the region.

The analysis also estimated household and population impacts from the jobs expected in the region. This required a method to distribute the jobs throughout the region so that county-level estimates could be derived. Furthermore, the study had to distribute county-level estimates to zip codes within a sub-region of the study region which comprised the NorthEast Medical Center service territory. Must of this analysis was done using 2000 Census data. It should be noted that population and household estimates are based on historic data that do not reflect future location decisions impacted by patterns of housing development.

From the numbers in Table 10 below, it is clear that the NCRC has the potential to become a major economic engine for the region. All of these figures are in addition to any natural growth that would occur without the NCRC. For example, using recent population growth in Cabarrus County, its population could end up with about 306,000 people in 2032. The NCRC impact is estimated to add another 26,324 people to that total in 2032. In Rowan County, using its recent population growth, there could be as many as 163,000 people and from the NCRC impact, an additional 14,161 in 2032.

Cabarrus County currently has about 50,000 jobs and Rowan County about 42,000 jobs. The NCRC is expected to add another 13,616 jobs in Cabarrus and another 4,520 jobs in Rowan, by 2032. For the study region, total jobs are expected to rise by 37,450. These are significant increases although they are estimated to take 25 years to be realized.

Achieving this level of job creation and planning for the subsequent population change will take a coordinated effort by local governments and the economic development community in the region. A concerted effort will be required to lure biotechnology companies to the region based on the assets of the NCRC and its potential to create world-class research in the life sciences. If that effort is successful, then these estimates of job and population growth will likely occur. Details on key issues that need to be addressed to plan for the NCRC and maximize its potential area discussed in a companion document, the *SWOT Analysis: Preparing for the North Carolina Research Campus*.

**Table 10: Cumulative Population, Household, and Job Impact Estimates for the Study Region**

| | 2008 | 2010 | 2012 | 2017 | 2022 | 2027 | 2032 |
|---|---|---|---|---|---|---|---|
| **Cabarrus** | | | | | | | |
| Population | 2,614 | 5,080 | 6,827 | 10,693 | 15,246 | 20,705 | 26,324 |
| Households | 1,086 | 2,110 | 2,836 | 4,442 | 6,333 | 8,601 | 10,935 |
| Jobs | 2,219 | 4,111 | 5,273 | 7,348 | 9,437 | 11,526 | 13,616 |
| **Iredell** | | | | | | | |
| Population | 75 | 368 | 679 | 1,504 | 2,908 | 4,577 | 6,436 |
| Households | 33 | 161 | 297 | 659 | 1,273 | 2,004 | 2,818 |
| Jobs | 0 | 105 | 221 | 490 | 948 | 1,406 | 1,865 |
| **Mecklenburg** | | | | | | | |
| Population | 483 | 2,189 | 3,974 | 8,462 | 16,151 | 25,282 | 35,456 |
| Households | 217 | 981 | 1,781 | 3,792 | 7,238 | 11,329 | 15,889 |
| Jobs | 0 | 912 | 1,921 | 4,289 | 8,359 | 12,428 | 16,498 |
| **Rowan** | | | | | | | |
| Population | 609 | 1,287 | 1,812 | 3,949 | 6,903 | 10,385 | 14,161 |
| Households | 260 | 550 | 774 | 1,687 | 2,948 | 4,435 | 6,048 |
| Jobs | 0 | 73 | 154 | 1,004 | 2,176 | 3,348 | 4,520 |
| **Stanly** | | | | | | | |
| Population | 206 | 459 | 664 | 1,143 | 1,802 | 2,587 | 3,417 |
| Households | 91 | 204 | 294 | 507 | 799 | 1,147 | 1,515 |
| Jobs | 0 | 30 | 63 | 140 | 270 | 401 | 531 |
| **Union** | | | | | | | |
| Population | 43 | 254 | 479 | 985 | 1,781 | 2,728 | 3,777 |
| Households | 16 | 94 | 178 | 365 | 660 | 1,012 | 1,401 |
| Jobs | 0 | 49 | 100 | 175 | 256 | 338 | 420 |
| **Study Region** | | | | | | | |
| Population | 4,030 | 9,637 | 14,434 | 26,737 | 44,791 | 66,263 | 89,571 |
| Households | 1,703 | 4,100 | 6,160 | 11,452 | 19,251 | 28,528 | 38,606 |
| Jobs | 2,219 | 5,280 | 7,732 | 13,445 | 21,447 | 29,448 | 37,450 |

# APPENDIX A: DETAILED JOB IMPACTS BY NAICS INDUSTRY

**Table A-1: Year 3 NCRC Employment Impacts for the Study Region (2010)**

| Industrial Sector | Direct | Indirect | Induced | Total |
|---|---|---|---|---|
| Ag, Forestry, Fish and Hunting | 10 | 4 | 8 | 22 |
| Mining | | 0 | 0 | 0 |
| Utilities | | 6 | 6 | 12 |
| Construction | | 50 | 13 | 63 |
| Manufacturing | | 94 | 58 | 152 |
| Wholesale Trade | | 37 | 61 | 98 |
| Transportation and Warehousing | | 65 | 48 | 113 |
| Retail Trade | 53 | 33 | 429 | 515 |
| Information | 16 | 26 | 18 | 60 |
| Finance and Insurance | | 27 | 62 | 89 |
| Real Estate and Rental | | 108 | 61 | 169 |
| Professional, Scientific, and Technical Services | 3,207 | 125 | 44 | 3,376 |
| Management of Companies | | 8 | 7 | 15 |
| Administrative and Waste Services | 17 | 270 | 45 | 332 |
| Educational Services | 59 | 1 | 51 | 111 |
| Health & Social Services | 587 | 5 | 290 | 882 |
| Arts, Entertainment, and Recreation | | 14 | 65 | 79 |
| Accommodation and Food Services | 52 | 57 | 237 | 346 |
| Other Services | | 47 | 200 | 247 |
| Government | | 10 | 14 | 24 |
| **Total** | **4,001** | **987** | **1,717** | **6,705** |
| **Multiplier** | | | | **1.7** |

*Totals may not add due to rounding.*

## Table A-2: Year 5 NCRC Employment Impacts for the Study Region (2012)

| Industrial Sector | Direct | Indirect | Induced | Total |
|---|---|---|---|---|
| Ag, Forestry, Fish and Hunting | 10 | 5 | 11 | 26 |
| Mining | | 0 | 0 | 0 |
| Utilities | | 8 | 8 | 16 |
| Construction | | 65 | 16 | 81 |
| Manufacturing | | 116 | 73 | 189 |
| Wholesale Trade | | 47 | 76 | 123 |
| Transportation and Warehousing | | 80 | 60 | 140 |
| Retail Trade | 53 | 41 | 541 | 635 |
| Information | 16 | 32 | 23 | 71 |
| Finance and Insurance | | 33 | 78 | 111 |
| Real Estate and Rental | | 134 | 77 | 211 |
| Professional, Scientific, and Technical Services | 4,195 | 157 | 56 | 4,408 |
| Management of Companies | | 9 | 8 | 17 |
| Administrative and Waste Services | 17 | 339 | 57 | 413 |
| Educational Services | 111 | 1 | 64 | 176 |
| Health & Social Services | 587 | 5 | 366 | 958 |
| Arts, Entertainment, and Recreation | | 17 | 82 | 99 |
| Accommodation and Food Services | 52 | 69 | 298 | 419 |
| Other Services | | 59 | 252 | 311 |
| Government | | 13 | 18 | 31 |
| **Total** | **5,041** | **1,230** | **2,164** | **8,435** |
| **Multiplier** | | | | **1.7** |

*Totals may not add due to rounding.*

## Table A-3: Year 10 NCRC Employment Impacts for the Study Region (2017)

| Industrial Sector | Direct | Indirect | Induced | Total |
|---|---|---|---|---|
| Ag, Forestry, Fish and Hunting | 10 | 18 | 20 | 48 |
| Mining | | 1 | 0 | 1 |
| Utilities | | 25 | 16 | 41 |
| Construction | | 141 | 31 | 172 |
| Manufacturing | 1,956 | 524 | 141 | 2,621 |
| Wholesale Trade | | 488 | 148 | 636 |
| Transportation and Warehousing | | 436 | 117 | 553 |
| Retail Trade | 53 | 92 | 1,047 | 1,192 |
| Information | 16 | 140 | 45 | 201 |
| Finance and Insurance | | 103 | 150 | 253 |
| Real Estate and Rental | | 229 | 150 | 379 |
| Professional, Scientific, and Technical Services | 4,689 | 454 | 108 | 5,251 |
| Management of Companies | | 265 | 16 | 281 |
| Administrative and Waste Services | 17 | 529 | 111 | 657 |
| Educational Services | 111 | 36 | 124 | 271 |
| Health & Social Services | 587 | 5 | 708 | 1,300 |
| Arts, Entertainment, and Recreation | | 72 | 158 | 230 |
| Accommodation and Food Services | 52 | 206 | 578 | 836 |
| Other Services | | 173 | 489 | 662 |
| Government | | 28 | 35 | 63 |
| **Total** | **7,491** | **3,965** | **4,192** | **15,648** |
| **Multiplier** | | | | **2.1** |

*Totals may not add due to rounding.*

## Table A-4: Year 15 NCRC Employment Impacts for the Study Region (2022)

| Industrial Sector | Direct | Indirect | Induced | Total |
|---|---|---|---|---|
| Ag, Forestry, Fish and Hunting | 10 | 34 | 31 | 75 |
| Mining | | 1 | 0 | 1 |
| Utilities | | 45 | 24 | 69 |
| Construction | | 227 | 47 | 274 |
| Manufacturing | 4,401 | 1,020 | 217 | 5,638 |
| Wholesale Trade | | 1,034 | 228 | 1,262 |
| Transportation and Warehousing | | 872 | 179 | 1,051 |
| Retail Trade | 53 | 150 | 1,611 | 1,814 |
| Information | 16 | 271 | 69 | 356 |
| Finance and Insurance | | 187 | 231 | 418 |
| Real Estate and Rental | | 332 | 230 | 562 |
| Professional, Scientific, and Technical Services | 4,689 | 805 | 166 | 5,660 |
| Management of Companies | | 584 | 25 | 609 |
| Administrative and Waste Services | 17 | 724 | 170 | 911 |
| Educational Services | 111 | 80 | 191 | 382 |
| Health & Social Services | 587 | 5 | 1,090 | 1,682 |
| Arts, Entertainment, and Recreation | | 138 | 243 | 381 |
| Accommodation and Food Services | 52 | 370 | 889 | 1,311 |
| Other Services | | 309 | 752 | 1,061 |
| Government | | 45 | 54 | 99 |
| **Total** | **9,936** | **7,233** | **6,447** | **23,616** |
| **Multiplier** | | | | **2.4** |

*Totals may not add due to rounding.*

## Table A-5: Year 20 NCRC Employment Impacts for the Study Region (2027)

| Industrial Sector | Direct | Indirect | Induced | Total |
|---|---|---|---|---|
| Ag, Forestry, Fish and Hunting | 10 | 50 | 42 | 102 |
| Mining | | 2 | 0 | 2 |
| Utilities | | 65 | 33 | 98 |
| Construction | | 313 | 64 | 377 |
| Manufacturing | 6,846 | 1,516 | 293 | 8,655 |
| Wholesale Trade | | 1,579 | 307 | 1,886 |
| Transportation and Warehousing | | 1,308 | 242 | 1,550 |
| Retail Trade | 53 | 208 | 2,176 | 2,437 |
| Information | 16 | 402 | 93 | 511 |
| Finance and Insurance | | 271 | 312 | 583 |
| Real Estate and Rental | | 435 | 311 | 746 |
| Professional, Scientific, and Technical Services | 4,689 | 1,156 | 224 | 6,069 |
| Management of Companies | | 903 | 33 | 936 |
| Administrative and Waste Services | 17 | 919 | 230 | 1,166 |
| Educational Services | 111 | 124 | 258 | 493 |
| Health & Social Services | 587 | 5 | 1,472 | 2,064 |
| Arts, Entertainment, and Recreation | | 204 | 328 | 532 |
| Accommodation and Food Services | 52 | 534 | 1,201 | 1,787 |
| Other Services | | 444 | 1,016 | 1,460 |
| Government | | 61 | 72 | 133 |
| **Total** | **12,381** | **10,499** | **8,707** | **31,587** |
| **Multiplier** | | | | **2.6** |

*Totals may not add due to rounding.*

## Table A-6: Year 25 NCRC Employment Impacts for the Study Region (2032)

| Industrial Sector | Direct | Indirect | Induced | Total |
|---|---|---|---|---|
| Ag, Forestry, Fish and Hunting | 10 | 66 | 53 | 129 |
| Mining | | 2 | 0 | 2 |
| Utilities | | 84 | 41 | 125 |
| Construction | 9,291 | 2,012 | 369 | 11,672 |
| Manufacturing | | 2,125 | 387 | 2,512 |
| Wholesale Trade | | 1,744 | 305 | 2,049 |
| Transportation and Warehousing | 53 | 266 | 2,741 | 3,060 |
| Retail Trade | 16 | 533 | 117 | 666 |
| Information | | 355 | 393 | 748 |
| Finance and Insurance | | 538 | 391 | 929 |
| Real Estate and Rental | 4,689 | 1,507 | 282 | 6,478 |
| Professional, Scientific, and Technical Services | | 1,223 | 42 | 1,265 |
| Management of Companies | 17 | 1,113 | 290 | 1,420 |
| Administrative and Waste Services | 111 | 167 | 324 | 602 |
| Educational Services | 587 | 5 | 1,854 | 2,446 |
| Health & Social Services | | 270 | 414 | 684 |
| Arts, Entertainment, and Recreation | 52 | 698 | 1,513 | 2,263 |
| Accommodation and Food Services | | 579 | 1,280 | 1,859 |
| Other Services | | 78 | 91 | 169 |
| Government | | | | 0 |
| **Total** | **14,826** | **13,765** | **10,968** | **39,559** |
| **Multiplier** | | | | **2.7** |

*Totals may not add due to rounding.*

## Table A-7: Year 3 NCRC Employment Impacts for North Carolina (2010)

| Industrial Sector | Direct | Indirect | Induced | Total |
|---|---|---|---|---|
| Ag, Forestry, Fish and Hunting | 10 | 4 | 16 | 30 |
| Mining | | 1 | 1 | 2 |
| Utilities | | 6 | 7 | 13 |
| Construction | | 44 | 14 | 58 |
| Manufacturing | | 94 | 74 | 168 |
| Wholesale Trade | | 34 | 69 | 103 |
| Transportation and Warehousing | | 54 | 47 | 101 |
| Retail Trade | 53 | 27 | 428 | 508 |
| Information | 16 | 25 | 22 | 63 |
| Finance and Insurance | | 29 | 75 | 104 |
| Real Estate and Rental | | 99 | 74 | 173 |
| Professional, Scientific, and Technical Services | 2,696 | 123 | 55 | 2,874 |
| Management of Companies | | 7 | 8 | 15 |
| Administrative and Waste Services | 17 | 237 | 53 | 307 |
| Educational Services | 59 | 1 | 49 | 109 |
| Health & Social Services | 587 | 3 | 351 | 941 |
| Arts, Entertainment, and Recreation | | 11 | 60 | 71 |
| Accommodation and Food Services | 52 | 49 | 251 | 352 |
| Other Services | | 42 | 203 | 245 |
| Government | | 10 | 17 | 27 |
| **Total** | **3,490** | **900** | **1,874** | **6,264** |
| **Multiplier** | | | | **1.8** |

*Totals may not add due to rounding.*

## Table A-8: Year 5 NCRC Employment Impacts for the North Carolina (2012)

| Industrial Sector | Direct | Indirect | Induced | Total |
|---|---|---|---|---|
| Ag, Forestry, Fish and Hunting | 10 | 6 | 20 | 36 |
| Mining | | 1 | 1 | 2 |
| Utilities | | 8 | 10 | 18 |
| Construction | | 59 | 18 | 77 |
| Manufacturing | | 122 | 96 | 218 |
| Wholesale Trade | | 45 | 90 | 135 |
| Transportation and Warehousing | | 69 | 61 | 130 |
| Retail Trade | 53 | 35 | 557 | 645 |
| Information | 16 | 32 | 28 | 76 |
| Finance and Insurance | | 37 | 98 | 135 |
| Real Estate and Rental | | 127 | 96 | 223 |
| Professional, Scientific, and Technical Services | 3,684 | 161 | 72 | 3,917 |
| Management of Companies | | 9 | 11 | 20 |
| Administrative and Waste Services | 17 | 310 | 68 | 395 |
| Educational Services | 111 | 1 | 64 | 176 |
| Health & Social Services | 587 | 3 | 457 | 1,047 |
| Arts, Entertainment, and Recreation | | 14 | 78 | 92 |
| Accommodation and Food Services | 52 | 62 | 327 | 441 |
| Other Services | | 54 | 264 | 318 |
| Government | | 13 | 23 | 36 |
| **Total** | **4,530** | **1,168** | **2,439** | **8,137** |
| **Multiplier** | | | | **1.8** |

*Totals may not add due to rounding.*

## Table A-9: Year 10 NCRC Employment Impacts for the North Carolina (2017)

| Industrial Sector | Direct | Indirect | Induced | Total |
|---|---|---|---|---|
| Ag, Forestry, Fish and Hunting | 10 | 34 | 45 | 89 |
| Mining | | 6 | 2 | 8 |
| Utilities | | 29 | 21 | 50 |
| Construction | | 157 | 41 | 198 |
| Manufacturing | 1,956 | 932 | 212 | 3,100 |
| Wholesale Trade | | 606 | 198 | 804 |
| Transportation and Warehousing | | 533 | 135 | 668 |
| Retail Trade | 53 | 97 | 1,231 | 1,381 |
| Information | 16 | 178 | 62 | 256 |
| Finance and Insurance | | 145 | 216 | 361 |
| Real Estate and Rental | | 248 | 212 | 460 |
| Professional, Scientific, and Technical Services | 4,178 | 721 | 159 | 5,058 |
| Management of Companies | | 340 | 23 | 363 |
| Administrative and Waste Services | 17 | 554 | 151 | 722 |
| Educational Services | 111 | 45 | 141 | 297 |
| Health & Social Services | 587 | 4 | 1,010 | 1,601 |
| Arts, Entertainment, and Recreation | | 72 | 173 | 245 |
| Accommodation and Food Services | 52 | 234 | 721 | 1,007 |
| Other Services | | 205 | 583 | 788 |
| Government | | 35 | 50 | 85 |
| **Total** | **6,980** | **5,175** | **5,386** | **17,541** |
| **Multiplier** | | | | **2.5** |

*Totals may not add due to rounding.*

## Table A-10: Year 15 NCRC Employment Impacts for the North Carolina (2022)

| Industrial Sector | Direct | Indirect | Induced | Total |
|---|---|---|---|---|
| Ag, Forestry, Fish and Hunting | 10 | 68 | 73 | 151 |
| Mining | | 12 | 3 | 15 |
| Utilities | | 55 | 34 | 89 |
| Construction | | 271 | 66 | 337 |
| Manufacturing | 4,401 | 1,928 | 344 | 6,673 |
| Wholesale Trade | | 1,300 | 320 | 1,620 |
| Transportation and Warehousing | | 1,104 | 218 | 1,322 |
| Retail Trade | 53 | 168 | 1,993 | 2,214 |
| Information | 16 | 357 | 101 | 474 |
| Finance and Insurance | | 275 | 349 | 624 |
| Real Estate and Rental | | 382 | 344 | 726 |
| Professional, Scientific, and Technical Services | 4,178 | 1,398 | 258 | 5,834 |
| Management of Companies | | 753 | 38 | 791 |
| Administrative and Waste Services | 17 | 813 | 245 | 1,075 |
| Educational Services | 111 | 99 | 228 | 438 |
| Health & Social Services | 587 | 4 | 1,635 | 2,226 |
| Arts, Entertainment, and Recreation | | 143 | 281 | 424 |
| Accommodation and Food Services | 52 | 443 | 1,168 | 1,663 |
| Other Services | | 385 | 944 | 1,329 |
| Government | | 61 | 81 | 142 |
| **Total** | **9,425** | **10,019** | **8,723** | **28,167** |
| **Multiplier** | | | | **3.0** |

*Totals may not add due to rounding.*

## Table A-11: Year 20 NCRC Employment Impacts for the North Carolina (2027)

| Industrial Sector | Direct | Indirect | Induced | Total |
|---|---|---|---|---|
| Ag, Forestry, Fish and Hunting | 10 | 103 | 101 | 214 |
| Mining | | 18 | 4 | 22 |
| Utilities | | 81 | 48 | 129 |
| Construction | | 386 | 91 | 477 |
| Manufacturing | 6,846 | 2,923 | 475 | 10,244 |
| Wholesale Trade | | 1,995 | 443 | 2,438 |
| Transportation and Warehousing | | 1,675 | 302 | 1,977 |
| Retail Trade | 53 | 240 | 2,755 | 3,048 |
| Information | 16 | 536 | 139 | 691 |
| Finance and Insurance | | 405 | 483 | 888 |
| Real Estate and Rental | | 515 | 476 | 991 |
| Professional, Scientific, and Technical Services | 4,178 | 2,075 | 357 | 6,610 |
| Management of Companies | | 1,165 | 52 | 1,217 |
| Administrative and Waste Services | 17 | 1,073 | 338 | 1,428 |
| Educational Services | 111 | 153 | 315 | 579 |
| Health & Social Services | 587 | 4 | 2,260 | 2,851 |
| Arts, Entertainment, and Recreation | | 214 | 388 | 602 |
| Accommodation and Food Services | 52 | 651 | 1,615 | 2,318 |
| Other Services | | 565 | 1,306 | 1,871 |
| Government | | 87 | 112 | 199 |
| **Total** | **11,870** | **14,864** | **12,069** | **38,794** |
| **Multiplier** | | | | **3.3** |

*Totals may not add due to rounding.*

## Table A-12: Year 25 NCRC Employment Impacts for the North Carolina (2032)

| Industrial Sector | Direct | Indirect | Induced | Total |
|---|---|---|---|---|
| Ag, Forestry, Fish and Hunting | 10 | 137 | 129 | 276 |
| Mining | | 24 | 6 | 30 |
| Utilities | | 107 | 61 | 168 |
| Construction | | 500 | 117 | 617 |
| Manufacturing | 9,291 | 3,919 | 607 | 13,817 |
| Wholesale Trade | | 2,689 | 565 | 3,254 |
| Transportation and Warehousing | | 2,246 | 385 | 2,631 |
| Retail Trade | 53 | 311 | 3,518 | 3,882 |
| Information | 16 | 715 | 178 | 909 |
| Finance and Insurance | | 535 | 616 | 1,151 |
| Real Estate and Rental | | 649 | 607 | 1,256 |
| Professional, Scientific, and Technical Services | 4,178 | 2,752 | 455 | 7,385 |
| Management of Companies | | 1,578 | 67 | 1,645 |
| Administrative and Waste Services | 17 | 1,333 | 432 | 1,782 |
| Educational Services | 111 | 208 | 402 | 721 |
| Health & Social Services | 587 | 4 | 2,886 | 3,477 |
| Arts, Entertainment, and Recreation | | 285 | 495 | 780 |
| Accommodation and Food Services | 52 | 860 | 2,062 | 2,974 |
| Other Services | | 745 | 1,667 | 2,412 |
| Government | 0 | 112 | 143 | 255 |
| **Total** | **14,315** | **19,709** | **15,398** | **49,422** |
| **Multiplier** | | | | **3.5** |

*Totals may not add due to rounding.*

# APPENDIX B: REFERENCES

The Minnesota IMPLAN Group, www.implan.com

United States Census Bureau, 2000 census data tabulations.

The Employment Security Commission of North Carolina web site http://www.ncesc.com/

North Carolina State Center for Health Statistics, http://www.schs.state.nc.us/SCHS/data/vitalstats.cfm.