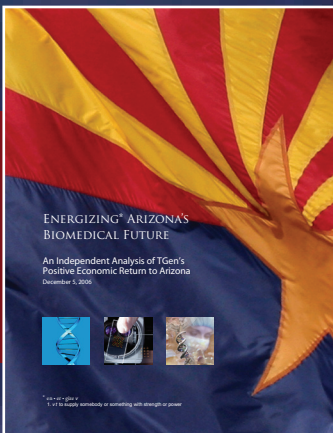


# ENERGIZING ARIZONA'S BIOMEDICAL FUTURE | 2009

*Positive Economic Benefits of TGen  
on the State of Arizona*



*An Update to TGen's 2006  
Economic Impact Report*

September 17, 2009

Dear Dr. Trent:

It is with pleasure that Tripp Umbach submits our updated independent analysis of the current and projected positive economic impact of the Translational Genomics Research Institute (TGen) on the Arizona economy. This report updates a previous economic impact analysis of TGen provided in 2006. TGen has certainly kept its promise to the State of Arizona to invigorate and diversify the economy.

Our previous analysis showed that your organization provided a significant return on investment to the Arizona economy and future returns were anticipated to be even more dramatic. Our updated analysis shows dramatic increases in economic, employment, and government revenue impacts on Arizona economy. As a result of your better than expected performance over the past two years our projected impact numbers for 2015 and 2025 are also significantly stronger. Beyond growth in TGen's operational impact, TGen has also been instrumental in the creation and expansion of commercial businesses.

TGen has become in six years an important generator of economic expansion and employment. Beyond the solid current performance and economic impact associated with TGen's operations, the projected future impact includes continued success in creating new companies stemming from research conducted at TGen. TGen's current and future success is grounded in its ability to leverage its appropriated and philanthropic investments through strategic statewide collaborations in the educational, biomedical and bioscience sectors.

Tripp Umbach believes that TGen is an important catalyst as Arizona becomes a national center for bioscience and biomedical advances.

Respectively Submitted,



Paul O. Umbach  
President and CEO

*“Strong collaboration with other organizations and strong support from the State of Arizona has allowed TGen to grow faster and more dynamically than any other research institute in the United States.”*  
- Tripp Umbach (2008)

## 2008 Highlights

In 2008, **there was a stronger return** on the State’s \$5.5 million non-general fund investment than in 2006. Return on investment of TGen’s operations increased from \$3.95 for every \$1.00 invested to \$8.09 for every \$1.00 invested in 2008.

TGen’s economic impact on the State of Arizona has more than doubled from \$21.7 million in 2006 to \$44.5 million in 2008 and is projected to **generate substantial future growth** both operationally and commercially.

Combining both operational and commercial activities in 2008, TGen generated more than \$77.4 million in the state’s economy. This represents **an increase of 357 percent** in total economic impact since 2006.

TGen's presence in Arizona generates a significant opportunity for nationally competitive, knowledge-based employment. In 2008 TGen generated full-time employment (directly and indirectly) for 461 residents of the State of Arizona. TGen has **doubled its employment impact in only two years** from 220 total full-time jobs in 2006.

TGen's operations and commercial activities in Arizona **generate significant state tax revenue.** In 2008 TGen generated \$5.7 million in state taxes (directly and indirectly). TGen has more than doubled its generation of state taxes in only two years from \$1.9 million in 2006.

# ENERGIZING ARIZONA'S BIOMEDICAL FUTURE | 2009

*Positive Economic Benefits of TGen on the State of  
Arizona: an update to TGen's 2006 Economic Impact Report*

en • er • gize v

1. v t to supply somebody or something with strength or power

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## Executive Summary

Since 2002, the Translational Genomics Research Institute (TGen) has become a significant generator of economic and employment impact within the State of Arizona. TGen's total economic impact as well as its return on investment to the State have been substantial and will continue to grow over the short- and long-term.

Equally significant is the national and international prominence TGen is bringing to the State of Arizona, leveraging a wide range of resources toward national collaborative initiatives and working with international partners resulting in direct foreign investment to Arizona. Strong collaboration with other organizations and strong support from the State of Arizona has allowed TGen to grow faster and more dynamically than any other research institute in the United States.

In September 2006, the TGen Foundation Board commissioned Tripp Umbach to conduct an initial comprehensive economic impact study of Institute's current and projected economic impact in the State of Arizona. To ensure the continuing viability of the data, TGen commissioned an update to the 2006 report. In response, Tripp Umbach re-calculated both direct and indirect impact numbers for TGen in 2008 and its projected impacts in 2015 and 2025, under both conservative and aggressive scenarios.

Tripp Umbach utilized the customized models as previously developed to calculate the economic, employment, and government revenue impacts associated with TGen's operations and commercialization

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<sup>1</sup> Pittsburgh based Tripp Umbach is the national leader in conducting economic impact studies for leading academic health organizations, research institutes, health systems, and universities. Tripp Umbach has completed studies for every U.S. medical school and major teaching hospital through a 15 year relationship with the Association of American Medical Colleges.

<sup>2</sup> Data submitted by TGen is based on calendar year 2008. All numbers presented in the report represent annual, point-in-time snapshots of the State of Arizona. Projections are presented in 2008 dollars.

of research. Models and data assumptions were generated by Tripp Umbach's previous experience with 125 medical schools, 400 teaching hospitals and research institutes. Tripp Umbach based data included in Tripp Umbach's models on actual historical data from similar research organizations and entities.

To calculate the economic impact of TGen and research commercialization in the State of Arizona, Tripp Umbach again used a methodology derived from an original set of research tools and techniques developed for the American Council on Education (ACE) (see appendix B). The ACE-based methodology employs linear cash flow modeling to track the flow of institution-originated funds through a delineated geographic area. In addition, Tripp Umbach utilized a forward-linkage modeling methodology to measure the potential impact of TGen and research commercialization in the State of Arizona. Tripp Umbach also utilized IMPLAN analysis to calculate TGen's current economic impact.

Direct spending and re-spending within the economy (multiplier effect) driven from the institution itself form the basis of traditional economic impact studies. Forward-linkage models measure the broader impacts that occur or may occur in the economy resulting from the research and development activities of an institution — beyond the traditional direct and indirect impact. Examples of forward-linkage impacts include businesses that spin-off from research activities, to new and existing businesses, and sponsored research relationships. The data presented in this report represent annual, point-in-time economic snapshots of TGen's impact on the Arizona economy.

## TGen's Economic Impact on the State of Arizona

- TGen's economic impact on the State of Arizona has more than doubled from \$21.7 million in 2006 to \$44.5 million in 2008 and is projected to generate substantial future growth both operationally and commercially.
- Tripp Umbach estimates that TGen will play an even greater role in the bioscience/biomedical sector in Arizona by 2025 when its projected economic impact of its operations is expected to exceed \$166.1 million.

At **\$44.5** million, TGen's economic impact has more than doubled since 2006

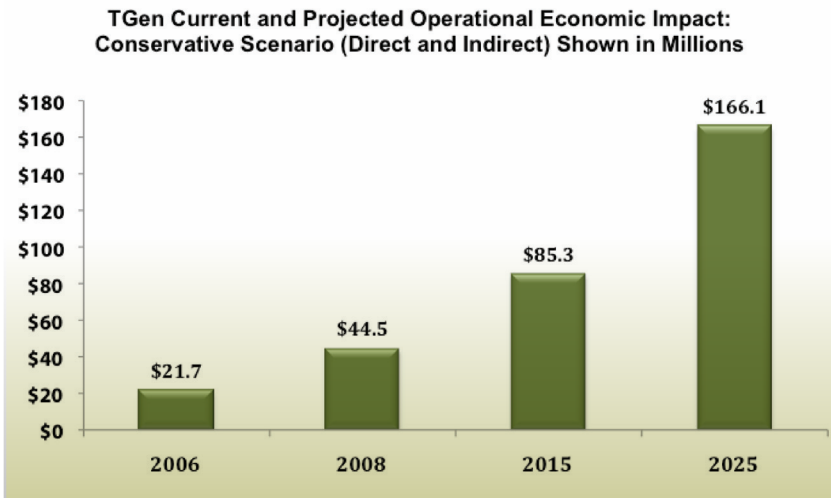


Figure 1 shows the current and projected economic impact of TGen's operations in the State of Arizona.

### TGen's Employment Impact on the State of Arizona

- TGen's presence in Arizona generates a significant opportunity for nationally competitive, knowledge-based employment. In 2008 TGen generated full-time employment (directly and indirectly) for 461 residents of the State of Arizona. TGen has doubled its employment impact in only two years from 220 total full time jobs in 2006.
- Total employment generated directly and indirectly from both TGen's operations and commercial spin-off activity in 2008 equaled more than 700 jobs.
- Estimates indicate that TGen operations will conservatively generate between 1,166 jobs (2015) and 2,332 jobs for the State of Arizona (2025). In the initial report completed in 2006, Tripp Umbach estimated that total employment from TGen operations would equal 558 jobs in 2015 and 900 jobs in 2025, representing 259% more jobs in 2025 than originally projected.

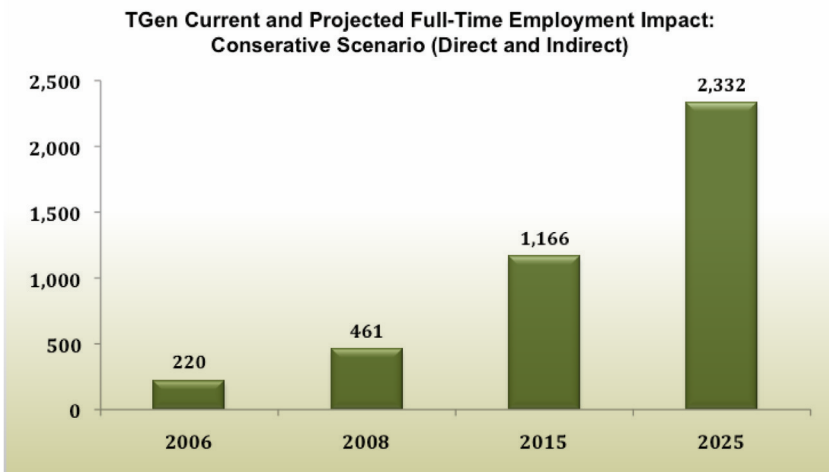


Figure 2 shows TGen's current and projected employment impact (direct and indirect).

## TGen's State Tax Revenue Impact on the State of Arizona

- TGen's operations in Arizona generate significant state tax revenue. In 2008 TGen generated \$2.7 million in state taxes (directly and indirectly). TGen has significantly increased its generation of state taxes in only two years from \$1.9 million in 2006.
- Estimates indicate that TGen's operations and commercial activities will conservatively generate between \$11.9 million (2015) and \$27.4 million for the State of Arizona (2025).

At **461**, TGen has more than doubled its employment impact since 2006

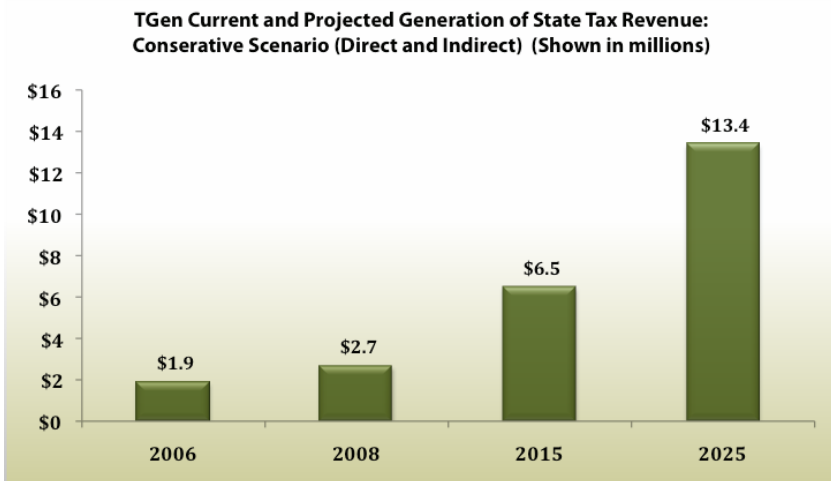


Figure 3 shows TGen's current and projected State Tax Revenue Impact (direct and indirect).

## Combined Operational and Commercialization of Research Impact of TGen-Led Research on the State of Arizona

The combined economic impact of TGen's operational impact and research commercialization impacts represent significant returns to the State of Arizona.

- TGen's combined operational and commercial activities in 2008 generated more than \$77.4 million in the state's economy. This represents an increase of 375% in total economic impact since 2006, when the total economic impact of TGen on the State of Arizona equaled \$21.7 million.
- TGen's operations and the value of the commercialization of TGen related research (conservative) is projected to generate \$145.4 million in the state's economy by 2015 and \$321.3 million in the state's economy by 2025. While new companies will be formed from research activities, the majority of economic, employment, and government revenue impacts will be attributable to growth of existing companies in the established bioscience/biomedical sector.

Since 2006, TGen's combined operational  
and commercial activities increased by **375%**  
and now totals **\$77.4** million

- TGen's operations and commercialization of research activities will support 2,327 jobs (2015) and 4,116 jobs (2025) for Arizona residents.

TGen's operations and commercialization of research activities will support **4,116** jobs for Arizona by 2025

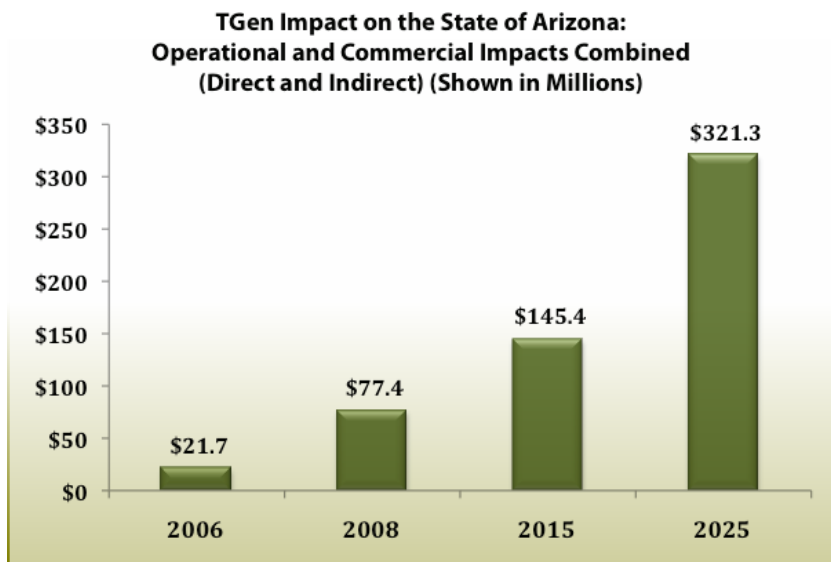


Figure 4 depicts TGen's operational and commercial activities on the State of Arizona, shown in millions of dollars annually.

## Combined Impact of TGen's operations and the commercialization of TGen-led research (Conservative)

Combined Impact of TGen Operations and Commercialization of Research				
Employment Impacts Direct and Indirect (jobs)	FY 2006	FY 2008 (actual)	FY 2015	FY 2025
TGen Operations	220	461	1,166	2,332
Commercialization of TGen Led Research		242	1,161	1,784
<b>Total Jobs</b>	<b>220</b>	<b>703</b>	<b>2,327</b>	<b>4,116</b>
Government Revenue Direct and Indirect (in millions)	FY 2006	FY 2008 (actual)	FY 2015	FY 2025
TGen Operations	\$1.9	\$2.7	\$6.5	\$13.4
Commercialization of TGen Led Research		\$3.0	\$5.4	\$14.0
<b>Total Government Revenue</b>	<b>\$1.9</b>	<b>\$5.7</b>	<b>\$11.9</b>	<b>\$27.4</b>
Economic Impacts Direct and Indirect (in millions)	FY 2006	FY 2008 (actual)	FY 2015	FY 2025
TGen Operations	\$21.7	\$44.5	\$85.3	\$166.1
Commercialization of TGen Led Research		\$32.9	\$60.1	\$155.2
<b>Total Economic Impact</b>	<b>\$21.7</b>	<b>\$77.4</b>	<b>\$145.4</b>	<b>\$321.3</b>

TGen's operations increased from **\$3.95** for every \$1 invested in 2006 to **\$8.09** for every \$1 invested in 2008.

## **TGen's Return on Investment to the State of Arizona**

### Return on Investment from TGen's Operations in 2008, 2015, and 2025

- In 2008, there was a stronger return on the State's \$5.5 million non-general fund investment than in 2006. Return on investment from TGen's operations increased from \$3.95 for every \$1.00 invested in 2006 to \$8.09 for every \$1.00 invested in 2008.
- In 2015, Tripp Umbach projects that the return on investment to the Arizona economy stemming from TGen operations will be \$15.50 for every \$1.00 invested
- In 2025, Tripp Umbach projects that the return on investment to the Arizona economy stemming from TGen operations will be \$30.20 for every \$1.00 invested

### Return on Investment from TGen's Operations & Commercial Application of TGen's Research (conservative scenario) in 2008, 2015, and 2025

- In 2008, the combination of TGen's operational impacts and the commercial application of Tgen's research results in a positive return on investment of \$14.07 for every \$1.00 invested.
- In 2015, Tripp Umbach projects that the combination of TGen's operational impacts and commercial application of TGen's research will result in \$26.44 for every \$1.00 invested.
- In 2025, Tripp Umbach projects that the combination of TGen's operational impacts and commercial application of TGen's research will result in \$58.42 for every \$1.00 invested.

## Conclusions

- From an economic impact perspective, TGen's support of collaboration across the state of Arizona has and will continue to accelerate commercial development in the bioscience/biomedical sectors. Tripp Umbach believes that the collaborative nature of TGen will continue to serve as a catalyst to create greater economic impact for the State of Arizona as an independent entity.
- TGen's participation in major national and international initiatives is bringing added benefits to Arizona, notably new research dollars, attraction of world renowned researchers, and foreign investment into the State.
- TGen's economic success in a short period of time is notable. As evidenced by the findings of the updated economic impact study, TGen has produced a significant return on investment to the State of Arizona. In order to continue to accelerate TGen's growth and the growth of Arizona's bioscience/biomedical sector, TGen would benefit from continued support from the State of Arizona.

## **Appendix A: Project Overview**

Tripp Umbach calculated both direct and indirect impact, employment and government revenue numbers for TGen in all benchmark years. Tripp Umbach calculated two different kinds of impacts: operational and commercialization of research. It is projected that as TGen continues to grow and increase its attraction of research dollars and reach into the broader Phoenix area and the State of Arizona, that staffing levels will increase incrementally. The models are predicated upon specific assumptions which were necessary to project the range of possibilities for the economic, employment and government revenue impacts out into the future. Tripp Umbach completed the current operational impact of TGen utilizing two methodologies: linear cash flow and IMPLAN (See Appendix B and C for a description of the methodologies). It is noteworthy that the utilization of two methodologies (linear cash flow and input-output) is a more rigorous approach than typically utilized in economic impact studies.

The model projecting the potential impacts of TGen 2015 and 2025 developed for this economic impact study assume that TGen will continue to grow, attract research funding, continue collaborating with other partners and generate revenue.

The economic impact of research commercialization is based on scenarios and assumptions from previous reports completed by/for the the Association of American Medical Colleges, The State University of New York, Wistar Institute, The University of Minnesota and Mayo Clinic BioMedical Partnership, and data collected from TGen directly.

## **Appendix B: Linear Cash Flow Methodology**

Tripp Umbach has performed more than 100 economic impact studies for both academic institutions, large health care systems and biotech research institutions and partnerships, including the Mayo Clinic Rochester, University of Minnesota and Mayo Biotechnology Partnership, UPMC Health System, Wistar and SUNY Upstate. This study utilized two methodologies: linear cash flow analysis and IMPLAN analysis (detailed in Appendix C). The methodology generally employed in these studies was originally derived from a set of research tools and techniques developed for the American Council on Education (ACE). The ACE-based methodology employs linear cash flow modeling to track the flow of institution-originated funds through a delineated spatial area. While this methodology is generally well suited to evaluate a hospital's impact on its local service area, it tends to be too limiting for a project with the complexity of a medical school with integrated systems.

Tripp Umbach recommended that the traditional model of economic impact for hospitals, based on the ACE model, be modified for the purposes of this research and to match the needs of TGen.

The “traditional” model of economic impact provides a good measure of the impact of expenditures and their flow within an economy. However, the model does not account for the origination of revenues, and thus counts the spending of revenues received by the hospital from in-state sources. The traditional model counts some of the spending of dollars that already existed in the Arizona economy.

The Tripp Umbach research team felt it important to distinguish the economic impact of the TGen related research and collaboration that are attributable to funds brought into the state from out-of-state sources. The application of this “fresh dollar” model provides a first-line measure of the initial direct expansion in the state economy caused by TGen. The final model concept evolved into a hybrid model including a fresh-dollar

approach feeding into a traditional model which tracks in-state spending. Thus the final model used for this research (See Figure 2) measures funds brought into the state together with the ultimate flow of these funds through the Arizona economy and the effect on economic expansion, job growth and enterprise development. The final methodology closely matches the impact study methodology recommended for individual medical schools by the Association of American Medical Schools.

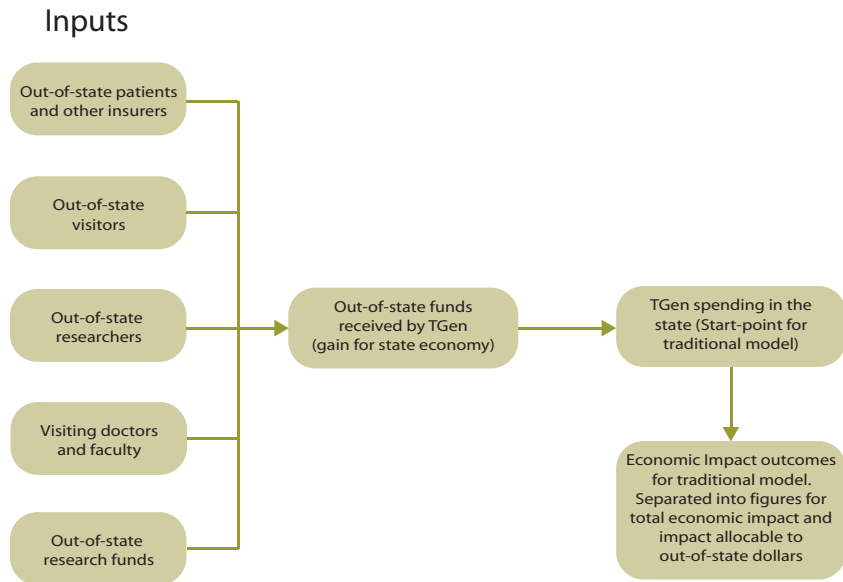
Tripp Umbach researchers worked closely with representatives from TGen to acquire the primary data utilized in this study.

Tripp Umbach utilized a forward-linkage modeling methodology to measure the potential impact of the commercialization of research and related commercial spin-offs in Arizona. Traditional economic impact studies are based on direct spending and re-spending within the economy (multiplier effect) driven from the institution itself. Forward-linkage models measure the broader impacts that occur or may occur in the economy as a result of the research and development activities of an institution – beyond the traditional direct and indirect impacts. Examples of forward-linkage impacts include new businesses based on academic research discoveries; academic intellectual property licensed to existing businesses for development, and sponsored research relationships.

Original research conducted by Tripp Umbach for the Mayo Clinic and the University of Minnesota was used as a starting point for customized analysis. The Mayo Clinic and University of Minnesota research involved the creation of a series of 36 customized economic impact models based upon numerous assumptions. The basic architecture of these models is the methodology most widely accepted within the industry. Due to the complexity of measuring the impact of biotechnology and medical research, Tripp Umbach researchers developed a series of customized economic impact models showing the economic, employment and government revenue impacts of both the recipient institutions and potential business spin-offs in the calendar year 2010, 2015 and 2025.

Economic impact projections were calculated for 2010, 2015 and 2025 in two distinct scenarios: conservative and aggressive. The linear cash flow models developed for this project represent annual, point-in-time economic impact projections.

Economic projections for each scenario are based upon a specific and detailed set of assumptions. Each assumption is based upon secondary data research, primary research and Tripp Umbach industry expertise.



The final model used for this research measures funds brought into the state together with the ultimate flow of these funds through the Arizona economy and the effect on economic expansion, job growth, and enterprise development.

## **Appendix C: IMPLAN Findings and Methodology**

### **IMPLAN Model**

In addition to linear cash flow, the IMPLAN economic impact model was used to estimate the economic, employment and tax impact of TGen to the Arizona economy. The model, which is licensed by the Minnesota IMPLAN Group, Inc., was developed over a period of eight years at the University of Minnesota. IMPLAN is used by more than 500 universities and government agencies to estimate the economic and fiscal impacts of investments and/or changes in industry employment.

### **IMPLAN Economic Impact Analysis**

An IMPLAN impact analysis involves specifying one or more economic changes, such as increases or decreases in employment. The model then uses the relationships between the various industries and sectors in the economy to calculate the additional indirect and induced economic impacts associated with the initial change. The key component is identifying the expenditures in terms of their sector impacts.

The definition of the multiplier relies upon the difference between the initial (direct) impact of a change and the total (direct, indirect and induced) effects of that change. Direct impacts are production changes associated with the immediate effects or final demand changes. Indirect impacts are production changes in backward-linked industries caused by the changing input needs of directly affected industries (e.g., additional purchases from equipment manufacturers by TGen). Induced impacts are the changes in regional household spending caused by changes in household income generated from the direct and indirect impacts (e.g., purchases of goods and services by TGen employees).

IMPLAN is an input-output model. Input-output accounting describes commodity flows from producers to intermediate and final consumers.

The total industry purchases of commodities, services, employment compensation, value added, and imports is equal to the value of the commodities produced. Purchases for final use (final demand) drive the model. Industries producing goods and services for final demand purchase goods and services from other producers. These other producers, in turn, purchase goods and services. This buying of goods and services (indirect purchases) continues until leakages from the geographic area (imports and taxes) stop the cycle.

The model summarizes these complex interactions as economic multipliers, which can be used to estimate the total economic impact of the employment, sales and taxes generated by TGen's activity in a portion of the biotech sector.

## **Appendix D: Glossary of Terms**

### **Collaborator**

Collaborators are defined as those companies, universities, or organizations that work/partner with TGen.

### **Direct Economic Impact**

Direct impact includes items such as institutional spending, employee spending, and spending by out-of-area visitors to the institution.

### **Direct Employment**

Total Employees based on Full-Time Equivalents (FTEs).

### **Direct Government Revenue**

Direct tax payments made by an institution to a unit of government.

### **Indirect Economic Impact**

Indirect economic impact, also known as the multiplier effect, includes the re-spending of dollars within the local economy.

### **Indirect Employment**

Indirect employment is the additional jobs created as a result of the institution's economic impact. Local companies that provide goods and services to an institution increase their number of employees as purchasing increases, creating an employment multiplier.

### **Indirect Government Revenue**

Government revenue that is collected by governmental units in addition to those paid direct by an institution, including taxes paid directly by employees of the institution, visitors to the institution, and vendors who sell products to the institution.

### **Life Sciences**

Any of several branches of science, such as biology, medicine, anthropology, or ecology, that deal with living organisms and their organization, life processes, and relationships to each other and their environment. (Also called bioscience)

### **Multiplier Effect**

The multiplier effect is the additional economic impact created as a result of the institution's direct economic impact. Local companies that provide goods and services to an institution increase their purchasing, creating a multiplier.

### **Total State Business Volume**

Total sales receipts generated within a given geographic area (State of Arizona). Business volume includes wholesale, retail, service sector spending as well as value added in the manufacturing process.

### **Total Economic Impact**

The total economic impact of an institution includes both the direct economic impact and the indirect economic impact, generated in the economy as a result of the direct impact. Direct impact includes items such as institutional spending, employee spending, and spending by out-of-area visitors to the institution. Indirect economic impact, also known as the multiplier effect, includes the re-spending of dollars within the



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