

Economic Impact of the Pennsylvania Biotechnology Center of Bucks County



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About this Study

I. Executive Summary

The **Pennsylvania Biotechnology Center of Bucks County** was established in 2006 by the Hepatitis B Foundation in partnership with Delaware Valley College. It was created to be a nonprofit research organization dedicated to the creation of a world-class biotechnology center; to the promotion of regional economic development and job creation; and to the education and training of tomorrow's researchers. The Pennsylvania Biotechnology Center of Bucks County (the Center) is truly unique with its wealth of resources and core group of nonprofit scientists and educators motivated to work collaboratively with their commercial colleagues on common research themes.

From the very beginning, the Center has been an economic driver that has increased jobs and revenues. In 2008, a report was published that examined its economic impact during the first three years, from 2006 through 2008, which was \$164 million. Since then, the Center has continued to be a strong contributor to both the economy of Bucks County and the Commonwealth of Pennsylvania.

The current total economic impact from the Pennsylvania Biotechnology Center and its affiliated organizations over the study period from 2009 through 2012 (which includes fiscal years 2009 through 2012 plus the first half of FY-2013) amounts to \$579 million for the Commonwealth of Pennsylvania.

- Nearly 90 percent of aggregate impact (\$507 million) accrues to Bucks County, PA while an additional \$72 million spills over to benefit the Commonwealth at large.

The economic impact can be classified into three categories: direct, indirect and induced.

- Direct impact is a result of spending and economic activity at the Center. For the study period, this amounts to \$190 million.
- Indirect impact is economic impact generated elsewhere as a result of initial economic activity at the Center. For the study period, this amounts to \$253 million.
- Induced impact is economic benefit related to additional household spending created by the Center. For the study period, this amounts to \$136 million.

The corresponding labor impact includes 573 direct (primary impact) and indirect (secondary) jobs. That includes:

- 263 jobs directly associated with the Center.
- 310 indirect jobs as a result of additional spending and output:
 - 184 jobs in Bucks County.
 - 126 jobs elsewhere in Pennsylvania.

II. Introduction: Pennsylvania Biotechnology Center — A successful experiment

Economic impact analysis is the method by which new inputs, development, and/or interventions can be viewed within a local economy by capturing their direct economic activity and modeling the impact of that given output throughout the rest of the economy. The most important impact measures tracked are economic output in the local economy as well as job creation and retention. Applying economic multipliers to these measures can quantify the economic impact and provide a determination of the spillover economic benefit of this activity.



The reason to continue to understand and document the economic impact of the Pennsylvania Biotechnology Center of Bucks County is largely due to the fact that previously the campus was the DA Lewis manufacturing facility. The site was about to close and displace 100 local jobs in Bucks County in 2005. These jobs were related to light manufacturing operations which were medium skill and medium wage positions. If the decision had not been made to move forward with the redevelopment project to form the Center, the economy could possibly absent this element of economic activity.

This means a highly skilled and highly productive center for biotechnology research and business development would not be functioning in the heart of Bucks County. The research could be scattered in other parts of the U.S. New entrepreneurial businesses would be emerging elsewhere. Layoffs in the large pharmaceutical industry would be occurring without the safety net to repurpose scientists to start businesses based on their own industry knowledge and intellectual property.

To be sure, the Center is much more than real estate, but a unique scientific community to progress scientific discoveries in infectious diseases and cancer. New discoveries form and new companies develop to advance science for the commercial market. Other companies have located near the research and to access the knowledge community. Furthermore, the Center brings together renowned academics to lecture and to interact with the community, which also attracts visitors and business people to Bucks County.



III. Activity Report 2009-2012

The Center was formed in part through an investment from the Commonwealth of Pennsylvania in 2006 with a vision that the Institute for Hepatitis & Virus Research (IHVR), the research and development arm of the Hepatitis B Foundation, would establish a supportive environment for translational-focused research on hepatitis and infectious disease and to also support biotechnology ventures that would form on site and provide benefit and additional activity to the Greater Philadelphia region's already existing life sciences industry. It is a unique model of economic development in that it:

1. Conducts mission oriented research through the anchor institutions of the IHVR and the Drexel Institute for Biotechnology & Virology Research (DIBVR),

2. Cultivates support from government agencies (notably the National Institutes of Health) and the investment community,
3. Nurtures early-stage companies for the targeted outcomes of discovering better ways to treat infectious diseases, and
4. Nurtures other technological progressions that impact biomedical research and the larger life sciences industry.

Today, the Center plays an important role in the interface between sound academic science and the resulting business opportunities. IHVR's prominent research endeavors have served as a catalyst for the recruitment of renowned research faculty, new business formation of both diagnostic and therapeutic companies, and the relocation of companies to the Center with existing synergies to the IHVR research. The strategic plan for the Center and research affiliates remains to conduct translational research, spin-out technologies from the research, support biotechnology ventures that grow the economic base of Bucks County and provide jobs for a highly-skilled and educated workforce.

In early 2009, when this experiment proved successful, the Center produced its first Economic Impact Study to show the direct and spillover benefits from the initial investment into the Center. Over three years, the initial \$7.9 million state investment had produced a 20 time return in economic benefit to the State.

With recession and then recovery as the latest themes of the most recent economic period in the United States specifically from 2008 through 2011 and then 2012 as a year with very slow economic growth, private sector business outlooks and investments have languished and some have fallen through altogether. This outlook highlights the reason to continue to promote the successful investment in the Center since it has prospered during this period and weathered the economic situation very well.

During this period the IHVR made a large expansion with the Natural Products Discovery Institute (NPDI). Established in June 2011 as a result of a gift by Merck and Company of its entire U.S. Natural Products Library and the Schering-Plough Legacy Culture Collection to the IHVR, the NPDI is one of the largest, most diverse, and most carefully developed natural products collections in the world. Its uniqueness is based on how the plants and microorganisms were selected to cover the greatest biological diversity and how the microbes were fermented to create the greatest chemical diversity.



Merck Executives with IHVR Leadership



Research activity utilizing this resource will lead to the discovery of novel molecules with biological activity to include pharmaceuticals, nutritionals, flavor enhancers, cosmeceuticals, and agricultural products.

A notable success on the commercial side at the Center has been the story of FlowMetric. This is a good example of very highly skilled talent that was let go from the downsizing of large Pharma in the region. A group of these people understood the technology and the market of the very high-end expensive service of flow cytometry. The Center gave them space to launch the endeavor, the opportunity to collaborate with other scientists within the community, shared equipment usage, and additional contacts for their go-to market strategy within large and small pharma. In 2012, FlowMetric was recognized as the best Contract Research Organization by the Pennsylvania Biotech Industry Organization.



Flowmetric was recognized as the “Best CRO” in 2012 by the Penna. Biotech Industry Organization



FlowMetric is a provider of state-of-the-art flow cytometry and cell sorting services

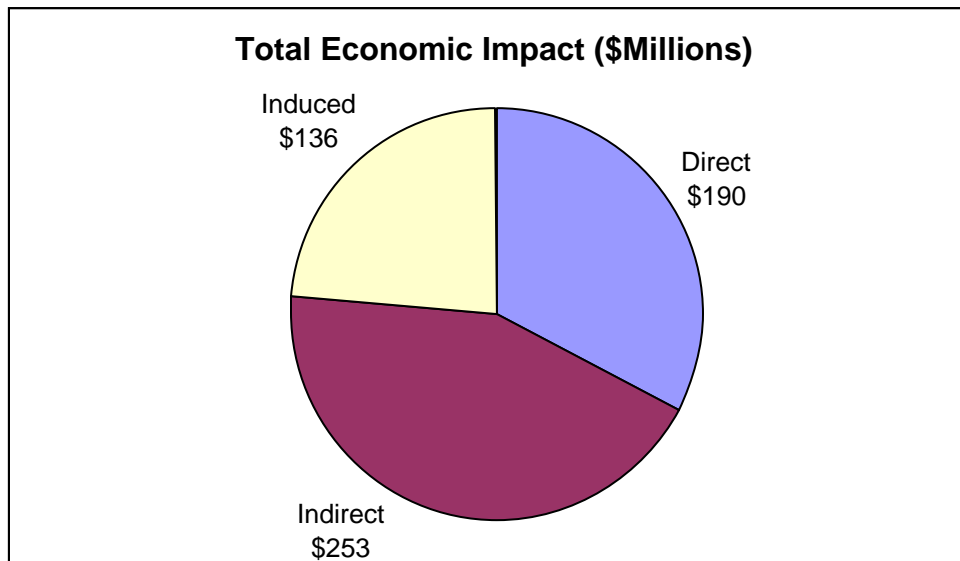
IV. Aggregate Economic Impact

The total economic impact from the Pennsylvania Biotechnology Center of Bucks County (the Center) and its affiliated organizations—which include the Hepatitis B Foundation (founding organization), the Institute for Hepatitis & Virus Research, the Drexel Institute for Biotechnology & Virology Research, the Bucks County Biotechnology Keystone Innovation Zone (KIZ)—as well as a co-located but unrelated warehouse and distribution facility¹ over the study period, amounts to \$579 million for the Commonwealth of Pennsylvania. Of that, nearly 90 percent (\$507 million) accrues to Bucks County, while an additional \$72 million spills over to benefit the Commonwealth at large.

The economic impact can be classified into three categories: direct, indirect and induced.

Economic impact, Pennsylvania Biotechnology Center of Bucks County (\$millions)*			
	Bucks County (A)	Pennsylvania other (B)	Total Pennsylvania (A+B)
Direct (1)	190	0	190
Indirect (2)	245	8	253
Induced (3)	72	65	136
Total (1+2+3)	507	72	579

*Numbers may not add due to rounding.



The corresponding labor impact includes 263 jobs directly associated with organizations at the Center (and the co-located warehouse and distribution facility). Spending and output related to those jobs spills over and is associated with another 184 jobs in Bucks County and 126 jobs elsewhere in Pennsylvania—in total, 573 direct (primary impact) and indirect (secondary) jobs.

¹ The operation, The Candlewic Company, has been a longtime occupant at the site, preceding the organization of the Center. It currently leases space from the Center.

Labor impact, Pennsylvania Biotechnology Center of Bucks County (jobs)			
	Bucks County (A)	Pennsylvania other (B)	Total Pennsylvania (A+B)
Direct (1)	263	0	263
Indirect (2)	184	126	310
Total (1+2)	447	126	573

V. Impact Detail

To determine the economic output of the Center's activities, the appropriate multiplier for Pennsylvania and Bucks County is applied to each category of output and then totaled.

A. Direct Economic Impact

Direct economic expenditures can be broken down further into three sub-categories of output, Professional & Scientific Services, Real Estate, and Investment. These categories best represent the economic activities at the Center.

Direct Impact	2009-2012
Professional & Scientific Services	\$173 million
Real Estate	\$9 million
New Investment	\$8 million
	\$190 million

The IHVR and DIBVR remain the drivers of this activity on campus as a \$12.5 million combined research enterprise annually. In addition, thirty-seven small biotechnology, medicinal chemistry, contract service organizations, medical device and nanotechnology companies produce another \$25.8 million (average) annually in research, development, product testing, and sales. New investment in these companies and the real estate operation at the Center also contribute to the direct economic impact.

B. Indirect Economic Impact

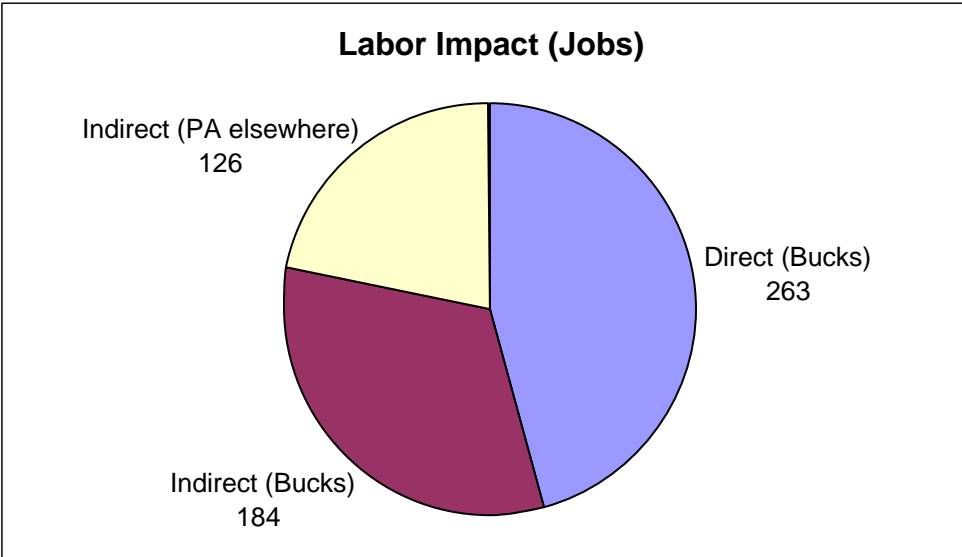
The indirect and induced effects generated an additional multiplier in the economy. Multipliers were applied based on the type of spending which would then have a subsequent impact on supply chains as well as business and personal or household spending. The primary industry sectors indirectly impacted by the activity at the Center are Professional, Scientific, and Technical Services, Facilities Support Services, Construction, and Management of Companies and Enterprises.

	Bucks County	Pennsylvania other
Indirect Economic Impact	\$245 million	\$8 million
Induced Economic Impact	\$72 million	\$65 million

C. Job Impact

A total of 573 jobs were impacted through the activities at the Center during this study period:

- Direct jobs at the Pennsylvania Biotechnology Center 263
- Indirect jobs created & retained in Bucks County 184
- Indirect jobs created & retained elsewhere in Pennsylvania 126



Indirect job impact uses a calculation based on revenues received for goods and services rather than the expenditure methodology applied to the calculation of output and financial impact. This is due to the nature of biotechnology research and development industry not always leading directly to new products. Revenues generated at the Center totaled \$20 million during the study period expressed in 2009 dollars. This impacts 184 jobs created and/or retained locally and another 126 in Pennsylvania in addition to the 263 direct jobs at the Center.

VI. Future Impact

In its first three years, the focus of the Center was to attract other scientific organizations, both nonprofit and for-profit, in order to create the synergistic dynamic needed for success. In the past four years that success has been realized, and the Center now is home to more than 47 different organizations and experiences continuing demand for additional space. This comes from its current tenants due to their organic growth and also from outside organizations who view the Center as a place where they see the potential for their ideas to take root and succeed.

If the Center can successfully add the much needed capacity it needs to accommodate the internal growth and external demand it sees over the next five years, its direct economic impact should grow to as much as \$400M based on the indicators described in this study. As a result, job creation would continue to grow and in total should exceed 700 based on current trends.

The ongoing vision in 2013 is the same as it was in 2009: weave an even stronger knowledge community consisting of high-value personnel in Doylestown that will be known in the Region and the State as a true accelerator of biotechnology growth.



2005: DA Lewis building sits empty



2013: Pennsylvania Biotechnology Center is a thriving knowledge community

VII. Case Studies

In addition to the economic impact model that was used to generate the preceding estimates, a set of questions was administered to a sample group of companies located at the Center. The purpose was to document the multiple roles that the Center plays in the operations of its tenants.

A. FlowMetric

Overview

FlowMetric Inc. (www.flowmetric.com) is a privately held company that provides state-of-the-art flow cytometry and cell sorting services. FlowMetric supports several programs across the entire drug development value chain for a number of pharmaceutical, biotech and CRO organizations. The company began operations in 2010. Initial funding was provided by the company founders, followed by a private offering. Company revenue now includes fees for the services that it offers. In 2012, FlowMetric was recognized as the best Contract Research Organization by the Pennsylvania Biotech Industry Organization.

Company staff consists of several individuals with extensive scientific and business experience inside large pharmaceutical and biotech companies, other major industries and the venture capital sector.

Role of the Pennsylvania Biotechnology Center

Company principals cite the availability of laboratory space and the financial benefits of operating in a Keystone Innovation Zone (KIZ) as important reasons for locating at the facility. The facility's appearance was also cited as a positive factor in due diligence visits by potential company clients.

B. Fox Chase Chemical Diversity Center (FCCDC)

Overview

Fox Chase Chemical Diversity Center Inc. (www.fc-cdci.com) is a company focused on providing medical chemistry and chemical biology support to basic research programs. The company's mission is to assist researchers with the development of fundamental research and grow it to full scale drug discovery. This collaborative strategy capitalizes on the trend for conducting drug discovery research outside of the walls of large biopharmaceutical companies.

FCCDC began operations in 2008, at which time it located at the Center. Initial funding came from a Small Business Innovation Research (SBIR) grant from the National Institutes of Health (NIH). The company's initial funding has been expanded to include a blended revenue stream that arises from its partners and clients, based on its collaborative strategy. FCCDC earns revenue through grant-sharing arrangements, full-time sponsored research and fee-for-service operations.

In 2009, FCCDC expanded its office and laboratory space at the Pennsylvania Biotechnology Center. This is the company's sole location at this time.

Company staff consists of several individuals with extensive scientific and business experience inside large pharmaceutical companies. The company location, at the Pennsylvania Biotechnology Center, was selected because of proximity to the founder's residence as well as the resources provided by the facility, including access to other tenants and equipment sharing. An alternative site that was considered is the biotech incubator affiliated with the University of Arizona in Tucson.

Company principals also maintain a separate company at the Pennsylvania Biotechnology Center, ALS Biopharma LLC (www.alsbiopharma.com). The company is an emerging biotechnology company involved with small-molecule drug discovery, therapeutics and diagnostics for the treatment of amyotrophic lateral sclerosis (ALS). The company is currently funded through several research grants.

Role of the Pennsylvania Biotechnology Center

Company principals cite several advantages to the location, including "...synergy between tenants and sharing of equipment. The academic component helps the small business part, as well...the credibility of the overall site helps to provide validation to any small company, who otherwise would appear to be small and relatively vulnerable to small perturbations in infrastructure or equipment needs." The principals further cite the location as playing an important role for future development.

Future Company Plans

Immediate future plans include adding new collaborations and looking for new funding sources—including general company funding and funding related to specific technology development. Additional site expansion may be required as a result.

C. Synergy Pharmaceuticals (Synergy)

Overview

Synergy Pharmaceuticals Inc. (www.synergypharma.com) is a biopharmaceutical company focused on the development of new drugs to treat gastrointestinal disorders and diseases. The company began operations in 1992, as a small privately owned biotechnology company. Initial funding came from Small Business Innovation Research (SBIR) grants from the National Institutes of Health (NIH), private placements (primarily to high net worth investors) and Direct Public Offerings (DPOs). Synergy initially operated out of leased space in Norristown, PA.

The company refocused operations in 2000, to develop innovative drug products for treatment of gastrointestinal diseases. This strategic shift was based on internal and external market research that showed significant potential for such technology.

In 2005, Synergy began leasing space from the Institute of Hepatitis Virus Research (IVHR) on the campus of Delaware Valley College. At the time, the company required additional office space as well as a wet lab facility, to facilitate R&D expansion. When IVHR relocated to the PA Biotechnology Center, in 2007, Synergy also made the move.

Synergy began trading publicly on the OTC Bulletin Board market in July 2008, and was listed on the NASDAQ stock exchange in December 2011. Since July 2012, Synergy has been included in the Russell 3000 Biotechnology Index. The company maintains a corporate office in Manhattan, as well as research facilities at the Pennsylvania Biotechnology Center.

Company staff consists of several individuals with extensive scientific and business experience inside large pharmaceutical companies, as well as academic background.

Role of the Pennsylvania Biotechnology Center

Company principals cite several advantages to the location, including "...excellent atmosphere for scientific research as well as for interaction with other scientists and entrepreneurs...(the facility) provided the space we need to advance our discovery portfolio...(and) outstanding networking opportunities. " The principals further cite the location as instrumental in recruiting talented scientists who reside in the region.

Future Company Plans

Synergy will require additional lab space as it hires more scientists. The company will also require an animal research facility, which is important for evaluation of drug candidates.

D. Digna Biotech USA (Digna)

Overview

Digna Biotech USA LLC (www.dignabiotech.com) is a biotechnology company whose mission is to generate viable clinical therapeutic and diagnostic candidates which are then available for development and commercialization partnerships with pharmaceutical companies. The company works with the University of Navarra's Translational Medicine Center (CIMA), in Spain, to commercially leverage the prophylactic, therapeutic and/or diagnostic potential of new molecules discovered there. CIMA focuses on four clinical areas: oncology; cardiovascular physiopathology; neuroscience; and gene therapy and hepatology. It began operations in 2004, when it was underwritten by a consortium of Spanish corporations and financial institutions and spun out of the University of Navarra. The company is headquartered in Pamplona, Spain, and also has offices in Madrid, in addition to its research laboratories and US offices at the Pennsylvania Biotechnology Center.

Company staff consists of several individuals with extensive scientific and international business experience, as well as academic background, especially through its strong ties to the University of Navarra.

Role of the Pennsylvania Biotechnology Center

Company principals cite several advantages to the location, calling it an "ideal match," in particular, "because Digna and its partner...CIMA have a very strong focus on hepatic diseases...and (similar) focus on hepatology at (the Center) through its partnership with the Hepatitis B Foundation..." The principals further cite the "...capabilities offered...which arise from a unique...combination of academic research, business services and biotech companies" and identify it as "...the best incubator we have visited."

Future Company Plans

Digna's pipeline has grown from seven patented product candidates in 2004 to 18, today. As the company grows, it has indicated that the Pennsylvania Biotechnology Center will remain a centerpiece for US operations because of the combination of resources that it offers.

E. JBS Science (JBS)

Overview

JBS Science Inc. (www.jbs-science.com) is a start-up diagnostic company working on the development of non-invasive tests for cancer screening and management. The company began operations in 2011 with a grant from the Commonwealth of Pennsylvania. It located at the Pennsylvania Biotechnology Center in 2012, and has since received two Phase 1 Small Business Innovation Research (SBIR) grants from the National Cancer Institute (NCI).

As a start up, the company maintains a lean staff with scientific, business experience, and academic background.

Role of the Pennsylvania Biotechnology Center

Company principals cite several advantages to the location. The company is co-located in laboratory space that is also used by an academic researcher. Additionally, business management and support is provided by an onsite company (Artemis Solutions, Inc.) that specializes in providing such assistance to early stage technology companies.

Future Company Plans

JBS' immediate plans are to continue the research in which it is currently engaged.

VIII. Appendix A: Methodology

The Economic Impact of the Center is calculated by aggregating the spending activity or wages, research, product development, and other expenditures of the organizations and companies for the study period. The primary impact however is from what has occurred from the overall output of the research organizations and companies.

The definition of the total economic impact is the direct impact of the activities at the Center which includes the annual output of the research and development as well as the companies located at the facility. Direct impact refers to the real jobs and output produced in the local economy from the organizations and businesses located at the Center. We also look at the indirect and induced impacts on the economy from the output at the Center. A dollar spent in any sector of the economy will ripple through the economy and yield spillover benefit to additional sectors of the economy. This includes additional spending as well as additional jobs. New jobs and spending continue to ripple through the economy for several rounds of additional economic activity. Multipliers quantify the total impact within the Commonwealth of successive rounds of spending as a result of direct expenditures at the Center, as well as additional employment related to the new spending. This is what the indirect and induced elements approach.

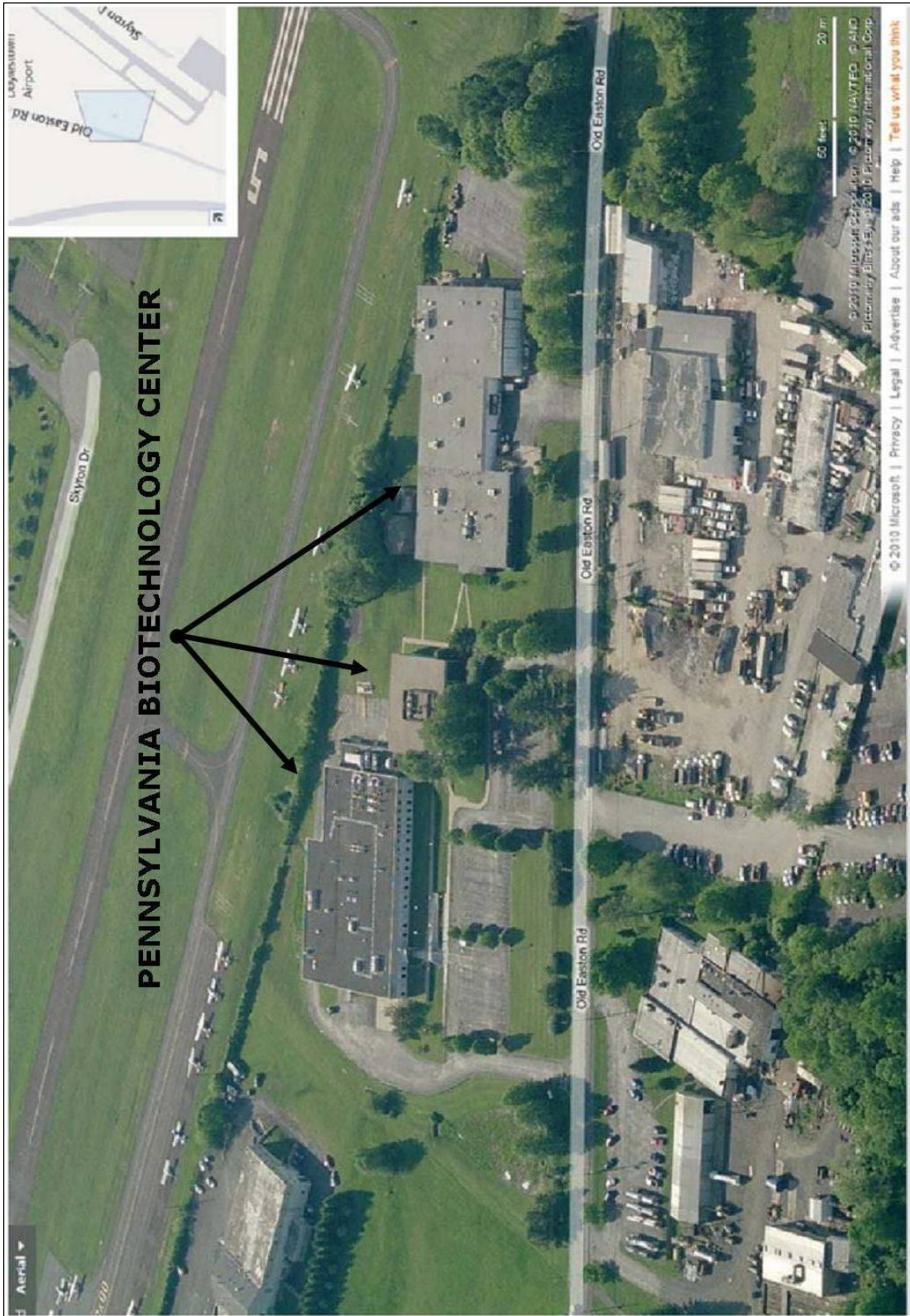
Indirect impacts refer to the second round of expenditures made by organizations and businesses within the common supply-chain of the Center. The Center's spending indirectly supporting direct beneficiaries of its business.

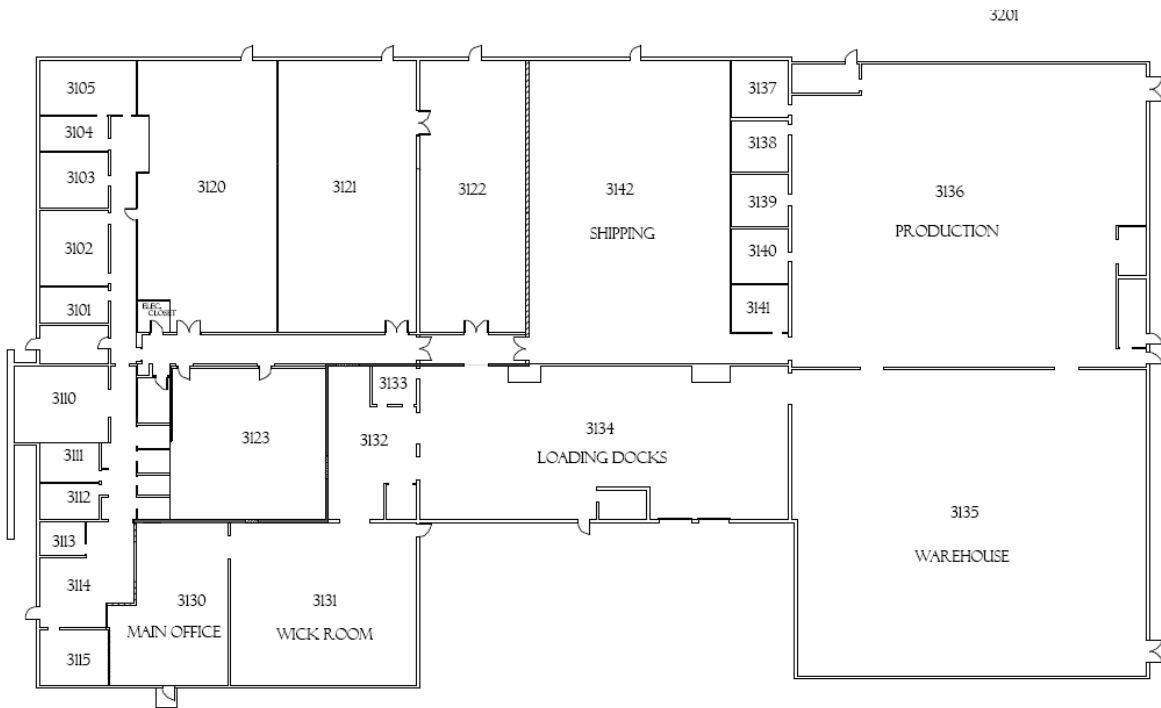
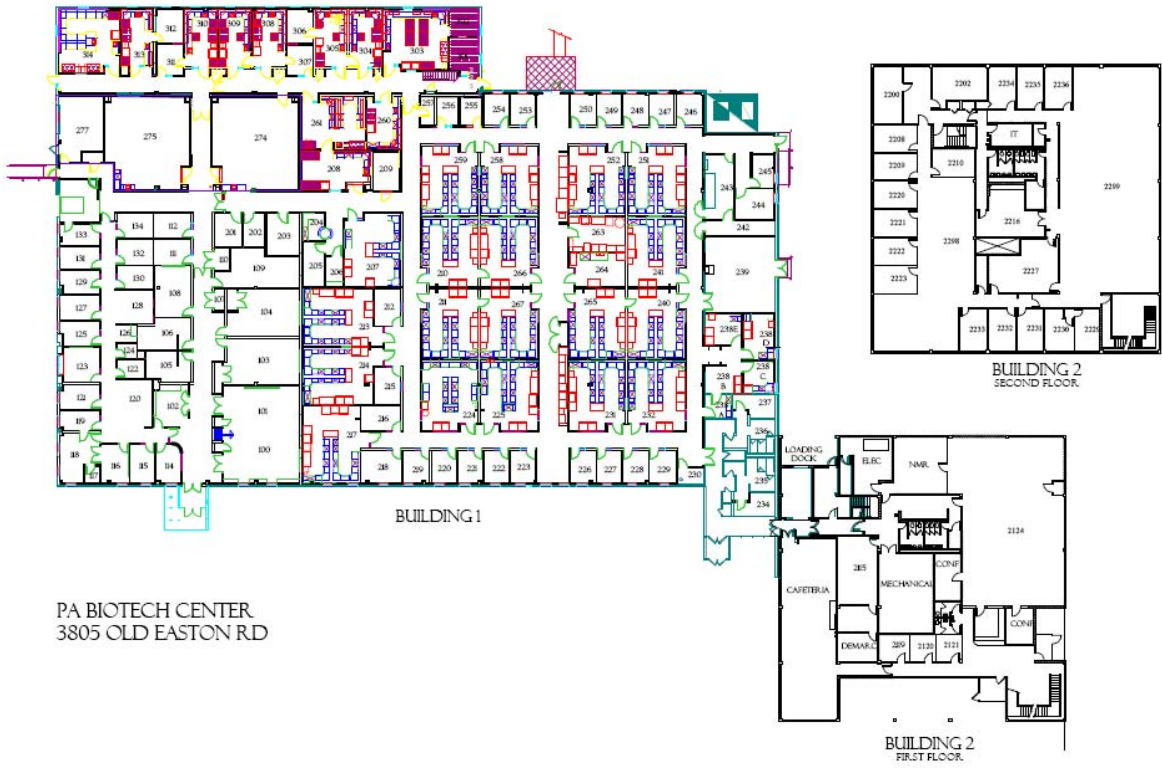
Induced impacts refer to the increased sales of goods and services in the local economy due to employees of these businesses living and working in Pennsylvania.

To determine indirect and induced impacts, economic multipliers are applied to all expenditures that benefits income, jobs, and total economic activities to demonstrate the full economic output. The multipliers used are final-demand output multipliers that indicate the level of total regional output that result from an increase in expenditures in an industry. The multipliers express the additional dollars spent by every extra dollar generated by companies and organizations located at the Center.

The indirect and induced expenditures used in this report are derived by using the expenditures as inputs into a standard regional input-output model developed by the U.S. Department of Commerce, Bureau of Economic Analysis, the Regional Input-Output Modeling System (RIMS II). The RIMS II system has been in development and continually improved and refined since the 1970s. The model takes into account the relationships between approximately 500 industries within the region (Buck County and the entire Commonwealth), the prevailing economic structure and regional trading patterns. The RIMS II model measures the extent to which an investment or spending in one industry affects all other industries in the region.

IX. Appendix B: Facilities Overview





PA Biotech Center
3765 Old Easton Rd
Building 3
Feldstein Pavilion

About this Study

Data collection, analysis and initial report layout was completed by Byler & Associates, LLC. The methodology and data was reviewed and report layout finalized by KLIOS, Inc.