

## **Life Sciences Laboratory Initiative**

### **Wadsworth Future State Report**

The Dormitory Authority of the State of New York (DASNY), New York State Empire State Development (ESD), and New York State Department of Health (DOH)  
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## Executive Summary

### The Lab

The New York State Department of Health's Wadsworth Center (Wadsworth) is a premier public health institution, enabling the State to respond to and prepare for emerging public health threats affecting New York State (NYS) residents. The impact of Wadsworth's work extends beyond state lines, benefiting public health and the broader medical community worldwide.

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"The impact of Wadsworth's work extends beyond state lines, benefiting public health and the broader medical community worldwide"

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- When Zika struck in 2015, Wadsworth was successfully leveraged. It was one of the first labs in the world to conduct isolated genetic sequencing of Zika to study its evolution.
- When the Ebola outbreak occurred in 2014, Wadsworth was successfully leveraged. The lab supported investigation of possible cases, and provided detailed guidance on infection control protocols and procedures to ensure the health and safety of workers, patients, visitors, and the general public.
- When Anthrax was used as a bioterrorist agent in 2001, Wadsworth was successfully leveraged. The lab rapidly analyzed over 1,000 suspicious materials and specimens.

Wadsworth plays an integral public health role in so many other ways. It is a surveillance hub for antimicrobial resistance pathogens. It serves as the sole source for newborn screening for NYS. It has one of the few biodefense research centers in the country, which takes measures to protect against biological threats (including an attack using biological weapons). It acts as a Centers for Disease Control and Prevention (CDC) independent testing lab, responding to unique or emerging public health needs.

Time and again, Wadsworth plays a vital public health role for NYS and beyond. But this role is under threat. Without upgrades, Wadsworth will become less and less able to prepare for and respond to current and future public health needs. For example in 2012, an inadequate fire emergency management system led to an almost catastrophic fire in Biggs Laboratory, and Wadsworth fortunately avoided the loss of life.

Wadsworth's facilities are aging, and need to be rebuilt into a facility that meets 21<sup>st</sup> century needs. With support from NYS and private partners, Wadsworth can be the public health facility the State needs for today, and for the future.

### The Goal

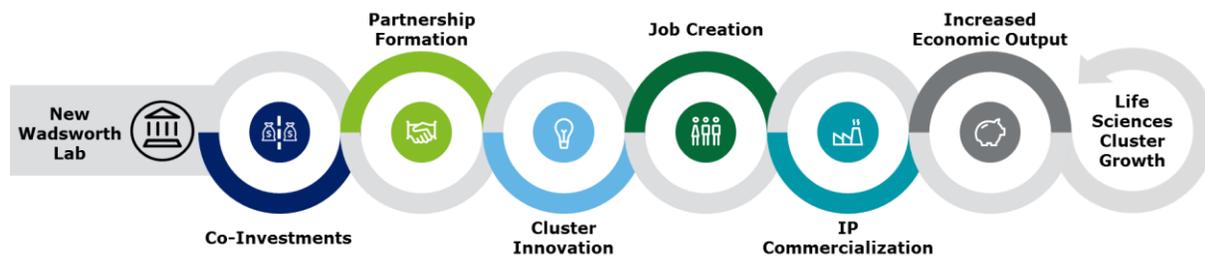
With its central role and national profile in public health, Wadsworth could serve as the focal point in the attraction, retention, and growth of life sciences companies, accelerating an emerging life sciences industry cluster in the Capital Region. The State has earmarked \$150m in this year's budget for its Life Sciences Laboratory

Initiative and to begin development of a new Wadsworth facility – with an even larger investment being considered to fully construct the new facility.<sup>1</sup>

Deloitte Consulting LLP (Deloitte) has been engaged to evaluate Wadsworth’s potential to promote life sciences industry cluster growth in the Capital Region, and specifically to identify key opportunities for Wadsworth to build academic and commercial partnerships. This report analyzes the potential for such partnerships, and provides the high-level economic case for investing in the Life Sciences Laboratory Initiative in the Capital Region.

**Figure 1** illustrates how investment in the Wadsworth Lab could lead to increased economic output and life sciences industry cluster growth.

**Figure 1: Role of a New Wadsworth Lab in Life Sciences Industry Cluster Growth in the Capital Region**



Aging infrastructure, substandard life safety systems, poor ventilation, and building designs unfit for modern, competitive research needs weigh the institution down. Building a new laboratory supports resiliency and public preparedness. An updated laboratory would help Wadsworth respond faster in identifying unknown substances and streamline its management of the vital daily screening program for all NYS newborns. Furthermore, the lab will likely be unable to attract and retain sustainable partners in its current state without key enhancements. A new facility provides the opportunity to evolve the lab’s basic research, attract partners, and serve as a focal point for the Capital Region’s life sciences industry cluster.

**The Desired Outcome**

NYS should invest up to \$750m in a new Wadsworth laboratory and consider additional capital investments to facilitate commercial and academic partnerships, and further accelerate the life sciences industry cluster growth and economic development potential of the Capital Region. Benefits for NYS and the Capital Region would be realized from the start of the investment, even before construction begins, through the initiation of partnerships and their nurturing of the life science value chain. A critical enabler, which would enhance the success of the lab and economic development potential,

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“Wadsworth’s facilities are aging, and it needs to be rebuilt into a facility that meets 21<sup>st</sup> century needs”

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<sup>1</sup> Capital Projects Budget Bill, Chapter 54 of the Laws of 2017, pp. 828-829

would be an overarching life sciences strategy, and as a part of that a statewide approach to bioinformatics.

Until recent efforts by the newly formed life sciences office of the NYS Empire State Development Corporation (ESD), there has been no clear strategy to optimize the integration of the region's full portfolio of unique and valuable life sciences assets. Without a statewide strategy, new partnerships would form in a vacuum, unexposed to the ecosystem of resources and opportunities critical to life sciences industry cluster growth. This inhibits the potential for partnerships to contribute to sustainable economic development. Collaboration is the key to maximizing the full potential of the various life sciences components in the Capital Region.

A new, modern, Wadsworth lab, *strategically located to facilitate future cluster growth*, could function as a magnet for future investments. Redesigned as "A Lab For The 21<sup>st</sup> Century", Wadsworth would be the place where employees, visiting researchers, company executives, and academic partners could cross paths, accelerating innovation and value creation. A modern facility and committed co-investment could serve as a flagship project for NYS, signaling a strong and long-term commitment to the Capital Region's life sciences industry.

The building blocks to attract commercial partners to the region are present and could help to cultivate a thriving life sciences ecosystem. However, left to its own timeline and without significant and coordinated public investments, life sciences industry cluster growth would proceed in a piecemeal fashion, even potentially stagnating without a strategic direction. For the desired economic ripple effects to cascade from a public investment in the Capital Region's life sciences capabilities, the State needs to think about how to integrate what already exists with future investments, and how to leverage operational assets to attract more commercial and academic interest in the Capital Region.

### Conclusion/Findings

Historically, Wadsworth has been a key contributor in life sciences research and public health emergency response. A new revitalized lab, having anchored robust commercial and academic partners, could address the most important public health challenges and trends such as the growing importance of molecular biology and genomics, the need to address bacteria's growing resistance to treatments, the influx of large amounts of data, and the rising incidence of environmental and food contamination.

However, Wadsworth needs to make some critical improvements to continue to succeed and play a large part in the success of the life sciences industry cluster in the Capital Region:

- **Potential Partnerships** – Wadsworth's breadth of globally relevant programs have drawn the initial interest of potential academic and commercial partners to co-solve pressing opportunities with innovative solutions. These opportunities include:

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"A partnership, catalyzed by NYS's \$750m investment in the new lab, could generate up to a 160% return on the invested amount and attract 1,200 life sciences jobs"

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- **Evolving Population Genomics** – Studying the human genome at the population level to better understand factors related to developing and treating disease;
- **Infectious Disease Diagnostics** – Rapidly identifying bacteria or viruses that cause infectious diseases, like Zika or Anthrax, in order to effectively treat patients and mitigate outbreaks;
- **Infectious Disease Therapeutics** – Development of treatments for infectious diseases to fight the ever-increasing resistance to antibiotics;
- **Life Sciences Information Technology, Bioinformatics, and Artificial Intelligence Strategy** – Development of methodologies to collect, store, analyze, and act on the influx of health data being provided by new technology; and,
- **Small Molecule Detection and Characterization** – Ability to detect and analyze the impact to human health of small molecules generated from environmental contamination.

After identifying and qualifying 15 potential collaborating organizations from biopharmaceutical, informatics, diagnostics, and financial fields, the following organizations have confidentially demonstrated an interest in future collaboration:

- A renowned academic medical center;
  - A top-five biopharmaceutical company; and,
  - An informatics/genomics company
- **A new “21st Century Lab” for Wadsworth** – While Wadsworth’s impactful research has attracted the attention of potential partners, its existing facilities impede the ability to partner with commercial and/or academic entities. This report assesses 10 sites and highlights the tradeoffs of 3 potentially viable candidates, including:

Expanded Axelrod

SUNY East Campus

Harriman Campus

There are trade-offs among these sites. Expanded Axelrod would be the most favorable for stimulating life sciences cluster and economic growth, and the ability to keep the existing David Axelrod Institute building. However, the Harriman Campus and the SUNY East Campus would support consolidation of Wadsworth labs into a single facility.

The assessment in this report was preliminary, and as such, further due diligence and tradeoff analysis is required to make a decision on a final site. Deloitte recommends a site feasibility study to affirm the constructability at each location and to identify any physical or environmental constraints that might be present. Furthermore, a cost benefit analysis should be undertaken

to appropriately weigh and monetize the identified trade-offs each site presents (i.e. cost versus proximity to peer institutions and cluster analysis).

- **Economic Benefits to the Capital Region** – Using well-established economic modeling techniques, it was estimated that a partnership, catalyzed by NYS’s \$750m investment in the new lab (using the earmarked \$150m plus additional funds as allocated), could potentially generate up to a 160% return on the invested amount and likely attract approximately 1,200 life sciences jobs<sup>2</sup>. In other words, each dollar of investment in life sciences could yield up to \$1.60 in return for the Capital Region. Economic analyses further suggest that investing to attract a private partner, in addition to the new lab, could generate up to approximately \$2.3b in total economic activity in the Capital Region.

Rebuilding a new lab is necessary for Wadsworth to continue serving its critical public health mission in NYS and making important life sciences contributions. In conjunction with partnership investments, the State has the opportunity for this rebuild to be a focal point of the emerging life sciences cluster in the Capital Region.

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<sup>2</sup> These estimates are based on a high co-investment scenario, with \$300m contributed by NY State and matched by private sector.

## 1. Setting the context

### 1.1. NYS Life Sciences Initiative

In December 2016, Governor Cuomo announced a \$650m initiative to spur the growth of a life sciences industry in NYS and included that proposal in the FY 2018 Executive Budget. The Legislature subsequently enacted a \$620m life sciences initiative, substantially similar to Governor's original proposal. The enacted proposal offers the following State investments to advance the life sciences sector in New York:

- \$200m in tax incentives;
- \$220m in State capital grants to invest in wet-lab and innovation space, and
- \$100m in venture capital and operating support for early stage life sciences initiatives (with private sector partnerships providing up to \$100m in matching funds).

The State also aims to boost economic growth in the Capital Region via an initiative to help advance the life sciences industry cluster. To aid in this effort, \$150m in funding, separate from the \$620m State initiative, has been allocated to Wadsworth for the development of a new facility.

The potential for advancing a life sciences industry cluster and economic growth in the Capital Region is directly linked to Wadsworth. The goal of this report is to demonstrate that linkage to key stakeholders so that they may support budget allocation towards a new lab facility alongside a collaborative investment vehicle for the region. Wadsworth, with its industry leading programs, could serve as the focal point in the attraction, retention, and growth of life sciences companies, accelerating the maturation of a life sciences industry cluster in the Capital Region.

### 1.2. Wadsworth Life Sciences Initiative

Wadsworth has been the public health laboratory of NYS since 1914. The center performs a wide array of research and mandated, nationally and internationally recognized programs such as emergency response and biological and chemical research. For example, Wadsworth:

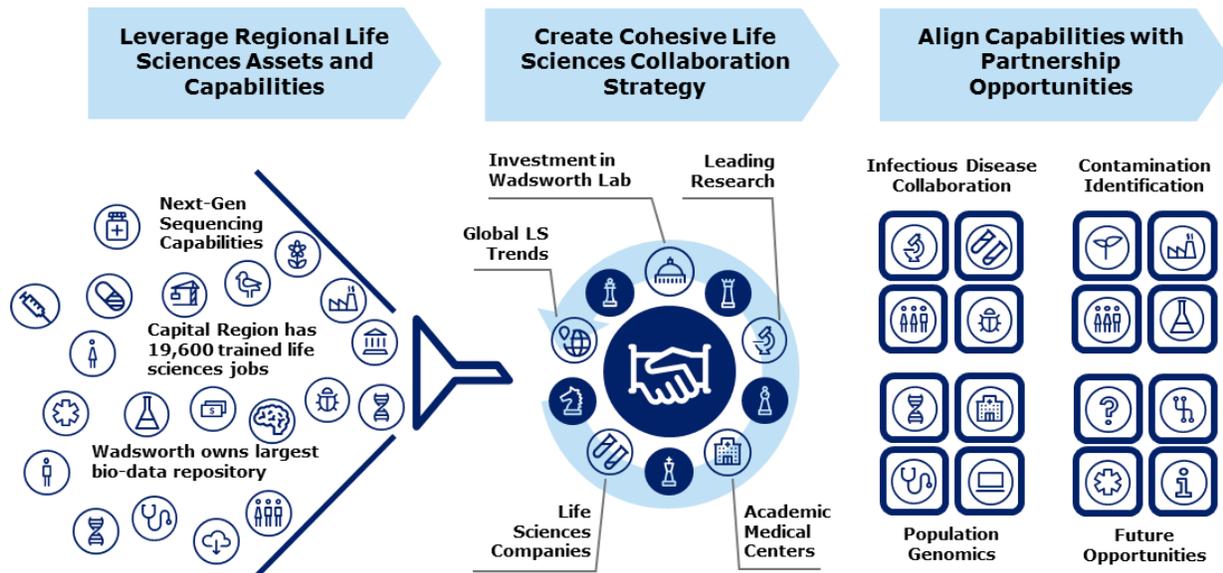
- Serves as the sole source for newborn screening for NYS;
- Has one of the few biodefense research centers in the country;
- Serves as the main provider of rabies and infected insect testing in NYS;
- Carries out a number of critical infectious disease research projects; and,
- Acts as a Centers for Disease Control and Prevention (CDC) independent testing lab, responding to unique or emerging public health needs

Wadsworth is the anchor tenant in a hub of life sciences-related activity, including technology and life sciences companies as well as medical and academic research and institutions for the Capital Region.

The center is currently dispersed across five facilities that cover roughly 910,000 SF and employ approximately 700 staff members. Various assessments<sup>3</sup> over the past 10 years have confirmed that the facilities are significantly dated and in need of pressing upgrades. These prior studies have affirmed that Wadsworth’s mission would be better served through co-location and new purpose-built facilities. Delaying improvements of these facilities contributes to ongoing fiscal burden as numerous ‘risk mitigation’ projects are required just to adequately maintain current operations. Further delay poses a significant risk that could easily trigger high-cost maintenance and repair events, and potential shutdowns of some critical publicly mandated lab functions, thereby possibly jeopardizing public safety.

In alignment with NYS’s aim to help build a life sciences industry cluster in the Capital Region, Wadsworth proposes to consolidate its research and programs into a high-quality, specialized facility. A primary goal in building a new Wadsworth facility is to better foster innovation and collaboration across Wadsworth functions and with academic and commercial partners.

**Figure 2: Fostering Life Sciences Collaboration in the Capital Region**



As a partner to commercial organizations, Wadsworth brings its experienced and specialized staff, the lab’s unique capabilities, important life science data assets, and access to specialized equipment. The lab’s close relationships with NYS, the largest insurance provider in NYS, and hospitals and labs in and out of NYS further help Wadsworth stand out as an attractive potential partner.

**1.3. Goals of the Wadsworth Life Sciences Initiative**

NYS has asked whether building a new Wadsworth lab could play a role in the broader Life Sciences Initiative and stimulate life sciences industry cluster growth in the Capital

<sup>3</sup> Assessments include a 2007 report titled “Conditions Assessment and Survey Biggs Laboratory” prepared by Cannon Design for the Office of General Services, and a 2013 report titled “New York State Consolidated Laboratory Basis of Design” prepared by Jacobs.

Region. Deloitte Consulting LLP (Deloitte) has been engaged to evaluate Wadsworth's potential to promote life sciences industry cluster growth in the Capital Region, and specifically to identify key opportunities for Wadsworth to build academic and commercial partnerships. This report analyzes the potential for such partnerships, and provides the high-level economic case for investing in Wadsworth through the Life Sciences Laboratory Initiative in the Capital Region.

As such, this report covers the following activities:

- A future vision for a cohesive strategy across academia, government, industry, and entrepreneurs that has the potential to develop the Capital Region into a measurably and sustainably thriving life sciences industry cluster;
- An assessment of Wadsworth's core capabilities and how they align with global trends in the life sciences industry;
- A list of three potential Wadsworth/partner collaborations that address market-based life sciences challenges, vetted by and reflective of partners interested in investing resources in the Capital Region;
- An evaluation of potential sites for developing the new Wadsworth facility; and,
- An economic impact assessment based on high-level investment scenarios deemed feasible from the use case development activity.

## 2. Future Vision

### 2.1. The Capital Region Life Sciences Industry Cluster Today

The Capital Region is host to a number of companies and academic institutions that, in concert with the Wadsworth lab, make the region an emergent life sciences industry cluster. This industry cluster includes biopharmaceutical companies such as AMRI, Regeneron, and Taconic Biosciences; medical devices companies like General Electric Medical; medical institutions like Albany Medical Center; and academic institutions like Rensselaer Polytechnic Institute (RPI), State University of New York Albany (SUNY Albany), and SUNY Polytechnic Institute (SUNY Poly).

The biopharmaceutical companies, medical devices companies, and academic medical centers that make up the life sciences industry cluster directly contributed to over \$16b of the region's economic activity in 2015.<sup>4</sup> Over 102,000 jobs classify as positions in life sciences, supported by approximately 104,000 jobs with clearly defined economic linkages.<sup>5</sup> We observe the Albany EA, rather than the Capital Region alone, to reflect the labor shed and commuting patterns of employees<sup>6</sup>. The Economic Area best represents the life sciences catchment where people live and work.

**Figure 3** shows the component parts of the Albany EA life sciences industry cluster, providing summary data for employment, average labor income (which equals wages plus non-wage benefits<sup>7</sup>), and the economic contribution of each subcomponent:

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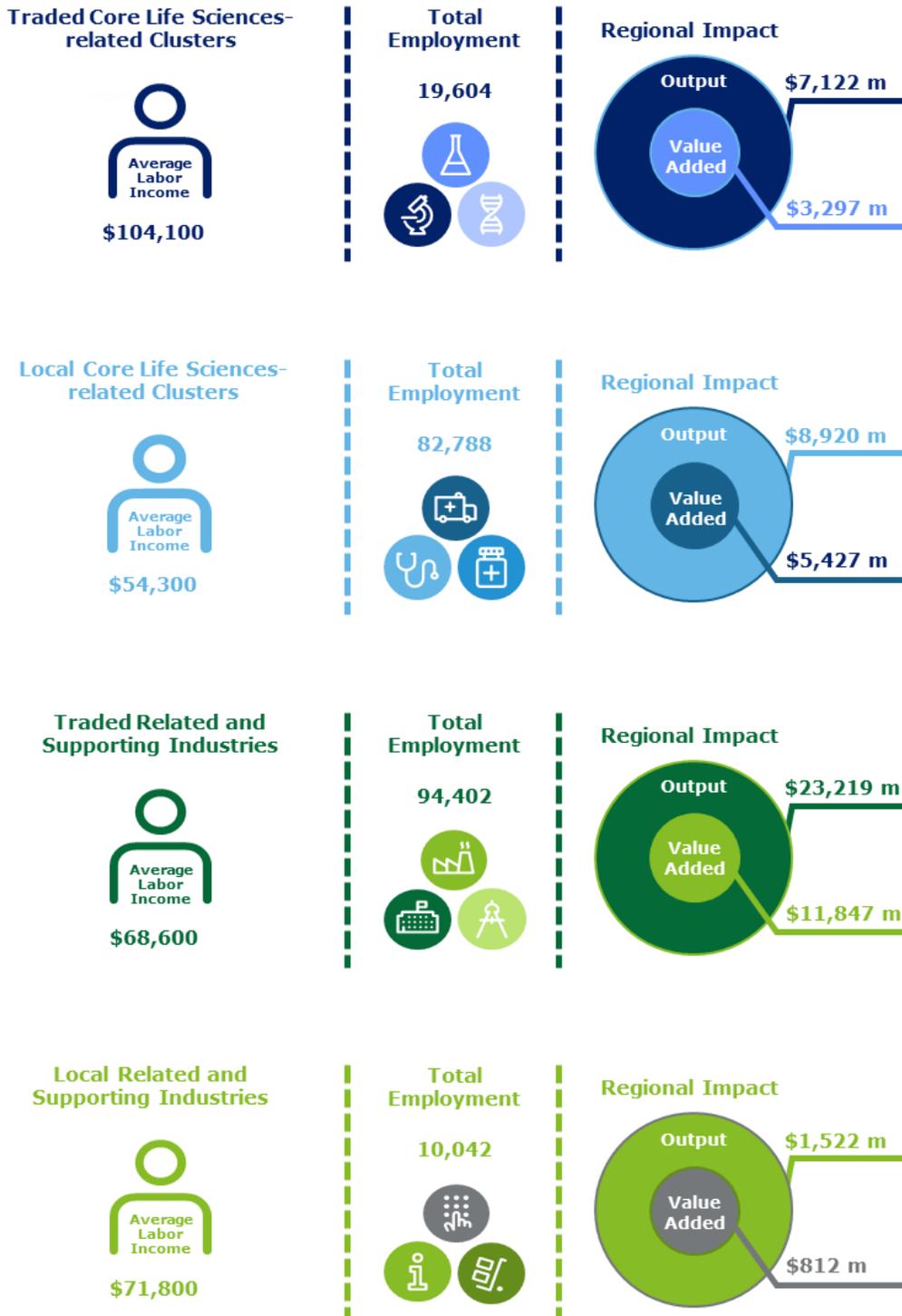
<sup>4</sup> IMPLAN NY County Data, 2015; EDA Cluster Data

<sup>5</sup> For more information on the U.S. Economic Development Administration's Cluster Methodology, see <http://clustermapping.us/content/cluster-mapping-methodology>. See **Appendix E** for a detailed coding of jobs according to NAICS codes.

<sup>6</sup> Described in **Appendix A**, the EA includes the 12 counties within NYS that make up the Albany Economic Area, as described by the U.S. Economic Development Administration. See **Appendix D** for tabular representation of summary data at the other levels of analysis. This area was used to conduct the economic analysis, but is comparable to the 8-county Capital Region.

<sup>7</sup> Non-wage benefits capture elements of employee compensation not captured by wages, including insurance benefits, vacation time, proprietor income, etc.

**Figure 3: Albany EA: Profile of Life Sciences-Related Clusters, 2015<sup>8</sup>**



Source: IMPLAN NY County Data, 2015; EDA Cluster Data.  
 Note: Labor Income includes all wages, non-wage benefits, and proprietor’s income.

<sup>8</sup> For the applied sorting methodology used to describe the life sciences industry cluster, see **Appendix E**.

The four subcomponents are:

1. Traded<sup>9</sup> core life sciences-related clusters: includes biopharmaceuticals, medical devices, and knowledge creation (key to this analysis);
2. Local<sup>10</sup> core life sciences-related clusters: includes local medical and diagnostic labs as well as hospitals;
3. Traded related and supporting clusters: includes many industries such as information technology, marketing, and downstream chemicals production, among others; and,
4. Local related and supporting clusters: includes other local biological, medical, and environmental services.

Of particular note are a few key trends observed for the Albany EA:

- The traded core life sciences-related clusters had 19,604 jobs in 2015. These jobs contribute significantly in terms of the Albany EA's total economic output (total economic output<sup>11</sup> from traded core life sciences-related economic activities was \$7.1b in 2015<sup>12</sup>);
- The traded core life sciences-related clusters are linked to over \$23.2b in economic activity from other traded clusters, and over \$8.9b of economic activity from the local core life sciences-related cluster; and,
- Traded core life sciences-related jobs in the Albany EA exhibit average wages of \$104,100 per worker<sup>13</sup>, higher than jobs found in local core life sciences-related clusters (\$54,300) – reflecting the impact of global competition and trade-flows that traded life sciences-related clusters exhibit. These higher wages are also due to the fact life sciences-related talent attract equity and grant funding. This has been the case in places like the Research Triangle Park in North Carolina, the UConn Health Cluster in Connecticut, and the Medical and Related Sciences (MaRS) Discovery District in Toronto, Canada – to name a few.<sup>14</sup>

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<sup>9</sup> Traded clusters contain industries that create products in a region that are sold to customers inside and outside the region. For example, medical device companies make a traded product, whereas hospitals typically provide a local service. In the United States, traded clusters contain only about one-third of private sector jobs, but companies in these clusters tend to be more innovative and productive.

<sup>10</sup> Local clusters feature goods or services created and sold within the same region that do not compete with similar goods or services created outside of the region.

<sup>11</sup> Total economic output is the quantity of goods and services produced in a given time period.

<sup>12</sup> IMPLAN NY County Data, 2015.

<sup>13</sup> IMPLAN NY County Data, 2015.

<sup>14</sup> See **Appendix H** for more details on these clusters.

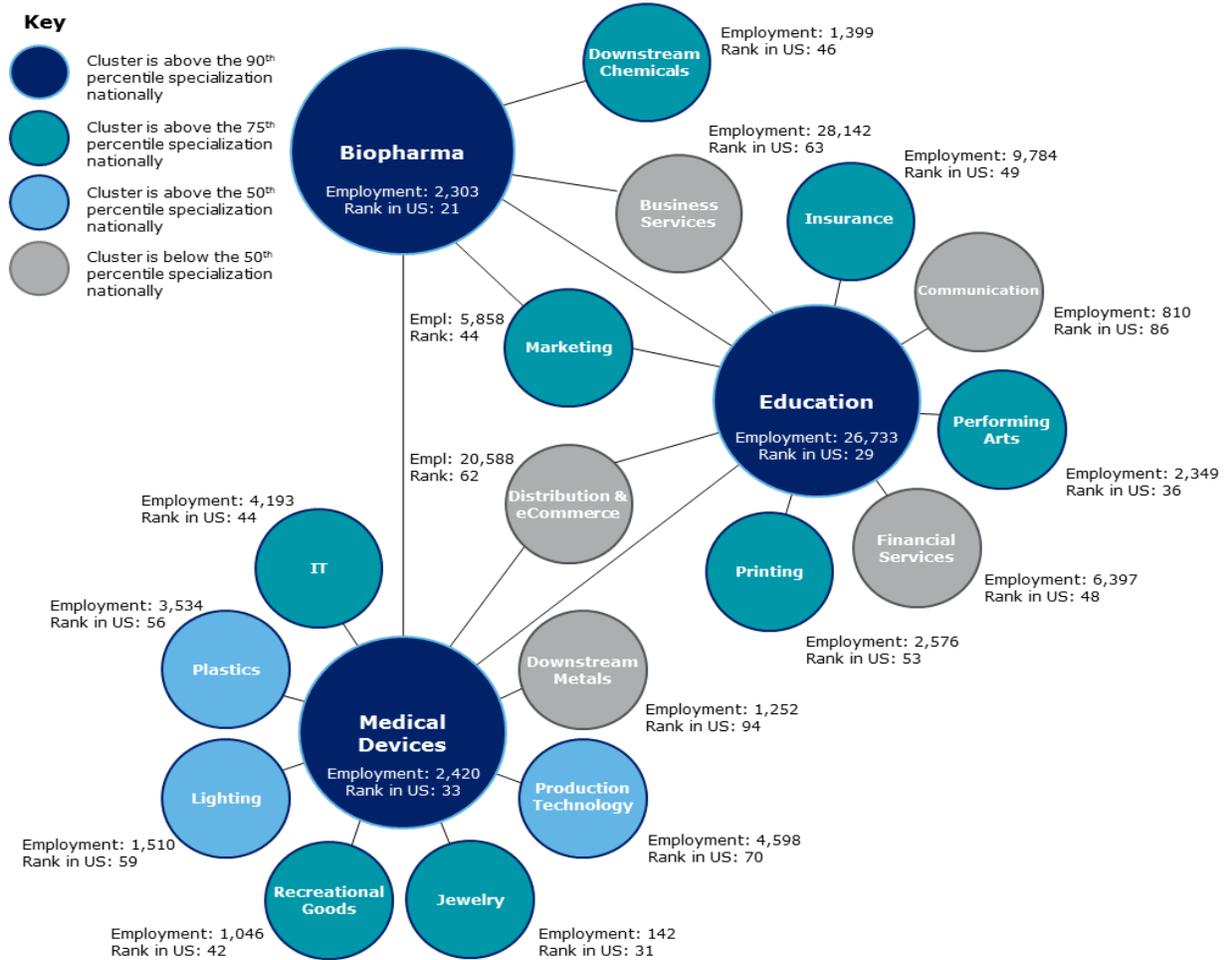
**Figure 4** displays a U.S. Economic Development Administration (EDA) Life Sciences Industry Cluster Map, which shows traded clusters considered core to this analysis (i.e., Biopharmaceuticals, Medical Devices, and Education & Knowledge Creation industry clusters) and their supporting and related traded clusters considered significant to life sciences-related economic activity (subcomponents #1 and #3 of the life sciences industry cluster described above). It highlights the interconnectedness of life sciences core and supporting industries and their relative ranking to national peer clusters.<sup>15</sup> Between Cluster Relatedness (BCR)<sup>16</sup> is the metric the EDA uses to define connections. Biopharmaceuticals, medical devices, and education and knowledge creation clusters closely link to 16 other traded clusters, 11 of which are at least specialized above the 50<sup>th</sup> percentile compared to other national peers.

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<sup>15</sup> These linkages are defined by the US Economic Development Administration. For more information, see **Appendix A**. Note that not shown here are the local clusters related to life sciences, which include local health services comprising hospitals, outpatient facilities, pharmacies, or other health-related facilities that predominantly cater to residents of the region. Also note that the life sciences industry cluster does not include some of the positions in the displayed education and knowledge creation cluster.

<sup>16</sup> Between Cluster Relatedness (BCR): Measures the average relatedness between industries in each cluster, using four key metrics: locational correlation of employment between the industries, locational correlation of industry establishments, input-output flows between the industries, and occupational overlap between the industries. See <http://www.clustermapping.us/content/glossary-terms>

**Figure 4: Albany EA Cluster Linkages, Employment, and Employment Specialization by Life Sciences-Related Clusters**



Source: Adapted from U.S. Economic Development Administration.

According to the EDA, the Albany EA appears to be relatively specialized in the biopharmaceuticals cluster, ranking the 12<sup>th</sup> highest in the nation (out of 181 total Economic Areas) in employment concentration in 2015 (when normalized for size of the economy)<sup>17</sup>. For medical devices, the region ranks 17<sup>th</sup> in terms of employment concentration and for education and knowledge creation, the region ranks 7<sup>th</sup>.

The strength of linkages between and within clusters is often demonstrably linked to the leadership of state governments that include academic institutions and business leaders in the creation of clusters, which over time increase the concentration of highly skilled life sciences-related jobs in their regions. This was

<sup>17</sup> Note that the EDA ranks specialization using what is termed a location quotient calculation. In simple terms, the location quotient is a ratio, where a score of "1" indicates that the proportion of a region's workforce employed in that particular cluster equals the national average, with higher scores indicating higher than average proportions of employment. See: [http://www.clustermapping.us/region-cluster/biopharmaceuticals/economic/albany\\_schenectady\\_amsterdam\\_ny](http://www.clustermapping.us/region-cluster/biopharmaceuticals/economic/albany_schenectady_amsterdam_ny)

the case at Research Triangle Park, where in the 1950s the governor's office led the creation of a real estate and land development strategy that created incentives for the private sector to allocate resources to the park.<sup>18</sup> The role of government in laying the framework upon which cluster linkages could grow was also demonstrated in the Center for AgriBioscience in Victoria, Australia. There, the Victorian Government partnered with a local university to invest in the development of a major new research facility for agricultural biosciences, creating a joint venture that has led to the formation of at least three public-private partnerships related to agricultural biosciences.<sup>19</sup>

From these examples it is apparent that the public sector plays an important role in deepening connections within life sciences industry clusters. In the Capital Region, many of the building blocks for a thriving life science ecosystem already exist. However, left to its own timeline and without significant and coordinated public investments, life sciences industry cluster growth would proceed in a piecemeal fashion, even potentially stagnating without strategic direction from the State. For the desired commercial partnerships and associated economic ripple effects to cascade from a public investment in the Capital Region's life sciences capabilities, the State needs to think about how to integrate what already exists with future investments, and how to leverage operational assets to attract more commercial and academic interest in the Capital Region.

## 2.2. The Need for a Cohesive Collaboration Strategy

Life sciences organizations are demonstrably embedded within the Capital Region and contribute significantly to the local economy. However, while there are widely recognized instances of collaboration between these various entities, for instance between SUNY Poly and IBM (and previously, Tokyo Electron, GlobalFoundries, and Samsung), there appears to be no clear overarching strategy to optimize the integration of the region's full portfolio of unique and valuable life sciences assets. Without a strategy, new partnerships form in a vacuum, unexposed to the ecosystem of resources and opportunities critical to life sciences industry cluster growth. This inhibits the potential for partnerships to contribute to sustainable economic development.

The Capital Region needs an approach that incorporates the existing assets of not only the Wadsworth labs, but also the broader set of life sciences capabilities in the region<sup>20</sup>. Collaboration across the life sciences ecosystem enables varied groups of stakeholders to achieve together what would be difficult for any individual participant. A collaboration strategy should align the various academic, government, industry, and entrepreneurial players along the life sciences value chain in the Capital Region. The aim of the strategy would be to deepen research capabilities through collaborative planning, accelerate the rate of scientific discovery, strengthen the handoff from research to development and commercialization, and capture value creation within a framework of co-developed intellectual property.

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<sup>18</sup> For more information on this cluster, see **Appendix H**.

<sup>19</sup> For more information on this cluster, see **Appendix H**.

<sup>20</sup> For an in-depth analysis of the Capital Region's life sciences assets and capabilities, see **Section 2**.

One key area of collaboration in the Capital Region is in developing a bioinformatics strategy. There appears to be currently State, academic, and commercial interest in advancing informatics through the development of robust health-based datasets and advanced analytics, aligning with the State's goals of greater population and public health insights. Wadsworth should develop a strategy that leverages the existing bioinformatics assets in the region, through collaborative data aggregation and analysis, to support the State's public health goals and attract partners to Wadsworth.

Going forward, Wadsworth's role as a premier public health institution will remain of vital importance. With its inclusion in a broader, cohesive life sciences strategy, Wadsworth's public health programs and research would also be able to play a larger role in the life sciences value chain. Wadsworth would be better able to provide data, research, equipment, and experienced professionals to advance collaborative solutions to pressing issues in public health and life sciences. Through heightened collaboration with the private sector, the lab would see its discoveries more rapidly carried through to commercial viability. The strategy would integrate and attract both mature and start-up companies by aligning their respective interests with the assets and capabilities of the lab.

A life sciences strategy for the region should be both cohesive and inclusive of the Capital Region's current and emerging life sciences ecosystem and include:

- Strengthening of collaborative opportunities between scientists and clinicians, whether in the provision of co-used labs or offices, eating areas, and/or networking events (meetings, lunches/dinners, etc.) to formally and informally share research and work efforts
- A formal mentorship program for researchers, entrepreneurs, and early stage professionals to learn from more experienced entities, potentially taking the form of an accelerator or incubator. The program would provide access to resources and support for Research and Development (R&D) and enable rapid identification of industry application of existing technology and assets
- A workforce development program that creates a path for clinical and scientific graduates to gain experience and contribute to the region's life sciences capabilities and results
- A plan for development and exchange of shared intellectual property among key participants
- A commercialization resource center to help carry discoveries through to development and commercialization
- The provision of bioinformatics capabilities related to use cases and partnership solutions
- A steering committee staffed by persons across the life sciences value chain to oversee the advancement of the life sciences strategy

Additionally, an initial partnership with at least one reputable, stable, and active life sciences commercial company would help anchor the Life Sciences Initiative through the leveraging of Wadsworth's existing research expertise and functional

capabilities. Working with Wadsworth and NYS, Deloitte has identified potential partnering opportunities (detailed in **Section 4**) that NYS could act on in the near term, building industry and stakeholder confidence for future collaborations with other companies. Furthermore, as NYS makes investments to construct a state-of-the-art Wadsworth lab, it would improve the lab’s operational efficiency, giving administrators and researchers more bandwidth to explore and develop joint ventures and other initiatives with the private sector.

A collaboration strategy alone does not guarantee a successful Life Sciences Laboratory Initiative or cluster growth. However, without a collaboration strategy, it is likely that the Life Sciences Laboratory Initiative would achieve only a portion of its full potential. The Capital Region has a collection of capabilities and assets that when properly integrated and managed would enable it to be an ascendant hub for life sciences. Collaboration between various entities is crucial to ensure NYS’s investments have sustainable economic benefits.

### 2.3. Life Sciences Industry Cluster Development in Other Regions

With the above-mentioned strategy in place, the Capital Region would be able to effectively promote its capabilities to attract additional commercial investment and alliances. In time, these investments could significantly augment the region’s profile into a nationally recognized hub for R&D; innovation; manufacture of safe and effective therapies, devices, and supporting technologies; and leading-edge scientific knowledge.

**Table 1** below introduces a few case studies that are relevant for the NYS Life Sciences Initiative. Each case study includes examples of how investments in public life sciences research facilities led to the development of anchor institutions and investments by commercial entities that enabled the growth of vibrant, innovative clusters. **Appendix H** provides more discussion and examples.

**Table 1: Case Studies for Successful Life Sciences Industry Cluster Development**

Case study	Development History	Key Parallels
<b>Massachusetts Life Sciences Super Cluster</b> <sup>21</sup>	The Massachusetts Life Sciences Initiative began in 2008. It represents a 10-year, \$1b investment in the State’s life sciences capabilities. The public capital injection targeted biotechnology, pharmaceuticals, medical diagnostics, medical devices, and bioinformatics. The Massachusetts Life Sciences Center (MLSC), founded in 2006, was made responsible for carrying out the initiative. From the initiative, the state saw the creation of 2,537 jobs, and a tax revenue/incentive ratio of 1.66 over five years,	<ul style="list-style-type: none"> <li>• Each dollar of tax incentive repaid about \$1.66 to public accounts, which mirrors the multiplier effect estimated in <b>Section 6</b>.</li> <li>• This cluster embraced an economic theory that weighted technological progress, including interdependencies between new ideas and new investment.</li> <li>• Large companies depended on breakthroughs by being proximate with a concentration of smaller firms engaged in research, similar to Wadsworth’s research functionalities.</li> <li>• Smaller companies depended on the MLSC for accelerator support, including loans and R&amp;D.</li> </ul>

<sup>21</sup> **Appendix H** does not include this case study. For more information, see: [https://www.tbf.org/~media/TBFOrg/Files/Reports/LifeSciences\\_f.pdf](https://www.tbf.org/~media/TBFOrg/Files/Reports/LifeSciences_f.pdf)

Case study	Development History	Key Parallels
<b>Research Triangle, North Carolina</b>	with \$93m in taxes generated from \$56m in incentives.  In the late 1950s, the Research Triangle, North Carolina area was among the lowest in the country in terms of wage and employment levels. A group of business, academic, and government leaders worked together to create and develop Research Triangle Park. Research Triangle Institute, an independent, nonprofit institute that provided research, development, and technical services, started in 1958. It took 20 years to build a large corporate R&D presence and another 20 to see economic consequences flow from it.	<ul style="list-style-type: none"> <li>• Not a large metro area. Also the site of the state capital</li> <li>• Strong local universities, with a high number of graduates leaving the area after receiving their degrees</li> <li>• Used and enhanced the specialized assets it had to attract large multinationals and research institutions</li> <li>• Critical mass of scientists, researchers, and technicians existed across life sciences and related industries</li> </ul>
<b>Life Sciences Cluster, San Diego, California</b>	Hybritech was founded in 1978 by University of California at San Diego (UCSD) and became a training ground for researchers and staff that would later form 50 biotechnology companies in the region. In 1985, UCSD CONNECT brought venture capital funding and connected new businesses with the university. Eight thousand jobs were added between 1988 and 1997, and the region had the fastest growth rate of patent registration out of the largest 20 US clusters.	<ul style="list-style-type: none"> <li>• The area was not known for life sciences initially.</li> <li>• The cluster is composed of many small companies that focus on one to two drug development targets, as well as numerous research institutions.</li> <li>• Different types of research organizations (e.g., large public university, small private centers focused on basic research, commercially oriented institutes) provide a range of technologies and partnering opportunities.</li> <li>• Scripps Research Institute required researchers to raise their own funds, encouraging innovation and R&amp;D funding in the region, and partnered with businesses which encouraged technology transfer to industry.</li> <li>• Salk Institute does not seek corporate sponsorships, but actively licenses its discoveries.</li> </ul>
<b>University of California at Berkeley &amp; Large Biopharmaceuticals Company, California</b>	In 1998, the Department of Plant and Microbial Biology (PMB) at the University of California at Berkeley (UCB) and a private company entered into a five-year public-private research partnership to develop a broad-plan genomics research alliance. The arrangement incentivized private investment in PMB's sequencing capabilities in exchange for patent rights for all discoveries.	<ul style="list-style-type: none"> <li>• Agreement involved PMB's entire faculty, with the company giving UCB \$25m over five years to conduct plant genomics research. Private partner provided equipment and supplies and eventually provided additional funds to renovate department laboratory facilities and house staff there.</li> <li>• Researchers and private partner co-controlled the selection of specific research projects within the broader scope.</li> <li>• Private sector partner made its proprietary genomics database and other research tools available to department faculty.</li> <li>• Private sector partner had first refusal of negotiating rights to a percentage of discoveries resulting from the research.</li> </ul>
<b>Johns Hopkins Medicine, Maryland</b>	Johns Hopkins Medicine (JHM), an 88-acre mixed use Science and Technology park, is now home to 40 life sciences companies and research institutes in close proximity to JHM's institutions and hospital complex. Opened in 2006, the campus cost \$1.8b. In 2015,	<ul style="list-style-type: none"> <li>• JHM has established strategic industry collaborations in oncology, ophthalmology, anti-cancer drugs, small molecule drug development, and therapeutics.</li> <li>• Through its collaboration strategy, Johns Hopkins University reported \$58m in licensing revenue, with recent growth largely fueled by a major biopharmaceutical partnership.</li> </ul>

Case study	Development History	Key Parallels
	JHM generated over \$7b in revenue through globally relevant research activities.	<ul style="list-style-type: none"> <li>• JHM uses Johns Hopkins "Fast Forward" business incubator program to help fund startup opportunities, with 22 startups receiving \$434m in funding in 2016.</li> <li>• JHM experiences difficulty attracting and retaining employees and businesses due to urban decay.</li> <li>• JHM employed master planning to address incubation and collaboration spaces early on, creating a private sector involvement roadmap.</li> </ul>
<b>Medical and Related Sciences (MaRS) Discovery District, Toronto, Canada</b>	The MaRS Discovery District is a non-profit organization dedicated to maximizing the economic and social impact of Canadian innovation, built with the objective to grow Canada as a global leader in the race for innovation leadership. MaRS was first conceived in 2000 by business and community leaders as a solution to this challenge. MaRS is the world's largest urban innovation hub and brings together diverse players – scientists, startups and scaling firms, multinationals, investors and enablers	<ul style="list-style-type: none"> <li>• MaRS charges market rates for commercial tenants, which allows them to provide discounted rates to startups.</li> <li>• The district aggressively recruited scientists, startups, scaling firms, multinationals, investors and enablers to a single location.</li> <li>• Its commercialization entity, MaRS Innovation, takes equity stakes in ventures.</li> <li>• Has been able to co-locate different players in the innovation system, from researchers to startups to multinational companies, along with service providers and investors.</li> <li>• MaRS Health's team of accomplished entrepreneurs and experienced business leaders support growth-oriented ventures to commercialize innovation, providing mentorship and strategic advice, as well as connections to a robust network of investors, industry specialists, potential partners, customers, and talent.</li> </ul>
<b>Agribioscience Center, Victoria, Australia</b>	Established in 2012, Agribioscience Center (AgriBio), is a joint initiative of The Victorian Government of Australia, and La Trobe University, to invest in the development of a major new research facility for agricultural biosciences. Its objective is to leverage Victoria's current competitive biosciences and biotechnology advantage to create a scientific research hub.	<ul style="list-style-type: none"> <li>• The Victorian Government entered into a joint venture with the university, creating an adaptable facility that can address emerging trends as they develop.</li> <li>• AgriBio was linked to a regional accelerator program that provided access to funding, office space, structured mentoring programs, and international pitching opportunities.</li> <li>• The center's capabilities were leveraged to compete in biosciences and biotechnology and create a scientific research hub.</li> </ul>

What these few (out of many) examples show is the importance of strong anchor research institutions, often funded by government, in the development of leading, globally competitive life sciences industry clusters – and their contribution to sustained economic growth.

Investments in foundational public institutions send a clear message to potential commercial partners of a state's commitment to standing up a world-class life sciences industry cluster. In particular, a new Wadsworth lab, strategically located to facilitate future cluster growth, could function as a magnet for future investments. The lab would be the place where employees, visiting researchers, company executives, and academic partners could cross paths, accelerating innovation and value creation. After the lab becomes operational, the facilities would also help company executives, researchers, or other partners considering relocating to the Capital Region to envision their own collaborations with Wadsworth.

## 3. Aligning with Global Trends

### 3.1. Wadsworth Current Capabilities

Wadsworth is recognized as one of the nation's premier public health laboratories, performing a wide array of research and public health programs critical to the State to protect the health of NY residents. The CDC also notes it as a Regional Center of Excellence, supporting public health labs in other states. Wadsworth has played an integral role in public health, and has often led the charge in combatting emerging public health threats. For example, when Zika struck in 2015, Wadsworth was one of the first labs in the world to conduct isolated gene sequencing to study its evolution. When the Ebola outbreak occurred in 2014, the lab supported investigation of possible cases, and provided detailed guidance on infection control protocols and procedures to ensure the health and safety of workers, patients, visitors, and the general public. Wadsworth also rapidly analyzed over 1,000 suspicious materials and specimens when Anthrax was used as a bioterrorist agent in 2001. Clearly, the impact of Wadsworth's work extends beyond state lines, benefiting public health and the broader medical community worldwide. In fact, one of Wadsworth's former scientists was recognized with a Nobel Prize for the work they did at Wadsworth.

To execute this mission, Wadsworth has established scientific capabilities across 12 special program areas spanning laboratory-based program areas, laboratory quality certification, and administration of extramural funding:

**Laboratory-Based Special Program Areas:** Wadsworth performs testing and surveillance to protect the residents of NYS through identification of genetic diseases, infectious diseases, and environmental threats. It has world-class capabilities and is a leader in the fields of drug-resistant pathogens, environmental protection, and biodefense, and has one of the largest collections of blood samples in the country (a biobank that is a key asset resulting from the newborn screening program). In addition, Wadsworth conducts basic and applied research to develop new analytical methods (the chemical processes for performing biological and chemical studies) and set reference standards (the calibrated levels of biological effects used as a measurement base for testing new compounds).

**Laboratory Quality Certification Special Program Areas:** Wadsworth regulates clinical labs in NYS and is the Clinical Laboratory Improvement Amendments (CLIA)<sup>22</sup> authority in NYS. As part of this program, it ensures the quality of laboratory services provided in all labs that test specimens originating from NYS through certification programs, on-site surveys, and regular proficiency testing, and by establishing minimum qualifications for directors.

**Administration of Extramural Funding Special Program Areas:** Wadsworth manages extramural funding programs to administer investments, grants, and other financial resources to support stem cell research, breast cancer research and education, and development of spinal cord treatments.

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<sup>22</sup> CLIA is a federally mandated program to regulate laboratories that test patient specimens to ensure the labs produce accurate and reliable test results.

Greater detail on Wadsworth’s facilities and capabilities could be found in **Appendix B**.

Wadsworth’s capabilities are designed to address and respond to public health needs in NYS. To attract potential partners, Wadsworth should consider how its competence in addressing NYS’s public health needs intersects with the broader interests of the life sciences industry.

### 3.2. Alignment to Life Sciences Industry Trends

To evaluate options for new facilities improvements, spur growth, and attract partners, the Capital Region cluster should nurture areas of research and testing that align with current and emerging global trends. The global outlook for healthcare appears to be positive, with spending expected to reach \$8.7 trillion by 2020.<sup>23</sup> The growth is anticipated to be driven by emerging and lower-income countries, with expansion in developed countries contributing due to shifting demographics towards older and more chronically ill populations.<sup>24</sup> Some predominant healthcare drivers include oncology, HIV/AIDS, the leading causes of death (cardiovascular disease, cancer, and respiratory disease), diabetes, dementia and other neurological diseases<sup>25, 26</sup>.

North America’s healthcare sector alone is projected to have a 4.3% growth in healthcare spend by 2020. New technologies, influence from regulatory bodies, and rising demand for value-based healthcare services are transforming the healthcare market and expanding opportunities for preventive and personalized care.

These influencing factors are driving growth and change in the life sciences industry, compelling life sciences and healthcare organizations to evolve. In line with the Johns Hopkins Medicine (JHM) case study<sup>27</sup>, Wadsworth could achieve successful partnerships by focusing on globally relevant life sciences activities. Leading organizations are focusing their efforts in a numbers of areas, including, but not limited to<sup>28</sup>:

- **Managing risk.** The broad challenge of managing cost and pricing is not expected to subside anytime soon and mitigating risk will remain a primary focus for the foreseeable future. One particular area of interest across the life sciences value chain is gene sequencing. The cost of sequencing the human genome has rapidly declined from nearly \$95m in 2001 to approximately \$1,000 by October 2015.<sup>29</sup> In NYS, there has been increasing demand for broad sequencing of oncology and other patients in clinical settings to identify treatable gene mutations, mutations being studied through ongoing clinical trials, and mutations that may increase the risk for getting cancer and

<sup>23</sup> World Industry Outlook, Healthcare and Pharmaceuticals, Economist Intelligence Unit, June 2016.

<sup>24</sup> 2017 Global Life Sciences Outlook, Deloitte, 2017.

<sup>25</sup> Facing the tidal wave: De-risking pharma and creating value for patients, Deloitte UK Centre for Health Solutions, 2016.

<sup>26</sup> Top 10 causes of death, WHO.

<sup>27</sup> For more information, see **Appendix H**.

<sup>28</sup> 2017 Global Life Sciences Outlook, Deloitte, 2017.

<sup>29</sup> Wetterstrand KA. DNA Sequencing Costs: Data from the NHGRI Genome Sequencing Program (GSP). Available at: [www.genome.gov/sequencingcostsdata](http://www.genome.gov/sequencingcostsdata). Accessed August 2017.

other diseases; however, the sequencing process lacks payment mechanisms and insurance coverage. Value-based business models with unique approaches to risk/value sharing (between healthcare plans, providers, and other industry stakeholders) are thus coming to dominate healthcare. Wadsworth has a biobank asset and genome sequencing capabilities, and has the opportunity and incentives to test unique payment models because NYS is the second largest Medicaid payer in the country, spending ~\$28b to cover 33% of NY residents in 2016 (6.4m people)<sup>30</sup>.

- **Driving research and development (“R&D”) innovation.** Driving and sustaining innovation persists as a priority in the life sciences industry, as stiff competition and patent cliffs continue to put pressure on R&D organizations by jeopardizing revenue. Top trends in R&D innovation include genomics (and related capabilities that enable personalized medicine, immune modulation, etc.), molecular biology, biomedical engineering, biotechnological solutions, and “breakthrough” designated devices and drugs. Oncology is the largest therapeutic area in life sciences research, comprising more than a third of R&D pipelines by value<sup>31</sup>. It is expected to remain the largest segment through 2022, with an expected annual growth of 12.5% per year, reaching sales of \$190b (16.3% market share)<sup>32</sup>. As a leader in drug-resistant pathogens, environmental protection, and biodefense, and with key assets including the biobank, Wadsworth has capabilities that align with these R&D trends.
- **Connecting with patients as healthcare “consumers”.** Increasingly engaged and empowered healthcare consumers are demanding services and solutions that are coordinated, convenient, customized, and accessible. As technology continues to advance and impact clinical settings, an abundance of health data is being generated through lab tests, sensors, clinical exams, etc. This has caused a need for, and market interest in, advanced analytics, bioinformatics, and the application of artificial intelligence and cognitive processing to extract insights from massive, robust health datasets. Wadsworth has unique data assets, which if combined with the State’s All Payer Database (APD) and a partnering bioinformatics capability, could empower healthcare providers across NYS and the nation to provide more tailored, bedside solutions for patient care.
- **Transforming business and operating models.** Many life sciences companies are looking at options to transform their current operating models to counter rising cost pressures and improve productivity across their organizations. Traditional asset-based partnerships have a common objective to progress a single molecule along the R&D process through to launching a new drug. More recently, non-asset based partnerships have been used to form collaborative alliances between a mix of ecosystem stakeholders, allowing for broader shared control and decision-making. To achieve this transformation, some life sciences companies are engaging with peers and

<sup>30</sup> The Henry J. Kaiser Family Foundation, State Health Facts, 2016.

<sup>31</sup> 2015 Global Life Sciences Outlook, Deloitte, 2015.

<sup>32</sup> World Preview 2016, Outlook to 2022, EvaluatePharma, 2016.

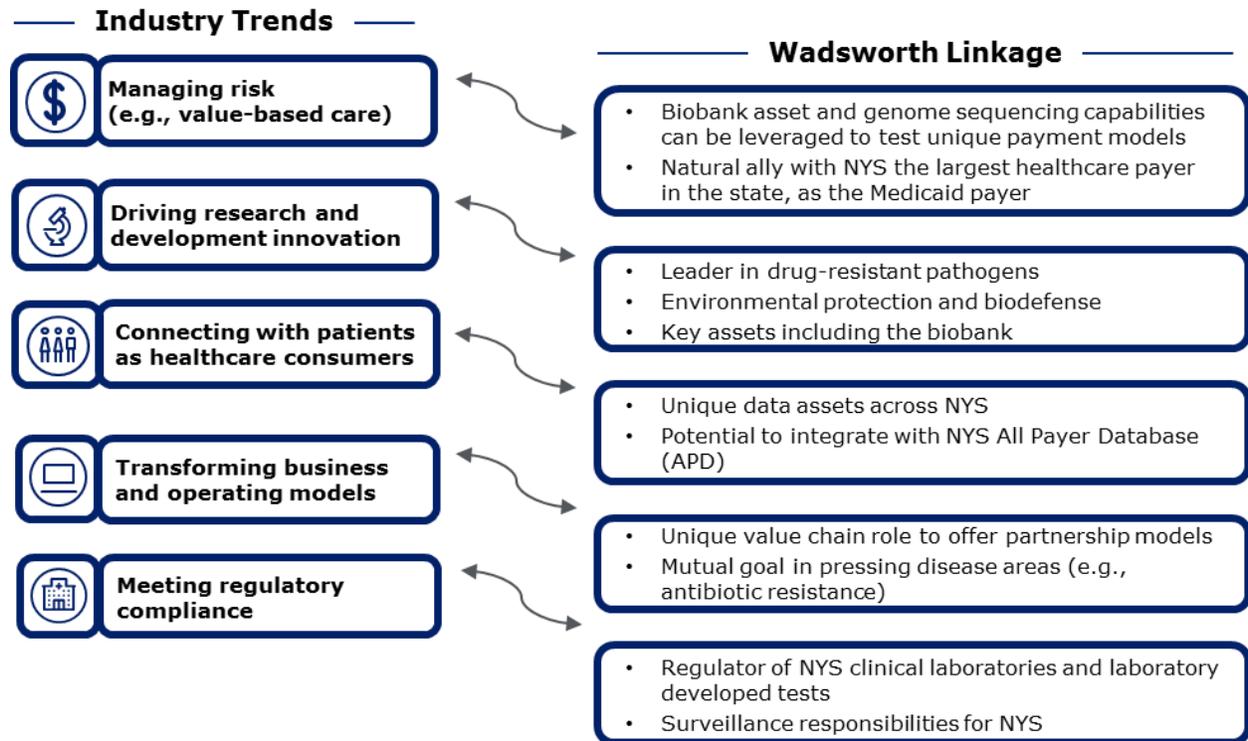
other ecosystem stakeholders in “open innovation” and other collaborative models. Antibiotic resistance is an increasingly serious threat to global public health, and one area where a new business model is needed to efficiently generate results. A growing number of prevalent infections (e.g., pneumonia, tuberculosis, and gonorrhea) are becoming harder to treat as antibiotics become less effective. Policy makers, health professionals, life sciences companies, and the agriculture sector should work together in innovative ways to limit the spread and develop new treatments to antibiotic resistant pathogens. Multiple players across the life sciences value chain could benefit from Wadsworth’s leading research capabilities in the field of antibiotic resistance.

- **Meeting regulatory compliance.** Regulatory evolution and approval timelines continue to challenge life sciences companies by increasing the effort and complexity of getting new medicines to patients in need. It remains difficult to manage regulatory pathways both in the United States and globally. Wadsworth’s role as the State regulator of clinical laboratories and Laboratory Developed Tests (LDTs), and its surveillance responsibilities of all of NYS hospitals (arguably some of the largest hospitals in the world) provide a unique ability to impact and shape the regulatory environment.

### 3.3. Wadsworth’s Attractiveness to Partners

Wadsworth’s role as a State public health lab, along with its alignment with the stated life sciences trends, presents a unique value proposition for collaboration with potential partners across the life sciences value chain. To bring collaboration potential a step further and attract commercial partners, Wadsworth should leverage not only its scientific expertise, but also its role as part of the NYS government.

**Figure 5: Wadsworth’s Linkage with Critical Life Sciences and Healthcare Industry Drivers**



**Access to Robust Datasets:**

One of the key drivers of life sciences partnerships is access to data that provides stakeholders the benefit of quickly generating insights to develop and offer their respective products and services. The lab’s surveillance responsibilities provide unparalleled access to healthcare data across NYS. Academic and commercial organizations would otherwise be unable to access such data from a single entity. In addition to the data generated by Wadsworth’s basic research and public health functions, NYS DOH collects and stores statewide medical data and healthcare payer data through ADP that could be leveraged by the lab. Allowing potential partners to analyze this robust, statewide health data (de-identified) could help generate insights that could be unattainable using smaller, more limited datasets.

**Paying for Healthcare through Medicaid:**

Another unique value proposition Wadsworth has to offer potential partners is its relationship to the State as one of the largest healthcare payers in NYS through its Medicaid program. Payer healthcare plans are not often structured to handle some of the emerging care models. For example, population genomics allows providers the ability to offer personalized medicine to more quickly and effectively make clinical decisions for the best care, but the cost of gene sequencing is not often covered. Wadsworth’s relationship to NYS, however, allows it to inform payer models to cover costs in line with emerging treatment options.

**Life Sciences Resources in the Capital Region:**

Finally, Wadsworth's position in the Capital Region and connection to other regional assets is vital to its attractiveness to potential partners. Wadsworth sits in the middle of an emerging life sciences industry cluster, with access to broad skillsets and opportunities to collaborate with many academic institutions and life sciences companies. In line with the University of California at Berkeley (UCB) case study<sup>33</sup>, Wadsworth could leverage public-private partnerships with existing local organizations, ultimately incentivizing greater interest and private investment in the region. In addition, potential partners' interest in bioinformatics could be satisfied by Wadsworth through its unparalleled access to healthcare data across NYS. Forming a robust bioinformatics strategy that leverages existing assets in the Capital region will be paramount to supporting Wadsworth's continued growth and ability to form sustained and mutually beneficial partnerships. The future vision of the Capital Region (**Section 2**) outlines the importance of cohesive collaboration throughout the region, and this vision rings true for Wadsworth's ability to attract partners.

**Criticality of Lab Enhancements:**

Wadsworth's capability alignment with global trends and their unique position and assets in NYS make it potentially attractive to partners; however, the lab would likely be unable to attract and retain sustainable partners in its current state without key enhancements. Two of the most critical enhancements include developing a bioinformatics strategy and building a new lab. Although the lab has the ability to provide unique and robust datasets, it currently lacks a clear information strategy to define how these datasets should be integrated, harmonized, and enhanced to make them functional for advanced analytics. Moreover, Wadsworth's facilities are in various degrees of obsolescence and not in line with a fully functioning working environment currently expected by leading life sciences companies. Wadsworth requires new facilities to support collaboration and attract potential partners.

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<sup>33</sup> For more information, see **Appendix H**.

## 4. Wadsworth Opportunities for Partnership

### 4.1. Use Cases and Solutions

One academic medical center, one biopharmaceutical company, and one informatics company have so far expressed initial interest in further discussions related to partnering with the Wadsworth lab. The partners expect to identify internal resources to be dedicated to generating formal partnership requirements during Q4 2017.

Following requirements submission, the expectation is for key stakeholders from participating Executive agencies – the Division of Budget (DOB), ESD, and DOH – to generate a proposal to the partnering organizations with a quick turnaround time. The process will require dedicated attention from partner organizations, Wadsworth staff, and the State in order to create a timely and mutually beneficial partnership agreement that also contributes to economic growth and life sciences industry cluster development in the Capital Region.

In order to engage with industry in a focused and meaningful way, five use cases were developed by highlighting the value proposition Wadsworth could offer potential partners in its current state to support life sciences business opportunities, which include the identification of capability gaps for partner contribution and generally define partnership requirements. Positioning the use cases as current focus areas, three solutions were then designed to illustrate how a partnership could address life sciences opportunities and possible collaboration structures that would leverage value contributions from each stakeholder. Executing on the solutions would integrate the attractive elements of Wadsworth’s current work with complementary value from academic and commercial partners; ultimately generating mutual benefit while addressing some of the most pressing life sciences challenges today.

The use cases and solutions were iteratively developed and tested with industry stakeholders through a defined market sounding process. As depicted in **Figure 6**, market sounding used the Wadsworth laboratory review as a starting point, and followed a multistep approach to advance from discussions around potential use cases, to design potential partnership solutions, and more specifically define partners’ value proposition. Greater detail about each step can be found in **Appendix C**.

**Figure 6: High-Level Overview of Market Sounding Approach**



With an understanding of Wadsworth’s capabilities and assets based on laboratory walkthroughs, multiple discussions with leading experts, and additional research, the use cases were identified where Wadsworth has existing assets and/or

capabilities aligned with an area of unmet medical need with attractive business potential (e.g., Antimicrobial Resistance [AMR]). **Table 2** describes the identified use cases for Wadsworth to potentially attract and collaborate with academic and commercial partners, which have gone through successive iteration and refinement throughout July and August 2017.

**Table 2: High-Level Description of Potential Use Cases and Partnership Opportunities**

Use Case	Rationale	Wadsworth Function	Goal	Potential Partnership Type <sup>34</sup>
<b>1. Evolving Population Genomics</b>	Increasing ease of genetic sequencing has resulted in increased interest in studying the human genome at the population level to better understand factors related to contracting and treating disease; Wadsworth has the ability to generate new, large datasets and plays a unique regulatory role in the State	Regulate LDTs and license associated labs, develop basic assays, and possess large biobanks associated with the State (major payer) and bioengineering institutions	Utilize NYS and Lab healthcare data, biobank assets and industry partners to establish a large genomic data repository to support population health and genomics research and related business initiatives such as value-based care, precision medicine and disparate medical outcomes	Academic entities, diagnostic product and information companies, and biopharmaceutical companies focused on genomics; engineering entities focused on microfluidics; and bioinformatics and nanotechnology companies
<b>2. Infectious Disease Diagnostics</b>	Rapidly identifying pathogen variants is a goal of life sciences companies and healthcare organizations in order to more effectively treat patients; Wadsworth has surveillance responsibilities that allow for an unparalleled view into diseases across the State	Collect specimen, identify and analyze specific strains, develop assays and provide diagnostic strategy to bioengineering partners, integrate diagnostic hardware and drug development partners	Develop/integrate surveillance software with diagnostic devices to support point of care “bug-to-drug” isolation, sequencing and therapeutic development	Academic entities, diagnostic product manufacturers, and diagnostic information companies focused on infectious disease; microfluidics, bioinformatics, and nanotechnology companies

<sup>34</sup> Due to the confidential nature of potential future partnerships, the names of specific companies could not be included in this report.

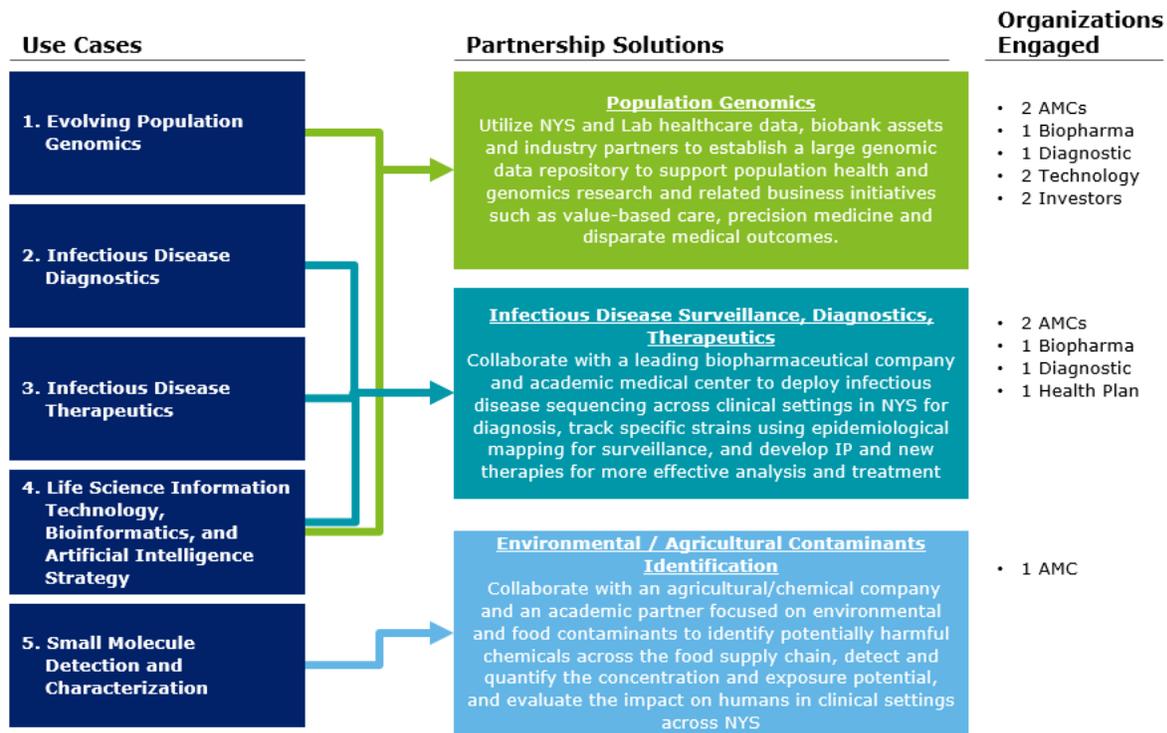
Use Case	Rationale	Wadsworth Function	Goal	Potential Partnership Type <sup>34</sup>
<b>3. Infectious Disease Therapeutics</b>	Developing targeted treatments for infection and new therapies is needed as antibiotic resistance is an increasing challenge throughout clinical settings globally; Wadsworth has world-class research in the field of antibiotic-resistant pathogens	Convene complementary functions along the basic research to clinical development value chain by integrating research from diverse areas including basic systems biology, high-resolution structure analysis of potential drug targets, and animal models, etc.	Develop treatments to antibiotic-resistant pathogens such as Mycobacterium tuberculosis and non-tuberculous bacteria. Discovery of new drug targets and development of novel therapeutics	Academic medical centers, accelerators, Contract Research Organizations (CROs) biopharmaceutical companies, and informatics companies
<b>4. Life sciences Information Technology, Bioinformatics, and Artificial Intelligence Strategy</b>	Massive amounts of health data are being generated without proper methods to support advanced analysis; Wadsworth could lead the development of a bioinformatics strategy benefitted by its access to large datasets available to NYS	Create demand for data-intensive applications given data requirements associated with the other use cases	Create an Information Technology (IT) / bioinformatics capability to enable NYS's life sciences strategy	IT companies, Healthcare IT companies, genomics and medical information companies, and related vendors
<b>5. Small Molecule Detection and Characterization</b>	Agricultural processes continue to evolve, resulting in the proliferation of byproducts in the environment; Wadsworth has extremely precise detection capabilities to support analysis of the impact of such molecules on human health	Leading environmental contamination detection capability; high throughput analytical capacity for population-based health studies	Support drug development with high-resolution small molecule mechanistic studies; detect chemicals of emerging interest for the assessment of population exposures through drinking water and human/animal biomonitoring studies; develop disease biomarkers for early diagnosis and intervention	Academic and commercial drug development organizations, chemical companies, agricultural companies, analytical/bioanalytical laboratories and forensic laboratories

The imperative to determine (to the extent possible) commercial interest in partnership with the lab required a focused shortlist of potential opportunities on which to base conversations. The use cases were based on iterative discussions with Wadsworth scientists and researchers, academic input, and an understanding of the interests of potential life sciences commercial partners. It's important to note that the use cases were developed for the purposes of market sounding conversations and should not be considered an exhaustive list of regional capabilities. The region has many life sciences and related academic and commercial assets, and other opportunities ranging from tissue engineering to pure artificial intelligence could be explored as additional use cases.

The solutions articulate the potential value Wadsworth could bring to a collaboration and underscore how to best position the lab for potential academic and commercial partnerships.

A mapping of use cases to solutions is depicted in **Figure 7**.

**Figure 7: Mapping of Use Cases to Solutions**



The defined solutions were then vetted for commercial viability and current interest in the business world, as depicted in **Figure 7**. Solutions were reviewed with a representative sample of potential partners across academia, life sciences companies in biopharmaceuticals and devices, technology companies, and investors. The input from all parties was strongly considered and evaluated, and led to updates to the solutions (such as including non-TB antibiotic resistant pathogens, and broadening genomics to include diagnostics applications beyond oncology) and generated thinking around possible structures to actualize a partnership. Overall, three potential solutions were refined based on an understanding of what is

currently desired in industry, what Wadsworth has to offer, and what gaps remain that could be filled through partnership with academic and commercial organizations. In line with the Medical and Related Sciences (MaRS) and San Diego case studies, the solutions might involve multiple simultaneous collaborations that bring together different types of organizations to provide a range of technologies, research, and partnering opportunities. The solutions are:

1. **Population Genomics:** Utilize NYS and Lab healthcare data, biobank assets, and industry partners to establish a large genomic data repository to support population health and genomics research and related business initiatives such as value-based care, precision medicine, and disparate medical outcomes. A specific business opportunity is to develop, validate, and demonstrate value of multigene panels for identifying known and suspected mutations associated with to enable effective treatment, trial matching, and clinical decision support.
2. **Infectious Disease Surveillance, Diagnostics, and Therapeutics:** Collaborate with a leading biopharmaceutical company and academic medical center to deploy infectious disease sequencing across clinical settings in NYS for diagnosis, track specific strains using epidemiological mapping for surveillance, and develop IP and new therapies for more effective analysis and treatment.
3. **Environmental/Agricultural Contaminant Identification:** Collaborate with an agricultural/chemical company and an academic partner focused on environmental and food contaminants to identify potentially harmful chemicals across the food supply chain, detect and quantify the concentration and exposure potential, and evaluate the impact on humans in clinical settings across NYS.

The solutions represent an informed approach to attracting partners for collaboration with Wadsworth. Greater detail describing the development of the solutions along with illustrations of the interactions between each partner can be found in **Appendix C**.

Leveraging insights gained from use case vetting, industry knowledge and expertise, and company research, potential partners for each use case were identified based on organization type, therapeutic focus, an interpretation of each organization's top research interests, and perceived propensity to seek partnerships to pursue those interests.

#### 4.2. Developing the Value Proposition and Identifying Potential Partners

The market sounding process included conversations related to the genomics, infectious disease, and environmental/agricultural contaminant solutions, with multiple organizations across each partner type. These included academic medical centers, biopharmaceutical companies, diagnostics/medical device companies, informatics companies, and investors. Traditionally, commercial organizations have not aggressively pursued formation of public-private partnerships in life sciences due to operational and logistical hurdles, conflicting priorities, and scarce resources;

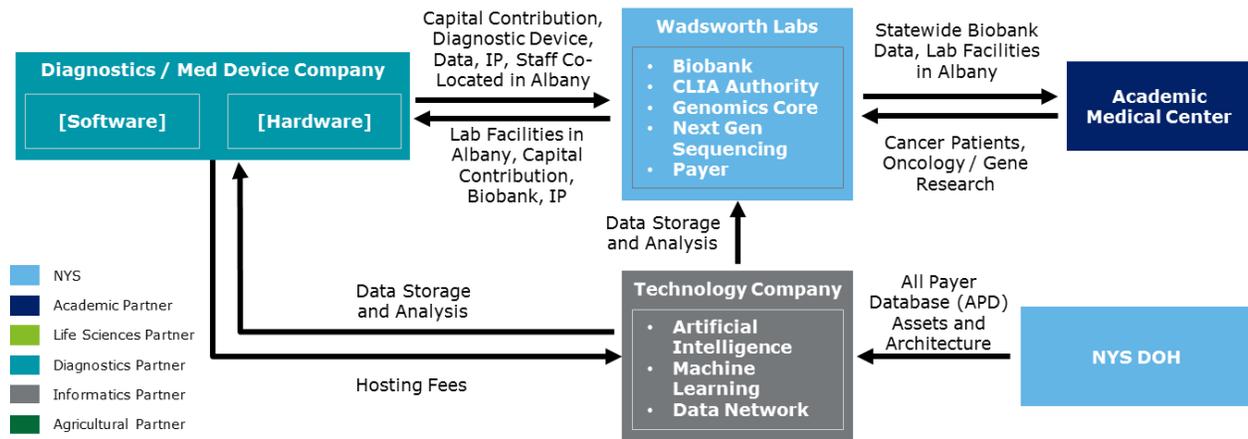
therefore, the creation and tailoring of specific value propositions was needed to target individual organizations to promote productive initial discussions.

Key factors expected to impact decision-making included the potential to augment local life sciences capabilities and other local scientific capabilities (from both academic and commercial partners), as well as economic incentives (particularly direct co-investment focused on specific industry opportunities).

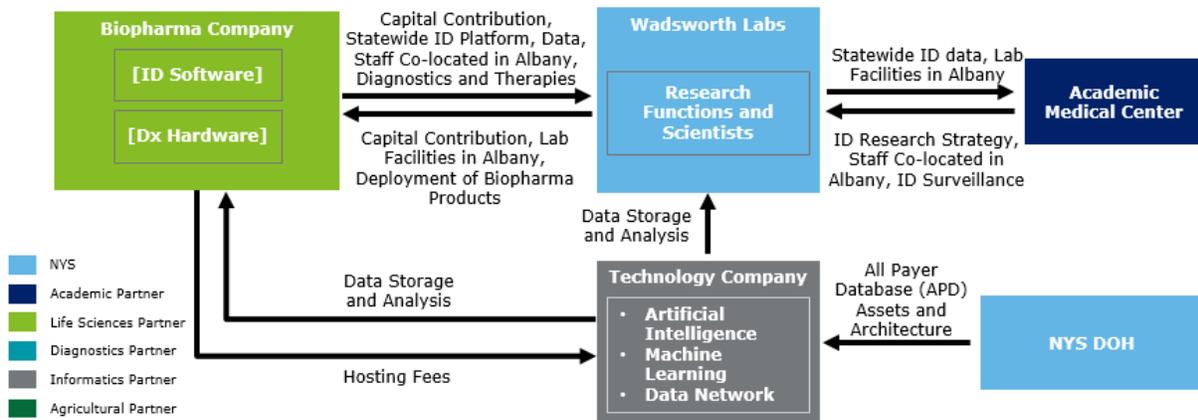
Initial feedback led to detailed follow-up conversations with some organizations and informed the value proposition for partner types based on the three identified solutions.

Transaction diagrams for each solution are shown in **Figure 8**, **Figure 9**, and **Figure 10** below. Additional details on the value propositions for each solution can be found in **Appendix C**.

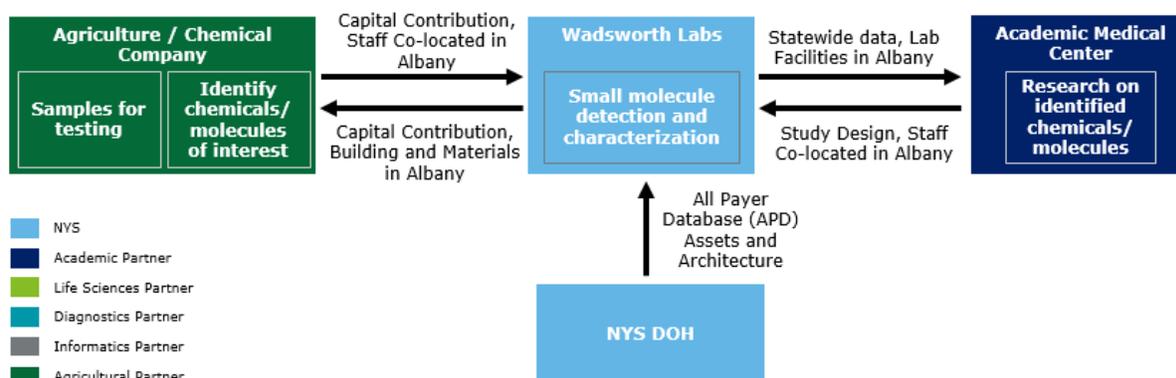
**Figure 8: Transactional Diagram for Population Genomics Solution**



**Figure 9: Transactional Diagram for Infectious Disease Surveillance, Diagnostics, Therapeutics Solution**



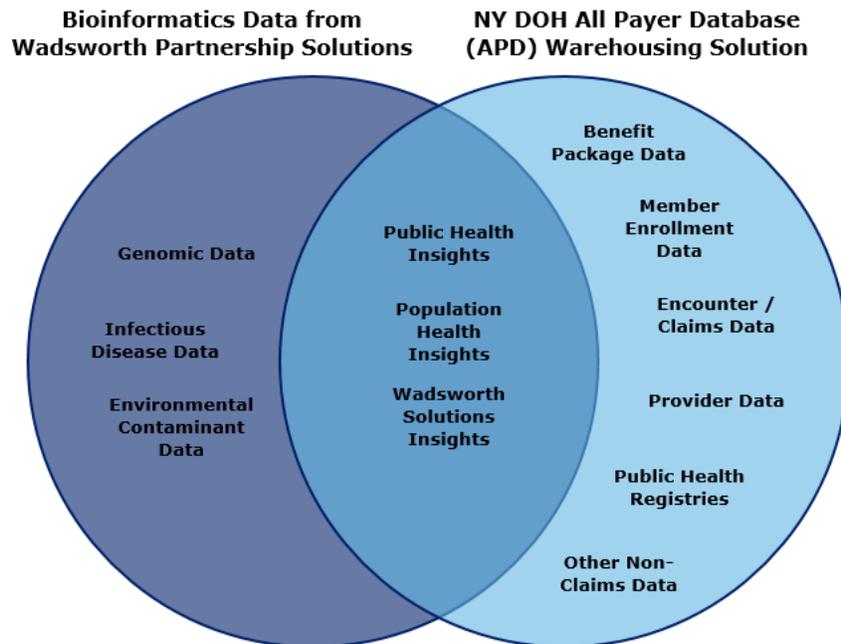
**Figure 10: Transactional Diagram for Agricultural & Environmental Contaminant Identification Solution**



These prospective solutions and transactional descriptions were sufficiently detailed to qualify the interest of three potential collaborators, resulting in stated indications of interest for pursuing formal partnering with the State. The partners have indicated that they expect to begin partnering discussions in the next phase of the project. In order to support these partnership solutions, a bioinformatics strategy should be developed in collaboration with Wadsworth, government, academic institutions, and commercial organizations within the Capital Region.

### 4.3. Leveraging Bioinformatics in the Capital Region for Wadsworth Labs

A comprehensive bioinformatics strategy would be required to underpin the proposed use cases and partnership efforts. A comprehensive bioinformatics strategy would support not only the individual solutions, but also the State's broader population health objectives. The DOH has been developing an informatics solution, the All Payer Database (APD), to provide policymakers, researchers, and consumers the most comprehensive health database in NYS to support decision-making with regard to the challenges of enhancing patient experience, improving population health, and reducing the costs of healthcare. It is intended to serve as a comprehensive data and analytical resource to evaluate system performance, enable public health research, and to analyze cost of care, care coordination, and clinical decision support. The APD uses a variety of data sources including commercial and public payer data (claims, benefits, and enrollment) as well as non-claims health-related data (Statewide Health Information Network for New York [SHIN-NY] Electronic Health Records [EHR], health assessment data, and public health data) to form a robust database containing population-based data. Integrating the bioinformatics components of Wadsworth solutions with the APD would generate greater population and public health insights to affect positive change for the residents of NYS (**Figure 11**).

**Figure 11: Intersection of Wadsworth Data and DOH APD**

In addition to the APD, many of the universities in the area (e.g., SUNY University at Albany, Rensselaer Polytechnic Institute) are developing population health analytics capabilities, which could support the State's population health objectives. For example, the Capital Region's Upstate Revitalization Initiative plans to combine collaborative local healthcare assets with research expertise and leading global technology companies to form a population health technology cluster, which would transform healthcare in NYS and nationally. Wadsworth could play a central role to the population health technology cluster and, if pursued through a collaborative strategy, would help support growth of the Capital Region's life sciences industry cluster.

The APD is currently under development, with the initial warehousing and analytical solution (provided by Optum) expected to be implemented in winter 2017. As immediate next steps, the State should define:

- Bioinformatics requirements for Wadsworth solutions;
- How the Wadsworth solution data and APD data could be integrated;
- How data in the integrated solution could be used, by whom, and how it should be accessed; and,
- The role of an informatics partner in establishing and supporting the Wadsworth solutions in the context of the broader bioinformatics strategy

Enabling the identified Wadsworth solutions and bioinformatics strategy is anticipated to have a substantial impact on the capabilities along the life sciences value chain in the Capital Region.

#### 4.4. Potential Partnership Considerations

Moving forward the State should consider the following key themes from potential partners and other stakeholders engaged to date:

- **Commitment:** Potential partners have expressed concern that the State might not be fully committed to rebuilding the Wadsworth lab and developing partnerships. In addition, partners must confirm their willingness to focus on quickly developing proposal requirements. The State would need to work through partnership terms and generate a proposal in a timely manner to avoid all parties dedicating time and effort to an endeavor that does not result in a partnership agreement;
- **Bandwidth:** Availability and focus of Wadsworth staff should be carefully monitored to avoid overextending the laboratory and its capabilities, jeopardizing current operations for the sake of this initiative. Ongoing Wadsworth operations must be maintained in order to continue achieving its public health mission;
- **Coordination:** There could be many parallel conversations with potential partners when moving forward to a formalized partnership process. There may also be a need to partner with multiple entities of the same partner type (i.e., multiple academic medical centers may be beneficial to generating a robust pre-clinical pipeline or comprehensive patient registry). It is imperative that the State, Wadsworth, partners, and vendors be in alignment and actively coordinated throughout this process;
- **Culture:** As multiple distinct partners plan to work together, there are likely to be different “company cultures” across the organizations. It is imperative that Wadsworth and academic/commercial partners be able to function as constructive and supportive partners. Key stakeholders and individuals from across the organizations should be flexible and willing to adapt to differences in organizational structure, processes, and policies in order to work together toward common goals; and,
- **Planning Ahead:** Careful planning would be necessary to ensure proper execution of a lasting and fruitful partnership arrangement. Partnership duration, scope, success factors, and goals should be clearly defined, as well as the methods to be used to measure and evaluate results. In addition, the agreement should account for changing market conditions, and include a process that allows for adaptation to an evolving healthcare ecosystem.

Developing ESD proposal requirements is out of scope for the engagement summarized in this report, but is expected to involve formal engagement with interested organizations on deal structure, proposed timeline for engagement, partnership terms and investments, areas of cooperation and anticipated outcomes, and mitigation plan for potential risks. It is expected that this step would occur after this report is completed and delivered, and would be required for the interested organizations to confirm interest in pursuing a partnership agreement. Forming a partnership between Wadsworth and an academic or commercial partner could then help to generate economic development as part

of the life sciences industry cluster, discussed below and in further detail in **Appendix D**.

## 5. Location, location, location

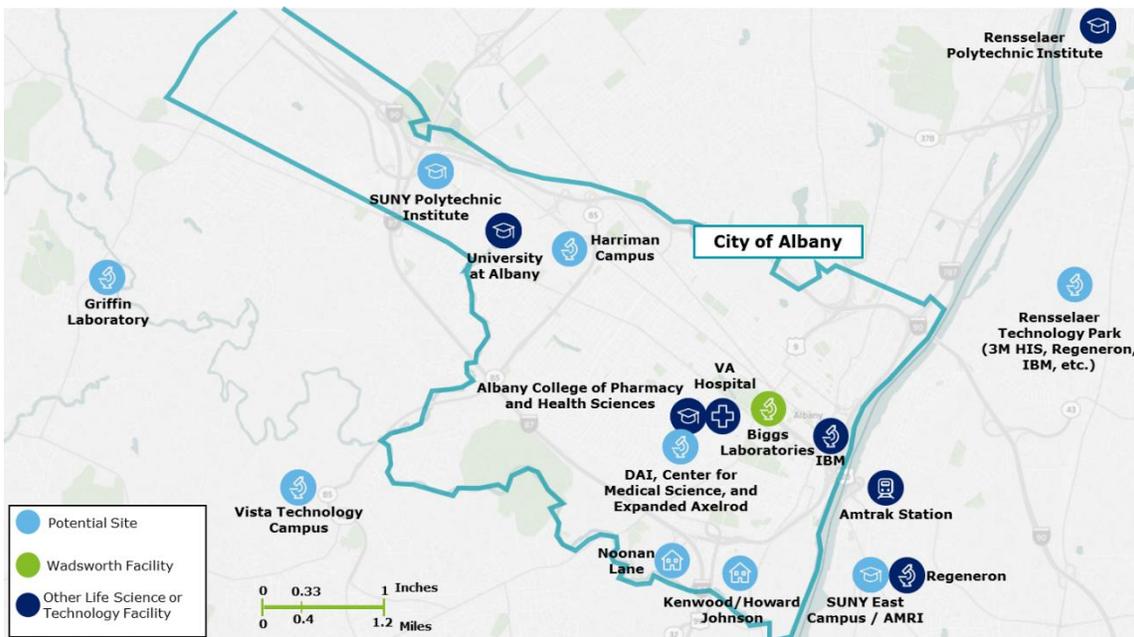
### 5.1. Capital Region Cluster and Site Selection

Selection of a suitable site is critical to enabling the identified solutions and potential commercial partnerships to stimulate the Capital Region’s life sciences industry cluster; Wadsworth needs a site for the new facility.

Robust industry clusters are an integral part of economic development, which, in combination with a talented workforce, good education, strong research, strong competition, demanding customers, responsive government, and collaboration across public and private sectors, create a competitive business environment that fosters true innovation. The life sciences industry cluster in the Capital Region is centered in the City of Albany, with a number of life sciences companies and supporting industry including technology companies and academic and medical institutions in close proximity, as shown in **Figure 12**.

This site assessment was conducted to identify viable sites for Wadsworth’s relocation as well as to identify sites that would be attractive for potential partners and help to stimulate collaboration and cluster growth. For that reason, this assessment focused on potential sites within the Capital District and more specifically, in or near the City of Albany. Locating Wadsworth within this geography would support its mission, better enable it to collaborate with institutions and companies in the area, and strengthen the appeal of the overall region to the private sector.

**Figure 12: Proximity of Wadsworth Current Facilities, Potential New Sites, and Capital District Life Sciences Companies**



## 5.2. Sites under Consideration

Deloitte was provided a list of seven potential sites by stakeholders that have been assessed by means of data collection, site visits, and further research. These sites are mapped out in **Figure 12**:

- Griffin Laboratory
- David Axelrod Institute (DAI)
- Harriman Campus
- Rensselaer Technology Park
- Vista Technology Campus
- SUNY Poly Colleges of Nanoscale Science and Engineering (SUNY Poly)
- SUNY East Campus

In addition to the sites provided by the stakeholders, a targeted search for other possible locations was also performed. This search focused on potentially available brownfield and greenfield sites within the Capital Region, and preferably near to the City of Albany. With these criteria, possible locations were identified through discussion with regional economic authorities and an Albany-based life sciences organization. The search resulted in three possible locations, which were assessed by similar means as the sites above:

- Noonan Lane
- Kenwood/Howard Johnson
- Expanded DAI site (Expanded Axelrod)

These sites are mapped out in **Figure 12**.

Two additional sites identified through the targeted search process were considered, but were not fully evaluated due to the considerations below:

- The site of the old convention center in downtown Albany was considered, but excluded from further evaluation due to limitations with available space, the need for the City's Historic Resource Commission considerations, and the need for possible relocation of private companies on site; and,
- The site of the Capital District Psychiatric Center across the street from the DAI was considered as an option, but it was excluded from further evaluation due to the effort required to both re-purpose the building for Wadsworth and to find new space and re-locate the Psychiatric Center.

## 5.3. Site Selection Evaluation Criteria and Scoring

A set of criteria was developed to evaluate each site based on key factors important to the mission of Wadsworth and its ability to encourage cluster growth. Scoring each site using these criteria supports comparison of the sites and identification of preferred locations for Wadsworth relocation. Of the criteria evaluated, three were identified as primary drivers of the site selection decision through discussions with key DOH, DASNY, ESD, and DOB stakeholders. These primary drivers were selected based on perceived advantages to budget (proxy criteria: Site Acquisition & Construction), the ability to stimulate cluster growth (proxy criteria: Proximity to Similar Institutions), and the ability to consolidate Wadsworth labs into a single site (proxy criteria: Ability to Accommodate Space Needs). The criteria have been

categorized into two groups, Cost Criteria and Conditions Criteria, and are listed below, with a \* indicating the primary drivers.

### Cost Criteria

- **\* Site Acquisition & Construction** – Price to purchase or lease the land, and the type of construction. State-owned land would come at no cost to Wadsworth, while private land would need to be purchased or leased. The cost of new construction would likely be less expensive than retrofitting, demolishing, or expanding an existing building. This is considered a primary driver because State-controlled land would result in lower costs and quicker start times for construction.
- **Utilities** – The availability of necessary utilities such as electric, gas, water, and sewage. This is important since there could be negative time and cost impacts if utilities are not readily available.
- **Environmental Risks** – Potential risks communicated during site visits such as risk of flooding or steep hills, and consideration of whether the site has gone through a State Environmental Quality Review (SEQR) Act process in the past. These risks could have negative time or cost impacts.

Rather than developing cost estimates for each site, the relative high-level cost of each site is compared. For example, the cost of new construction on a State-owned piece of land would be more favorable than retrofitting an existing building on privately leased property.

### Conditions Criteria

- **\* Proximity to Similar Institutions** – Distance and drive times to nearby life sciences and relevant technology companies and academic and medical institutions. This is considered a primary driver because proximity to similar institutions promotes collaboration and innovation, and would be more desirable/suitable for potential commercial partners. In some ways, it serves as a proxy for the site's ability to stimulate industry cluster-based growth. Based on observations of other successful life sciences industry cluster developments, such as MaRS in Toronto<sup>35</sup>, the ability to co-locate different players in an innovation ecosystem would be a critical factor of long-term success and sustainability of the Wadsworth lab.
- **\* Ability to Accommodate Space Needs** – How well the site could accommodate a new 649,970 SF Wadsworth facility, as estimated by the Basis of Design<sup>36</sup>. This is considered a primary driver because a single Wadsworth facility, accommodating all lab functionality, is preferred for smooth operation and internal collaboration purposes. Second to a single facility would be multiple buildings on the same site which allow for easy walking between buildings. If the site cannot accommodate the space needs for Wadsworth, alternative options such as multiple sites would need to be considered.

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<sup>35</sup> For more information, see **Appendix H**.

<sup>36</sup> New York State Consolidated Laboratory Basis of Design (Jacobs Engineering, August 2013).

- **Proximity to Labor Pool Residences** – The location of the site relative to where the appropriate life sciences-related labor market resides. This is based on a mapping of population locations for people working in applicable labor categories. This is important for attracting well-qualified professionals for employment, as long commute times could reduce the pool of potential employees. See **Appendix G, Figure 35** for mapping of labor pool concentrations.
- **Proximity to Airport** – The distance and estimated travel time to and from Albany International Airport. This is an important consideration for potential partners that could have employees traveling from distant locations. It is also important for collaboration with companies in other major hubs.
- **Proximity to Train Station** – The distance and estimated travel time to and from the Albany Rensselaer Train Station. This is important to consider for commuters, and for collaboration with companies in other major hubs such as Cambridge, MA and New York City.
- **Access to Infrastructure** – The site’s proximity to major roads or highways and availability of public transportation. This is important for reducing commuter travel time from various directions and boosting collaboration with nearby facilities.
- **Quality of Amenities** – Proximity of amenities such as grocery stores, shops, restaurants, hotels, dry cleaners, etc. This could support a greater quality of life for professionals working at the facility and help to attract new staff.
- **Permitted Uses and Zoning** – Zoning classification of the site, and permitted uses based on classification. There could be negative time impacts if laboratory type facilities are not permitted or require use permits.

The information gathered around these criteria was used to score the sites and do a relative comparison to one another. To arrive at these relative scores, sites were first rated on a scale of 1 to 3 for each of the criteria described above:

- 3 – Indicates that the site has an above-average positive impact relative to the pool of sites
- 2 – Indicates it has about the same impact as other sites
- 1 – Indicates it has a more negative impact relative to the pool

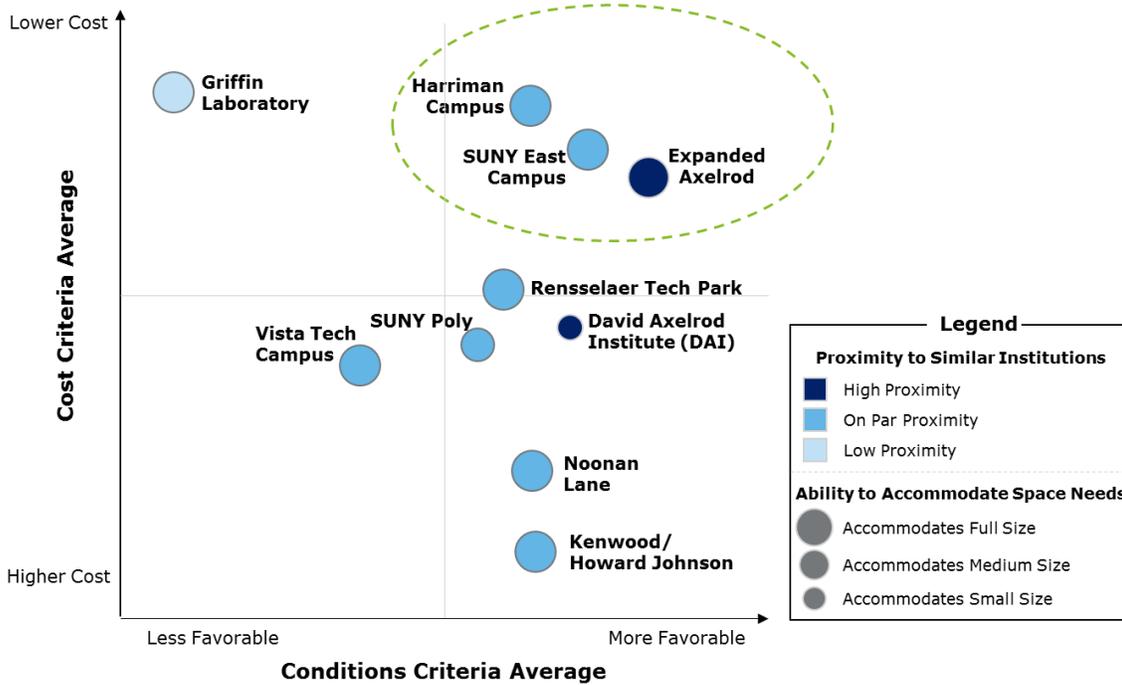
The scoring for the primary drivers Proximity to Similar Institutions and Ability to Accommodate Space Needs were weighted with double the value of the other conditions criteria (receiving scores of 2, 4, or 6). The primary driver Site Acquisition & Construction was not weighted since the site acquisition cost is minimal when compared to the estimated cost to build the new facility, and it is presumed that site acquisition costs could be at least partially offset by divesting of the existing facilities.

**Appendix G** has the rules for scoring each evaluation criteria.

#### 5.4. Site Assessment Analysis

Scoring of the sites was analyzed using an X and Y plot, shown in **Figure 13**, where the cost criteria was averaged on the Y-axis and plotted against conditions criteria, which were averaged on the X-axis.

**Figure 13: Cost versus Conditions Criteria Matrix**



Reviewing this matrix, sites falling into the upper right quadrant are considered favorable due to comparatively lower costs and more favorable conditions criteria. The sites not falling in the top right quadrant are less favorable due to higher costs and/or less favorable conditions criteria. Six sites fell outside of the upper right quadrant. Although Griffin Laboratory is State-owned, has lower associated costs, and could accommodate the space needs, it has low proximity to similar institutions and falls lower on other conditions criteria such as quality of amenities and proximity to labor pool residences. The five remaining sites fall near each other on the matrix: Rensselaer Tech Park, Vista Tech campus, DAI, Noonan Lane, SUNY Poly, and Kenwood/Howard Johnson. Though Rensselaer Tech Park and Vista Tech Campus have the size to accommodate the full building requirement, they are not very close to similar institutions and are not state-owned. Noonan Lane and the Kenwood/Howard Johnson sites appear to have enough acreage to accommodate the space needs, but they have environmental challenges like steep slopes, acquisition challenges since they are not state-owned, and are not close to similar institutions. SUNY Poly and DAI are in close proximity to similar institutions, but are relatively smaller sites that may not fit the space needs required. Additionally, DAI (and thereby Expanded Axelrod) may face environmental challenges related to a potter’s field, which requires further investigation.

Harriman Campus, SUNY East Campus, and Expanded Axelrod all ranked in the upper right quadrant with relatively close scoring. The three sites seem relatively close in comparison, but it is important to consider that each site has tradeoffs which require further analysis to determine their implications. **Table 3** provides details about the tradeoffs that could be considered related to the primary drivers for the three sites in the upper right quadrant.

**Table 3: Top Site Primary Drivers**

Site/Scores	Positive Primary Drivers	Negative Primary Drivers
<b>Harriman Campus</b> ▲ Site Acq. & Constr: 3 ► Prox. To Sim. Inst.: 4 ▲ Accommodate Space: 6	<ul style="list-style-type: none"> <li>• Site is State-owned and cleared land is ready for new construction</li> <li>• Roughly 27 acres of land that would accommodate the necessary building area requirements</li> </ul>	<ul style="list-style-type: none"> <li>• Campus is mainly occupied by government offices with no life sciences or academic institutions within walking distance</li> </ul>
<b>SUNY East Campus</b> ► Site Acq. & Constr: 2 ► Prox. To Sim. Inst.: 4 ▲ Accommodate Space: 6	<ul style="list-style-type: none"> <li>• Roughly 25 acres of land that would accommodate the necessary building area requirements</li> <li>• Notable overlap of Wadsworth staff with faculty on site at SUNY Albany School of Public Health</li> </ul>	<ul style="list-style-type: none"> <li>• Site is owned by University at Albany Bioscience Development Corporation; cost of acquisition would need to be discussed</li> <li>• Campus has some life sciences facilities and academic institutions nearby, though they are not entirely within walking distance</li> </ul>
<b>Expanded Axelrod</b> ► Site Acq. & Constr: 2 ▲ Prox. To Sim. Inst.: 6 ▲ Accommodate Space: 6	<ul style="list-style-type: none"> <li>• There are many life sciences, academic, and medical institutions within walking distance</li> <li>• Site would accommodate the requisite space needs and other potential economic development opportunities</li> <li>• Would allow for continued use of the DAI building</li> </ul>	<ul style="list-style-type: none"> <li>• Site is only partially State-owned and cost relative to other sites can only be determined after an in-depth evaluation of the necessary expansion</li> </ul>

Key: ▲ Relative above average positive impact ► Relative similar impact ▼ Relative negative impact

These tradeoffs exemplify that even though some sites score highly when looking at all criteria, there are pros and cons that need to be considered. For example if the primary driver of site selection is:

- **Ability to stimulate economic growth** – Proximity to Similar Institutions is most highly correlated with this goal, and Expanded Axelrod would be preferred if this were the State’s primary focus. A new facility at Expanded Axelrod, located in the New Scotland Avenue medical corridor, could allow continued operation at DAI and foster a truly collaborative environment with the many life sciences facilities within walking distance.<sup>37</sup> A centralized cluster in the heart of the City of Albany stimulates agglomerative benefits caused by proximity, reduction of transportation times, and natural networking opportunities. Such an environment would be attractive to potential partners, who could boost employment and consequently fuel economic growth. Preliminary review indicates that Expanded Axelrod could accommodate the space needs required for the new facility, and potentially site space for future economic development opportunities associated with the Wadsworth lab.
- **Ability to consolidate Wadsworth labs into a single site** and potential for expansion – Ability to Accommodate Space Needs would rank SUNY East Campus or Harriman Campus as the preferred sites for consolidating Wadsworth into a single facility, and Expanded Axelrod would be the next preference which would allow multiple buildings on a single site. The ability

to accommodate the space needs, and in most cases, the ability to expand further if potential partners desire is important for keeping all Wadsworth programs together. It could also entice potential partners with the ability to have a significant facility footprint. However, if SUNY East Campus or Harriman Campus is selected, Wadsworth would have less opportunity for collaboration with other life science and academic institutions outside its campus, and could be in a less desirable location for potential private partners. There would not be the same opportunity for serendipitous collaboration, compared to Expanded Axelrod, and there would be an increased need for structured collaboration. This case only strengthens the need for a cohesive life sciences collaboration strategy across the Capital Region.

- **Budget** – Site Acquisition and Construction indicates whether the site is State-owned and is a proxy for cost and timing, and Harriman Campus would be the preferred site. The considerations of Harriman Campus are outlined in the point above and heighten the need for a cohesive life sciences collaboration strategy across the Capital Region.

Further detail on all evaluation criteria for each of the potential sites can be found in **Appendix G**.

### 5.5. Site Assessment with Focus on Proximity to Similar Institutions

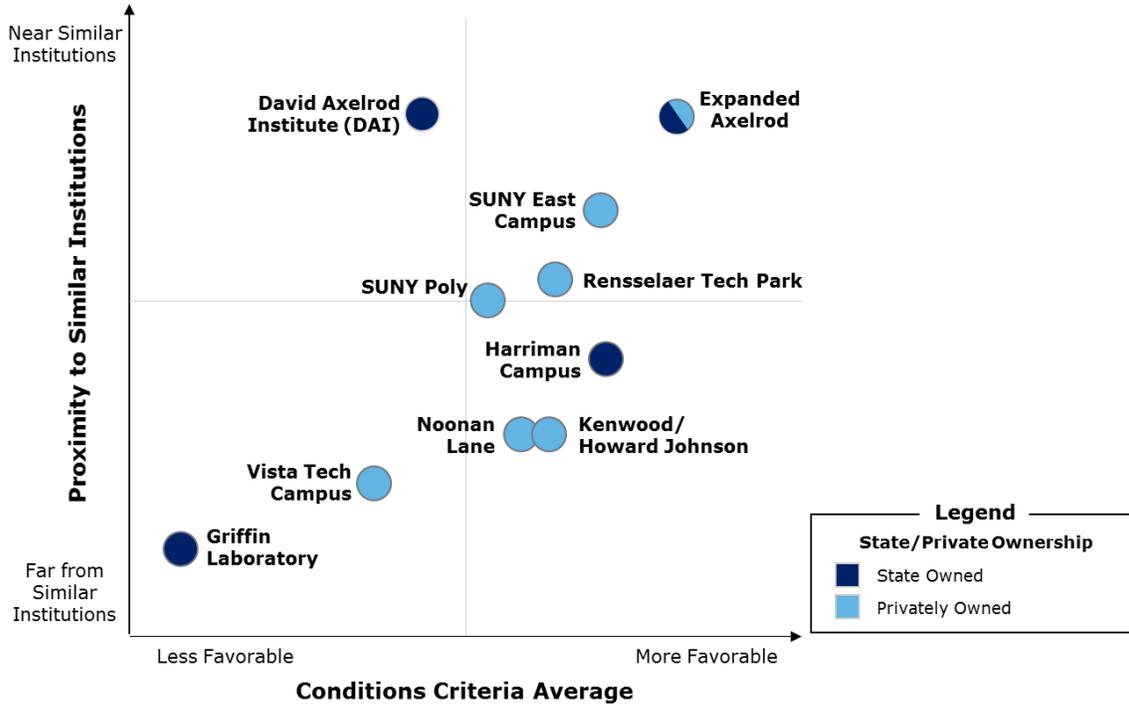
Acceleration of the life sciences industry cluster growth and economic development potential of the Capital Region are some of the key goals of this initiative. Location of the Wadsworth facility will have an important role in the success of achieving these goals. A new facility near other life sciences institutions will promote exponential growth of the cluster as opposed to a facility isolated from similar institutions. World-renowned clusters like Cambridge, MA have been successful because the institutions are able to collaborate and feed off the innovation of their colleagues that are within walking distance of one another<sup>38</sup>.

With this in mind, an additional analysis was conducted based on the site assessment data. Proximity of similar institutions (y-axis) was compared to the average of the conditions criteria (x-axis) as shown in **Figure 14**.

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<sup>38</sup> Refer to Table 1 details about Massachusetts Super Life Sciences Cluster, and [https://www.tbf.org/~media/TBFOrg/Files/Reports/LifeSciences\\_f.pdf](https://www.tbf.org/~media/TBFOrg/Files/Reports/LifeSciences_f.pdf) for more detail.

**Figure 14: Proximity vs Conditions Criteria Matrix**



In this analysis, Expanded Axelrod stands out as the most favorable site. With the other institutions in the New Scotland Avenue medical corridor (e.g., Albany Medical College, VA Medical Center, Albany College of Pharmacy, and the Capital District Psychiatric Center), this area has the foundation for accelerating life sciences cluster growth, and boosting economic growth for the City of Albany and the Capital Region. Other sites, in particular SUNY East and Rensselaer Tech Park, are proximate to other life sciences assets in the Capital Region. However, these locations lack the critical mass of life sciences related entities within walking distance to constitute a sufficient basis for investing in them as life sciences clusters, relative to what already exists in the New Scotland Avenue medical corridor, where Expanded Axelrod resides.

**5.6. Site Assessment Key Observations**

The purpose of this assessment was to conduct an initial scan of potential sites and identify more favorable sites within the Capital Region and the City of Albany. Evaluation of potential sites using cost and conditions criteria identified Expanded Axelrod, SUNY East Campus, and Harriman Campus as more favorable sites. These sites are better prepared to serve the mission of Wadsworth because they involve co-locating the program areas and placing them in an area that is attractive to potential employees. With a focus on better positioning the Life Sciences Laboratory Initiative to spur economic growth and advancement of the Capital Region’s life sciences industry cluster, the most favorable of these candidates would be Expanded Axelrod. Furthermore, Expanded Axelrod is the only site which would

allow Wadsworth to take advantage of the existing buildings, by keeping and updating DAI.

As detailed in the analysis, these sites all scored relatively closely, and all come with tradeoffs. In future assessments, as Wadsworth begins to narrow its list of potential sites, it is important to carefully weigh the factors most important for the success of Wadsworth and the broader Life Sciences Initiative in the Capital Region. The end goal of the site selection process should be to select a site that supports Wadsworth's mission and attracts commercial partnerships, in turn creating a positive impact for the Capital Region's economy and NYS more broadly. Three suitable sites have been evaluated, with a framework to apply as key stakeholders in the State continue tradeoff discussions.

The assessment in this report was a preliminary exercise that relied on a combination of available qualitative and quantitative information for each site. Due to the different possible weightings of each criteria and the possibility for more detailed analysis using sub-regional indicators, further due diligence and tradeoff analysis is required to make a decision on a preferred site. Deloitte recommends a site feasibility study to affirm the constructability at each location and to identify any physical or environmental impediments or constraints that might be present. Furthermore, a cost benefit analysis using a more granular approach should be undertaken to appropriately weigh and monetize the identified trade-offs each site presents (i.e. cost versus proximity to peer institutions).

## 6. Economic impact

The analysis reveals that public investments in life sciences can generate up to a 1.6x multiplier on economic output. NYS's investment in the Wadsworth lab would facilitate economic development opportunities like the solution partnerships described in **Section 4**. Assuming that NYS invested \$750m to rebuild Wadsworth (the cost as estimated in 2013, plus inflation)<sup>39</sup> and matched \$300m co-investment by a private partner to form a joint venture, the estimated economic impact of the NYS outlay (\$1.05b) could be approximately 1,200 new life sciences jobs, a \$300m private investment, and upwards of \$950m in likely net economic activity.

### 6.1. High level investment scenarios

Leveraging the solution partnership hypotheses and our understanding of Wadsworth's future facility and partnership goals, five future investment scenarios were developed for analysis. Because the potential partnerships identified in this report are still preliminary, the five scenarios define high-level economic impacts possible from different levels of investment. These scenarios rely on multipliers common to the life sciences and construction industries, adjusted for the Capital Region<sup>40</sup>. To model these investment scenarios, the analysis relied on an economic impact modeling tool (Input-Output model) produced by IMPLAN<sup>41</sup>. The model analyzes direct, indirect, and induced spending that would be expected based on possible future actions and partnerships. Table 4 describes the scenarios.

**Table 4: Description of Scenarios Used in Analysis**

Scenario	Description	Total Outlay
<b>1. Do-nothing for five years</b>	Wadsworth facilities remain unconsolidated across the currently existing facilities, and the State contributes no additional capital resources to construct a new facility; Significant costs would nevertheless accrue to the State from potential temporary closures or catastrophic failures within the current Wadsworth facilities, given various states of disrepair.	\$0
<b>2. Rebuild-only</b>	The State invests to rebuild a consolidated Wadsworth facility, without any additional investment to attract a private partner	\$748m
<b>3. Rebuild and low co-investment</b>	The State rebuilds the Wadsworth facilities in a consolidated location and co-invests with a private sector partner (\$100m from each party) in an add-on facility for the private sector partner	\$948m
<b>4. Rebuild and medium co-investment</b>	The State rebuilds the Wadsworth facilities in a consolidated location and co-invests with a private sector partner (\$200m each) in an add-on facility for the private sector partner	\$1,148m

<sup>39</sup> New York State Consolidated Laboratory Basis of Design (Jacobs Engineering, August 2013).

<sup>40</sup> See **Appendix E** for a more detailed discussion on economic impact assessments.

<sup>41</sup> See **Appendix E** for a more detailed discussion on IMPLAN and input-output modeling.

Scenario	Description	Total Outlay
<b>5. Rebuild and high co-investment</b>	The State rebuilds the Wadsworth facilities in a consolidated location and co-invests with a private sector partner (\$300m each) in an add-on facility for the private sector partner	\$1,348m

Scenarios #3 through #5 resemble other investments in clusters around the country. For instance, The Johns Hopkins University Science + Technology Park cost \$1.8b, while the University of Maryland Baltimore BioPark complex has an estimated cost of close to \$1b.<sup>42</sup> These scenarios assume a matched cash investment by NYS, although in actuality a partnership would likely leverage the whole spectrum of economic development incentives, including tax rebates, property development, and so forth. The range of \$100m – \$300m for the partnership co-investment was used to map potential economic impacts based on the level of investment; in reporting potential impacts throughout the report, the analysis assumes that a matched investment of \$300m would be what occurs in the Capital Region.

## 6.2. Approach to Economic Impact Assessment

The economic impact assessment utilizes an input-output model that estimates the impact of an investment “shock” or change in an economy’s economic makeup. The model estimates this impact by calculating a multiplier effect for dollars spent by industry category, where the coefficient is determined by correlation matrices for each industry category.<sup>43</sup> The output of this analysis is the anticipated impact on jobs and overall economic impact.

The results of the model estimate investment effects on regional final demand, broken down on a direct, indirect, and induced basis.<sup>44</sup> Direct effects model the jobs and output created by the investment activity itself, while indirect and induced effects model follow-on impacts related to increased business activity and additional regional spending. Direct effects include construction jobs, which are temporary positions not related to the life sciences industry cluster, as well as life sciences jobs generated from partnership investments.

## 6.3. Summary of Scenario Inputs

The five scenarios described above model the potential economic impact of a new Wadsworth facility constructed in 2017 in the Albany EA including the impact of possible incremental private co-investment<sup>45,46</sup>.

<sup>42</sup> See **Appendix H** for more details on these clusters.

<sup>43</sup> The coefficients are developed by and proprietary to IMPLAN, and are based on collaborative work with the U.S. Forest Service. See **Appendix E** for a more detailed discussion on IMPLAN and input-output modeling.

<sup>44</sup> For more information on the approach to the economic impact assessment, see **Appendix E**.

<sup>45</sup> See **Appendix F** for a more detailed description of each scenario.

<sup>46</sup> Described in **Appendix A**, the EA includes the 12 counties within NYS that make up the Albany Economic Area, as described by the U.S. Economic Development Administration.

**Table 5** breaks down how each scenario allocates investment in the model. Rather than specifically linking to the solution partnerships described in **Section 4**, the scenarios describe a high-level investment directionally applicable to the three identified partnership opportunities.

**Table 5: Summary of Scenario Inputs<sup>47</sup>**

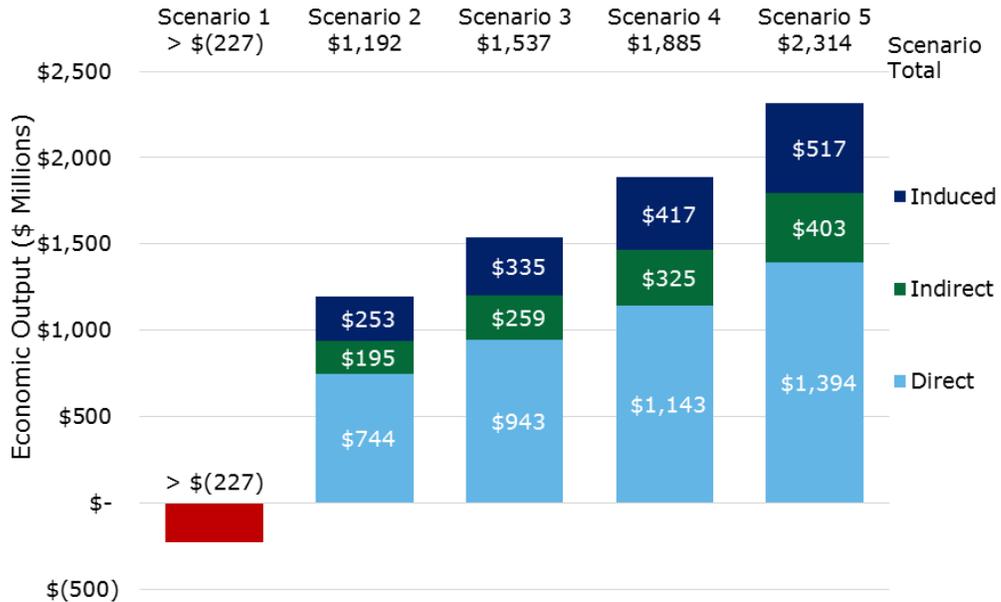
Industry Category	Scenario (in millions)				
Construction in 2017	#1	#2	#3	#4	#5
Construction of New Healthcare Structures	-	\$374	\$374	\$374	\$374
Construction of New Educational and Vocational Structures	-	\$374	\$374	\$374	\$374
Construction of Commercial Structures	-	-	\$100	\$200	\$300
Scientific Research and Development Services	-	-	\$100	\$200	\$300
Deferred Maintenance Costs (does not account for potentially significant capital outlays that would result from catastrophic failures or temporary closures, etc.)	(\$24)	-	-	-	-
Construction Delay Escalation	(\$203)				
<b>Total</b>	<b>(\$227)</b>	<b>\$748</b>	<b>\$948</b>	<b>\$1,148</b>	<b>\$1,348</b>
<i>Private Sector Contribution</i>	-	-	\$100	\$200	\$300
<i>NYS Contribution</i>	-	\$748	\$848	\$948	\$1,048

## 6.4. Scenario Results

**Figure 15** and **Figure 16** show the results of the five scenarios on economic output and employment impact, respectively. It is important to note that the following results present possible futures where Wadsworth engages in partnerships that align to its capabilities. The economic analysis relies on assumptions about the correlative relationship between spending by an industry and the amount of employment. These correlative relationships use economic multipliers commonly applied to this industry cluster, tailored to specific Capital Region demographics and industry data. It is not necessarily the case that a linear increase in spending would lead to a linear increase in employment, as the model does not account for labor supply in the region.

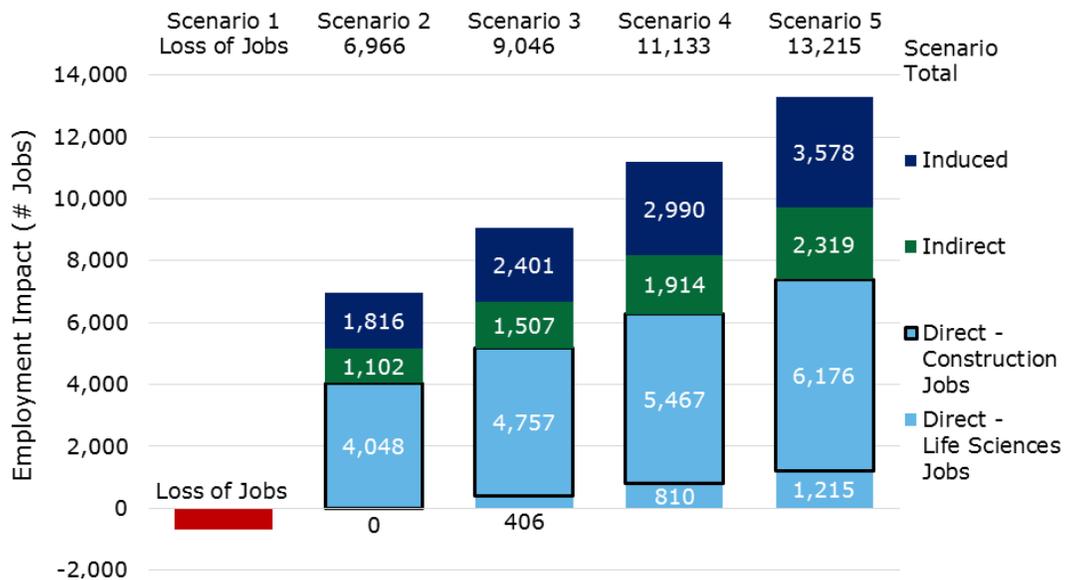
<sup>47</sup> Note that to model the investment in a new Wadsworth lab within the parameters of the input-output model used, half of the investment was allocated to "Construction of New Healthcare Structures" and the other half to "Construction of New Educational and Vocational Structures".

**Figure 15: Scenario Results, Economic Output**



The analysis indicates that any level of investment generates net economic benefits for the Albany EA. The direct effect of investment is about 1-for-1. For instance, in Scenario #2, \$748m of total investment likely yields approximately \$744m of direct economic benefit, while in Scenario #5, \$1,348m of total investment likely yields approximately \$1,394 of direct economic benefit. The additional output generated, roughly the sum of indirect and induced economic effects, would be a net economic benefit. These incremental benefits range between approximately \$448m in Scenario #2 to approximately \$966m in Scenario #5.

**Figure 16: Scenario Results, Employment Impact**



Pertinent conclusions stand out that are critical to the decision-making process around Wadsworth and the Life Sciences Laboratory Initiative<sup>48</sup>:

- The more NYS is willing to invest to attract a private sector life sciences partner into the Capital Region, the greater the potential benefit could be. Rebuilding by itself likely would generate approximately \$1.19b in gross economic output and upwards of 6,966 jobs, while a rebuild with high co-investment generates would likely nearly double the impact with approximately \$2.31b in gross economic output and upwards of 13,215 jobs. These estimates are comparable to the impact of investments in other life sciences-related initiatives. For example, The University of Maryland Baltimore BioPark, which began in 2003, is estimated to have a final cost of around \$1b, and generate over 5,225 construction jobs and 4,000 life sciences-related jobs by 2030.<sup>49</sup> Similarly, MaRS Discovery District, which began in 2005, has created approximately 6,000 jobs with an upfront investment of approximately \$600m.<sup>50</sup>
- From Scenario #1, it is clear that further delaying investment to build a consolidated Wadsworth facility would be a costly option for NYS. While this scenario approximates the line-item cost of delay, it does not attempt to value the cost of potential temporary closures or catastrophic failures within the current facilities, which would likely pose a much higher cost than represented in the estimate. It does attempt to show the possible impact on employment of a public safety event, with the loss of jobs.
- In Scenarios #2 through #5, over half of the jobs created and the final impact on output originates from the direct effects of the initial investment. Most of these directly generated jobs (and associated output) are related to the physical construction of the new consolidated facility (and in Scenarios #3 through #5, the additional construction of a new commercial facility). It is important to highlight that these jobs provide a temporary boost to economic activity as they pertain directly to the construction activities. The addition of a private sector that locates personnel, equipment, and commercial activity in the Capital Region generates a longer-lasting impact on jobs and output. The division between construction and life sciences jobs directly generated from the initial investment is detailed in **Figure 16** above.<sup>51</sup>
- Calculating the investment-to-output ratio for each Scenario (or the gross economic output generated from the investment), the investment yields positive benefits over time, with a final magnitude of 1.6x. Thus, the model demonstrates that for every dollar of investment in life sciences, the Capital Region could expect to yield up to \$1.60 in return.

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<sup>48</sup> The scenario results here apply to the Albany EA level of analysis. See **Appendix F** for tabular representations of the other levels of analysis.

<sup>49</sup> For more information on this cluster, see **Appendix H**.

<sup>50</sup> For more information on this cluster, see **Appendix H**.

<sup>51</sup> Note that the model does not necessarily capture local labor supply constraints, and hence a portion of jobs may need to be temporarily imported from other regions. In addition, jobs created by the investment may exit the local labor market if market demand changes.

## 6.5. Economic Benefits for the Life Sciences Industry Cluster and Capital Region

The potential benefits of investing in the Capital Region's life sciences industry cluster are significant, if uncertain. While NYS could expect some of the benefits of the new lab to accrue in the near-term, an investment of this magnitude would likely take time to yield its full potential. Besides patience, the success of the Life Sciences Laboratory Initiative would also depend on key enabling conditions, including the strategic location of the new Wadsworth lab, alignment with other local and external life sciences assets, and the formation of a partnership with a commercial partner, as described in **Section 2.2**.

In the future envisioned in this report, NYS invests almost \$750m to build a new Wadsworth lab. Alone, this could generate approximately \$440m in net economic benefit (\$1,190m gross economic benefit minus the initial investment of \$750m). The creation of construction jobs and activities associated with construction would drive this economic growth. The public investment appears to be sound with a potential return of approximately 160% on the outlay.

It is Deloitte's estimation that these returns would be only part of the potential created by the Capital Region's life sciences industry cluster. Creating "A Lab For The 21<sup>st</sup> Century" within a broader collaboration and bioinformatics strategy would unlock the potential for truly innovative, complementary solution partnerships between Wadsworth and life sciences organizations. As demonstrated in **Section 4**, Wadsworth's existing research capabilities put it in a position to partner in the near-term. However, an updated lab would allow Wadsworth to leverage its enhanced efficiencies and attract even more partnerships into the Capital Region.

The scenarios analysis illustrates that an investment of the same magnitude as NYS's, including a new \$750m lab and a \$300m investment matched by a private partner, could result in the attraction of approximately 1,200 new life sciences jobs to the Capital Region. In total, the application of common economic multipliers suggests that the aggregate \$1.05b public investment plus the \$300m private investment could create approximately \$950m in new economic output, net of the invested amount.

This new economic output would be realized over time, as partnerships create value through innovation and the commercialization of viable ideas. At first, partnerships could use existing lab and office space in the Capital Region, acting quickly to capitalize on Wadsworth's globally-relevant research capabilities. Over time, collaboration would accelerate economic development, as the involvement of companies along the life sciences value chain would facilitate the transfer of discoveries through to market. Eventually partners would invest in new facilities, R&D, and production capabilities, deepening their presence in the region. Companies would create new traded goods and services resulting in revenue generation and increased spending along the life sciences supply chain.

Further, if this order of magnitude impact assessment holds true, the Capital Region could see the following in terms of cluster growth arising from the Life Sciences Laboratory Initiative:

- Assuming that the investment targets a solution focused on the biopharmaceuticals cluster, the result would likely be a first-order uptick in employment, causing the Capital Region's concentration in life sciences and life sciences-related jobs to jump from ranking 12th nationally to ranking 5th nationally, all else being equal; and,
- The Capital Region's total employment in the biopharmaceuticals cluster (without weighting for area population) would move from 20<sup>th</sup> to 17<sup>th</sup> compared to other economic areas.

While these initial employment impacts are moderate in comparison to total regional employment, they represent significant progress for the cluster, and would help stimulate the additional commercial and academic participation previously described. Some of the most successful life sciences industry clusters, such as Research Triangle Park and Johns Hopkins Medicine, took decades to grow and develop into what they are today. Similarly, NYS's investments could help anchor future academic and commercial collaboration in the Capital Region, which in time could generate significant economic benefit and sustainability.

## 7. Conclusion

Wadsworth serves a vital role in the NYS public health ecosystem, and stands in urgent need of a new, modernized facility to house its research and public health functions. It is well-documented that Wadsworth urgently requires consolidating its staff and equipment, currently spread across five obsolescent facilities, into a new, modernized, workplace that could meet the demands of increasingly complex public health crises. A new lab would help mitigate many current operational risks and reduce the maintenance burden on the State, and potentially provide space for emergent partnerships. The longer this investment is delayed, the more it would likely cost taxpayers, with even five years' delay estimated to cost at least \$227m.

NYS has earmarked \$150m in this year's budget to advance the construction of the Wadsworth lab, one of the nation's premier public health and research institutions. Under Governor Cuomo, NYS has also announced a \$620m Life Sciences Initiative in an effort to spur life sciences and economic growth in NYS. As an ascendant hub for R&D and commercial activity within the life sciences industry cluster, the Capital Region is well-positioned for investment as part of this initiative.

Wadsworth has developed and maintained leading-edge research capabilities that align with prominent global trends in the life sciences industry, despite numerous challenges, as a result of its committed administration, expert staff, and long-standing support from NYS. Investing in a new lab and committing funds towards a co-investment vehicle would allow NYS to leverage these capabilities and enable partners to collaboratively solve life science market opportunities. With the new lab acting as a hub, the Capital Region could become a magnet for life sciences talent, innovation, and economic development.

In line with Wadsworth's impressive capabilities, and as a result of discussions with industry and in-depth use case development with Wadsworth's researchers, three potential solutions were identified in which Wadsworth could play a key role in attracting investment and talent to the Capital Region. These solutions include:

- 1) Population Genomics
- 2) Infectious Disease Surveillance, Diagnostics, and Therapeutics, and
- 3) Agricultural and Chemical Contamination Identification.

These solutions were critically evaluated and iteratively refined through a market sounding effort that strategically targeted 15 potential partners. As a result of these conversations, one academic medical center, one biopharmaceutical company, and one informatics company have confidentially expressed initial interest in partnering around one or more of the outlined solutions. Through an evolving process, these partners are preparing to create formal partnership requirements.

While an isolated investment in Wadsworth would reduce the public health risk its facilities currently pose, and a partnership may attract jobs, these alone would not be enough to sustain economic development and cluster growth in the Capital Region. NYS's investments require coordination under a cohesive life sciences and bioinformatics strategy that could integrate existing capabilities and provide critical infrastructure to advance innovative collaborations. The strategy would need to enable and incentivize collaboration to achieve mutual life sciences goals, such as

shared development of intellectual property and mutual gain from bioinformatics. It should enable collaboration across the life sciences ecosystem in the Capital Region, including academia, industry, government, and entrepreneurs. With these strategies in place, Wadsworth could act as an attractive partner to commercial and academic organizations, providing data, research equipment, and experienced researchers to help co-solve life sciences challenges.

As a part of this strategy, NYS also needs to carefully consider where to locate the new Wadsworth lab within the Capital Region. A preliminary site assessment was conducted and identified a few potential sites for relocation that have favorable factors such as proximity to similar institutions, ability to accommodate the requisite space needs, and comparatively low acquisition and construction costs. This analysis found Expanded Axelrod, Harriman Campus, and SUNY East Campus as the most favorable options for varying reasons. Each of these potential sites comes with tradeoffs that require consideration during the decision-making process. However, strategically consolidating Wadsworth into a campus or facility that is proximate to other existing life sciences assets and nearby space suitable for future partnership investments would let Wadsworth best serve its role as a catalyst for cluster growth. In this case Expanded Axelrod would be the most favorable option.

Wadsworth is in a position to form partnerships in the near term. With the signaled support of NYS in providing funds for the construction of a new, modernized lab, tangible commercial partnerships could form that utilize Wadsworth's capabilities to generate long-term benefits for the Capital Region. The economic analysis supports that a joint venture matching partner investments with a public contribution would attract life sciences jobs to the area. If NYS and one or more private partners contributed approximately a total of \$600 million (with \$300m coming from NYS and \$300 million coming from the private partners) to one or more commercial endeavors that leveraged Wadsworth's scientific expertise and resources (evolving population genomics, infectious disease diagnostics and benefit, and life science information technologies and assets, etc.), common economic multipliers suggest that upwards of 1,200 life sciences jobs could flow into the region with the formation of the partnership and associated activity along the life sciences value chain.

The construction of the lab alone, without related investments by commercial entities, appears to be a good public investment. Constructing a new lab would stimulate approximately \$440m in net economic benefit through the inflow of construction jobs, with a 1.6x multiplier effect likely for every dollar invested. While the construction impact would likely be temporary with economic benefits dissipating over time, the investment would clearly signal NYS's commitment to the life sciences industry cluster and provide space for emerging partnerships going forward. Additional investment resulting in commercial partnerships with Wadsworth could lead to more significant economic benefits for the region over time under a framework that propelled discoveries in the lab through to their commercial application.

Wadsworth could and should play a central role in the development of the Capital Region's life sciences industry cluster and in NYS's Life Sciences Initiative. The economic benefits of investment in a new lab and formation of a partnership would

accrue as Wadsworth establishes partnerships, attracts life sciences jobs and capabilities, and spurs innovation within pressing life sciences challenges. Like most significant investments, the full extent of these benefits would take time to materialize as partnerships mature. In time, NYS's investment in a new lab and a mature commercial partnership could create approximately \$950m in net economic benefits. These benefits would help propel cluster growth through increased employment specialization within the life sciences industry and stimulate the Capital Region's economy through the accelerated development of life-sciences related products and services.