



GO Virginia Region 4 Updated Economic Growth and Diversification Plan

July 29, 2019

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EXECUTIVE SUMMARY

ECONOMIC GROWTH AND DIVERSIFICATION PLAN UPDATE, REGION 4

Featured Metrics

1. Employment in Region 4 increased 2.0% between 2016 and 2018, adding 13,094 jobs. Three of the targeted industry clusters grew at a faster pace than the regional average over this period, led by 5.3% growth in both information technology and communications (+2,106 jobs) and logistics, warehousing, and distribution (+1,751 jobs). Bioscience advanced 2.2%, adding 1,497 jobs, while manufacturing employment in the region expanded 1.3% (+442 jobs). Traded (export-oriented) sectors added 9,144 jobs over this period, accounting for about 70% of regional employment growth.
2. While employment in the target clusters grew faster than the average of all industries, average wage growth was relatively slower in three of the four target clusters. Average annual wages per worker increased 4.9% across all industries for Region 4 between 2016 and 2018, outpaced only by logistics, warehousing, and distribution (6.6%). Despite this growth, however, wages in this cluster remain below the regional average wage. Bioscience average wages advanced 4.3% over this period, followed by 3.9% growth in manufacturing, and 2.4% growth in information technology and communications. Total wage growth in traded sectors accounted for 54% of total wage growth in the region over this period.
3. Several measures point to advances in entrepreneurship development and alignment of the talent pipeline with needed skills and occupations. Total certificates and degrees linked to key occupations in the target clusters increased 1.4% from 2016 through 2017, driven by 13.5% growth in certificates and 2-year awards. Small business growth in Region 4 has consistently outperformed the national average, reaching an estimated 28,982 small businesses as of 2016 (the latest available data);¹ small businesses account for approximately 94% of all business establishments in the region.
4. Registered Apprenticeships data suggest this is an underutilized pathway to filling high-demand, high-wage jobs supporting targeted clusters. Almost all sponsors are located only in and

¹ Small business is defined as establishments with fewer than 50 employees.

immediately around Richmond, and the occupations with the most sponsors are cosmetologists, electricians, and barbers.

Industry Clusters in Region 4

5. Between 2016 and 2018, employment in most clusters was less competitive locally based on national growth trends.² Employment expanded in logistics, bioscience, and information technology, but at a slower pace than growth in those clusters nationally resulting in lower local competitiveness. Within manufacturing, advanced materials employment was less competitive locally but food and beverage (particularly breweries) and glass and ceramics (driven by concrete manufacturing) had higher local competitiveness. Logistics, warehousing, and distribution had low competitiveness; and despite rapid wage growth, average annual wages remain below the regional average. However, logistics is a significant and growing component of employment in the southern part of Region 4, and automation of routine work within the cluster can be expected to boost worker productivity and continue to lift wages.
6. The industry mix of localities within the region vary substantially, and some clusters that may not be dominant at the regional level are important locally. Manufacturing has been a strength in the Crater region and continues to account for about 10% of all employment. Logistics, warehousing, and distribution employs more than 6,100 workers in the Crater region, and with a location quotient of 1.59, employment concentration in the region is more than 50% higher than the nation. However, average wages in the cluster are \$40,263—more than \$3,000 below the average across all industries in the Crater region. The Council should explore steps that could begin to lift wages above the regional average in this industry cluster.
7. Changes in employment and wages over 2018 also vary by cluster and locality. Counties with both employment and wage growth in the information technology and communications cluster are concentrated to the north of Richmond City, while more southern localities have relatively smaller numbers of employees or saw year-over-year declines in employment or wages, or both. However, both employment and wages for the logistics cluster grew in the southern part of the region, while wages for logistics in Hanover and Powhatan declined despite employment growth. Localities with both wage and employment growth in the bioscience/life sciences

² The original Growth & Diversification Plan examined 18 potential clusters based on local and state economic development targets before narrowing down to four priority targeted clusters: logistics; advanced manufacturing; bioscience/life sciences; and information technology. The potential clusters were reexamined in this analysis for changes since the end of 2016 relative to the nation.

cluster are generally more clustered around Richmond City, while those with both wage and employment growth in manufacturing tend to be distributed more along the edge of the region.

Workforce Skills and Job Gaps

8. Online job postings data show the largest number of openings for the following occupations requiring less than a college degree: retail salespersons; sales representatives; general maintenance and repair workers; and computer user support specialists. Jobs with a large number of online postings that require higher levels of training (high school plus certification, or a college degree) include registered nurses; applications software developers; heavy and tractor trailer truck drivers; and medical and health services managers.
9. Over the next ten years, occupations that are expected to grow at the fastest pace require a postgraduate degree, or a two-year degree or certificate. This is consistent with previous studies that have shown a need for advanced skills and identified a large “middle skills” gap in jobs that require more than high school and less than a four-year degree.
10. The report details potential training gaps in 55 occupations that are mainly needed by the targeted clusters. Virtually all pay average wages above the regional average. Thirty-two of them typically require a bachelor’s degree, and 13 typically require an associate degree. These gaps could potentially inhibit growth within clusters in Region 4 and should be addressed in workforce development strategies.

Linkages with Statewide Initiatives

11. Region 4’s strategic priorities are well aligned with major statewide initiatives developed or associated with GO Virginia. Activation Capital is already operating as the regional quarterback for the Regional Entrepreneurial Initiative and is well positioned to complete a strategic plan with project priorities expeditiously. The recommendations of the TEconomy Partners report will be helpful in guiding project directions.
12. Region 4’s own initiatives on site development complement the effort that VEDP is undertaking to characterize sites of 25+ acres in order to expand the number of business-ready sites. The Virginia Gateway Region is doing the same for sites in the southern part of Region 4 that are less than 25 acres. The results of these two projects will enable the Council to prioritize site development efforts and encourage the creation of RIFAs in the region.

13. To not only meet demand but lead the country in cybersecurity research, the Commonwealth Cyber Initiative plans to increase the cybersecurity talent pool in Virginia through investments in research capabilities and commercialization efforts. Under this initiative, the supply of graduates with cyber-focused degrees is expected to double by fiscal year 2026. Aligning GO Virginia efforts with this cyber initiative, as well as the tech-talent pipeline initiative related to Amazon HQ2, represents an opportunity for Region 4 to grow this cluster. There is an estimated shortage in information security analysts supporting cyber security in the region, as well as several other computer occupations including applications software developers, computer systems analysts, electrical engineers, and computer network support specialists.

Project Generation and Assessment

14. Region 4 has been proactive in seeking compelling project proposals. It will utilize in a more coordinated manner the methods that have been successful in informing potential proposers about Go Virginia and moving proposals through its comprehensive vetting process. The continued use of ideation sessions, a process for converting planning grants into per capita proposals, and a more pronounced emphasis on developing competitive grants will be implemented. In addition, Grow Capital Jobs will provide “last mile” grant development and consulting assistance to proposers who have gone through the vetting process.

15. Region 4 has formalized its internal review process. The process specifies the respective roles of staff and subject matter experts while reserving for Council members the responsibility of deciding what proposals should undergo second level vetting and what proposals should ultimately be submitted to the statewide Board for funding.

16. As some initial projects near completion, Region 4 will implement a review process that will address outcomes, cost-effectiveness, and sustainability of the projects.

Priorities to Projects

17. The report details potential project recommendations under each of the Council’s major strategic priorities: accelerating workforce development; supporting cluster development and transformation; addressing gaps in the entrepreneurial ecosystem; and developing business ready sites.

GROWTH & DIVERSIFICATION PLAN UPDATE

1. Featured Metrics

Over the two years since the original Growth & Diversification Plan was completed, Region 4 has seen significant growth in employment and wages in targeted clusters, advances in entrepreneurship development, and greater alignment of the talent pipeline with needed skills and occupations.

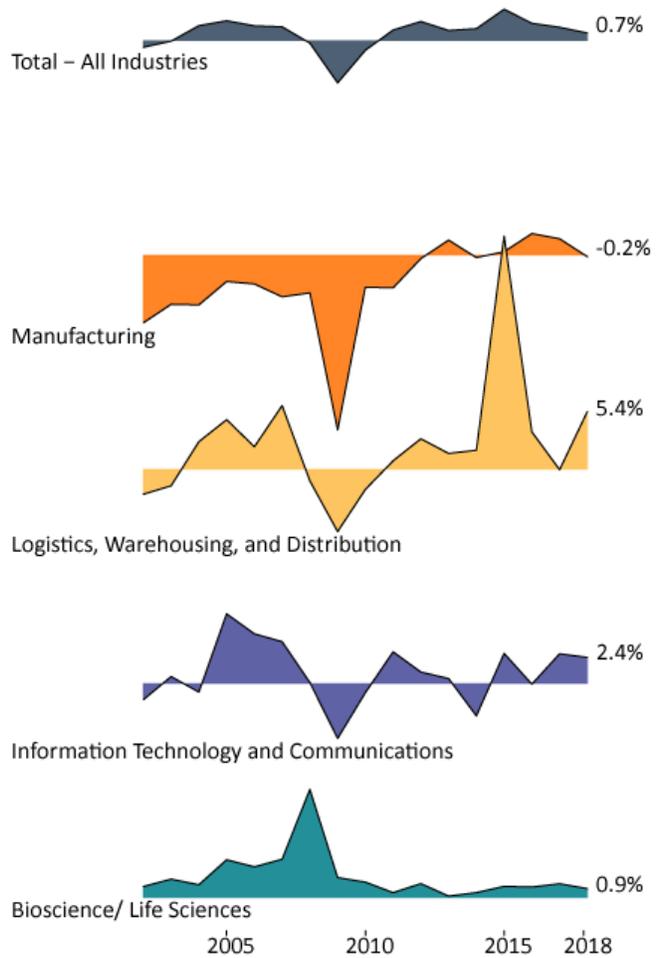
Employment

Employment in Region 4 expanded 0.7% over the year ending 2018, following 1.3% growth in 2017. In comparison, employment grew faster in the state in 2018 (1.4%) and slightly slower in 2017 (1.2%).

The fastest growing targeted cluster is logistics, warehousing, and distribution, where employment grew 5.4% over 2018. Employment in this cluster jumped in 2015 due to a change in the industry classification Amazon reported, along with announcements of warehouses and distribution centers for Amazon, Wal-Mart Harris Teeter, ALDI, and Lidl, among others.³ Employment in information technology and communications grew 2.4% over the year ending 2018, followed by bioscience/ life sciences (0.9%). Manufacturing

employment slightly declined over the year by 0.2%, after growing 1.5% in 2017. During the Great

Employment Change Year-over-Year by Cluster



Source: Chmura's JobsEQ®

³ Source: VEDP Virginia Announcements Data, <https://vedpweb.vedp.org/announcements>

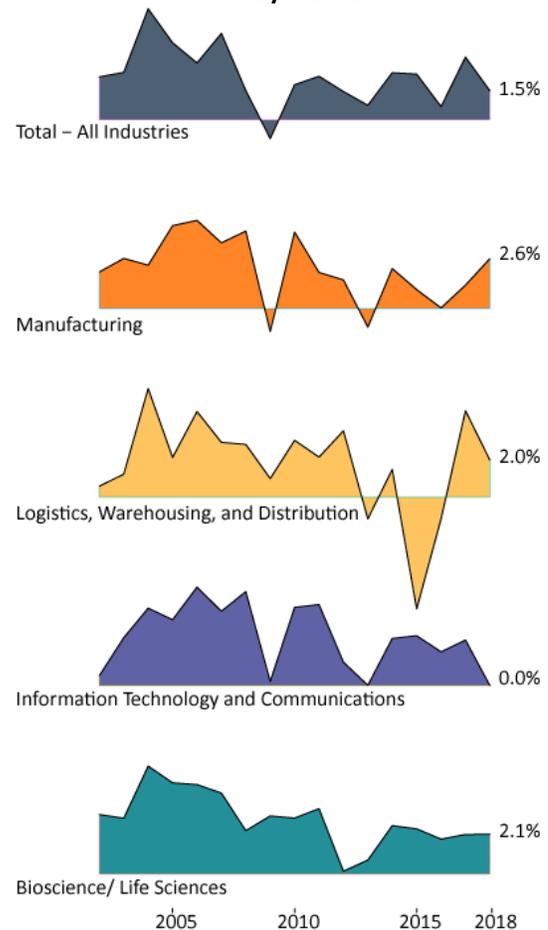
Recession, employment continued to grow in bioscience/ life sciences, suggesting this cluster may be resistant to future economic downturns.

Wages

Average annual wages in the region grew from \$51,169 in 2017 to \$51,956 in 2018, growth of 1.5%. When adjusted for inflation, real wages declined by 0.4%.

As of the first quarter of 2019, average annual wages in the region are \$51,914. Among the targeted clusters, wages in manufacturing grew the fastest between 2017 and 2018, up 2.6% to \$64,486. The next fastest growth was in bioscience/ life sciences (up 2.1% to \$53,452) and logistics, warehousing, and distribution (up 2.0% to \$49,287). Wages in the information technology and communications cluster were stagnant over 2018 at \$72,357.

Change in Average Annual Wages Year-over-Year by Cluster



Source: Chmura's JobsEQ®

The tables below summarize changes by cluster for the years 2016 through 2018. Between 2016 and 2018, the four targeted clusters added 5,796 jobs, accounting for 44% of all jobs added in the region. Over the same period, total wage growth in the targeted clusters accounted for 32% of growth in total wages in Region 4.

Change in Employment by Cluster, GO Virginia 4

	2016	2017	2018	Change 2016-18	
				%	#
Employment					
Manufacturing	32,902	33,399	33,343	1.3%	442
Logistics, Warehousing, and Distribution	32,774	32,758	34,525	5.3%	1,751
Information Technology and Communications	39,879	40,986	41,985	5.3%	2,106
Bioscience/Life Sciences	68,655	69,556	70,152	2.2%	1,497
Total – All Industries	663,724	672,024	676,819	2.0%	13,094

Source: Chmura's JobsEQ®

Change in Wages by Cluster, GO Virginia 4

Average Annual Wages					
Manufacturing	\$62,058	\$62,826	\$64,486	3.9%	\$2,428
Logistics, Warehousing, and Distribution	\$46,225	\$48,340	\$49,287	6.6%	\$3,062
Information Technology and Communications	\$70,649	\$72,357	\$72,357	2.4%	\$1,709
Bioscience/Life Sciences	\$51,264	\$52,345	\$53,452	4.3%	\$2,188
Total – All Industries	\$49,521	\$51,169	\$51,956	4.9%	\$2,435

Source: Chmura's JobsEQ®

Exporting Industries

Exporting industries (“traded” sectors) bring more wealth into the region when products are sold to consumers and businesses that are outside the region. These new dollars provide profits and wages to owners and workers in the region who spend some of that money in the region, thereby increasing the demand for products and services provided by local service industries (or “non-export” industries) such as retail stores, restaurants, healthcare, construction, and real estate.⁴

Since 2016, traded sectors and local sectors in Region 4 have both grown 2.0%, but traded sectors have added more than twice the number of jobs added in local sectors. The 9,144 new jobs added over this period account for about 70% of regional employment growth. Total wages, however, have grown more slowly in traded sectors (6%) than local sectors (10%). Difficulty filling high-demand, locally-oriented jobs such as those in healthcare industries could contribute to faster wage growth. In addition, average wages in local sectors are generally lower than in traded sectors, at \$43,094 and \$78,648, respectively. Wage growth in traded sectors accounted for 54% of total wage growth in the region over this period.

Change in Employment and Wages by Export Orientation, GO Virginia 4

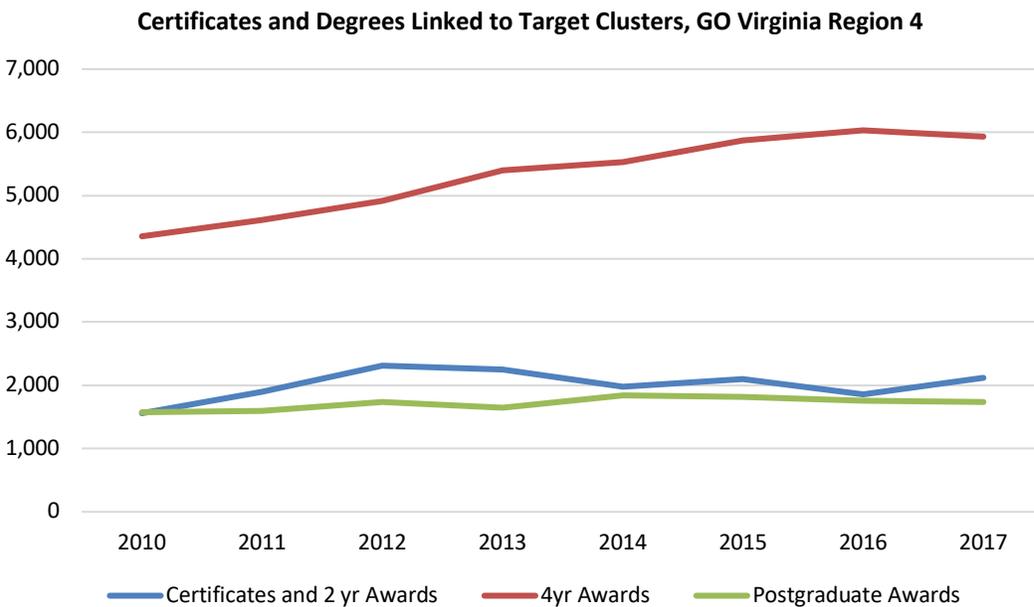
	2016	2017	2018	Change 2016-18	
				%	#
Employment					
Traded	464,291	469,919	473,435	2.0%	9,144
Local	199,433	202,105	203,383	2.0%	3,950
Total – All Industries	663,724	672,024	676,819	2.0%	13,094
Total Wages					
Traded	\$19,179,259,215	\$19,976,753,970	\$20,402,080,418	6%	\$1,222,821,203
Local	\$14,566,075,610	\$15,563,666,378	\$15,995,586,055	10%	\$1,429,510,445
Total – All Industries	\$33,745,334,825	\$35,540,420,348	\$36,397,666,473	8%	\$2,652,331,648

Source: Chmura's JobsEQ®

⁴ Exporting industries are defined following the US Cluster Mapping methodology for traded industries, for more details and definitions see <https://clustermapping.us/content/cluster-mapping-methodology>.

Program/Degree Completions

In 2017, an estimated 9,784 certificates and degrees were awarded in Region 4 linked to key occupations in the targeted clusters. Though the programs are related to occupations supporting the clusters, many graduates may not end up employed in the cluster, or even necessarily in occupations related to the training program.⁵ Total linked awards increased 1.4% from 2016-2017, driven by 13.5% growth in certificates and 2-year awards. Specifically, certificates of 2-years or less increased rapidly over this period, including registered nursing (+52), welding technology/welder (+35), and automotive mechanics technician (+12). The number of 4-year awards declined 1.7% over the year, while postgraduate awards declined 1.1%. Program completions and potential training supply gaps are discussed more fully in the workforce gap analysis section later in this report.



Source: NCES, JobsEQ®

⁵ To relate training programs to occupations, this report uses a modified version of the Classification of Instructional Programs (CIP) to Standard Occupation Classification (SOC) crosswalk from the National Center for Education Statistics (NCES) for key occupations as defined in the workforce gap analysis section of the report. While the crosswalk used is helpful for estimating occupation production from training program awards data, it is neither perfect nor comprehensive. Indeed, it is hard to imagine such a crosswalk being perfect since many training program graduates for one reason or another do not end up employed in occupations that are most related to the training program from which they graduated.

Internships

Internships provide an entry point to gain experience in a specific industry. The table below shows the top fifteen internships by occupation posted online in Region 4 in the first quarter of 2019. Most of the internships offered supported financial services and information technology (IT).

Internships by Occupation in GO Virginia Region 4, 2019Q1

SOC	Title	Total Ads
27-3031	Public Relations Specialists	43
13-1161	Market Research Analysts and Marketing Specialists	29
41-2031	Financial Managers, Branch or Department	26
11-3031	Sales Representatives, Services, All Other	25
41-3099	Secretaries and Administrative Assistants, Except Legal, Medical, and Executive	21
43-6014	Human Resources Specialists	18
13-1071	Accountants	18
13-2011	Retail Salespersons	17
11-9033	Social and Human Service Assistants	13
21-1093	Purchasing Managers	13
11-3061	Software Developers, Applications	13
29-1063	Office Clerks, General	13
15-1132	Financial Analysts	12
43-9061	Computer and Information Research Scientists	12
13-2051	Business Operations Specialists, All Other	12

Source: Real-Time Intelligence from JobsEQ

The table below shows the top 10 employers that posted internship advertisements online in Region 4 in the first quarter of 2019. Dominion was a major provider of internships in the region over this period, with 38 online job postings ranging from electrical engineering and financial analyst to public/media relations and accounting. Many of the internships offered by these employers involved a finance or IT background.

Employers Posting Internships Online in GO Virginia Region 4, 2019Q1

Employer Name	Number of Ads
Dominion Energy	38
Henrico County	28
CarMax	21
Performance Food Group	19
Ernst & Young Global Limited	18
Altria	16

Employers Posting Internships Online in GO Virginia Region 4, 2019Q1

Employer Name	Number of Ads
U.S. Bank	15
Union Bank & Trust	13
SeaWorld Parks & Entertainment	13
Busch Gardens Williamsburg	11

Source: Real-Time Intelligence from JobsEQ

Apprenticeships

Apprenticeships within Region 4 are opportunities for individuals to learn and apply new skills in the labor force. The following data on apprenticeships is from the Commonwealth of Virginia’s Department of Labor and Industry as of June 18, 2019. The table shows the number of apprenticeship sponsors available per locality. There were no apprenticeship sponsors in Dinwiddie, Greensville, Surrey, or Sussex counties.

Apprenticeship Sponsors, GO Virginia Region 4, 2019

County/City	Number of Apprenticeship Sponsors
Richmond	137
Henrico	129
Chesterfield	98
Hanover	69
Colonial Heights	14
Prince George	13
Hopewell	10
Emporia	6
Charles City	5
Goochland	5
Powhatan	4
New Kent	2
Petersburg	2

Source: Virginia Department of Labor and Industry, Chmura

Most of the apprenticeships were available in urban areas. Richmond, Henrico, Chesterfield, and Hanover accounted for 433 out of the 494 apprenticeship sponsors in the region.

The table below shows the most apprenticeship sponsors by occupation in the region (data on participants or completions are not available). Cosmetologists and barbers were the most popular and were evenly distributed throughout the region. Occupations such as electrician, optician, machinist,

maintenance mechanic, and machine operator support targeted clusters; but these data suggest this is an underutilized pathway to filling high-demand, high-wage jobs needed in the region.

Apprenticeship Sponsors, GO Virginia Region 4, 2019

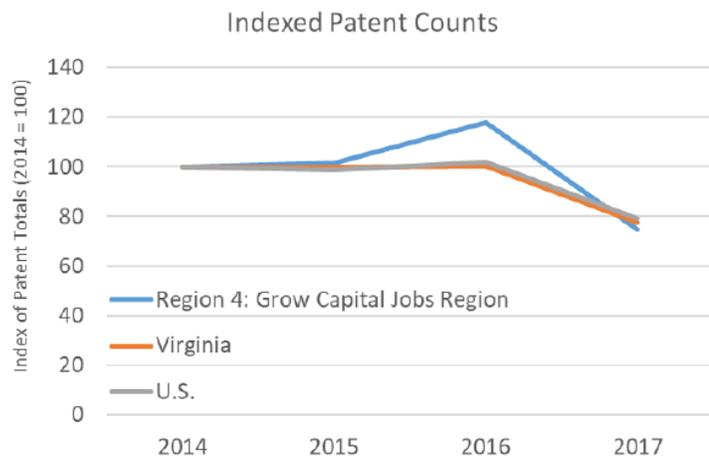
Occupation	Number of Apprenticeship Sponsors
Cosmetologist	167
Electrician	86
Barber	60
Optician, Dispensing II	38
Machinist	26
HVAC-Environmental-Ctrl	22
Plumber	15
Nail Technician	14
Pipe Fitter Construction	8
Maintenance Mechanic	6
Highway Construction Insp	4
Machine Operator I	4
Industrial Hygienist	3

Source: Virginia Department of Labor and Industry, Chmura

Start Ups and Scale Ups

A recent study completed by TEconomy Partners highlights several metrics related to startups and scale ups in GO Virginia Region 4.⁶ Patent

activity in the region has declined from 635 in 2014 to 475 in 2017, a 25% drop. Leading areas of patent activity over this period include chemical features or treatment of tobacco, digital payment architectures, financial software, and biopharmaceuticals. As another measure of research and development (R&D) activity, Virginia Commonwealth



Source: TEconomy Partners

University generated an average 0.64 licenses from commercialized research per \$10 million in research expenditures between 2010 and 2016, below the national average of 1.04 licenses.

⁶ Startups refer to new business formation. Scale ups refer to survival and growth in young firms.

Over the ten years between 2007 and 2017, the transportation, distribution, and logistics cluster had the highest number of startups formed by far (1,421). Manufacturing and information technology each had about 350 startups, while life sciences startups totaled 226. In 2017, an estimated 45% of all traded sector startups formed in 2012 are still in existence in the region.

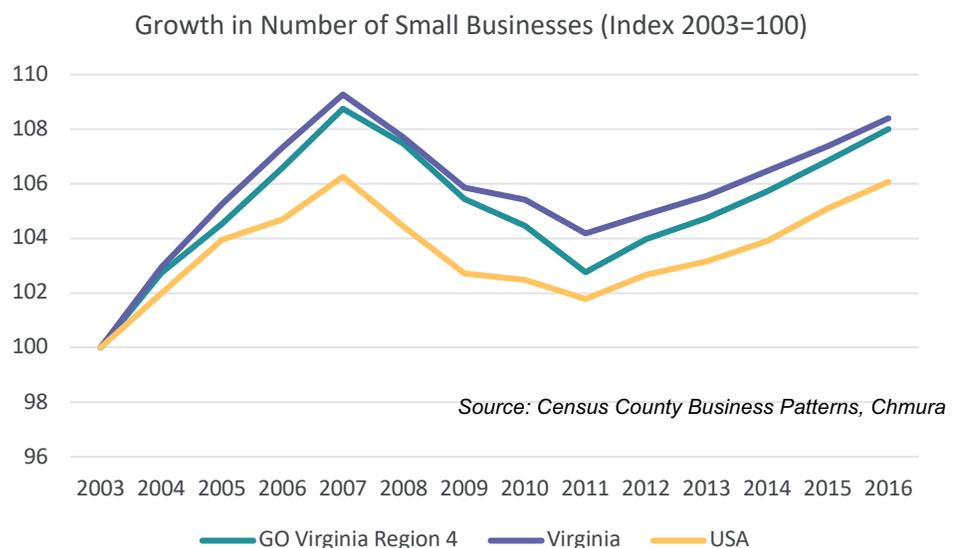
Cluster Startup Activity

	Number of Startups, 2007-2017	Number of Startups Surviving by 2017
Information Technology and Communications	343	187
Life Sciences	226	109
Manufacturing	368	184
Transportation, Distribution and Logistics	1,421	695

Source: Regional Entrepreneurial Assessment Project: Final Briefing Report, TEconomy Partners, December 2018

Small business growth in GO Virginia Region 4 has consistently outperformed that of the nation since 2003 but underperformed that of the state.⁷ Specifically, the region has added 2,146 small businesses since 2003 (a total growth rate of 8%, or less than 1% per year on average). This compares with 8.4% growth in Virginia and 6.0% growth in the nation over the same period. Following the trend in the state, the number of small businesses in the region was severely impacted during the recession from 2007 to 2009 and took another two years to start growing again.

Prior to the Great Recession, the number of small businesses in Region 4 grew at an average of 2.2% annually, reaching a peak of 29,184 small businesses in 2007. From 2007 to 2011, small businesses for Region 4 declined at an average annual rate of 1.4%, faster than Virginia (1.2%) and the United States



⁷ Business establishments with less than 50 employees are used as a measure for entrepreneurial activity and are referred to in this study as small businesses. This is the same definition used by international organizations such as the World Bank and OECD. Chmura chose not to use the definition used by the U.S. Small Business Administration of 500 employees as it is too broad. Source: "The dynamics of employment growth," OECD Science, Technology and Industry Policy Papers No. 14.

(0.9%). Like the state and the nation, Region 4 hit a trough in 2011, losing a total of 1,605 small businesses from 2007 through 2011. Since 2011, the number of small businesses in Region 4 has grown at a yearly rate of 1.02%, faster than Virginia (0.81%) and the United States (0.78%). Small businesses are not growing as quickly following the recession, however; the post-Great Recession small business growth rates are lower than pre-recession growth rates for all three regions. As of 2016 (the latest available data), Region 4 had not reached its previous peak of 29,184 small businesses, but the trend suggests the region may have reached and surpassed this number in 2017.

As of 2016, there were 28,982 small businesses in Region 4 that make up an estimated 93.9% of all business establishments in the region.⁸ This compares with 187,962 small businesses in Virginia which make up 94.1% of all business establishments in the state and 7.3 million small businesses nationally which comprise approximately 94.5% of all U.S. business establishments.

Small business trends for GO Virginia Region 4 vary by locality. On average, some of the fastest growing areas in the region include New Kent, Powhatan, Prince George, Henrico, and Chesterfield. Four localities, Charles City, Richmond City, Greenville, and Emporia have all experienced average annual declines in small businesses since 2003 of at least 1%. Since 2003, New Kent has seen the largest percentage increase in small businesses (at an average annual rate of 2.2%), followed by Powhatan (1.9%), and Henrico (1.9%). Charles City County has seen the largest decline over this period (2.2%), followed by Richmond City (1.7%), and Greenville (1.1%). Richmond City was hit especially hard during the recession, experiencing a 20% loss of small businesses in 2007, but has not experienced a loss or gain greater than 2% in all other years.

Change in Number of Small Businesses for GO Virginia 4 (year-over-year) by Locality

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Charles City	-4%	3%	-3%	-18%	-1%	-7%	1%	-4%	1%	2%	3%	-2%	4%
Chesterfield	3%	2%	2%	12%	-1%	-2%	-2%	-2%	2%	2%	2%	1%	1%
Colonial Heights	0%	0%	2%	2%	0%	-3%	2%	-2%	-3%	-2%	0%	2%	0%
Dinwiddie	7%	-3%	1%	9%	-6%	-3%	4%	-1%	-2%	-3%	-1%	0%	-1%
Emporia	-5%	1%	2%	-3%	3%	-5%	-4%	-3%	0%	3%	2%	-2%	0%
Goochland	4%	1%	-1%	18%	0%	-1%	-2%	-5%	3%	4%	-1%	2%	1%
Greenville	-5%	2%	-2%	6%	-1%	-3%	-1%	-6%	0%	-7%	3%	2%	-2%
Hanover	3%	3%	2%	4%	-3%	-4%	0%	-1%	3%	0%	-1%	2%	0%

⁸ An establishment is a unique business location. If there are 20 Shell gas stations in the region, for example, that would represent 20 establishments.

Change in Number of Small Businesses for GO Virginia 4 (year-over-year) by Locality

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Henrico	3%	2%	3%	13%	0%	-1%	-1%	-1%	1%	2%	2%	1%	1%
Hopewell	3%	-1%	1%	0%	-1%	-1%	2%	-2%	-5%	-4%	1%	1%	-3%
New Kent	5%	5%	1%	27%	-3%	-5%	-5%	0%	8%	-7%	2%	4%	1%
Petersburg	1%	-3%	2%	-1%	-1%	-3%	-1%	-3%	-1%	-1%	0%	-2%	3%
Powhatan	8%	8%	4%	10%	0%	-5%	-4%	-3%	3%	0%	2%	3%	0%
Prince George	1%	6%	1%	8%	-2%	0%	0%	0%	6%	-2%	1%	1%	2%
Richmond	2%	0%	1%	-20%	-2%	-1%	0%	-1%	0%	1%	1%	0%	1%
Surry	5%	-1%	-3%	3%	0%	3%	0%	-4%	-5%	0%	1%	-4%	3%
Sussex	0%	5%	1%	-2%	-6%	-1%	3%	-4%	3%	1%	-7%	2%	1%
GO Virginia Region 4	3%	2%	2%	2%	-1%	-2%	-1%	-2%	1%	1%	1%	1%	1%

Source: Census County Business Patterns, Chmura

By sector, the number of small businesses in retail trade accounted for 13.4% of all small business establishments in Region 4 in 2016. The next largest share of small businesses is professional, scientific, and technical services (12.2%), followed by other services (11.5%), health care and social assistance (10.6%), and construction (10.5%).⁹

Number of Small Businesses by Sector, 2016

Sector	Establishment Count	% of All Small Businesses
Retail Trade	3,880	13.4%
Professional, Scientific, and Technical Services	3,527	12.2%
Other Services (except Public Administration)	3,338	11.5%
Health Care and Social Assistance	3,082	10.6%
Construction	3,037	10.5%
Accommodation and Food Services	2,444	8.4%
Finance and Insurance	2,009	6.9%
Administrative and Support and Waste Management and Remediation Services	1,558	5.4%
Wholesale Trade	1,477	5.1%
Real Estate and Rental and Leasing	1,436	5.0%
Transportation and Warehousing	724	2.5%
Manufacturing	710	2.4%
Information	491	1.7%
Arts, Entertainment, and Recreation	432	1.5%
Educational Services	398	1.4%
Management of Companies and Enterprises	237	0.8%
Utilities	50	0.2%

⁹ Other services include, for example, religious, grantmaking, civic, professional, and similar organizations; automotive repair and maintenance; and private households with employees.

Number of Small Businesses by Sector, 2016

Sector	Establishment Count	% of All Small Businesses
Agriculture, Forestry, Fishing and Hunting	48	0.2%
Mining, Quarrying, and Oil and Gas Extraction	29	0.1%
Total – All Industries	28,982	100%

Source: Census County Business Patterns, Chmura

The top three fastest growing small business sectors in terms of number of establishments since 2003 are management of companies and enterprises (45%); educational services (43%); and accommodation and food services (41%). The small business sectors which have declined the most since 2003 are agriculture, forestry, fishing, and hunting (-29%); manufacturing (-13%), and construction (-12%).

The changes in small business sector size may be the effects of many different factors, not all particularly bad. For example, declines in small businesses may partially be due to businesses growing in size and thus outgrowing their “small business” classification. Nevertheless, consistent growth rates should still be taken as overall positive indicators. Industries that have experienced consistent small business growth since 2003 such as healthcare and real estate are more likely to continue growing.

Percent Change in Small Businesses by Industry

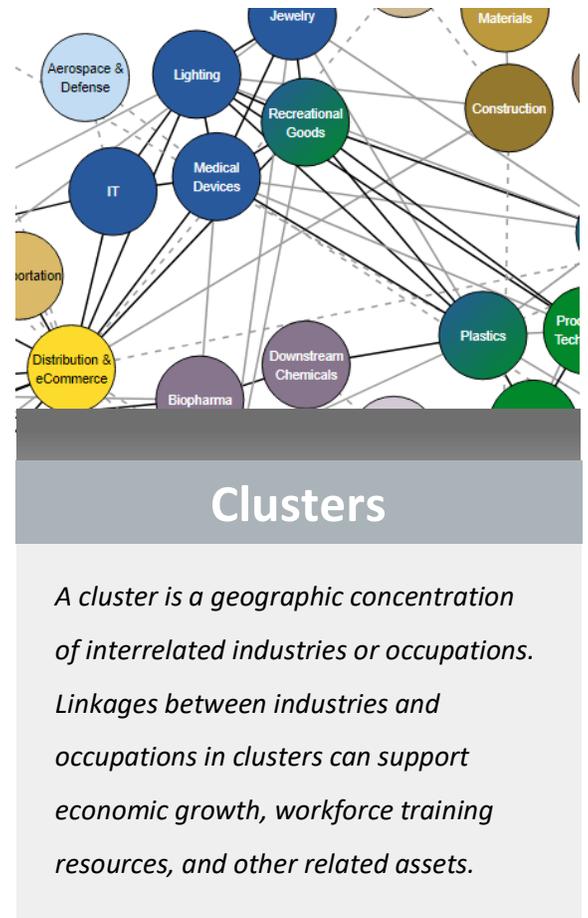
Industry Type	2003-2016	2006-2016	2011-2016	2014-2016	2015-2016
Accommodation and Food Services	41%	24%	10%	2%	3%
Administrative and Support and Waste Management and Remediation Services	14%	5%	8%	2%	2%
Agriculture, Forestry, Fishing and Hunting	-29%	-16%	-16%	-8%	-11%
Arts, Entertainment, and Recreation	30%	18%	7%	3%	-1%
Construction	-12%	-20%	1%	3%	2%
Educational Services	43%	33%	20%	1%	-1%
Finance and Insurance	2%	-7%	2%	1%	1%
Health Care and Social Assistance	32%	22%	13%	5%	3%
Information	9%	2%	5%	0%	5%
Management of Companies and Enterprises	45%	30%	30%	10%	6%
Manufacturing	-13%	-11%	-2%	1%	-1%
Mining, Quarrying, and Oil and Gas Extraction	7%	-3%	16%	4%	0%
Other Services (except Public Administration)	6%	2%	5%	2%	1%
Professional, Scientific, and Technical Services	18%	9%	6%	2%	-1%
Real Estate and Rental and Leasing	22%	5%	19%	9%	4%
Retail Trade	-5%	-6%	-3%	-1%	-1%
Transportation and Warehousing	8%	3%	10%	4%	5%
Utilities	-2%	-18%	-9%	-2%	-2%
Wholesale Trade	-8%	-7%	-4%	-2%	-1%

Source: Census County Business Patterns, Chmura

2. Cluster Analysis

This section reviews changes in the GO Virginia Region 4 targeted clusters since the original Growth and Diversification Plan and explores potentially emerging clusters.

Clusters, which are geographic concentrations of interrelated industries or occupations, have been examined for the Richmond region under several different studies. Analysis for the Greater Richmond Partnership, Richmond's Future, the Crater Workforce Development Area, the Capital Workforce Development Area, and the Virginia Economic Development Partnership have identified approximately 40 clusters. However, there is significant overlap in the definitions of the various clusters. The list of clusters examined in the original Growth and Diversification Plan was narrowed to remove overlapping industries where possible to get the most specific definitions and identify regional drivers. Even so, some overlap in definitions remains as industries could potentially serve multiple clusters. This process resulted in the following potential clusters (definitions by NAICS codes are included in the appendix of the original Growth and Diversification Plan):



- Logistics, Warehousing, and Distribution
- Construction
- Professional Services
- Financial Services
- Creative Services
- Information Technology and Communications
- BioScience/ Life Sciences
- Energy
- Management of Companies and Enterprises
- Chemicals
- Arts and Entertainment
- Printing and Publishing
- Education and Knowledge
- Glass and Ceramics
- Mining
- Advanced Materials
- Food and Beverage
- Defense and Security

These clusters are reviewed in this update to explore changes in the past two years.

Historical Drivers

A shift-share analysis is conducted for each cluster to identify drivers of regional employment change. Shift-share analysis sheds light on factors underlying regional employment growth by breaking total employment change for a given period into three components:

- *National Growth* is due to the overall growth or contraction in the national economy
- *Industry Mix Share* is attributable to the specific industries or clusters being examined based on national industry growth and the industry mix of the region
- *Local Competitiveness* is the remaining growth or contraction that is attributable to regional factors. A positive number indicates a productive advantage in this industry that may be due to superior technology, management, labor pool, etc.

Shift-share analysis is dependent on the job growth over time, and thus can change depending on the time period selected. The period for this analysis is the last two years (2016 through 2018), allowing for analysis of changes since the start of GO Virginia and the previous diversification plan.

The results of this analysis are summarized in the figure below. The average annual wages in 2018 for each cluster are shown on the vertical axis and the local competitiveness component (number of jobs gained or lost attributable to regional factors) for the reference period is shown on the horizontal axis. The chart is divided into four quadrants by lines marking the regional average annual wage per worker in the first quarter of 2019 (\$51,914) and the average local competitiveness for all clusters considered. Targeted clusters are shown in orange in the chart. Manufacturing is broken into several clusters following the methodology of the original plan to better identify drivers within the sector.

Clusters that appear in the upper right quadrant (high wage, high local competitiveness) represent industries that pay a high average annual wage and have grown relatively faster over the last two years. Clusters with higher local competitiveness represent a demonstrated regional competitive advantage over this period. Growth in the food and beverage cluster was driven by beverage manufacturing, especially craft breweries. Cement and concrete product manufacturing drove regional growth in the glass and ceramics cluster, along with announcements of expansion in glass manufacturing companies in Greenville and Henrico counties.

Average Wages and Local Competitiveness in Region 4, 2016-2018



Source: JobsEQ®

Several of the targeted clusters are in the upper right quadrant but have negative local competitiveness. As shown in the following table, employment in logistics, transportation, and distribution; information technology and communication;

bioscience/life sciences; and manufacturing has been growing; but this analysis suggests these high-paying industries are not growing as quickly in the region as might be expected based on national growth. Low local

Average Annual Change in Employment, 2016-2018

	Region 4	USA
Bioscience/Life Sciences	1.1%	1.6%
Information Technology and Communications	2.6%	3.1%
Logistics, Warehousing, and Distribution	2.6%	3.9%
Manufacturing	0.7%	1.4%

Source: JobsEQ®

competitiveness could be due to several factors, but there may be reason for some concern for the region if employers in these clusters could be more competitive elsewhere and choose to relocate to a region where the supply chain is stronger, training providers have a stronger pipeline of talent, and there are more commercialization opportunities.

Some of the fastest growing industries within the bioscience cluster over this period were pharmaceutical and medicine manufacturing, scientific research and development services, and general medical and surgical hospitals. Negatively impacting the local competitiveness calculation, employment in medical equipment and supplies manufacturing as well as industrial machinery manufacturing declined in the region but grew in the state and the nation.

Though employment in the information technology and communications cluster grew in Region 4, it grew slower than in the nation, driving the local competitiveness factor negative. The largest losses over this period were in professional and commercial equipment and supplies merchant wholesalers. Employment in management, scientific, and technical consulting services as well as software publishers grew more quickly than in the state and the nation. Employment in computer systems design and related services grew over this period but at a slower rate than in Virginia or the nation.

High-paying clusters in the upper left quadrant (higher wages, lower local competitiveness) are not growing as quickly regionally as they are on average in the nation and are growing slower (or declining faster) than the average across all clusters. Within the creative services cluster, employment in architectural, engineering, and related services and advertising, public relations, and related services declined in Region 4 but grew nationally.

The lower right quadrant (lower wages, higher local competitiveness) contains only two clusters: arts and entertainment; and education and knowledge creation. These clusters outperformed what would be

expected based on national industry growth and overall U.S. growth; however, overall regional wage growth is slowed by growth in clusters with below-average wages. In the arts and entertainment cluster, other amusement and recreation industries (with average wages of \$17,808) such as fitness centers accounted for much of the cluster's local competitive growth. Job declines in the education and knowledge sector were driven by colleges, universities, and professional schools, as well as newspaper, book, and directory publishers.

The lower left quadrant (low wages, low local competitiveness) is the most difficult to justify investment for promoting high-growth high-wage jobs at the regional level. The logistics, warehousing, and distribution cluster grew from 2016 through 2018, especially in general warehousing and storage, with an average annual wage of \$32,387. Employment also expanded in long-distance general freight trucking less than a truckload; special needs transportation; and freight transportation arrangement. However, employment in warehousing and storage expanded more rapidly at the national level, outperforming local growth. Industries within this cluster that grew nationally but declined in Region 4 over this period include specialized freight trucking, air transportation, and refrigerated warehousing and storage.

Logistics is a significant and growing component of employment in the southern part of Region 4. The lower wages of the cluster represent a challenge in converting this growth into high-paying jobs, but automation in the industry has the potential to impact wage growth. Automation of work in the medium-term is not expected to be a wholesale replacement of all workers but rather an automation of routine work that overall boosts worker productivity.^{10, 11} Along with the expected productivity gains from automation, workers will require the new skills and training to work with autonomous systems and robotics—both factors are expected to positively impact wages in this industry. In addition to analysis at the regional level, these distinctions within Region 4 are important to the Regional Council in setting priorities and are explored further in the next section.

¹⁰ See, for example, <https://www.mckinsey.com/featured-insights/future-of-work/jobs-lost-jobs-gained-what-the-future-of-work-will-mean-for-jobs-skills-and-wages>

¹¹ For commentary on Amazon's outlook on automating jobs, see <https://www.reuters.com/article/us-amazon-com-warehouse/amazon-dismisses-idea-automation-will-eliminate-all-its-warehouse-jobs-soon-idUSKCN1S74B9>

Intraregional Distinctions

Although Region 4 is a large geographic region with some significant variation between localities, the metro area tends to dominate analysis of economic drivers due to the significantly larger economic base. Not all clusters identified at the regional level apply to every locality. In addition, some clusters that appear relatively small in the region are important for some localities. This section analyzes changes in clusters for the Crater and Richmond Planning Commission regions.¹²

Manufacturing has historically been a strength in the Crater region and continues to account for more than 7,200 jobs, or 10% of all employment, in the region as of the first quarter of 2019. While manufacturing employment was stagnant year-over-year in the Richmond region, it expanded 2.5% in the Crater region. The cluster pays above-average wages of \$68,795 and has a high location quotient of 1.17.¹³

Cluster Employment, Wages, and Specialization by Planning District

	Empl 2019Q1		Avg Ann Wages		Empl Change YoY		LQ	
	Richmond	Crater	Richmond	Crater	Richmond	Crater	Richmond	Crater
Manufacturing	26,524	7,290	\$63,187	\$68,795	0.0%	2.5%	0.53	1.17
Logistics, Warehousing, and Distribution	29,211	6,102	\$51,374	\$40,263	6.1%	3.6%	0.95	1.59
Information Technology and Communications	39,978	2,441	\$73,513	\$51,167	2.8%	-3.2%	0.92	0.45
Bioscience/ Life Sciences	61,338	9,055	\$55,850	\$39,196	1.3%	0.5%	0.93	1.10
Total - All Industries	604,142	75,451	\$52,931	\$43,553	0.6%	0.5%	1.00	1.00

¹² The two planning districts account for every county and independent city in GO Virginia Region 4. The Crater Planning Commission region is defined as Charles City, Dinwiddie, Greensville, Prince George, Surry, Sussex, Colonial Heights, Emporia, Hopewell, and Petersburg. The Richmond Planning Commission is defined as Chesterfield, Goochland, Hanover, Henrico, New Kent, Powhatan, and Richmond City.

¹³ The location quotient (LQ) for an industry identifies the degree to which the industry specializes in or is concentrated in a region. With an LQ of 1.25 or higher, a region is considered to possess a competitive advantage in that industry. Firms in a specific industry are often concentrated in a particular region because of some competitive advantage found in an area such as geographic location, natural resources, and human resources, though a region can have a competitive advantage in a growing or declining industry. By formula, the location quotient is the ratio of an industry's share of total employment within the region to the same industry's share of employment in the nation.

$$LQ = \frac{\text{Employment in industry } I \text{ in area } J / \text{Total employment in area } J}{\text{U.S. employment in industry } I / \text{Total U.S. employment}}$$

Logistics, warehousing, and distribution is another cluster that is more prominent in the Crater region when compared to the overall region. The sector employed more than 6,100 workers in the first quarter of 2019, expanding 3.6% from first quarter 2018. With a location quotient of 1.59, employment is more than one and a half times as large in the region compared to the average in the nation, and the Crater region can be considered to possess a competitive advantage in this cluster. However, average wages remain low in the cluster, even considering sub-regional differences. The average wage in logistics, warehousing, and distribution is \$40,263 in 2019Q1, more than \$3,000 below the average across all industries in the Crater area of \$43,553.

The charts on the following two pages replicate the shift share analysis for the Crater and Richmond Regional planning districts. In the Crater region, the bioscience, logistics, and information technology clusters have relatively lower employment growth due to local competitiveness factors. However, the manufacturing-related clusters of chemicals and glass and ceramics were relatively more competitive. Growth in the high-wage management of companies and enterprises cluster was also more competitive in the Crater region over this period. The bioscience cluster also pays below-average wages in the Crater region, moving it to the lower left of the quadrant along with logistics, transportation, and warehousing. Within the bioscience cluster, local employment declined despite national growth in pharmaceutical and medicine manufacturing; industrial machinery manufacturing; and medical equipment and supplies manufacturing industries over this period. Within the logistics cluster, the region also experienced relatively faster local declines in management, scientific, and technical consulting services and rail transportation.

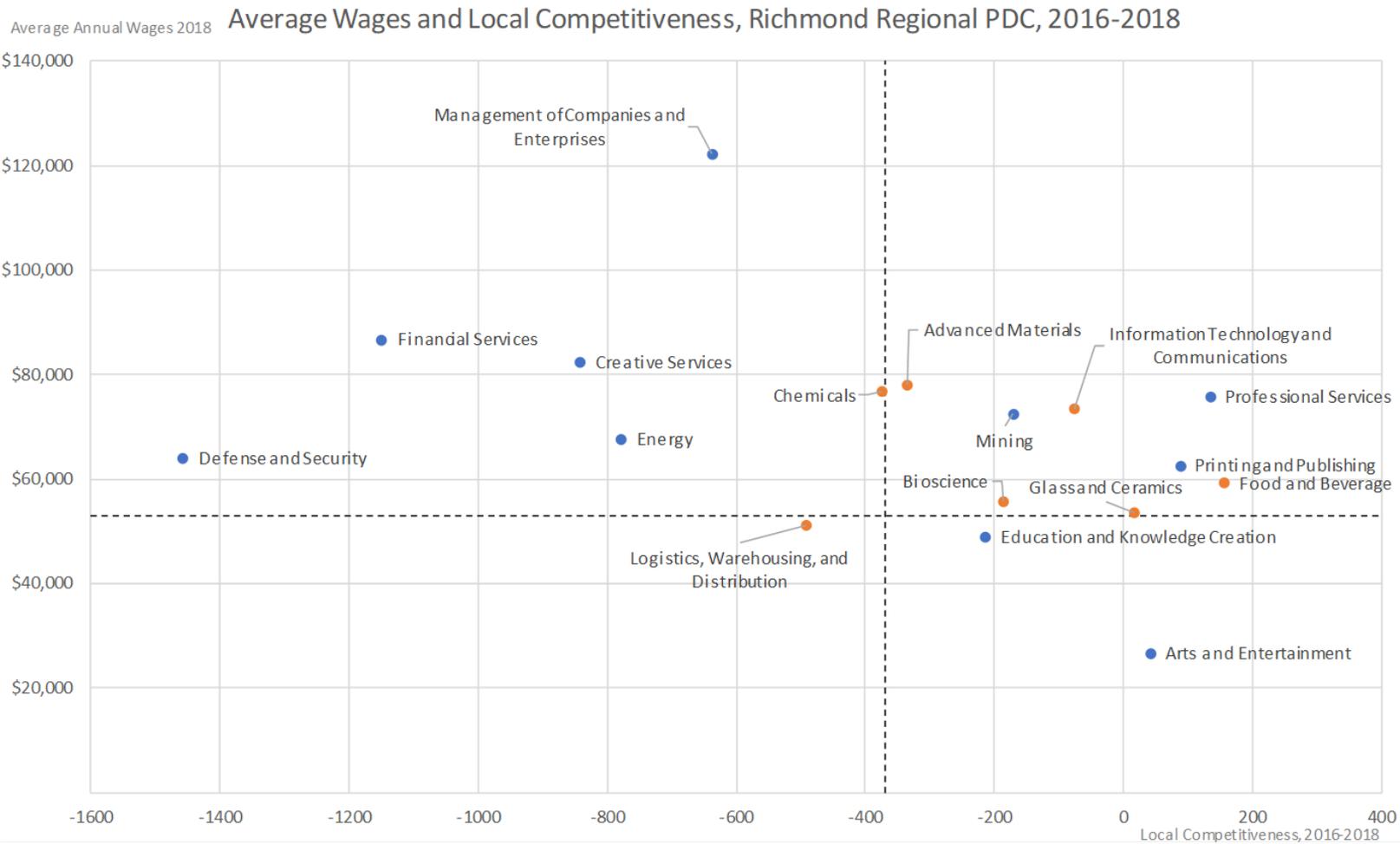
Unsurprisingly given the concentration of employment in the region, the chart for the Richmond planning district looks largely the same as in the entire Region 4 analysis. Two notable exceptions are the chemical cluster and advanced materials cluster, which both had much lower employment growth due to local competitiveness without the Crater region.

Average Annual Wages 2018

Average Wages and Local Competitiveness, Crater PDC, 2016-2018



Source: JobsEQ®



Source: JobsEQ®

Changes in employment and wages over 2018 also vary by cluster and locality. Across all the industries in GO Virginia Region 4, employment grew year-over-year in 13 out of the 17 localities, while average annual wages grew in 14 of the 17 regions. No county or city experienced both a decrease in employment and a decrease in average annual wages.

Employment and Average Annual Wages, Total - All Industries in GO Virginia 4, 2017-2018

Region	Percentage Change Year-over-Year		Values (2018)	
	Employment	Average Annual Wages	Employment	Average Annual Wages
Charles City	-0.9%	2.4%	2,022	\$43,460
Chesterfield	1.6%	2.1%	147,743	\$46,313
Colonial Heights	0.3%	0.4%	11,150	\$31,512
Dinwiddie	0.2%	3.2%	9,463	\$41,744
Emporia	0.5%	-6.9%	3,562	\$30,014
Goochland	0.6%	3.8%	17,236	\$96,672
Greensville	0.0%	5.5%	4,799	\$40,781
Hanover	2.5%	-0.3%	56,396	\$42,072
Henrico	-0.4%	0.8%	203,155	\$52,519
Hopewell	2.3%	2.4%	8,426	\$52,705
New Kent	3.9%	0.6%	5,130	\$36,557
Petersburg	1.4%	3.1%	13,880	\$39,752
Powhatan	1.8%	-0.5%	8,094	\$38,528
Prince George	0.7%	0.5%	15,666	\$51,174
Richmond	0.6%	2.2%	163,665	\$60,135
Surry	-0.9%	6.8%	2,583	\$75,094
Sussex	-0.3%	0.9%	3,850	\$37,500

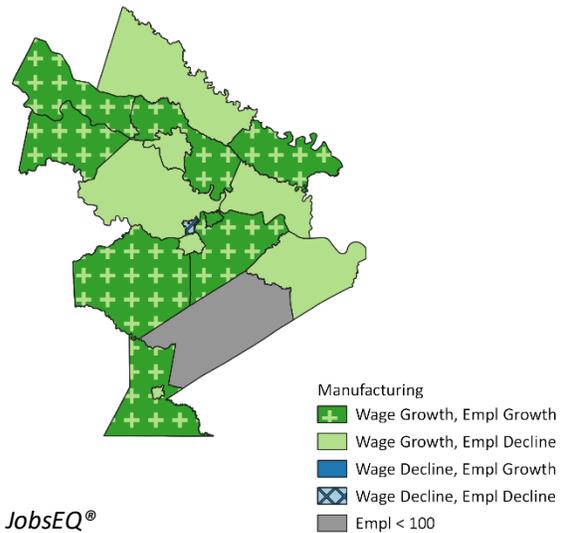
Source: JobsEQ®

In the manufacturing cluster, wages grew in all the localities within Region 4 except for Colonial Heights, where average annual wages decreased by 3.2% (but remained above the average annual wages for all industries in Region 4). Wages grew most notably in Prince George (10.1%) and Sussex (8.9%).

Changes in manufacturing employment vary greatly around the GO VA 4 region. Eight of the 17 localities¹⁴ experienced a decrease in employment. Surrey and Charles City experienced the greatest percentage decrease in employment, 17.5% and 12.3% respectively. Other counties experienced a modest increase in employment, most notably manufacturing employment increased by 10.4% in Dinwiddie. Henrico and Hopewell were the only counties with more than 1,000 workers that showed an increase in employment.

Several manufacturing firms announced new and expanding employment from 2017 through 2018.¹⁵ Cascades, Inc. announced in July 2018 that it would be adding 140 jobs in Hanover, creating and marketing tissue products from recycled materials. A manufacturer of sustainable packaging materials announced in May 2018 it would add 141 jobs. On the negative side, the closing of a fluid milk processing plant in Richmond in 2017 lost the city 71 jobs.

Manufacturing Employment and Annual Average Wage Change 2017-2018



Source: JobsEQ®

Employment and Average Annual Wages for Manufacturing in GOVA 4. 2017-2018

Region	Percentage Change Year-over-Year		Values (2018)	
	Employment	Average Annual Wages	Employment	Average Annual Wages
Charles City	-12.3%	4.5%	256	\$45,799
Chesterfield	-2.5%	1.6%	8,386	\$72,459
Colonial Heights	-5.7%	-3.2%	223	\$54,185
Dinwiddie	10.4%	0.9%	677	\$71,356
Emporia	-4.6%	2.1%	557	\$53,342
Goochland	2.6%	0.2%	465	\$62,953
Greensville	4.6%	0.6%	1,440	\$39,661
Hanover	-4.3%	1.0%	3,557	\$48,205
Henrico	4.2%	3.5%	7,443	\$58,952
Hopewell	0.4%	6.0%	2,179	\$98,450
New Kent	3.3%	6.9%	243	\$34,118

¹⁴ Counties and cities employing less than 100 workers in a cluster are excluded from this analysis.

¹⁵ Unless otherwise states, all announcements are collected from the Virginia Economic Development Partnership Announcements & Closings Database, available at <https://vedpweb.vedp.org/announcements>.

Employment and Average Annual Wages for Manufacturing in GOVA 4. 2017-2018

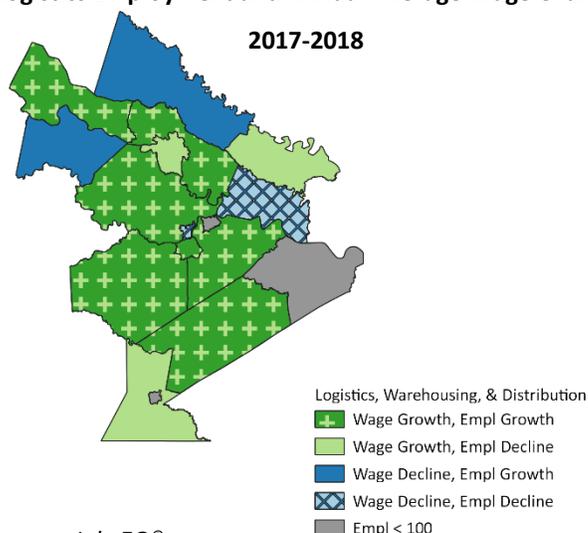
Region	Percentage Change Year-over-Year		Values (2018)	
	Employment	Average Annual Wages	Employment	Average Annual Wages
Petersburg	-0.8%	4.1%	858	\$63,570
Powhatan	3.4%	4.8%	292	\$48,535
Prince George	2.6%	10.1%	775	\$70,686
Richmond	-0.9%	1.8%	5,791	\$67,352
Surry	-17.5%	4.2%	138	\$35,863
Sussex	-7.9%	8.9%	64	\$43,814

Source: JobsEQ®

Seven of the 17 localities in Region 4 saw an increase in both wages and employment in the logistics, warehousing, and distribution cluster, particularly in the Crater region.

Twelve of the 17 localities within Region 4 saw an increase in average annual wages in the logistics, warehousing, and distribution industry. In eight of these localities, wages increased by more than 2%, outpacing inflation. Only two counties—Powhatan and Hanover, both located in the northern part of Region 4—had annual average wage decreases while employment rose.

Logistics Employment and Annual Average Wage Change



Source: JobsEQ®

Two counties experienced a decrease in both employment and average annual wages—Charles City and Colonial Heights. In the former, employment decreased by 26.4% and average annual wages decreased by 21.4%. Surry is not included in the map as fewer than 100 workers are employed in this cluster. In August 2018, Ocean Network Express announced an expansion of its deep-sea freight transportation business in Richmond, adding 129 jobs. Looking ahead, it was announced in May 2019 that a truckload carrier company would start business in Hanover County, expected to add 250 new jobs.

Employment and Average Annual Wages for Logistics, Warehousing & Distribution in GOVA 4, 2017-2018

Region	Percentage Change Year-over-Year		Values (2018)	
	Employment	Average Annual Wages	Employment	Average Annual Wages
Charles City	-26.1%	-1.4%	179	\$50,250
Chesterfield	8.1%	0.7%	12,704	\$40,285

In 2017 it was announced that Facebook would expand its data center in Henrico, adding 300 jobs, while Rising Tides Solutions announced an expansion in 2018 adding another 90 jobs in custom computer software for data analytics. In September 2017, Thompson Reuters announced a new cyber security operations center expected to support 68 new jobs. Northrup Grumman’s operations center/ IT services/ data center in Chesterfield County announced a reduction of 348 jobs in effect August 2018.

Employment and Average Annual Wages for Information Technology and Communications in GOVA 4, 2017-2018

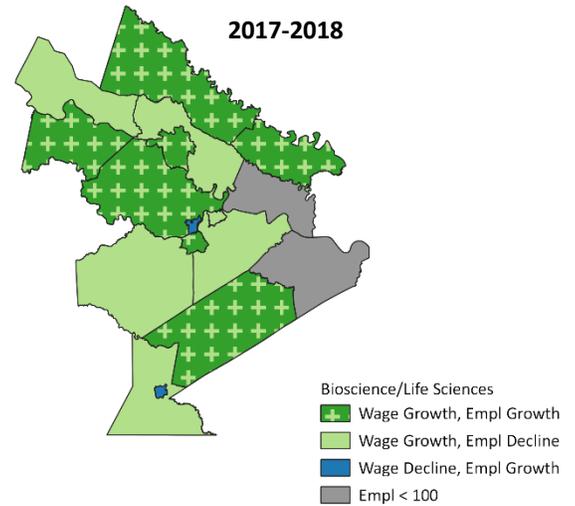
Region	Percentage Change Year-over-Year		Values (2018)	
	Employment	Average Annual Wages	Employment	Average Annual Wages
Charles City	-24.1%	5.4%	160	\$59,811
Chesterfield	-0.3%	-1.5%	8,571	\$68,218
Colonial Heights	-33.7%	-21.8%	197	\$41,211
Dinwiddie	-1.6%	-1.7%	180	\$42,752
Emporia	4.7%	-3.2%	39	\$32,481
Goochland	1.1%	1.4%	541	\$74,455
Greensville	-21.7%	6.2%	100	\$47,505
Hanover	3.8%	1.6%	4,328	\$59,542
Henrico	4.6%	0.3%	15,395	\$81,817
Hopewell	-3.3%	18.6%	296	\$48,705
New Kent	10.3%	0.0%	165	\$48,304
Petersburg	-0.6%	5.8%	407	\$45,131
Powhatan	1.4%	3.9%	595	\$60,242
Prince George	6.4%	-7.6%	941	\$57,562
Richmond	3.2%	-0.8%	9,964	\$73,125
Surry	-8.4%	-8.5%	46	\$50,519
Sussex	-8.4%	-4.9%	59	\$42,782

Source: JobsEQ®

Almost all the counties experienced an increase in average annual wages for the bioscience/ life sciences industry. Emporia and Colonial Heights were the only two regions where average annual wages decreased over the year.

Employment increased in nine of the 15 localities (excluding Charles City and Surry as they both employ less than 100 workers), primarily centered around Richmond. In Richmond, employment grew 2.3% over the year, while wages grew 2.1%. Employment in the cluster expanded more rapidly in Chesterfield (2.7%), but wages grew more slowly (0.7%). In Henrico, wages grew 2.3% but employment declined 1.1%.

**Bioscience/ Life Sciences Employment and Wage Change
2017-2018**



Source: JobsEQ®

Employment and Average Annual Wages for Bioscience in GOVA 4, 2017-2018

Region	Percentage Change Year-over-Year		Values (2018)	
	Employment	Average Annual Wages	Employment	Average Annual Wages
Charles City	168.0%	290.9%	11	\$67,039
Chesterfield	2.7%	0.7%	10,843	\$48,014
Colonial Heights	2.2%	-0.2%	1,083	\$32,167
Dinwiddie	-3.7%	4.4%	1,337	\$38,587
Emporia	4.2%	-6.0%	743	\$27,411
Goochland	-3.6%	4.3%	475	\$69,790
Greensville	-10.3%	8.1%	265	\$35,286
Hanover	0.7%	3.8%	4,908	\$51,773
Henrico	-1.1%	2.3%	21,337	\$55,224
Hopewell	-0.6%	3.8%	1,065	\$49,688
New Kent	4.7%	2.7%	341	\$37,162
Petersburg	0.1%	1.0%	3,713	\$37,220
Powhatan	9.7%	5.5%	164	\$47,304
Prince George	-5.5%	4.9%	509	\$69,940
Richmond	2.3%	2.1%	23,066	\$60,348
Surry	-4.1%	-12.9%	5	\$28,002
Sussex	11.1%	6.5%	287	\$25,907

Source: JobsEQ®

3. Workforce Gap Analysis

This section details immediate and potential gaps in occupations that support clusters identified in the previous section as well as across industries in the region. Current demand is based on Real-Time Intelligence (RTI) gathered and analyzed by Chmura Economics & Analytics from online job postings. Long-term needs and gaps are based on JobsEQ analytics. Overlaps with some of the prominent state and regional efforts to close gaps are summarized.

Skills Gaps

Skill gaps that are negatively impacting employers in the region must first be identified to implement programs to close them. Job openings identify an immediate skills gap for employers and opportunities for job seekers. Large numbers of job postings for individual occupations suggest an apparent skills gap as many businesses need the same skills. As shown in the table below, retail salespersons and registered nurses top the list of jobs posted online in Region 4.¹⁶ Many of the top 20 occupations by online job posting count typically do not require postsecondary education. Occupations with a high job post count that typically require at least a postsecondary award (such as an industry-recognized credential or a Bachelor’s degree) are primarily in healthcare (registered nurses; nursing assistants; medical and health services managers), information technology (applications software developers; network and computer systems administrators; computer user support specialists), and management (management analysts).

Region 4 Job Postings for Top 20 Occupations, 2019 Q1

SOC	Title	Typical Entry-Level Experience	Total Ads
41-2031	Retail Salespersons	Less than high school	4,469
29-1141	Registered Nurses	Bachelor's degree	2,752
41-1011	First-Line Supervisors of Retail Sales Workers	High school diploma or equivalent	1,956
35-3021	Combined Food Preparation and Serving Workers, Including Fast Food	Less than high school	1,714
41-3099	Sales Representatives, Services, All Other	High school diploma or equivalent	1,529
43-4051	Customer Service Representatives	High school diploma or equivalent	1,499
15-1132	Software Developers, Applications	Bachelor's degree	1,398

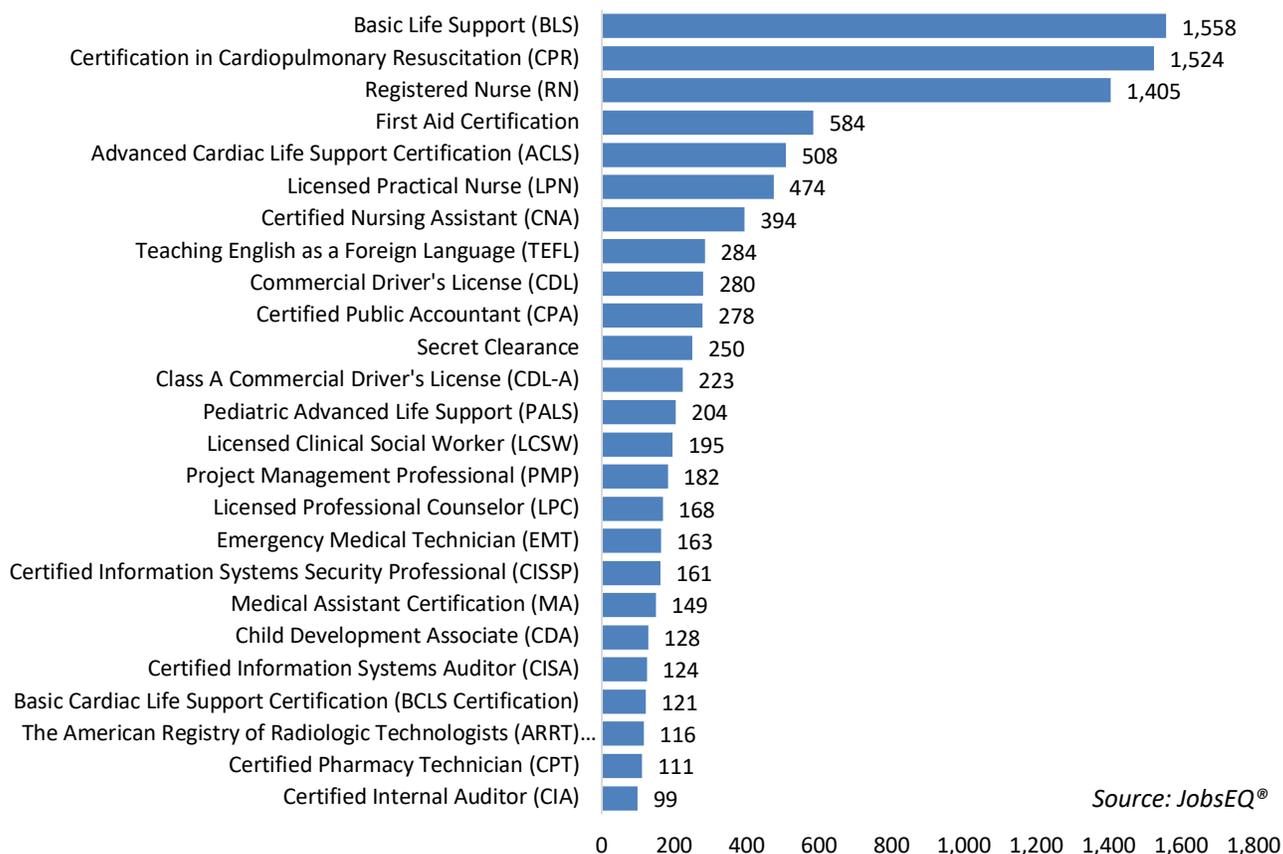
¹⁶ Counts of unique job postings may not equate with actual job demand. For example, job postings may be placed in anticipation of possible openings that do not materialize. Moreover, slight variations of ads may be placed such that the number of ads exceeds the actual number of openings.

43-6014	Secretaries and Administrative Assistants, Except Legal, Medical, and Executive	High school diploma or equivalent	1,299
21-1093	Social and Human Service Assistants	High school diploma or equivalent	1,230
49-9071	Maintenance and Repair Workers, General	High school diploma or equivalent	1,210
53-3032	Heavy and Tractor-Trailer Truck Drivers	Postsecondary non-degree award	1,072
15-1151	Computer User Support Specialists	Some college, no degree	1,049
35-1012	First-Line Supervisors of Food Preparation and Serving Workers	High school diploma or equivalent	1,027
11-9111	Medical and Health Services Managers	Bachelor's degree	940
37-2011	Janitors and Cleaners, Except Maids and Housekeeping Cleaners	Less than high school	928
43-5081	Stock Clerks, Sales Floor	High school diploma or equivalent	831
53-7062	Laborers and Freight, Stock, and Material Movers, Hand	Less than high school	807
13-1111	Management Analysts	Bachelor's degree	748
13-1071	Human Resources Specialists	Bachelor's degree	726
15-1142	Network and Computer Systems Administrators	Bachelor's degree	725

Source: JobsEQ®

Certifications requested in the text of online job postings primarily support the healthcare sector. Basic Life Support (with 1,558 ads), Certification in Cardiopulmonary Resuscitation (1,524), and registered nurse (1,405) top the list of the top 25 certifications requested in job ads over this 30-day period. Supporting the logistics, warehousing, and distribution cluster, Commercial Driver's License (CDL) was the 9th most requested certification (280 postings), and Class A CDL ranked 12th with 223 posts. The Certified Information Systems Auditor (124) certification supports the information technology cluster.

Total Ads for Certifications in GO Virginia 4, 2019Q1



Skills and occupations that are in demand today may not be in demand in the months or years ahead when a student finishes a training program or education. For that reason, long-term gaps need to be considered in conjunction with current needs.

The approach taken here is to identify the apparent long-term skills gaps based on the total annual demand created from growth in industries needing the occupation as well as from positions that need to be filled because individuals are retiring or moving to a different occupation. In this case, a shortage of qualified workers could potentially occur if individuals are not being trained or educated to fill the openings.

The potential supply shortfall or gap is an underlying force that the labor market will resolve in one way or another, such as by employers recruiting from further distances for these occupations, wages going up to attract more candidates, and demand and wages both enticing more residents to get training for this occupation.

Over the next 10 years, the fastest growing occupation group in Region 4 is expected to be healthcare support occupations with a 1.9% year-over-year rate of growth. The occupation groups with the strongest projected growth in terms of the number of jobs expected to be added over this period are healthcare practitioners and technical occupations (+6,008 jobs) and personal care and service occupations (+4,762). Over the same period, the highest replacement demand (occupation demand due to exits and transfers from the occupation field) is expected in office and administrative support occupations (118,844 jobs) and sales and food preparation and serving related occupations (96,402). Of note for separation demand, more than half of the workforce is age 45 through 64 years old and nearing retirement in the utilities and manufacturing sectors.

Occupation Snapshot in GO Virginia Region 4, 2019Q1

SOC	Occupation Title	Four Quarters Ending 2019q1 Empl	10-Year Forecast				
			Total New Demand	Separations		Growth	
				Exits	Transfers	Empl	Avg Ann Rate
31-0000	Healthcare Support	17,074	24,352	10,504	10,258	3,589	1.9%
39-0000	Personal Care and Service	28,337	49,188	22,848	21,578	4,762	1.6%
29-0000	Healthcare Practitioners and Technical	41,034	28,986	11,678	11,299	6,008	1.4%
15-0000	Computer and Mathematical	21,683	17,471	3,875	10,876	2,720	1.2%
21-0000	Community and Social Service	14,153	17,917	6,042	10,008	1,866	1.2%
47-0000	Construction and Extraction	32,194	37,790	11,870	22,405	3,514	1.0%
11-0000	Management	33,547	30,002	9,040	17,874	3,087	0.9%
25-0000	Education, Training, and Library	37,769	36,895	16,886	16,280	3,729	0.9%
13-0000	Business and Financial Operations	44,468	44,326	13,513	26,906	3,907	0.8%
35-0000	Food Preparation and Serving Related	54,791	100,893	42,889	53,513	4,491	0.8%
37-0000	Building and Grounds Cleaning and Maintenance	24,179	33,214	15,263	15,936	2,015	0.8%
17-0000	Architecture and Engineering	9,046	7,346	2,347	4,320	679	0.7%
19-0000	Life, Physical, and Social Science	5,763	5,706	1,580	3,723	403	0.7%
23-0000	Legal	6,866	4,907	1,773	2,645	489	0.7%
53-0000	Transportation and Material Moving	46,833	61,661	23,682	34,531	3,448	0.7%
27-0000	Arts, Design, Entertainment, Sports, and Media	11,006	11,457	4,650	6,185	621	0.6%
49-0000	Installation, Maintenance, and Repair	26,448	27,228	9,411	16,183	1,635	0.6%
41-0000	Sales and Related	68,589	97,248	41,126	53,669	2,453	0.4%

Occupation Snapshot in GO Virginia Region 4, 2019Q1

SOC	Occupation Title	Four Quarters Ending 2019q1 Empl	10-Year Forecast				
			Total New Demand	Separations		Growth	
				Exits	Transfers	Empl	Avg Ann Rate
33-0000	Protective Service	15,976	16,234	7,366	8,652	215	0.1%
43-0000	Office and Administrative Support	106,129	120,127	54,378	64,466	1,283	0.1%
45-0000	Farming, Fishing, and Forestry	1,301	1,873	481	1,389	3	0.0%
51-0000	Production	30,405	32,217	12,449	21,128	-1,360	-0.5%
00-0000	Total - All	677,593	807,036	323,651	433,824	49,560	0.7%

Source: JobsEQ®

Data as of 2019Q1 unless noted otherwise

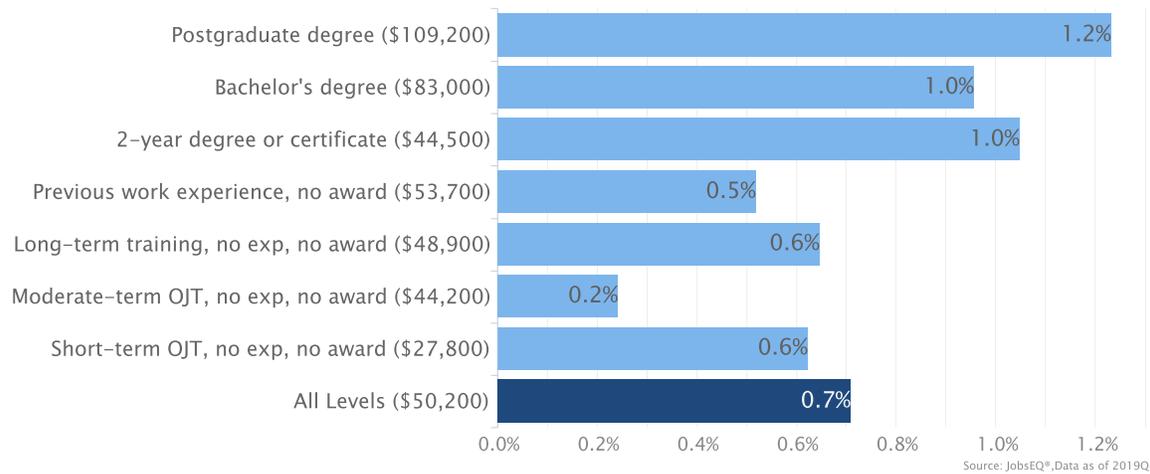
Note: Figures may not sum due to rounding.

Occupation employment data are estimated via industry employment data and the estimated industry/occupation mix. Industry employment data are derived from the Quarterly Census of Employment and Wages, provided by the Bureau of Labor Statistics and currently updated through 2018Q3, imputed where necessary with preliminary estimates updated to 2019Q1. Forecast employment growth uses national projections from the Bureau of Labor Statistics adapted for regional growth patterns.

Expected growth rates for occupations vary by the education and training required. While all employment in Region 4 is projected to grow at an average annual rate of 0.7% over the next ten years, occupations typically requiring a postgraduate degree are expected to grow 1.2% per year, those requiring a bachelor’s degree are forecast to grow 0.9% per year, and occupations typically needing a 2-year degree or certificate are expected to grow 1.1% per year. The high growth forecast for 2-year degrees or certificates is consistent with numerous other studies of Virginia’s economy that have found a current and growing “middle skills” gap of jobs that typically require more than a high school diploma but not a four-year degree.

Annual Average Projected Job Growth by Training Required for Region 4

Annual Average Projected Job Growth by Training Required for GO Virginia Region 4



Employment by occupation data are estimates as of 2019Q1. Education levels of occupations are based on BLS assignments. Forecast employment growth uses national projections from the Bureau of Labor Statistics adapted for regional growth patterns.

Among occupations at the detailed level in Region 4, the largest projected potential shortfalls are for combined food preparation and serving workers; cashiers; and retail salespersons, including fast food workers. For these occupations, which typically do not require a formal educational credential for entry, there is a potential annual supply gap of at least 2,700 workers per occupation over the next decade. Waiters and waitresses had the fourth largest potential annual supply gap over this period at 2,243, followed by laborers and freight, stock, and material movers (1,962); customer service representatives (1,887), office clerks (1,659), personal care aids (1,601) and janitors and cleaners excluding housekeeping (1,560).

Registered nurses have the highest projected shortfalls in occupations that typically require a bachelor's degree (938 workers) followed by general and operations managers (786), accountant and auditors (731), and management analysts (553).

Most of the detailed occupations with the largest projected potential shortfalls have annual average wages below the regional average. Only one of the top ten has above-average wages—registered nurses. Out of the 35 occupations with more than 500 annual openings projected, seven occupations have above-average wages and four of them require a bachelor's degree.

Potential Occupations Gaps over 10 years with Total Annual Demand >500

SOC	Title	Typical-Level Education Need for Entry	Empl	Avg Ann Wages ¹	Forecasted Employment Growth over 10 years	Avg Ann Rate	Total Annual Demand ¹⁷
35-3021	Combined Food Preparation and Serving Workers, Including Fast Food	Less than high school	15,464	\$19,300	2,068	1.3%	3,183
41-2011	Cashiers	Less than high school	16,691	\$20,400	-244	-0.1%	3,059
41-2031	Retail Salespersons	Less than high school	18,481	\$25,700	609	0.3%	2,725
35-3031	Waiters and Waitresses	Less than high school	11,310	\$22,400	701	0.6%	2,243
53-7062	Laborers and Freight, Stock, and Material Movers, Hand	Less than high school	12,890	\$28,400	1,295	1.0%	1,962
43-4051	Customer Service Representatives	High school diploma or equivalent	13,867	\$34,900	890	0.6%	1,887
43-9061	Office Clerks, General	High school diploma or equivalent	14,582	\$33,500	-211	-0.1%	1,659
39-9021	Personal Care Aides	High school diploma or equivalent	8,200	\$19,800	2,846	3.0%	1,601
37-2011	Janitors and Cleaners, Except Maids and Housekeeping Cleaners	Less than high school	10,975	\$23,600	996	0.9%	1,560
43-5081	Stock Clerks and Order Fillers	High school diploma or equivalent	9,420	\$26,500	502	0.5%	1,265
53-3032	Heavy and Tractor-Trailer Truck Drivers	Postsecondary non-degree award	8,974	\$43,400	592	0.6%	1,029
29-1141	Registered Nurses	Bachelor's degree	13,768	\$68,600	1,925	1.3%	938
43-6014	Secretaries and Administrative Assistants, Except Legal, Medical, and Executive	High school diploma or equivalent	9,642	\$37,700	-668	-0.7%	923
43-3031	Bookkeeping, Accounting, and Auditing Clerks	Some college, no degree	7,992	\$41,500	-140	-0.2%	858
35-2014	Cooks, Restaurant	Less than high school	5,468	\$23,100	593	1.0%	855
31-1014	Nursing Assistants	Postsecondary non-degree award	6,408	\$27,400	777	1.2%	834

¹⁷ In 2017, the Bureau of Labor Statistics switched from replacement rates to separation rates. The BLS determined that a newer, more robust and more statistically sound model was necessary. More information about these changes can be found here: https://www.bls.gov/emp/documentation/separations-faqs.htm#Why_Change. 'Total Annual Demand' is the annual demand caused by estimated separations, transfers, and growth over the next ten years.

Potential Occupations Gaps over 10 years with Total Annual Demand >500

SOC	Title	Typical-Level Education Need for Entry	Empl	Avg Ann Wages ¹	Forecasted Employment Growth over 10 years	Avg Ann Rate	Total Annual Demand ¹⁷
11-1021	General and Operations Managers	Bachelor's degree	8,488	\$130,100	726	0.8%	786
43-1011	First-Line Supervisors of Office and Administrative Support Workers	High school diploma or equivalent	7,456	\$59,500	233	0.3%	756
37-2012	Maids and Housekeeping Cleaners	Less than high school	5,500	\$21,800	263	0.5%	756
39-9011	Childcare Workers	High school diploma or equivalent	4,860	\$20,800	301	0.6%	749
43-4171	Receptionists and Information Clerks	High school diploma or equivalent	5,199	\$30,000	459	0.8%	737
13-2011	Accountants and Auditors	Bachelor's degree	7,279	\$79,100	655	0.9%	731
37-3011	Landscaping and Groundskeeping Workers	Less than high school	5,279	\$29,800	541	1.0%	705
41-1011	First-Line Supervisors of Retail Sales Workers	High school diploma or equivalent	6,209	\$44,700	294	0.5%	689
41-4012	Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	High school diploma or equivalent	6,148	\$73,400	301	0.5%	658
47-2061	Construction Laborers	Less than high school	5,339	\$29,000	692	1.2%	639
33-9032	Security Guards	High school diploma or equivalent	4,659	\$30,200	201	0.4%	637
49-9071	Maintenance and Repair Workers, General	High school diploma or equivalent	5,907	\$38,700	393	0.6%	629
35-1012	First-Line Supervisors of Food Preparation and Serving Workers	High school diploma or equivalent	4,121	\$34,800	297	0.7%	625
41-3099	Sales Representatives, Services, All Other	High school diploma or equivalent	4,449	\$66,100	410	0.9%	587
13-1111	Management Analysts	Bachelor's degree	5,620	\$85,000	593	1.0%	553
35-2021	Food Preparation Workers	Less than high school	3,046	\$25,100	210	0.7%	545
53-3033	Light Truck or Delivery Services Drivers	High school diploma or equivalent	4,615	\$38,200	343	0.7%	535

Potential Occupations Gaps over 10 years with Total Annual Demand >500

SOC	Title	Typical-Level Education Need for Entry	Empl	Avg Ann Wages ¹	Forecasted Employment Growth over 10 years	Avg Ann Rate	Total Annual Demand ¹⁷
25-9041	Teacher Assistants	Some college, no degree	4,494	\$26,100	473	1.0%	523
53-7064	Packers and Packagers, Hand	Less than high school	3,245	\$24,400	159	0.5%	514

Source: JobsEQ®. Occupation Wages are as of 2017.

Key occupations for each cluster are identified using a test of significance and dominance.¹⁸ Occupations that account for a substantial share of total employment (1% or greater) in the given cluster are considered significant, while if 20% or greater of an occupation’s total employment is in the cluster, it is considered dominant.

The table below presents the top thirty occupations, based on total annual demand projected, for occupations that meet the criteria of significance or dominance in at least one of the prioritized regional clusters and have average wages above the regional average of \$51,194. Eight of the top thirty occupations are attainable with less than an associate’s degree, including sales representatives; first-line supervisors; insurance sales agents; and industrial machinery mechanics. Another 16 occupations typically require a bachelor’s degree, including registered nurses; accountants and auditors; software developers, and computer systems analysts.

Top 30 Occupations Supporting Plan Clusters, with Above-Average Wages

SOC	Title	Typical Education Need for Entry	Current Empl 2019Q1	Avg Ann Wages	Total Annual Demand over next 10 years
29-1141	Registered Nurses	Bachelor's degree	13,768	\$68,600	938
11-1021	General and Operations Managers	Bachelor's degree	8,488	\$130,100	786
43-1011	First-Line Supervisors of Office and Administrative Support Workers	High school diploma or equivalent	7,456	\$59,500	756
13-2011	Accountants and Auditors	Bachelor's degree	7,279	\$79,100	731
41-4012	Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	High school diploma or equivalent	6,148	\$73,400	658
41-3099	Sales Representatives, Services, All Other	High school diploma or equivalent	4,449	\$66,100	587
13-1111	Management Analysts	Bachelor's degree	5,620	\$85,000	553
13-1199	Business Operations Specialists, All Other	Bachelor's degree	4,648	\$74,500	464

¹⁸ This approach of significance and dominance was used in *The Commonwealth of Virginia WIOA Combined State Plan for July 1, 2016 through June 30, 2020*.

Top 30 Occupations Supporting Plan Clusters, with Above-Average Wages

SOC	Title	Typical Education Need for Entry	Current Empl 2019Q1	Avg Ann Wages	Total Annual Demand over next 10 years
13-1161	Market Research Analysts and Marketing Specialists	Bachelor's degree	3,152	\$68,700	398
15-1132	Software Developers, Applications	Bachelor's degree	4,032	\$100,100	398
11-9199	Managers, All Other	Bachelor's degree	3,556	\$116,500	279
15-1121	Computer Systems Analysts	Bachelor's degree	3,401	\$96,400	243
51-1011	First-Line Supervisors of Production and Operating Workers	High school diploma or equivalent	2,123	\$64,400	196
11-9111	Medical and Health Services Managers	Bachelor's degree	1,710	\$118,600	173
15-1133	Software Developers, Systems Software	Bachelor's degree	1,854	\$99,200	146
11-3021	Computer and Information Systems Managers	Bachelor's degree	1,660	\$147,100	144
15-1142	Network and Computer Systems Administrators	Bachelor's degree	2,141	\$87,300	143
49-9041	Industrial Machinery Mechanics	High school diploma or equivalent	1,487	\$54,000	129
41-4011	Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products	Bachelor's degree	1,198	\$91,800	128
49-3031	Bus and Truck Mechanics and Diesel Engine Specialists	High school diploma or equivalent	1,160	\$52,200	117
53-1021	First-Line Supervisors of Helpers, Laborers, and Material Movers, Hand	High school diploma or equivalent	983	\$51,900	116
53-1031	First-Line Supervisors of Transportation and Material-Moving Machine and Vehicle Operators	High school diploma or equivalent	986	\$51,900	109
21-1023	Mental Health and Substance Abuse Social Workers	Master's degree	835	\$52,800	107
21-1022	Healthcare Social Workers	Master's degree	798	\$60,400	100
29-1171	Nurse Practitioners	Master's degree	997	\$98,400	90
15-1199	Computer Occupations, All Other	Bachelor's degree	1,126	\$89,600	87
11-9151	Social and Community Service Managers	Bachelor's degree	800	\$89,300	86
15-1152	Computer Network Support Specialists	Associate's degree	1,000	\$63,000	80
29-1123	Physical Therapists	Doctoral or professional degree	1,050	\$89,400	70
29-1069	Physicians and Surgeons, All Other	Doctoral or professional degree	1,717	\$264,300	70

Source: JobsEQ®

Training Pipeline

To analyze occupation training and identify potential gaps, Chmura translates awards from regional postsecondary institutions into occupation output.¹⁹ The target output range is determined using two measures: 1) regional projected annual growth in employment for each occupation, and 2) a national benchmark of average awards granted in regions with similar levels of employment.²⁰ Potential gaps are presented for key occupations for each cluster.

As a conservative measure of demand, the minimum of this range is used to compare with the output of awards to derive a potential award gap or surplus. In the long-term, the market will need to resolve a potential supply shortfall in one way or another. In areas where there exists substantial shortfalls in training, industries would be either drawing applicants from outside their immediate market area; raising wages to attract more candidates and entice local residents to gain training for an occupation; or hiring individuals that lack the desired occupation-specific skills and background, thus needing to commit to a longer initial training and familiarization period. Potential gaps may also be alleviated by non-credit awards targeting specific skills and certifications, particularly in occupations that typically require relatively less classroom-based training.

Within the manufacturing cluster key occupations, the largest potential award gaps are for general and operations managers (151 per year), mechanical engineers (13), mechanical drafters (10), and industrial production managers (9). Some of the potential gaps are attributable to a lack of related programs being offered within the region as of 2017. These include chemical technicians, materials engineers, health and safety engineers, and materials scientists. While local demand may not be sufficient to warrant developing a program for each individual occupation, there may be an opportunity for the region to identify and develop a program around common training needs across these occupations. All occupations except chemical technicians and drafters, all other pay above-average wages. The potential award gaps are summarized in the table and chart below.

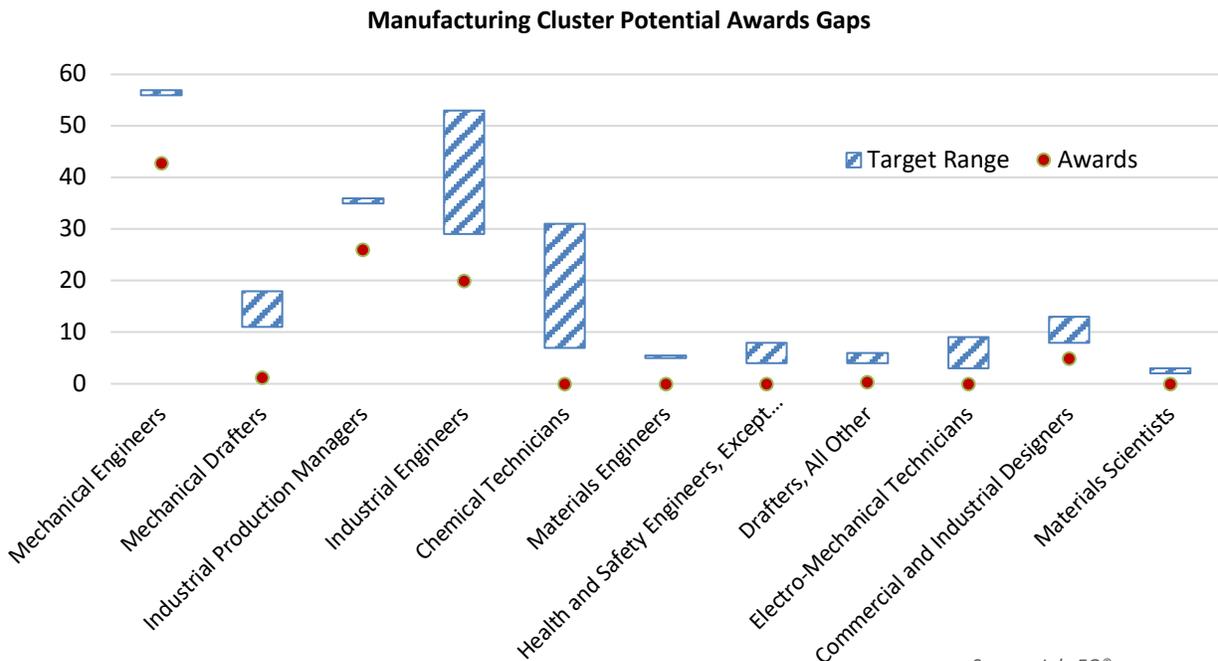
¹⁹ To relate training programs to occupations, this report uses a modified version of the CIP to SOC crosswalk from the National Center for Education Statistics (NCES). While the crosswalk used is helpful for estimating occupation production from training program awards data, it is neither perfect nor comprehensive. Indeed, it is hard to imagine such a crosswalk being perfect since many training program graduates for one reason or another do not end up employed in occupations that are most related to the training program from which they graduated.

²⁰ The national benchmark is termed the training concentration in Chmura's JobsEQ. It compares the local rate of degree production to the national average. 100% is equal to the average rate of degree production in the nation for a particular occupation. For example, 110% is 10% above average, 50% is half the national average, and so on. For occupations with a training concentration below 100%, the shortfall is the number of additional awards needed to bring the regional production up to the national average.

Manufacturing Cluster Potential Award Gaps, GO Virginia Region 4

SOC	Title	Average Annual Wages (2017)	Annual Gap	Awards (2017)	Target Range
11-1021	General and Operations Managers	\$130,100	(151)	577	728 – 776
17-2141	Mechanical Engineers	\$96,400	(13)	43	56 – 57
17-3013	Mechanical Drafters	\$59,500	(10)	1	11 – 18
11-3051	Industrial Production Managers	\$134,400	(9)	26	35 – 36
17-2112	Industrial Engineers	\$95,600	(9)	20	29 – 53
19-4031	Chemical Technicians	\$48,100	(7)	0	7 – 31
17-2131	Materials Engineers	\$82,600	(5)	0	5 – 5
17-2111	Health and Safety Engineers, Except Mining Safety Engineers and Inspectors	\$99,400	(4)	0	4 – 8
17-3019	Drafters, All Other	\$50,700	(3)	0	4 – 6
17-3024	Electro-Mechanical Technicians	\$54,400	(3)	0	3 – 9
27-1021	Commercial and Industrial Designers	\$64,700	(3)	5	8 – 13
19-2032	Materials Scientists	\$104,300	(2)	0	2 – 3

Source: JobsEQ®



Source: JobsEQ®

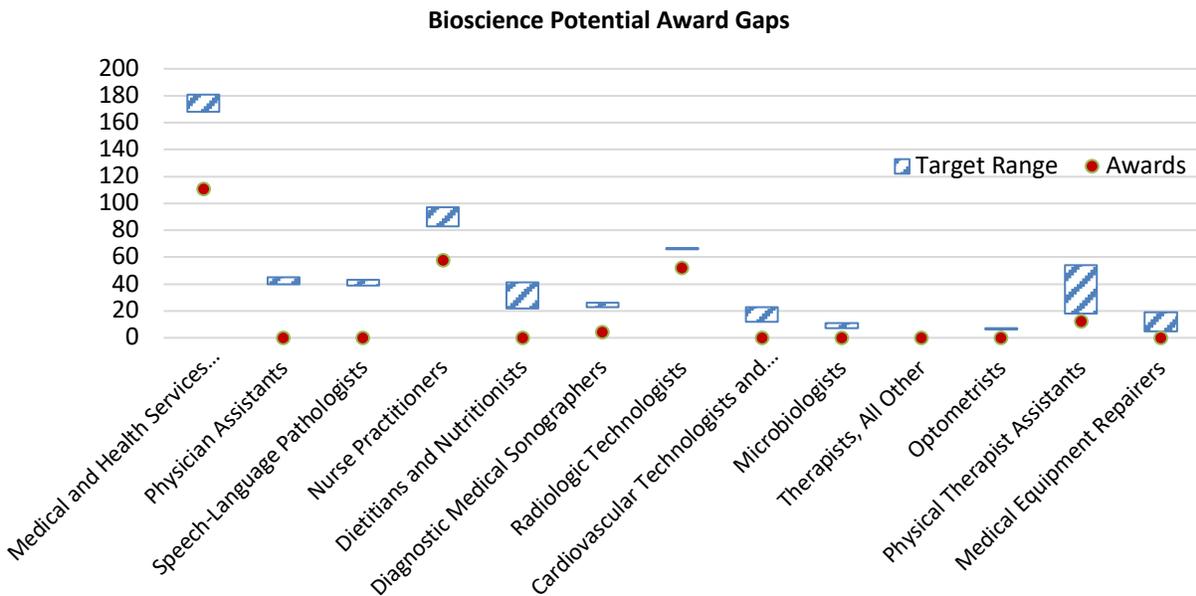
Within the bioscience cluster key occupations, the largest potential award gaps are for medical and health services managers (57), physician assistants (40), speech-language pathologists (39), and nurse practitioners (26). Some of the potential gaps are attributable to a lack of related programs being offered within the region as of 2017. These include physician assistants, speech-language pathologists, dietitians

and nutritionists, and microbiologists. Microbiologists also appear below in the information technology gaps, suggesting overlap in demand for these skills across clusters. All occupations with potential award gaps pay above-average wages. Potential award gaps for this cluster are summarized in the table and chart below.

Bioscience Cluster Potential Award Gaps, GO Virginia Region 4

SOC	Title	Average Annual Wages (2017)	Annual Gap	Awards (2017)	Target Range
11-9111	Medical and Health Services Managers	\$118,600	(57)	111	168 – 181
29-1071	Physician Assistants	\$102,000	(40)	0	40 – 45
29-1127	Speech-Language Pathologists	\$78,100	(39)	0	39 – 43
29-1171	Nurse Practitioners	\$98,400	(26)	57	83 – 97
29-1031	Dietitians and Nutritionists	\$65,000	(22)	0	22 – 41
29-2032	Diagnostic Medical Sonographers	\$69,200	(19)	4	23 – 26
29-2034	Radiologic Technologists	\$56,800	(14)	52	66 – 67
29-2031	Cardiovascular Technologists and Technicians	\$63,300	(12)	0	12 – 23
19-1022	Microbiologists	\$72,700	(7)	0	7 – 11
29-1129	Therapists, All Other	\$70,700	(7)	0	7 – 7
29-1041	Optometrists	\$122,600	(6)	0	6 – 7
31-2021	Physical Therapist Assistants	\$56,900	(6)	12	18 – 54
49-9062	Medical Equipment Repairers	\$52,300	(5)	0	5 – 19

Source: JobsEQ®



Source: JobsEQ®

Within the information technology and communications cluster key occupations, the largest potential award gaps are for computer occupations are applications software developers (124), computer systems analysts (65), and network and computer systems administrators (37). Information security analysts, closely tied to cyber security, have an estimated annual award gap of 22 in Region 4. To not only meet demand but lead the country in cybersecurity research, the Commonwealth Cyber Initiative plans to increase the cybersecurity talent pool in Virginia through investments in research capabilities and commercialization efforts. Under this initiative, supply of graduates with cyber-focused degrees is expected to double by fiscal year 2026.²¹ Aligning GO Virginia efforts with this cyber initiative as well as the tech-talent pipeline initiative related to Amazon HQ2 is an opportunity for Region 4 to grow this cluster. Several other occupations not directly related to computing but supporting this cluster have estimated award gaps, including general and operations managers, accountants, management analysts, and electrical engineers. Microbiologists also can support the bioscience cluster, suggesting an opportunity to align training to support multiple clusters. All occupations with potential award gaps pay above-average wages.

Information Technology and Communications Cluster Potential Award Gaps, GO Virginia Region 4

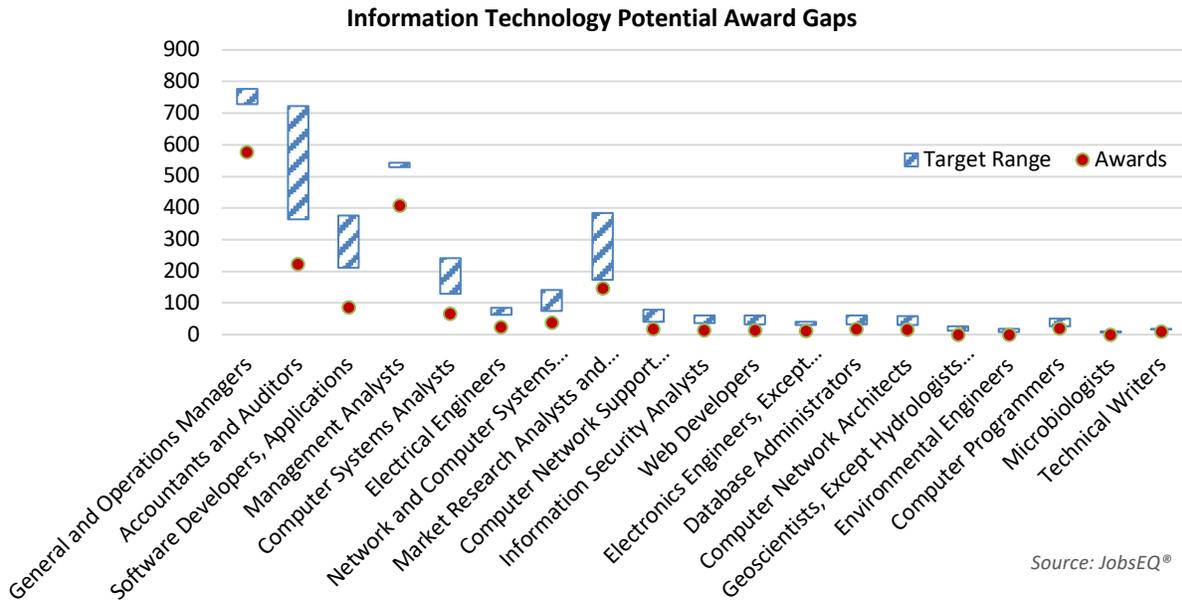
SOC	Title	Average Annual Wages (2017)	Annual Gap	Awards (2017)	Target Range
11-1021	General and Operations Managers	\$130,100	(151)	577	728 – 776
13-2011	Accountants and Auditors	\$79,100	(141)	223	364 – 722
15-1132	Software Developers, Applications	\$100,100	(124)	86	211 – 377
13-1111	Management Analysts	\$85,000	(121)	408	529 – 544
15-1121	Computer Systems Analysts	\$96,400	(65)	65	130 – 241
17-2071	Electrical Engineers	\$105,100	(40)	22	63 – 84
15-1142	Network and Computer Systems Administrators	\$87,300	(37)	38	75 – 142
13-1161	Market Research Analysts and Marketing Specialists	\$68,700	(27)	146	174 – 385
15-1152	Computer Network Support Specialists	\$63,000	(24)	17	41 – 79
15-1122	Information Security Analysts	\$94,100	(22)	14	36 – 61
15-1134	Web Developers	\$72,000	(19)	13	32 – 60
17-2072	Electronics Engineers, Except Computer	\$78,900	(19)	11	30 – 40
15-1141	Database Administrators	\$85,700	(16)	17	33 – 61
15-1143	Computer Network Architects	\$107,900	(16)	16	31 – 58
19-2042	Geoscientists, Except Hydrologists and Geographers	\$72,200	(12)	0	12 – 27
17-2081	Environmental Engineers	\$85,300	(9)	0	9 – 18
15-1131	Computer Programmers	\$96,300	(7)	20	27 – 51

²¹ Commonwealth Cyber Initiative Blueprint, https://vt.edu/content/dam/cci-blueprint_vt_edu/docs/CCI-Blueprint%20final.pdf

Information Technology and Communications Cluster Potential Award Gaps, GO Virginia Region 4

SOC	Title	Average Annual Wages (2017)	Annual Gap	Awards (2017)	Target Range
19-1022	Microbiologists	\$72,700	(7)	0	7 – 11
27-3042	Technical Writers	\$72,500	(7)	10	17 – 19

Source: JobsEQ®



Source: JobsEQ®

Within the logistics, transportation, and warehousing cluster key occupations, the largest potential annual award gaps are for general and operations managers (151), management analysts (121), and heavy and tractor-trailer truck drivers (42). Several occupations typically require more than a high school diploma but less than a bachelor’s degree, including truck drivers, aircraft mechanics and service technicians, and transportation equipment electrical and electronics installers and repairers. All occupations with potential gaps except two pay above-average wages. Potential award gaps for this cluster are summarized in the table and chart below.

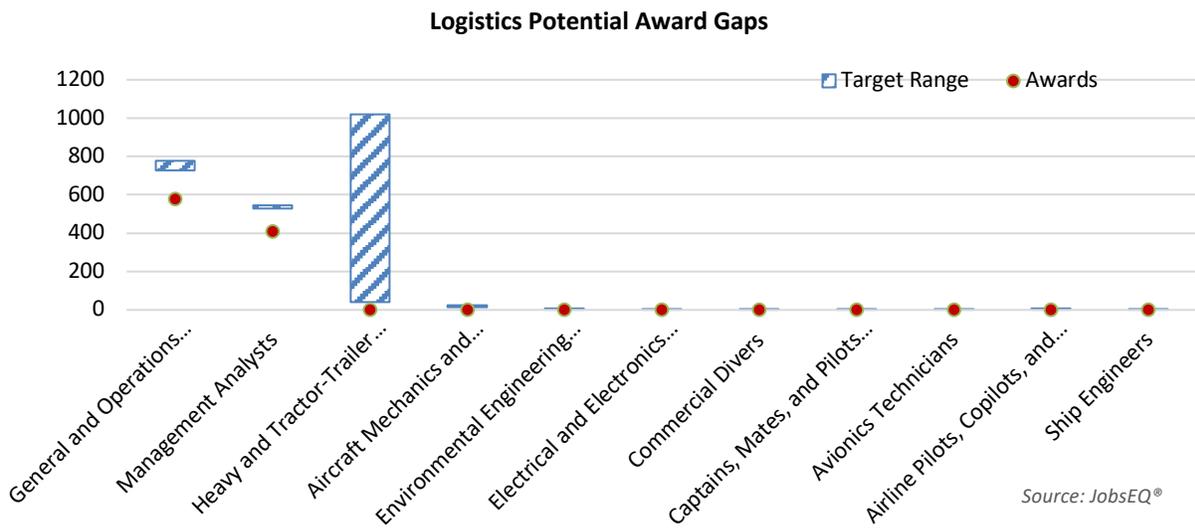
Logistics, Transportation, and Warehousing Cluster Potential Award Gaps, GO Virginia Region 4

SOC	Title	Average Annual Wages (2017)	Annual Gap	Awards (2017)	Target Range
11-1021	General and Operations Managers	\$130,100	(151)	577	728 – 776
13-1111	Management Analysts	\$85,000	(121)	408	529 – 544
53-3032	Heavy and Tractor-Trailer Truck Drivers	\$43,400	(42)	0	42 – 1,020
49-3011	Aircraft Mechanics and Service Technicians	\$67,000	(13)	0	13 – 24
17-3025	Environmental Engineering Technicians	\$39,900	(2)	0	2 – 8

Logistics, Transportation, and Warehousing Cluster Potential Award Gaps, GO Virginia Region 4

SOC	Title	Average Annual Wages (2017)	Annual Gap	Awards (2017)	Target Range
49-2093	Electrical and Electronics Installers and Repairers, Transportation Equipment	\$67,000	(2)	1	2 – 3
49-9092	Commercial Divers	\$49,600	(2)	0	2 – 4
53-5021	Captains, Mates, and Pilots of Water Vessels	\$77,100	(2)	0	2 – 5
49-2091	Avionics Technicians	\$61,700	(1)	0	1 – 4
53-2011	Airline Pilots, Copilots, and Flight Engineers	\$156,000	(1)	0	1 – 9
53-5031	Ship Engineers	\$71,400	(1)	0	1 – 2

Source: JobsEQ®



In summary, there is a need for additional trained workers to support regional clusters and for pathways for workers to move from lower-skilled jobs that pay below-average wages into higher-paying jobs. Many of the occupations with the highest forecast total demand require relatively little training and pay below-average wages. However, some of the most rapid growth forecasts are for occupations that typically require a two-year degree or certificate. This analysis aligns with several other studies and initiatives in Virginia that show increasing demand and gaps for middle-skill jobs and cyber skills across industries. Several potential gaps in occupations substantially related to targeted clusters that typically require bachelor’s and associate’s degrees are also identified—closing gaps in these high-demand, high-wage occupations should further GO Virginia’s mission to increase employment and average wages.

4. Linkages with Significant Statewide Initiatives

There are several statewide initiatives that are of special relevance to the mission of Go Virginia to create more high paying jobs through incentivized collaboration between business, education and government to diversify and strengthen the economy through every region in Virginia.

-The statewide Board has created a Regional Entrepreneurship Initiative to support the build out of the entrepreneurial ecosystem in each system.

- The Virginia Economic Development Partnership has identified enhanced site development efforts as crucial to the state's capacity to attract state-of-the-art manufacturing and original equipment producers.

-Most recently, in conjunction with the successful recruitment of Amazon HQ2, the Commonwealth Cyber Initiative has been funded to focus on workforce development and research in cyber-related areas.

Region 4's priorities are consistent with the statewide emphases and the Council is actively working to take advantage of the opportunities that these initiatives will present.

Linking with the Regional Entrepreneurial Initiative

Context

The Go Virginia Statewide Board and the Department of Housing and Community Development engaged TEconomy Partners in 2018 to "provide each Go Virginia region with an independent and objective assessment of the region's entrepreneurial ecosystem, and to help identify priority actions to strengthen the ecosystem." (Go Virginia Regional Entrepreneurship Initiative Guidance) As a follow-up to this engagement, the Go Virginia statewide board established a Regional Entrepreneurship Initiative (REI) that enables regions to identify a coordinating entity that may apply for up to \$300,000 in per capita funding to develop a regional entrepreneurial investment plan based on the recommendations of the TEconomy Partners report and other input from the Regional Council and interested stakeholders.

Enhancing the regional entrepreneurial ecosystem has been a consistent priority for Region 4 as the Council has recognized the special role that entrepreneurial activity plays in 21st Century job growth and in creating a competitive regional economy. The goal was highlighted in the original Growth and

Diversification Plan and was reinforced in the Special Committee Report that identified the enhancement of the entrepreneurial ecosystem as one of the four major Council strategic priorities.

In 2018 and 2019, Activation Capital assisted in hosting several ideation sessions with participants in the entrepreneurial community focused on how the ecosystem could best be strengthened and enhanced. As a result of these sessions, Lighthouse Labs produced a proposal that was awarded \$1M over a two-year period by the statewide Board. The project, titled Lighthouse U, will provide extensive mentoring and other services to students and graduates of Virginia universities who will become full-time founders of startups in the state after graduation. The project is intended to retain talent within Virginia as well as launch new businesses; thereby, generating high-paying jobs, high-growth companies, and revenue for the state.

The Council has identified Activation Capital as the coordinating entity that will conduct the strategic plan, create the regional entrepreneurial investment plan, and continue to catalyze projects such as Lighthouse U that build out the regional ecosystem. It has also recently initiated discussions examining how the RVA ecosystem could be helpful to enhancing entrepreneurship in the southern part of the region where the ecosystem is less well developed and less technologically grounded

In the criteria provided to the regions for updating their Growth and Diversification plans, the statewide board specified that **“The regional council should utilize the final report provided by TEconomy Partners to identify a regional approach for startup ecosystem development including a pipeline of projects that would be consistent with this development.”** In the remainder of this section, we outline the major findings of the TEconomy Partners report and describe how Activation Capital will structure its approach to filling the identified gaps in the ecosystem and expanding its reach to the southern part of the region.

TEconomy: Ecosystem Stages

TEconomy Partners prepared an entrepreneurial development assessment for Region 4. The assessment examined data trends in the region’s entrepreneurial activities, obtained stakeholder perspectives on these activities, and compared the performance in Region 4 to a set of peer regions nationally. Based on this assessment, TEconomy Partners identified priority actions that could fill the gaps in the entrepreneurial ecosystem. A working group of individuals who have been associated with the region’s Go Virginia activities as staff, Council and Foundation members, and consultants assisted TEconomy Partners in the development of the report.

The TEconomy Partners report identified 4 key stages in the entrepreneurial ecosystem and, for each stage, it specified the activities involved, the kind of assistance entrepreneurs needed, and the most likely sources of risk capital. These stages are:

- a. *Ideation*- This is the stage of idea development and market assessment. At this stage, entrepreneurs require guidance and coaching and rely on sweat equity and friends/family for funding.
- b. *Commercial Viability*- Activities at this stage include customer discovery, new product development, proof of concept testing, and prototype development. Entrepreneurs need assistance with market knowledge, positioning and validation of a business model. Sources of risk capital are proof of concept funding, accelerator angel investment, and SBIR grants.
- c. *Market Entry*- Activities include finalizing commercial products, executing business, marketing and manufacturing plans, developing supply chains and obtaining early revenues. Needed assistance focuses on execution of business plans and business development for first customers. Likely sources of capital are angel investors, formal venture capital investment, including seed, Series A and Series B.
- d. *Growth and Scalability*- Activities at this stage are a critical mass of firms that generate operating capital, scaling manufacturing, generating new employment and developing new products. Assistance needed centers on building a management team, positioning for IPO and entry into new markets. Sources of capital are the later rounds of venture capital funding, mezzanine funding and SBA (7)a loans.

TEconomy: Assessment of Region 4

The report identified the region's strength and weaknesses at each stage of the entrepreneurial ecosystem,

- a. *Ideation*- The region is competitive in overall level of business formation and outpaces the nation in technology transfer and commercialization effort. Perhaps most importantly, there is a growing focus on supporting the entrepreneurial ecosystem within the region with organizations such as Activation Capital, VCU Ventures, Lighthouse Labs, STARTUP Virginia, and NRV. At the same time, the report noted that there has been significant volatility in business startups from year-to-year and that gains in university R&D have been relatively flat over a five-year period.

- b. *Commercial Viability*- The report noted that pre-seed funding in terms of incubators and accelerators stands out in the region among national peers. It suggested that while there is room for improvement in university technology transfer, it is performing above the national average in key measures of disclosures and startups. It also noted that significant efforts have been added to the toolbox for supporting technology commercialization to emerging companies. In terms of gaps and weaknesses, the report identified insufficient levels of proof of concept funding and insufficient numbers of serial entrepreneurs and below average performance in obtaining SBIR awards by companies in the region.
- c. *Market Entry*- The region's employment levels in younger, traded sector firms is on par with the national average and there are numerous incubator and co-working space available to the region's entrepreneurs. But the report highlighted several gaps that are primarily related to the lack of risk capital in the region. There is a high failure rate in year two transition for early stage companies that may point to lack of support. The dip in survival in years 7 and 8 may point to a lack of later stage risk capital. Seed, early and later stage funding represents a small portion of the number of deals compared to the state and nation. There is also a lack of lead early stage investors for high potential startups needing VC investments beyond the angel infusion.
- d. *Growth and Scalability*- The region, especially the Richmond area, has a strong confluence of talent, amenities, and ecosystem attractive to entrepreneurs. Startup industries are growing in the emerging industry clusters in life sciences and engineering as well as in legacy industries such as finance and insurance. The major gaps are talent shortages to scale up startups and more formalized efforts to identify startups and emerging company needs outside of Richmond, including the Crater District.

TEconomy: Priority Action Recommendations:

The report highlighted a set of priority actions that could be undertaken to address the gaps and weaknesses at each stage of development for the entrepreneurial ecosystem.

a. Leverage Activation Capital-

The report emphasized that Activation Capital should function as the "regional quarterback" of the entrepreneurial ecosystem development and be tasked with advancing a strategic plan and prioritizing strategic investments. Activation Capital has been centrally involved with the Regional Council since its inception. It has defined its role as providing leadership and vision for the

knowledge-based innovation and entrepreneurial community. It has provided a forum for collaboration. It has identified gaps in the ecosystem and led efforts to fill these gaps. It has also identified gaps in capital requirements and led efforts to address this challenge. And it has worked to craft an overall marketing message for the region, positioning it more successfully among its national and global competitors. Given its commitment to advancing and supporting the entrepreneurial ecosystem both conceptually and financially, Activation Capital has been essentially serving as the regional quarterback and TEconomy recommended that it continue to do so.

b. Develop Stronger Ideation and Commercial Viability Programming Targeted toward Traded Sectors-

Possible activities include creating additional Proof-of-Concept funds and pre-seed, seed funds, developing an ongoing regional capacity for an ideation program for potential entrepreneurs, and expanding start-up programs at VCU to non-life sciences areas.

c. Develop a Serial Entrepreneurs Network- Create an Entrepreneurs-in-Residence (EIR) program that could address issues such as loss of companies in years 5-7 that may be related to talent availability. An EIR could give assistance to high growth companies that are fundable but lack C-level talent. The EIRs would assist in forming a high-level managerial team and in presenting investment-grade plans to potential funders. EIRs would be composed of serial entrepreneurs looking for the next opportunity who may join a local startup or become an active investor.

d. Catalyze a Wider Range of Risk Capital-

Consider establishing a Small Business Investment Company where investors participate as limited partners and have their investments matched by the federal Small Business Administration.

Form a regional or multi-regional seed fund to bridge angel investors and more formal venture capital.

Create an SBIR assistance program

e. Engage corporate stakeholders in the advancement of startups and commercialization-

Address limited connectivity between local corporations and startups through corporate innovation networks, supply chain linkages and talent outreach programs.

Leverage corporate engagement through CCAM and CCALS to develop connections with small and medium sized firms throughout the region.

Linking to the Virginia Business Ready Sites Program

Region 4 has made site development one of its key priorities. It was highlighted in the original Growth and Development Plan and was reinforced in the Special Committee report that identified it as one of the Council's 4 major strategic priorities. In 2018, the statewide board approved the Council's recommendation for funding a joint proposal of Emporia and Greensville County to shorten the timeframe and advance the development of the Mid-Atlantic Advanced Manufacturing Center mega site (MAMaC) adjacent to I-95 that has the potential for attracting advanced manufacturers or original equipment manufacturers seeking to locate in Virginia. In fact, the \$2, 217,500 award for MAMaC has frequently been seen as a model for how GO Virginia can play a critical role in site and infrastructure development.

The Virginia Economic Development Partnership operates the Virginia Business Ready Sites Program (VBRSP). The program has two major purposes.

First, it assesses existing levels of readiness and next steps for the development of Virginia's site portfolio. It accomplishes this through characterization grants of up to \$5K per site from an applicant pool by a private sector led working group.

Second, the program funds targeted development efforts to move identified sites to higher tiers of readiness. It does this through development grants of up to \$500K that require a 1 to 1 match awarded to sites selected from an applicant pool by a private sector led working group.

To date, five of the seventeen localities in GO Virginia Region 4 have certified sites, and only Chesterfield has more than one. Hanover has the highest total number of sites characterized (47), followed by Powhatan (35) and Henrico (31). By available acreage, however, Sussex leads with 5,058 acres, followed by New Kent (4,833), and Henrico (4,078). Overall, more than 5,500 available acres at 6 sites in the region are certified Tier 4 or higher in the Virginia Business Ready Sites Program or certified by a third party.

Site Development by Locality, GO Virginia Region 4

	Total Sites Characterized	Number of Tier 4 or Higher Sites*	Total Available Acreage of Sites Characterized	Total Available Acreage of Tier 4 or Higher Sites Characterized*
Hanover	47	1	2,430	275
Powhatan	35	0	455	n/a
Henrico	31	1	4,078	1,041
Chesterfield	28	2	3,673	1,106
Goochland	27	1	2,359	1,600
Prince George	19	0	2,913	n/a
New Kent	15	0	4,833	n/a
Dinwiddie	15	0	1,479	n/a
Sussex	12	0	5,058	n/a
Petersburg	10	0	553	n/a
Greensville	9	1	3,618	1,500
Richmond City	7	0	212	n/a
Charles City	4	0	360	n/a
Emporia	2	0	56	n/a
Surry	2	0	742	n/a
Colonial Heights	1	0	32	n/a
Hopewell	1	0	14	n/a
Total – GO VA 4	265	6	32,864	5,522

**Sites certified as Tier 4 or Tier 5 in the Virginia Business Ready Sites Program or certified by an external third party.*

Source: Virginia Economic Development Partnership, Chmura. Data as of 8/20/2019.

The VBRSP has funded 40 characterization grants and, in fiscal year 2018 funded \$1.2MM in site development grants. Yet VEDP also noted that less than 20% of the state’s 25+ acre sites have been characterized. In response, VEDP established a more comprehensive strategy to analyze and develop the Commonwealth’s site portfolio, specifying the number of project ready sites, quantifying the gap

between available sites and what is needed to fulfill job growth goals, identifying how much it will cost to close the gap and defining a strategy for funding it.

As an initial step, VEDP has contracted with site engineers to characterize all 25+ acre sites in the Commonwealth and to evaluate the economic development potential of the sites. When this is completed, a statewide sites advisory group composed of representatives from GO Virginia, local and regional economic developers, utility and communications representatives, state agencies, private business leaders, commercial real estate developers, site consultants and workforce experts will prioritize sites for investment. VEDP has fast tracked this process and expects to complete it by September of this year. VEDP's ultimate goals for the process is to support applications for GO Virginia funding, to encourage regional collaboration on high profile sites, to support public-private partnerships and to facilitate evaluation of utility infrastructure investments under HB 1840 and SB1695/HB2738.

Region 4 supported the Virginia Gateway Region Site Readiness proposal as a per capita project that has been approved by the statewide GO Virginia Board. The proposal complements the work that VEDP is performing as a part of its site characterization project. It has two major components.

- a. Virginia's Gateway Region (VGR) will evaluate a portfolio of (22) twenty-two 10-25-acre sites, focused on the southern half of the region. It will characterize each site and establish a framework and cost estimates for advancing all sites to at least Tier 4 according to the Virginia Business Site Readiness Program.
- b. VGR will coordinate with local economic development officials to facilitate and convene strategic planning sessions around potential revenue sharing options and/or the formation of a Regional Industrial Facility Authority (RIFA) structure. As the characterization work is being completed, VGR will seek prioritization input from local economic developers and seek next steps to focus on sites which will have the most regional impact and serve as the best opportunity to be developed.

Region 4 will also work within the framework of legislation designed to involve utilities more central in site development. Interviews conducted with stakeholders in 2019 continued to emphasize the difficulties of bringing power and natural gas to sites. In addition, stakeholders also repeated their concerns that broadband accessibility in the wider community (away from the site) negatively impacted the capacity to attract companies, even when an appropriate site was available.

Linking to the Commonwealth Cyber Initiative

The Commonwealth Cyber Initiative (CCI) was established to serve as an engine for research, innovation, and commercialization of cybersecurity technologies, and to address the Commonwealth's need for growth of advanced and professional degrees within the cyber workforce. In collaboration with public institutions in the Commonwealth, Virginia Tech will serve as the anchoring institution in northern Virginia and coordinate the activities of the Hub. There will be four regional nodes that will be centers of research, learning and innovation tailored to their local ecosystem. The VCU School of Engineering led a collaboration with the University of Virginia and a broad range of educational institutions in a successful proposal to coordinate the CCI node in Central Virginia.

Virginia Tech's Executive Summary of the CCI notes that it "will ensure Virginia is recognized as a global leader in secure CPS and in the digital economy more broadly for decades to come by supporting world class research at the intersection of data, autonomy, and security; promoting technology commercialization and entrepreneurship; and preparing future generations of innovators and research leaders. CCI will build on Virginia's strong base of research excellence, its innovative and diverse higher education system, vibrant ecosystem of venture capital investment and high-growth firms, and unparalleled density of cybersecurity talent. CCI must address two challenges, today's workforce gap, and tomorrow's new economy. They are different facets of the same problem and opportunity. To focus only on today's workforce challenge is to miss an opportunity to diversify the economy. Today's assessment is a look in the rear-view mirror. Conversely, to focus only on the future economy is to ignore the fact that the basis for that economy is threatened by the workforce gap." (Commonwealth Cyber Initiative Blueprint)

Region 4's Council has endorsed an Enhanced Capacity Building project led by the VCU School of Engineering that will bring together business leaders and educational institutions for the purpose of developing an integrated approach to cyber-related credentialing and degree production. The three major purposes of this initial project are to:

- a. Provide a roadmap for how the region can move forward in developing its cyber-related workforce
- b. Create the framework for organizing and coordinating ongoing workforce-related activities among the relevant stakeholders
- c. Incubate projects that will carve out a distinctive niche for the region within the CCI.

The statewide Board has requested that the project be put on a temporary hold until it becomes clear whether it should best be funded by GO Virginia or the CCI itself. In any case, Region 4 is committed to working closely with the CCI and to utilize the Central Virginia node to address workforce issues, to link to initiatives of the entrepreneurial ecosystem, and to explore cross-regional opportunities that may result from the VCU-UVA collaboration.

5. Project Generation Framework

The statewide GO Virginia Board has noted in its “Plan Amendment Guidelines” that a “key best practice is moving away from a project development process that waits for projects to apply and towards a council and staff driven process that incubates and seeds project pipeline development.” In the past year, Region 4 has proactively taken several initiatives consistent with the statewide Board’s guidance.

- The CEO and GROW Capital Jobs Foundation team have worked to catalyze proposals in all the priority areas through a wide range of outreach activities.
- They have provided information about the GO Virginia grant process to potential proposers and assisted them in addressing hurdles such as the local match requirement.
- They have conducted outreach to local governments to discover the most timely and effective means of accessing match funding.
- They have contracted with consultants to provide grant development assistance to potential proposers.
- They have initiated “ideation sessions” with a broad range of potential proposers to brainstorm possible Go Virginia projects.

It will be useful for the Regional Council to take the steps that have been effective in generating project proposals and formalize these within an explicit “Project Generation Framework” that can guide the Council and staff’s efforts for the next 24 months and can assure that potential project ideas will result in compelling proposals. The Project Generation Framework will include the following elements:

- a. Ideation Sessions- Establish a plan for conducting ideation sessions in key priority areas that will catalyze compelling project proposals.

- b. Expand upon Enhanced Capacity Building and Per Capita Projects- Convert capacity building projects into per capita projects and competitive projects and learn from the outcomes of existing projects in developing new proposals.
- c. Develop “Competitive” Projects- Identify priority areas where “competitive” projects that involve one or multiple other GO Virginia regions can be pursued. The ongoing collaboration between the business communities in RVA and Hampton Roads and the partnerships incentivized through the Commonwealth Cyber Initiative represent fruitful opportunities.
- d. Address obstacles to project generation. Establish a communication strategy with relevant stakeholders and work with relevant local governments to increase their engagement and buy-in and to smooth the process of obtaining local government matches. Offer consulting assistance to potential proposers in understanding GO Virginia guidelines and negotiating obstacles to successful proposal development.

Continuing Ideation Sessions

The Grow Capital Jobs team convened a set of ideation sessions over the previous sixteenth months. These sessions brought together business and thought leaders in priority cluster industries, including:

- Entrepreneurs who have an interest in building out the ecosystem
- Crater District business and education leaders examining how the RVA entrepreneurial ecosystem can be extended throughout Region 4.
- Representatives from the manufacturing industry concerned about workforce development and a K-12 to workforce pipeline
- Business leaders in industries that are tech-centered
- Local economic development and government officials considering how they can best interface with Go Virginia
- Millennial leaders identified by the Greater Richmond Chamber to explore ideas about how to attract and retain talent.

- University deans at VCU interested in how the area's major research university can have deeper connections with GO Virginia
- The major community foundations that provided philanthropic support for projects that enhance social capital and promote workforce development in the region.

The ideation sessions were instrumental in generating project ideas, including proposals that have been supported by the Regional Council and fostering collaboration across business, education and government. These meetings were important to developing the Lighthouse U project, the digital literacy planning grant sponsored by the VCU School of Engineering, and an embedded teacher in manufacturing facilities concept that is likely to be proposed in the next twelve months. In addition, the ideation sessions have addressed challenges in obtaining local matches for project ideas and ideas for enhancing the collaboration between CCAM and community colleges on workforce development.

The amended Plan should formalize the continuation and expansion of the ideation sessions along the key priorities the Regional Council and the statewide Go Virginia Board have articulated.

- The Council should continue to consult with representatives of the priority clusters and local government officials.
- The sessions should continue to explore how university-based research can be most fruitfully related to economic development priorities.
- Ideation sessions should be held focused on the specific elements of building out the entrepreneurial ecosystem.
- The Council should explore jobs of the future and emerging clusters by convening a diverse group of the region's business and thought leaders
- Ideation sessions related to how the demographic diversity of the region can be a lever for promoting economic development.

Expand Upon Enhanced Capacity Building and Per Capita Projects

The GO Virginia statewide board has given regions the opportunity to fund enhanced capacity building grants in key priority areas that will provide a foundation for potential per capita and

competitive projects. Region 4 has taken advantage of this opportunity and has supported several enhanced capacity building projects that are either ongoing or ready to be initiated pending final approval. During the next 12-24 months, attention should be focused on developing larger project proposals from the enhanced capacity building grants.

- *Campus RVA*: This project is focused on retaining a significantly greater percentage of the region's college graduates within its footprint. It brings together businesses and higher education institutions to enhance internships, summer work opportunities, and employment networks to make the region more attractive to its own graduates. The outcome of an enhanced capacity building grant will be a business plan for a sustainable structure to achieve these aims. It has the potential for resulting in both per capita and competitive grant proposals. The per capita proposal would be focused on establishing a permanent home for Campus RVA in the region. The competitive proposal would be to extend its reach to Hampton Roads through the RVA-HR business coalition or throughout the I-64 education corridor.
- *Cyber Workforce*- This project is focused on identifying the skills needed to produce the talent that will enable the region to have a distinctive niche in the emerging cyber economy and defining the region's distinctive economic development niche. It will enable the region to better align credentials with workforce needs and give individuals the tools to understand the opportunities in a rapidly changing economic environment. (Approval for this project is pending until the funding stream for the Commonwealth Cyber Initiative is determined.)

Excellent project ideas are also likely to evolve out of the ongoing projects per capita projects that have been approved and are currently underway.

- *Region 4 Site Development Project*-This project is focused on providing on identifying available sites in the Crater district footprint of the region and tiering the sites according to the VEDP criteria. After this is completed, the region will work to prioritize site development project initiatives and explore opportunities for joint site development.

(This is discussed more extensively in the Virginia Business Ready Sites section of this report.)

- CCAM Mechatronics Training Program- This project is focused on producing trained workers who can repair the machinery employed in state-of-the-art manufacturing facilities. Besides the program's success in producing employable technicians, it will give other proposers a better sense of how collaboration between entities such as CCAM and the area's community colleges can best proceed.

Develop Competitive Projects

The Go Virginia statewide board has encouraged the nine original regions to consider how these may work together on projects consistent with regional and statewide priorities. The statewide board has reserved a considerable set of dollars for these collaborative efforts under the rubric of "Competitive" projects.

Region 4 has been interested in exploring how its priorities might be aligned with the activities of other regions and how it might work collaboratively to advance mutual interests that meet the Go Virginia criteria. The Lighthouse U project where an RVA based organization, Lighthouse Labs, will bring their platform and mentoring models to universities throughout the Commonwealth for the purpose of supporting student entrepreneurs who will remain in the Commonwealth after graduation is an excellent example of how this can work.

In the next 12-24 months, Region 4 should explore developing more collaborative initiatives with other GO Virginia regions. Specific efforts could include:

- Exploring how the platform and mentoring activities of Lighthouse Labs can work in tandem with organizations building out the innovation ecosystem throughout the state.
- Building upon the business-to-business collaboration that has been mobilized by business leaders in RVA and Hampton Roads during the past 24 months and has identified targeted action steps.

- Linking more closely with the Danville Region and its expertise in workforce development for advanced manufacturing to develop best practices for cross-regional and statewide workforce development.
- Utilizing the VCU-UVA selection as the host for the Central Virginia node in the Commonwealth Cyber Initiative to explore cooperative projects in the digital economy on the I-64 cyber highways.
- Utilizing the work undertaken by the Virginia Economic Development Partnership and the Greater-Washington Partnership to explore how the Amazon development and the cyber needs of the national capital region can be niched in RVA.
- Exploring potential linkages in bio-health with the emerging cluster in the Roanoke region.

Collaborating with Ongoing non-Go Virginia Initiatives

The Regional Council will explore developing projects related to ongoing initiatives in the region that are not formally associated with Go Virginia. Potential areas of collaboration include the following.

- Working with the Greater Richmond Chamber on projects related to their Future RVA initiative, especially those connected to workforce and talent.
- Working with the region's career and technical education schools and centers to better align educational curricula and business needs by promoting more regionally based strategies
- Working with the entrepreneurial centers of the region's universities and their efforts to commercialize faculty research and support student entrepreneurship.
- Working with the Planning District Commissions to explore potential projects that could emerge from their Comprehensive Economic Development Strategies.

Utilizing Best Practices from Other Regional Councils

Region 4 will continue to monitor the project ideas submitted by all other regional councils to explore how its priorities can be advanced by incorporating project or sub-project elements that are working well in other parts of the Commonwealth.

Addressing Obstacles to Project Development

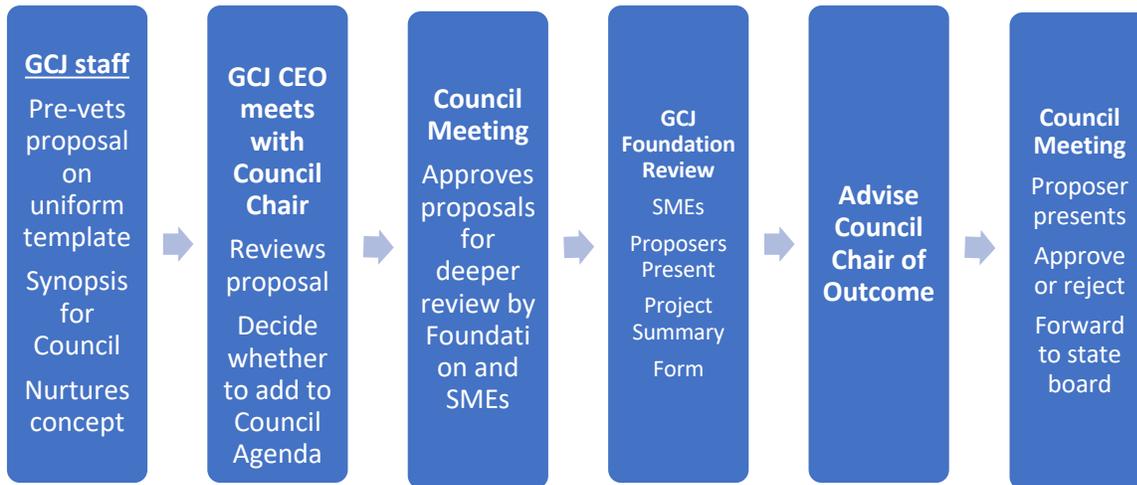
The project development framework should also be attentive to the issues that have been raised by potential proposers related to their perceptions about the grant writing process and challenges related to obtaining the required local match. Grow Capital Jobs (GCJ) has increasingly worked with project proposers not only to inform them of the grant requirements but to provide guidance and assistance in meeting these. During Go Virginia's next phase, Grow Capital Jobs should draw upon their experience with project proposers to ensure that the best ideas can reach fruition in compelling project proposals.

- *Update and enhance the Grow Capital Jobs website for potential project proposers.* The website currently provides useful information about the kind of projects that GO Virginia supports, examples of potential regional proposals and the metrics utilized for evaluating proposals. It would be useful for the website to include contact information at Grow Capital Jobs for informal feedback and a description of the review process undertaken by the Regional Council.
- *Point potential proposers to Go Virginia materials at an early stage:* The DHCD website contains very useful information for project proposers. It is important that grant-seekers be referred to these materials at the earliest possible stage.
- *Maintain regular communication and engagement with local government officials.* One of the most important outcomes of the Go Virginia process is the development of more extensive collaboration between local governments and the business community. Maintaining and enhancing this collaboration will be vital not only to GO Virginia project requirements but toward meeting the long-term goals of the initiative with respect to economic development. At the same time, the local government match has been a sticking point for proposers. Engaging with local government officials about the most effective ways of addressing this requirement is vital to successful proposal development.
- *Provide grant writing guidance and consulting assistance at critical stages of the application process.* The vetting process for proposals in Region 4 is extensive and

demanding. Proposals must pass content muster by subject matter experts and meet the detailed requirements of the Go Virginia Board. Targeted assistance at critical points in the process for proposers who have a strong concept can be extremely helpful in getting to the finish line successfully. Grow Capital Jobs has begun to provide this assistance and should continue to do so.

6. Project Assessment Framework

A process has been established for assessing proposals that utilizes support staff, Foundation members and subject matter experts to nurture proposals, to review completed proposals uniformly and objectively and to make informed recommendations. At the same time, the process involves Council members at an early stage so they can provide appropriate advice, assistance and guidance. It specifically reserves for Council members the responsibility of deciding what proposals should be accepted for deep review and what proposals should ultimately be forwarded to the statewide board with a favorable recommendation for funding. The chart below summarizes major steps in the project assessment process.



7. Project Review and Evaluation

None of the four funded ongoing projects in Region 4 (Lighthouse U, MAMac Site Development, CCAM Mechatronics, and Campus RVA) have reached the stage where a complete review and evaluation is possible. There are, however, preliminary assessments that can be made about the region's project composition. In addition, DHCD maintains a database that enables performance to be tracked against the milestones that were agreed upon in the funding contract. Finally, it is reasonable that the Council will establish now how it plans to review the projects when these are completed.

Project Composition Mix:

The four funded projects track well with the priorities articulated in the 2018 Special Committee Report. Two projects focus on workforce development, one on the expansion of the entrepreneurial ecosystem and a fourth on upgrading a mega-site to tier four status. The last two projects are well aligned with the recent emphases of the statewide board on joint site development and building out the entrepreneurial ecosystem. A project to develop an emerging cluster in pharmaceutical engineering was initially funded, but the proposal had to be withdrawn when a key participant relocated out-of-state and out of country. The Council should consider other possible ways of moving forward with pharmaceutical engineering and promoting strategies for cluster development.

DHCD Project Tracking

The Department of Housing and Community Development works with all projects to develop contracts that have been specific timetables and milestones that are aligned to these timetables. The Campus RVA project, albeit delayed by weather this winter, is nearing completion and will be able to produce the required business plan and launch Campus RVA at the end of the summer. One challenge in the ongoing projects relates to the transitioning military component of the CCAM mechatronics project. There was a delay in the original timetable due to difficulties encountered in obtaining the appropriate instructor. This has now been resolved through collaboration with Southside Virginia Community College. Transitioning

military represent an important part of the Commonwealth's workforce development strategy. It is important to note that there are several components of a successful program for transitioning military, including recruitment at the bases, tailored instructional practices, and direct linkages to employers and jobs. This is clearly an area where the region and the statewide Board should examine and publicize best practices.

Project Evaluation Components

Besides the milestone tracking required by DHCD, the Council will benefit from a more comprehensive project review that can inform its work going forward. Elements of this process should include:

- a. Process evaluation- How well did the project operate, what obstacles did it have to overcome, and what could have been done more successfully.
- b. Outcome evaluations- How well did the project meet its defined goals and, if it didn't, what were the reasons that it did not? What will be the long-term impact of the program?
- c. Cost Effectiveness- How cost effective was the project, and did it meet its intended ROI? How scalable are the results of the project?
- d. Sustainability- Will the project or ones similar in scope be able to be sustained over the long run without continual infusions of external dollars?

8. Priorities to Projects

While this updated plan does not presume to identify the range of project ideas that will emerge from the organic collaborations between business, local governments and educational institutions that have been catalyzed since the inception of GO Virginia, it can certainly outline both the general direction and a set of specific projects consistent with the economic metrics and Council priorities. These are listed below in terms of the four specific priorities highlighted in the 2018 Special Committee Report.

Accelerating Momentum on Workforce Development and Talent Attraction/Retention

The original Growth and Development Plan's emphasis on workforce development, talent attraction and talent retention as key elements of the region's economic competitiveness has only been reinforced over the ensuing two years. Businesses continue to report that the availability of a skilled workforce and the capacity to attract and retain top talent drive location and expansion decisions. There are three major categories of workforce-talent proposals that the region could consider over the next 12-24 months that are consistent with the data presented in the first section of this report.

a. *Proposals that address skills in short supply*

The mechatronics project at CCAM that was one of the first projects that the Regional Council supported is an excellent example. It proposed to train several dozen individuals who could meet a growing need for skilled employees who could repair the machinery used in contemporary manufacturing.

Potential examples in the next 12-24 months include:

- *Precision Machining*: Preliminary work has been undertaken to develop a partnership between CCAM, regional industries and John Tyler Community College to develop a precision machining program that could have the same type of success in supplying workers and attracting industry that has been experienced as a the result of the program at Danville Community College.
- *Drone Pilots*: The utilization of unmanned aerial vehicles is increasing exponentially to perform a wide range of tasks undertaken in both the private and public sectors. There is interest in using the airport in Dinwiddie as a facility that could train drone pilots who could obtain employment throughout the region.
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b. *Proposals that develop workforce and talent pipelines*

In addition to training for jobs that are in short supply, it is critical that the region develop workforce and talent pipelines that address the longer-term issues identified with middle skill jobs, tech talent, and the entrepreneurial ecosystem. Research about workforce and talent pipelines suggest attention should be given to familiarizing middle school and high school students and their parents with career opportunities and job requirements. It is also crucial to maintain strong connections between businesses, specialized education providers and higher education institutions. The data presented in the first section of this report suggest that middle skill jobs and those requiring post-graduate degrees are likely to be in the highest demand.

Potential examples in the next 12-24 months include:

-Embedded Teachers in Manufacturing: Enable area high school teachers and career counselors to work in a contemporary manufacturing facility in the summertime and utilize the experience to inform students about employment opportunities and to develop intern programs between the company and their school. This is especially true in the southern part of the region where manufacturing has 10% of total employment and far above average wages.

- Regional approaches to career education, that provide innovative ways of engaging business-k-12 linkages: Incentivize collaborative approaches to career education that enable the K-12 systems to collaborate with each other and with the area's community colleges.

- VSU-Richard Bland College Collaboration on Work College Model: Enable students to gain work experience as part of an academic curriculum that will reduce their cost of education and position them for high paying employment in the job market.

-Cyber talent pipeline: Bring together business, K-12 and higher education, and specialized education providers to identify the workforce needs in the emerging cyber economy, to provide information about the job requirements in the cyber field , and to catalyze changes in educational delivery that can meet this need.

-Expand registered apprenticeship programs: Utilize the model that has been successfully implemented by the workforce board in the Shenandoah region to address high demand manufacturing jobs

-Campus RV: Implement the business plan produced in the planning grant that will enable the region to retain its college graduates by connecting university students to area employers through internships, seminars, and summer employment.

c. Proposals that position the region to succeed with next generation jobs

There is considerable belief and research that robotics, automation and artificial intelligence will significantly transform the nature of employment during the next 10-20 years. The region should begin to prepare for the changes that will likely impact the employment mix and the kind of jobs available. As a first step, ideation sessions should be convened with relevant industry leaders, the Chmura workforce team, and academics to define the issues, examine the challenges and opportunities that robotics, automation and AI may provide.

Potential project proposals include:

- *Automation and Logistics*: How should the region respond to the emerging automation in logistics to train the workforce for the technical jobs (and higher paying ones) that will be available as the industry is transformed. The Commonwealth Center for Advanced Logistics Systems could be a valuable resource and/or a potential proposer.

- *Next Generation Jobs and Careers*: Create a plan for business-education collaboration that can identify potential careers and create a pathway for the region's students to train for next generation jobs related to AI, machine learning and robotics. This could be an integral feature of the region's response to the Commonwealth Cyber Initiative.

Support Transformative Initiatives in Emerging Clusters Related to Cyber and Bioscience and in the Region's Legacy Clusters

Most of the proposals related to cluster development have focused on the critical issues of attracting and retaining workforce talent for particular industries. It may be useful also to consider encouraging proposals that enhance emerging clusters in areas such as cyber and bioscience/biohealth and legacy clusters such as finance, insurance and business services.

Potential examples in the next 12-24 months include:

a. Proposal to commercialize continuous manufacturing in pharmaceutical engineering.

The Gates Foundation support for the work of Frank Gupton's Medicines for All initiative at VCU has been unprecedented in the region, totaling almost \$40M. The initiative's focus on replacing batch manufacturing with continuing process manufacturing to increase the reliability and reduce the cost of producing life-saving drugs holds enormous commercialization potential. In its most advanced form, the region could become a hub of pharmaceutical engineering, producing medicines that could impact the quality of global health. Continuing to explore these options could be a significant cluster development project.

b. Utilize the region's workforce IT expertise to enhance business services and legacy industries such as finance, insurance and real estate.

The region's relatively favorable wage position in business services and industries such as finance, insurance and real estate is evident in the cluster data. In recent years, the region has

been successful in recruiting data-driven firms such as CoStar to locate major operations in the area and has become a venue for major data center operations. The Regional Council should encourage proposals that will enable the region's strength in data science and data services to enhance the traditional clusters present in the region and potentially increase their location quotient.

Upgrading to Business Ready Sites

The availability of business ready sites along with the capacity to access a trained workforce are decisive elements in **attracting** manufacturers and original equipment producers. Success in attracting manufacturing to the southern part of the region is also dependent on dealing more effectively with utility challenges and ensuring that issues of broadband access for the wider community, including educational institutions, are addressed. The availability of step-up sites is a vital element in **retaining** entrepreneurial firms that have entered a growth phase.

Potential proposals in the next 12-24 months include:

- a. Proposals that build upon the planning grant currently being undertaken by the Gateway Region.

The site tiering projects currently being undertaken by VEDP statewide and the Gateway Region for 10-25 acres sites will establish the foundation for prioritizing sites within the region. These are likely to be related to providing more opportunities for the manufacturing and logistic clusters, especially in the southern part of the region.

- b. Proposals that take advantage of statewide reforms in providing power and broadband to sites.

Conversations with stakeholders in the southern part of the region have consistently emphasized how the challenge of supplying natural gas to potential manufacturing sites inhibits their recruitment efforts. Stakeholders also highlighted how the lack of access to broadband in the wider community presents a challenge to attracting manufacturers to locate in the community. There are statewide efforts underway to address these issues and Region 4 will be poised to take advantage of state specific initiatives that alleviate these challenges.

- c. Proposals that develop plans for step-up space for successful start-ups.
As part of its strategic plan for retaining companies in the region, Activation Capital can examine issues related to space for startups that outgrow their original location and provide guidance for how these issues could be addressed systematically.

Building Out the Entrepreneurial Ecosystem

Activation Capital's strategic plan will outline a set of specific projects to address the gaps in the ecosystem identified in the TEconomy Partners Report and in the ideation sessions that were held with stakeholders.

Potential proposals in the next 12-24 months are expected to be advanced on the following issues.

- a. Projects to catalyze a wider range of risk capital: Proposals to create a SBIR assistance program, a Small Business Investment Company, and a regional seed fund to bridge angel and formal venture capital investing could address this gap in the ecosystem.
- b. Entrepreneurs in Residence Program (EIR): Develop a program to give assistance to high growth companies that are fundable but lack C-Level talent. The EIRs would assist in recruiting a high-level management team and presenting investment grade plans to potential funders.
- c. Extending the Innovation Platform to the Southern Part of the Region: Specify how the innovation platform and the experience in developing an entrepreneurial ecosystem can be utilized to jump start innovation and address emerging company needs outside of RVA.

Competitive Projects

Region 4 will build upon the linkages that have developed or are emerging across regions to address priority issues of mutual interest. The ongoing business-to-business collaboration between RVA and Hampton Roads focused on economic development should be an important foundation for Go Virginia competitive proposals.

Potential projects in the next 12-24 months include:

- a. Lighthouse Labs Multi-Region Collaboration: Lighthouse Labs intends to propose a multi-region collaborative project to enhance the start-up ecosystem across the Commonwealth
- b. I-64 Science and Technology Corridor: This initiative would create workforce development programs, innovation programs and commercialization opportunities in science and technology anchors along I-64 from RVA to Virginia Beach. Some anchors include Virginia Commonwealth University, Old Dominion University, William and Mary, Jefferson Lab, NASA Langley and the proposed VA Beach Bio Research Park.
- c. Expansion of Campus RVA- The business model being developed in the Campus RVA capacity building grant can be extended to other regions interested in retaining college students in their area upon graduation. As an initial step, it could focus on retaining high quality talent exiting from the colleges and universities located between Richmond and Virginia Beach.