

TARGETED CLUSTER IDENTIFICATION & STRATEGIC ALIGNMENT

Pacific Mountain Workforce Development Council

September 2012



CONTENTS

1 ACKNOWLEDGMENT

2 INTRODUCTION

- 3 Report Structure
- 4 Targeted Industry & Cluster Selection Methodology
- 5 Data-Driven Regional Economic Strategy Alignment

12 INDUSTRY CLUSTER DATA ANALYSIS

- 13 Cluster Analysis & Supply Chain Overview
- 14 Cluster Summary
- 15 Food production
- 17 Wood product and paper manufacturing
- 19 Life sciences
- 20 Chemical product and plastics manufacturing
- 21 IT/telecommunications
- 22 Boundary Spanners

23 CONCLUSION

24 APPENDICES

- 24 Appendix A: Strategy Alternatives Matrix
- 30 Appendix B: Variables and Cluster Selection Process
- 32 Appendix C: Detailed Cluster Tables
- 42 Appendix D: Employment Distribution
- 44 Appendix E: Cluster Occupation Overview
- 47 Appendix F: Tourism and recreation
- 51 Appendix G: Boundary-Spanning Industries

ACKNOWLEDGMENT

Economic Modeling Specialists Intl. (EMSI) and J Robertson and Co. gratefully acknowledge the excellent support of the staff at the Pacific Mountain Workforce Development Council in making this study possible. Special thanks go to:

- Michael Cade – Thurston Co. EDC, Executive Director
- Cathy Russ – Pacific Co. EDC, Executive Director
- Tami Garrow – Satsop Business Park, Chief Executive Officer
- Amy Hatfield – Olympic College, Dean of Workforce Development
- Sheri Nelson – Sierra Pacific Industries, Community Relations Manager
- Todd Dixon – WA State Employment Security Department, Area Director
- Dick Larman – Lewis Co. EDC, Executive Director
- Tim Gibbs – Greater Grays Harbor Inc., Executive Director
- Lisa Smith – Enterprise for Equity, Executive Director
- Bob Hitt – Toad Hall Cranberry Farms, Owner
- Bob Guenther – Thurston, Lewis and Mason Co. Labor Council, President
- Dr. Jim Walton – Centralia Community College - President
- Dr. Gerald Pumphrey – South Puget Sound Community College, President
- Dr. Edward (Ed) Brewster – Grays Harbor Community College, President
- Cheryl Fambles – Pacific Mountain WDC, Chief Executive Officer
- John Loyle – Pacific Mountain WDC, Director, Strategic Initiatives
- Craig Clark – Pacific Mountain WDC, Planner and Equal Opportunity Officer

INTRODUCTION

In recent years, the Pacific Mountain Workforce Development Council (PMWDC) leadership has recognized a need to engage in a rigorous data-driven process of identifying target clusters and development strategies. The primary goal of this process is geared toward developing strategies to attract, grow, and diversify industries within the region in order to strengthen the regional economy and increase economic stability. A secondary goal is to increase strategic collaboration between leaders and stakeholders within the region. To this end, PMWDC has championed a data-driven, consensus-based targeted industry cluster analysis—with informed feedback from county and regional stakeholders—of the region to

identify and prioritize industry development opportunities. Based on these industry opportunities, PMWDC and regional leaders can strategically align economic development, workforce, and education resources to accelerate the growth and position of key industry clusters in the region.

To provide background assessment and guidance in this industry cluster selection and strategy development process, PMWDC contracted with Economic Modeling Specialists Intl. and its partner, J Robertson and Co. This report presents and describes the data-driven strategies and data assessments for each of the identified five clusters.

REPORT STRUCTURE

This report is structured into two primary components that focus directly on each of the five selected industry clusters: food production, wood product and paper manufacturing, life sciences, chemical product and plastics manufacturing, and IT/telecommunications. The first component builds upon data-driven strategic analysis to present a strategic action plan framework focusing on the best opportunities and organizational capacity for each cluster. The second component comprises the detailed data-driven analysis used

to identify existing strategies and alignment with regional opportunities and gaps.

Note that although general descriptions of the clusters are presented, the industries identified within the clusters are specifically customized to the region.¹ In other words, each cluster only contains regionally relevant industry sectors and not all industry sectors that could potentially fall within broad cluster descriptions.

¹ The region consists of Grays Harbor, Lewis, Mason, Pacific, and Thurston Counties.

TARGETED INDUSTRY & CLUSTER SELECTION METHODOLOGY

Targeting industry clusters for development, though not a new concept, has become the focus of more sophisticated research, information, and processes. Targeting clusters allows an area to focus on industry recruitment, retention, expansion, and development programs rather than attempting to spread resources across too many industry development directions. Ultimately, developing targeted cluster strategies allows for a more efficient allocation of limited community, county, and regional resources. However, not all industries provide equal opportunity for development. As a result, identifying data-driven approaches to selecting potentially successful industry cluster targets has become a new mantra for economic development.

To address the need for clear industry cluster targets, EMSI used a series of metrics to describe various aspects of industries and worked with a leadership group designated by PMWDC to identify the selection criteria used to articulate industry clusters. The leadership group included representatives from private enterprises, economic development councils, local community colleges, and other public entities. The following list summarizes the targeted industry clusters identified by the consultants and leadership team:

- *Food production:* Comprised of industries involved in agriculture production and fishing, as well as the transformation of livestock, agricultural products, and other consumable natural resources into products for immediate and final consumption. The cluster contains supply chain components ranging from agribusiness, transportation/distribution, and final consumption (e.g., supermarkets, restaurants, amusement parks, etc.).
- *Wood product and paper manufacturing:* The core industries range from logging and sawmills to different types of wood manufacturing. Since logging and sawmills are represented within the core industries, the industrial inputs include the engineering and industrial machinery that go into the core industries. Purchasers and distributors include a wide variety of industries such as hospitals, which require a wide range of wood and paper products, and soft drink

manufacturing, which primarily buy specific products like cardboard.

- *Life sciences:* This cluster's core industries are involved in the development and manufacturing of health-care products, such as electromedical products, as well as specialty and niche medical services, such as laboratories, diagnostic imaging, and kidney dialysis centers. Industries providing administrative and engineering services are represented in the industrial inputs, whereas medical facilities such as dentists play the role of purchasers and distributors.
- *Chemical product and plastics manufacturing:* The core industries are comprised of activities focused on the production of value-add chemicals, such as basic inorganic and organic chemical manufacturing, as well as the production of various plastic products. Inputs to these industries include plastics material and resin products, as well as the research and development behind the manufacturing. Purchasers are mostly within other manufacturing and industrial industries.
- *IT/telecommunications:* Industries specializing in performing computer programming and data processing related services, including custom services, internet hosting, and other computer-related services, comprise the core industries. This sector is particularly entrepreneurial-focused, given the high number of proprietors and self-employed jobs. The industrial inputs revolve around engineering, administrative, and other service-based industries required by the core industries. The purchasers include a variety of industries, such as hospitals, that use the core industries' services.

J Robertson and Co. then worked with PMWDC and the leadership group to develop a strategic action framework based on a regional economic strategy alignment matrix that identified the data-driven gaps and opportunities. The next section will focus on these strategies, while further detail on the data analysis behind these cluster strategies will be discussed later in the report.

DATA-DRIVEN REGIONAL ECONOMIC STRATEGY ALIGNMENT

The regional strategies framework represents a compendium of targeted initiatives the Pacific Mountain partners can pursue to bolster core industry strengths and address gaps in critical supply chain inputs and workforce capacity. By focusing on strategies to develop industries with core strengths, jobs will be created not only within those core industries, but also throughout their supply chains, rippling through the regional economy. By identifying the types of occupations necessary to support the growth and development of those industries, Pacific Mountain and partners can work to ensure the necessary workforce is in place. This goal has been kept at the forefront of this analysis through the incorporation of workforce needs into the strategies. Further discussion of the types of occupations and their skill level requirements, as well as the current availability of postsecondary training for those occupations, will be discussed in the next section.

Note that the framework is not intended to serve as a comprehensive economic development plan for the entire region or any individual partner. The primary goal, rather, is to identify specific measures participating organizations can take to supplement or otherwise enhance existing work plans.

The strategies presented here have been identified as priorities from among a more comprehensive list of alternatives considered by the project leadership team. Each strategy and summary rationale is derived from the Strategy Alternatives Matrix attached as Appendix A. The Strategy Alternatives Matrix also provides a summarized listing of trends and data points driving productivity leakage and/or emerging opportunities in each industry cluster.

In addition to an initial set of coordinating strategies to guide implementation of key recommendations as well as future communication with partners, the project team has outlined specific initiatives to address each of the five target industry clusters and workforce development opportunities

therein. The complete regional strategies framework includes six sections, as follows:

- Coordinating Strategies
- Food Manufacturing
- Wood Products Manufacturing
- Life Sciences
- Chemical Products Manufacturing
- IT/Telecommunication

While one additional target cluster, tourism and recreation, was also studied, the leadership team opted to remove it from the regional strategies framework given the predominance of supply-chain industries compared to core industries, the lack of available data for significant tribal operations in the region, and the relatively unique form the industry takes in each part of the region. Recognizing its economic value in the region, participating economic development councils will continue to pursue development of arts, tourism and recreation industries as part of their individual work plans. Additionally, the Pacific Mountain Workforce Development Council recognizes tremendous workforce development opportunities with the tribal communities in the region. Using this document as the basis for dialogue, PMWDC hopes to build and enhance existing partnerships. Strategies are organized in a matrix format, beginning on the next page. Each of the 32 strategies is preceded by an opportunity/rationale statement, and followed by clarifying notes, a suggested lead implementer and proposed timeline. The lead implementer is not expected to move the strategy ahead on its own in some cases, but rather to spearhead or coordinate efforts with other partners.

REGIONAL STRATEGIES FRAMEWORK: COORDINATING AND COMMUNICATIONS STRATEGIES

OPPORTUNITY/RATIONALE	STRATEGY	NOTES	LEAD	TIMELINE
Share and vet data findings to focus on best opportunities; build partnerships with core industry representatives	1. Reach out to representatives from core industries within each cluster to explore data findings, identify priority opportunities to support industry development or close gaps, and eliminate supply chain gaps that cannot be closed from further consideration	Company names for all industries can be located through EMSI Analyst, where necessary	EDC for each county as applicable to presence of core industries	2012-13
Ensure real-time access to industry conditions, gaps, and opportunities	2. Purchase EMSI Analyst license and provide key indicators reports quarterly	Update frequency to be based on capacity; # of licenses dependent on resources	EDC for each county as applicable to presence of core industries	2012-ongoing
Synchronize regional and institutional efforts to grow or protect core employment and revenue-generating industries	3. Provide industry cluster briefings to local governments, industry associations, and educational institutions to raise awareness of core industry impact and future opportunities to support them	Could be conducted as stand-alone presentation or part of other briefings	EDC for each county as applicable to presence of core industries	2012-ongoing
Increase PMWDC brand in region; provide current employment/workforce info to industry and partner orgs	4. Produce periodic employment projections targeting core industry and attendant workforce opportunities by job title	Could be in the form of a broader quarterly e-blast from PMWDC	PMWDC	2013-ongoing
Ensure action plan remains on target; produces positive impacts	5. Track and record implementation activities and results; update action plan periodically to ensure alignment with industry realities	Could be done at each EDC and funneled in similar format to PMWDC	PMWDC	2013-ongoing
Advance implementation of action plan	6. Hold regular meetings of PMWDC and EDC leadership team to share progress	Meeting frequency TBD by partners	PMWDC and EDC leadership team	2012-ongoing

REGIONAL STRATEGIES FRAMEWORK: FOOD MANUFACTURING

OPPORTUNITY/RATIONALE	STRATEGY	NOTES	LEAD	TIMELINE
Industry has had strongest job growth and represents largest total sales output; systems needed to protect continued viability and productivity	7. Develop a food safety/food security initiative to help expand employment, protect viability of core industries, and prevent loss from bad food distributed at market	Coordinate with IMPACT Washington to elevate issues and opportunity, marshal resources	Lewis EDC	2013-ongoing
	8. Ensure balance in critical area rules to protect growers without unnecessarily impacting other job and revenue producers	This is an ongoing PMWDC Board discussion—would require lead and/or partners to play an advocacy role	EDC leadership team	2012-ongoing
The region imports almost \$80M in manufactured food goods annually. Many additional imports come from industrial inputs required by local food producers	9. Partner with WSU Extension offices and other partners to develop a stop-leakage strategy targeting our dependence on external supplies of corn syrup, concentrate and other industrial inputs	Will require coordination with core industry partners	EDC for each county as applicable to presence of core industries	2013-ongoing
	10. Research other animal food manufacturing to identify potential local opportunities	See above	EDC leadership team	2013
Local institutions import a considerable percentage of food products; opportunity to increase local market share	11. Help market local food (farm to fork) to local hoteliers, restaurants and other institutions	Partnership opportunity with restaurant association, tourism promotion agencies, farms, fresh food movement, <i>etc.</i>	Unknown	2012-ongoing

REGIONAL STRATEGIES FRAMEWORK: WOOD PRODUCTS MANUFACTURING

OPPORTUNITY/RATIONALE	STRATEGY	NOTES	LEAD	TIMELINE
Despite setbacks, cluster remains top local exporter with highest job and earnings multiplier effect and best location quotient; also second highest sales output of all clusters with job growth projected for 2012-2018	12. Find ways to market and find new markets for forest product goods	Partner with the Forest Stewardship Council and other certifying orgs to identify additional timber tract and value added opportunities	EDC leadership team	2013-ongoing
	13. Support land use regulations and land use designations that allow for wood products manufacturing throughout region	Goal: protect existing industrial/manufacturing sites while also allowing for micro-opportunities in infrastructure-served areas	EDC leadership team	2012-ongoing
Nearly \$6M in shipping and freight purchased outside PMWDC region annually by wood products sector	14. Identify opportunities to provide more locally-sourced shipping and specialty freight services	Could be coordinated as broader outreach effort with TDL suppliers with core industry input	EDC leadership team	2013-ongoing
Core industries continue to import high percentages of certain industrial inputs	15. Work with core industries to reduce imports for wood preservation and paper mills	Start w/ core industries to find out why and if it can be solved	EDC leadership team	2013-ongoing
Greatest future growth potential projected to come from innovation and value added products	16. Research and potentially establish Innovation and Partnership Zone (IPZ) designation in all five counties	IPZ offers opportunity to market innovation sites; does not come with funding at present	EDC leadership team	2013-ongoing
Most job growth expected to occur in wood container and pallet manufacturing, and custom architectural and millwork manufacturing	17. Identify and develop cross-walk training for separating JBLM personnel in core industries that have high projected annual openings for skilled jobs	Not limited to JBLM workforce; PMWDC to coordinate with employers to ID best way to supply qualified candidates	PMWDC	2013-ongoing

REGIONAL STRATEGIES FRAMEWORK: LIFE SCIENCES

OPPORTUNITY/RATIONALE	STRATEGY	NOTES	LEAD	TIMELINE
Companies increasingly looking for single sites capable of supporting R&D, office, long-term rehabilitative care, etc.	18. Promote the adoption of land use policies that accommodate flexible zoning required for life sciences synergy	PMWDC region most likely to serve as satellite site for established industries; but may serve mix of 1099 workers as well—seeking shared space	EDC for each county as applicable to presence of core industries	2013-ongoing
Cluster has highest overall percentage of input imports (more than 50% of total); largest gaps are medical laboratories (92%); diagnostic imaging centers (81%); electromedical and electrotherapeutic apparatus manufacturing (80%); overall, the region imports \$429M worth of core life science goods and services.	19. Research and pursue opportunities to build presence of medical and dental laboratories and diagnostic imaging centers	Outreach to providers, users to determine if an how the gap can be closed	EDC leadership team	2013-ongoing
	20. Assess viability of recruiting or growing electrotherapeutic apparatus manufacturer	See above	EDC leadership team	2013
\$13M of industrial input purchased outside region: administrative management and general management consulting services, at \$6.5M, is the largest import	21. Coordinate with local health care providers to understand and address significant importation of administrative and general management services	Some of these services may be contracted outside due to regional provider contracts or specialized consulting	EDC leadership team	2013
Gaps in workforce compatibility are particularly wide: R&D in physical, engineering, and life sciences, except biotech (30%); general medical/surgical hospitals (26%)	22. Coordinate with local health care providers to develop a strategic approach to closing gap in trained personnel for engineering, general medical and surgical hospitals	While most workforce issues/opportunities will be addressed by PMWDC, this category will require a full-court press	PMWDC and EDC leadership team	2013-ongoing

REGIONAL STRATEGIES FRAMEWORK: CHEMICAL PRODUCTS MANUFACTURING

OPPORTUNITY/RATIONALE	STRATEGY	NOTES	LEAD	TIMELINE
Increase local knowledge and understanding of core industry businesses; find ways to support as industry has highest average output per worker, much higher than average jobs multiplier and wages	23. Explore potential of convening manufacturers to identify supply chain gaps/linkages	Business names can be identified through EMSI Analyst	EDC leadership team	2013
Core industries import 80% of industrial inputs from outside the region, including more than \$17M annually in plastics material and resin manufacturing alone	24. Identify critical sectors for import substitution/gap closure	Key gaps include other pressed and blown glass; plastics material and resin; flat glass manufacturing; basic organic chemical manufacturing	EDC for each county as applicable to presence of core industries	2013
	25. Research, target, and recruit satellite supply chain firms that can build cluster outputs	There are significant R&D opportunities for small businesses in sector; difficult entry for entrepreneurs	EDC for each county as applicable to presence of core industries	2013-ongoing
	26. Incubate start-up manufacturers and supply chain industries, with and emphasis on reducing the importation of industrial inputs		EDC for each county as applicable to presence of core industries	2013-ongoing
Some industry jobs may be uniquely suited to skill sets possessed by separating service members at JBLM	27. Identify and develop cross-walk training for separating JBLM personnel in core industries that have high projected annual openings for skilled jobs	Coordinate with JBLM to identify type and volume of matching skill sets projected to exit service	PMWDC	2013

REGIONAL STRATEGIES FRAMEWORK: IT/TELECOMMUNICATIONS

OPPORTUNITY/RATIONALE	STRATEGY	NOTES	LEAD	TIMELINE
Industry growth will occur where capacity is strong and growing; access to high speed communications system allows more fluid siting (<i>i.e.</i> , rural areas)	28. Determine and promote telecommunications capacity to support and site rural telework centers	Resulting inventory can also be used as marketing supplement in this and other industry clusters	EDC leadership team	2013
Opportunity to build on recent growth of computer system design services and other related core sectors by showing momentum and marketing available locations	29. Inventory, package, and market locally available office space to IT/telecom businesses looking to grow or relocate	In addition to helping grow IT/telecom industry, this strategy can help repurpose existing office buildings being vacated as government downsizes	EDC leadership team	2013-ongoing
	30. Market Washington State Information Services facility (Olympia) to data warehouse/computer system management firms		Thurston EDC	2013
High rate of participation for entrepreneurs, high start-up costs = opportunity to incubate next generation workforce/employer base	31. Explore the feasibility/desirability of establishing one or more business tech innovation centers/incubators to build momentum in cluster	Similar centers created with support from employers who need specialized skill sets; could also include investment funds (<i>e.g.</i> , angel network, <i>etc.</i>)	EDC leadership team	2014
Opportunity to coordinate with local educational partners to build clustered training programs for high-demand IT and engineering jobs	32. Market existing, and supplement where needed, training programs that prepare local workers for high-skilled IT jobs with high annual projected openings	Job growth: software engineers; network systems and data communications analysts; network and systems administrators	PMWDC and EDC leadership team	2013-ongoing

INDUSTRY CLUSTER DATA ANALYSIS

In economic development, especially industry and workforce development, quality data and analysis are a crucial element in identifying industry/occupation targets and opportunities. Data provide a descriptive component of what has happened, what is currently happening, and what is projected to happen within a given industry. Data can also be evaluated from varying perspectives to provide a larger context of economic understanding. For example, geographically specific data can give a stronger understanding of regional effects when compared to a larger geography (e.g., state and nation) and indicate whether a region may have a comparative advantage in a particular sector.

Each metric examined provides a different perspective of industry performance, regional fit, or economic ripple effects for 1,079 six-digit industry codes, as classified by North American Industry Classification System (NAICS) categories. In order to capture multiple viewpoints of historical and projected industry performance, EMSI gathered, developed, or calculated metrics to describe the following industry characteristics:

1. Historical Job Growth and Current Size
2. Future Job Growth Projection
3. Industry Concentration (Location Quotient)
4. Industry Competitive Effects (Shift-Share Analysis)
5. Job Multiplier Effects
6. Entrepreneurial Growth Potential
7. Earnings Multiplier Effects
8. Industry Average Wage
9. Mid-Wage Occupations
10. High-Wage Occupations
11. Change in Industry Average Wages
12. Research and Development Occupations
13. Establishments
14. Workforce Compatibility
15. Level of Output
16. Output per Job
17. Export Orientation
18. Excess Demand

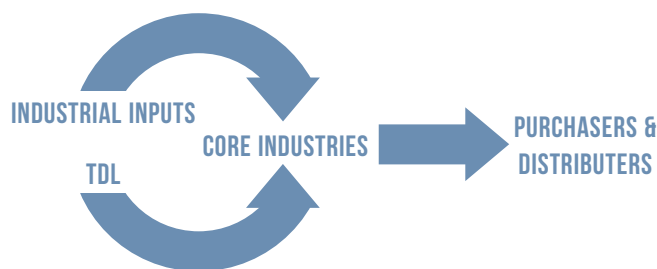
See Appendix B for the definitions of the above variables used in the targeted industry analysis. Out of the list of metrics, the leadership team prioritized shift share, earnings multiplier, and jobs multiplier. The consulting team also focused on projected growth as well as industries with average wages above \$15.00 per hour.

CLUSTER ANALYSIS & SUPPLY CHAIN OVERVIEW

Before diving into the data results, it is necessary to first describe the components of the clusters. The metrics listed above were initially used to select the industries that serve as the hub, or core, of each of the six clusters. Core industries seldom meet all selection criteria; however, those in which most (or some) of this criteria are met were ultimately selected. Additionally, the identified core industries are not all-encompassing. For instance, chemical product and plastics manufacturing focuses on a smaller number of high-potential NAICS categories that have increasing employment, have high job multipliers, and/or show strong competitive effects in the surrounding region.

The consulting team then used input-output modeling to identify upstream and downstream industries for the core industries. The upstream industries include raw materials and industrial inputs for the core industries, whereas downstream industries include the core industries' purchasers and distributors. Transportation, distribution, and logistics (TDL) industries act as both upstream and downstream industries for the core industries. Note: The input-output modeling also captures the flow of inputs and sales between the core industries, meaning it captures what the core industries are buying and selling to each other. Figure 1 illustrates the cluster supply chain.

FIGURE 1: CLUSTER SUPPLY CHAIN



Once upstream and downstream industries were identified for the target sectors, the consulting team narrowed them down by focusing on the industries already strong in the region and those presenting a good development opportunity. The list of industries was further narrowed down through the metrics prioritized by the leadership team—shift share, earnings multiplier, and jobs multiplier. The consulting team also focused on projected growth, industries with average wages above \$15.00 per hour, and the supply chain characteristics focusing on the level of sales from and the imports to the core industries.

In addition to analyzing the clusters by how the industries are performing given certain metrics, EMSI took a further look at the occupations and workforce required within the core industries of the clusters. This was done by looking at the staffing patterns of the industries and the level of education they typically require. Also, since it is critical for the region to be well-aligned with supplying the core industries with the necessary mid- to high-skilled labor, the consultants determined whether postsecondary education programs exist within the region to provide the required education.

Further data and description are provided in the following sections of the report for each target cluster. In order to summarize cluster information, data are aggregated by one of four roles in the supply chain: the core industries; inputs (raw materials and industrial inputs); TDL; and purchasers and distributors. Detailed core industry data are presented throughout the report, but detailed cluster data are only available in Appendix C. Employment distribution maps by county are available in Appendix D, as well as occupation and education data for each cluster in Appendix E. Finally, note that only data on the prioritized metrics are provided in the report tables. Detailed cluster data for all of the metrics are provided in separate excel tables.

CLUSTER SUMMARY

Additionally, before presenting data results for each of the clusters, it is important to provide a brief overview of all of the clusters. Table 1 presents each cluster's data results for just the core industries as well as the cluster as a whole. Note that the tourism and recreation cluster is included in the table. However, due to the broad focus of the cluster as well as lack of supporting data, the leadership group chose to remove this cluster from the strategy focus and will address it instead within their individual counties/areas. Appendix F holds the available regional data for the tourism and recreation cluster.

As seen in the table, in terms of the current size of each cluster, the tourism and recreation cluster is currently the largest cluster, and chemical product and plastics manufacturing is the smallest. The latter is also the smallest in terms of the size of the core industries, but the core industries also have one of the highest jobs multipliers, which points to more development potential and relevant supply-chain linkages within the region. The life sciences core industries are projected to add the most jobs from 2012 to 2018. While life sciences already has one of the highest projections, the growth within the core industries could also lead to addi-

tional value-add benefits (e.g., sales, employment, and earnings) within the rest of the cluster.

The last two columns of the table present supply chain data for each cluster. Imports here refer to the level the cluster industries must import into the region in order to produce their output (otherwise known as their requirements). For example, the food production core industries import \$79,937,000 worth of inputs into the region in order to produce its outputs. However, as a whole the core industries require \$583,864,000 worth of inputs; therefore the imports actually only represent 14% of the cluster's level of requirements.² On the other hand, the IT/telecommunications cluster imports more than 50% of its requirements. The last column measures the total output of the industries in terms of sales. The food production cluster and core industries have the highest level of sales compared to all of the other industries.

² Not shown in the table, but the total requirements data are available in a separate Excel document.

TABLE 1: SUMMARY OF TARGETED INDUSTRY CLUSTERS

DESCRIPTION	2012 JOBS	2012-18 JOB CHANGE	2012-18 SHIFT SHARE	JOBS MULTIPLIER	EARNINGS MULTIPLIER	2011 INDUSTRY AVERAGE WAGE	% OCCS HIGH WAGE	TOTAL IMPORTS (K)	TOTAL SALES (K)
FOOD PRODUCTION									
Core Industries	9,946	686	988	1.8	1.9	\$12.29	8%	79,937	1,567,057
Cluster Total	35,531	1,508	18	1.7	1.7	\$14.08	14%	694,236	4,026,705
WOOD PRODUCT AND PAPER MFG									
Core Industries	7,310	(412)	(133)	2.3	1.9	\$20.78	12%	56,693	1,400,791
Cluster Total	21,398	622	13	2.1	1.8	\$21.92	26%	754,339	3,775,028
LIFE SCIENCES									
Core Industries	9,760	1,429	217	1.8	1.4	\$26.67	48%	429,398	1,146,604
Cluster Total	22,504	3,137	244	1.7	1.5	\$22.60	38%	859,943	2,316,871
CHEMICAL PRODUCT AND PLASTICS MFG									
Core Industries	1,048	(54)	4	2.3	1.8	\$23.00	39%	26,382	351,191
Cluster Total	20,637	1,233	837	1.9	1.6	\$21.26	26%	684,787	3,103,479
IT/TELECOMMUNICATIONS									
Core Industries	2,407	318	56	2.2	1.6	\$25.99	45%	587,021	421,445
Cluster Total	24,314	3,143	1,056	2.1	1.5	\$29.46	33%	1,401,303	3,743,475
TOURISM AND RECREATION									
Core Industries	9,089	527	146	1.6	1.5	\$19.80	11%	175,407	318,278
Cluster Total	39,174	3,380	103	1.6	1.5	\$18.53	19%	923,594	3,359,644

Source: EMSI Complete Employment – 1.2012; EMSI input-output model calculations

FOOD PRODUCTION

The food production cluster is comprised of core industries involved in agriculture production and fishing, as well as the transformation of the agriculture products, livestock, fish, and other consumable natural resources into products for immediate and final consumption. The cluster contains supply chain components ranging from agribusiness, transportation and distribution, and final consumption such as supermarkets and restaurants.

Data highlights for the cluster are presented in Table 2. As seen, animal production and crop production drive the core industries due to their sheer size; they comprise almost two-thirds of the core industry employment. While this contributes to a high level of projected job change, it

also pulls down the average wages for the cluster as a whole. The cluster competitiveness effects, measured by location quotient and not shown in the table, are driven by the core industries, primarily shellfish and finfish fishing and seafood canning and processing.

As seen by looking at the total levels of sales for the cluster, animal production, crop production, and fresh and seafood frozen processing drive the output of the core industries. As would be expected, the purchasing industries represent higher levels of sales, mostly due to restaurants and supermarkets. In terms of imports, the core industries are only importing around 13% of their requirements; however, the industrial inputs import almost 50% of their inputs. Also, referring

TABLE 2: FOOD PRODUCTION CLUSTER SUMMARY

DESCRIPTION	2012 JOBS	2012-18 JOB CHANGE	2012-18 SHIFT-SHARE	JOBS MULTIPLIER	EARNINGS MULTIPLIER	2011 INDUSTRY AVERAGE WAGE	% OCCS HIGH WAGE	TOTAL IMPORTS (K)	TOTAL SALES (K)
CORE									
Animal Production	2,754	384	410	1.6	1.8	\$11.71	6%	8,478	281,662
Crop Production	3,736	419	615	1.5	1.8	\$10.01	4%	10,651	426,008
Support Activities for Animal Production	221	32	13	1.1	1.3	\$8.58	5%	8,378	4,888
Fruit and Vegetable Canning	123	(16)	(8)	3.7	2.7	\$25.03	16%	7,489	62,610
Wineries	133	29	13	2.5	2.7	\$15.04	6%	3,932	37,563
Coffee and Tea Mfg	62	11	5	2.5	2.8	\$11.84	21%	2,504	13,128
Fresh and Frozen Seafood Processing	944	23	(38)	2.6	2.8	\$11.74	15%	19,857	316,048
Finfish Fishing	552	(83)	(36)	1.3	1.3	\$17.37	7%	402	32,741
Shellfish Fishing	680	(15)	32	1.3	1.3	\$15.27	11%	317	36,083
All Other Misc Food Mfg	39	(7)	(4)	4.3	3.1	\$21.09	25%	1,819	21,839
Soft Drink Mfg	145	(10)	(12)	3.4	2.3	\$25.59	23%	5,575	111,802
Frozen Fruit, Juice, and Vegetable Mfg	266	(2)	29	3.6	2.8	\$20.33	18%	1,016	131,442
Dried and Dehydrated Food Mfg	106	5	19	2.7	2.6	\$16.23	16%	464	34,750
Seafood Canning	91	(38)	(3)	2.2	2.7	\$9.66	15%	2,718	26,391
Breweries	65	(46)	(47)	2.1	2.1	\$15.13	22%	5,868	22,992
Ice Mfg	29	0	(1)	1.8	2.4	\$10.18	5%	467	7,112
Core totals	9,946	686	988	1.8	1.9	\$12.29	8%	79,937	1,567,057
Inputs	1,533	144	(21)	2.5	1.8	\$31.36	44%	235,717	395,352
Purchasers and Distributors	21,432	617	(834)	1.5	1.6	\$12.89	16%	318,107	1,699,047
TDL	2,620	61	(115)	1.8	1.6	\$20.57	10%	60,475	365,249
Cluster Total	35,531	1,508	18	1.7	1.7	\$14.08	14%	694,236	4,026,705

Source: EMSI Complete Employment – 1.2012; EMSI input-output model calculations

back to fresh and frozen seafood processing, while it has one of the highest levels of output, it also has one of the highest levels of imports. Detailed supply chain data for the cluster are available in Appendix C.

In looking at the types of mid- to high-skilled occupations required by the core industries, they can be broken into two categories: “primary” or “secondary” occupations. Primary occupations mean the workers require cluster-specific skillsets, whereas secondary occupations are necessary to support the core industries but do not necessarily require specific

skillsets. As seen in Table 13 in Appendix E, primary occupations for the food production core industries include farmers and ranchers, agricultural managers, and related farmworkers and fishermen. In general, the majority of occupations only require on-the-job training. However, agricultural managers/supervisors and farmers/ranchers do require postsecondary education. Postsecondary programs are available in the region for farmers and ranchers, but not for agricultural managers/supervisors.

WOOD PRODUCT AND PAPER MANUFACTURING

The wood product and paper manufacturing cluster is comprised of core industries ranging from logging and sawmills to different types of wood manufacturing. Since logging and sawmills are represented within the core industries, the industrial inputs include the engineering and industrial machinery that go into the core industries. Purchasers and distributors include broad industries such as hospitals, which require a wide range of wood and paper products, to narrower industries, such as soft drink manufacturing, which primarily buy specific products (*i.e.*, cardboard).

In looking at Table 3, the core industries as a whole are projected to experience negative job growth between 2012 and 2018. However, a few industries, such as hardwood veneer and plywood manufacturing and wood container and pallet manufacturing, are expected to grow during that time. The cluster as a whole is also expected to have negative comparative effects, as measured through shift share. These are primarily driven by logging and softwood veneer manufacturing. However, again there are a few exceptions, such as hardwood veneer manufacturing and sawmills.

The logging and sawmill industries comprise almost 50% of the total output for the wood product and paper manufacturing core industries. These industries import very little of their requirements, which demonstrates their existing strength within the region. In fact, as a whole, the core industries import a fairly small amount (10%) into the region. The industrial inputs, on the other hand, import over 60% of their requirements into the region. These include engineering services and other value-add manufacturing industries. Detailed supply chain data for the cluster are available in Appendix C.

Again, the mid- to high-skilled occupations required by the wood product and paper manufacturing core industries have been categorized as either “primary” or “secondary.” These are displayed in Table 14 in Appendix E. In general, the majority of occupations require on-the-job training, especially moderate-term on-the-job training. Primary occupations requiring postsecondary education are forest and conservation workers, foresters, and conservation scientists; postsecondary education is available within the region for these occupations.

TABLE 3: WOOD PRODUCT AND PAPER MANUFACTURING CLUSTER SUMMARY

DESCRIPTION	2012 JOBS	2012-18 JOB CHANGE	2012-18 SHIFT SHARE	JOBS MULTIPLIER	EARNINGS MULTIPLIER	2011 INDUSTRY AVERAGE WAGE	% OCCS HIGH WAGE	TOTAL IMPORTS (K)	TOTAL SALES (K)
CORE									
Logging	1,663	(222)	(155)	2.2	1.7	\$20.86	9%	11,477	282,960
Wood Preservation	25	3	3	1.9	2.0	\$14.86	10%	6,263	2,419
Sawmills	2,341	(58)	206	2.7	2.0	\$23.54	9%	5,147	412,043
Paper (except Newsprint) Mills	58	(51)	(35)	2.6	2.0	\$26.25	8%	6,876	28,307
Paperboard Mills	38	(30)	(26)	3.5	1.9	\$44.84	95%	2,452	21,513
Other Millwork (including Flooring)	112	(46)	(25)	1.7	2.0	\$11.99	7%	2,404	14,896
Wood Window and Door Mfg	251	(91)	(64)	2.2	2.0	\$17.10	13%	1,493	50,417
Hardwood Veneer and Plywood Mfg	198	76	68	2.2	2.0	\$17.42	3%	620	29,748
Softwood Veneer and Plywood Mfg	578	(79)	(170)	2.5	2.0	\$22.68	4%	461	139,658
Corrugated and Solid Fiber Box Mfg	151	(44)	(27)	3.6	2.4	\$31.77	98%	3,261	83,571
Cut Stock, Resawing Lumber, & Planing	47	(26)	(21)	2.1	2.0	\$17.40	9%	456	10,479
Wood Kitchen Cabinet and Countertop Mfg	238	(2)	(7)	1.7	1.6	\$16.87	11%	1,835	24,857
Wood Container and Pallet Mfg	204	114	53	1.9	2.1	\$12.27	8%	1,254	32,421
Pulp Mills	207	7	8	3.2	2.1	\$30.83	8%	116	71,526
Custom Architectural Woodwork and Millwork Mfg	47	64	40	2.3	3.1	\$9.82	37%	2,959	10,017
Support Activities for Forestry	622	6	(12)	1.2	1.3	\$12.99	17%	256	25,245
All Other Miscellaneous Wood Product Mfg	47	(9)	(4)	2.2	2.1	\$18.21	6%	340	7,892
Coated and Laminated Paper Mfg	60	11	14	2.1	2.0	\$18.71	0%	8,218	15,359
Truss Mfg	79	(27)	(10)	1.9	2.1	\$12.96	48%	350	12,362
Prefabricated Wood Building Mfg	96	0	25	1.7	2.0	\$11.56	9%	311	11,031
Engineered Wood Member (except Truss) Mfg	99	(15)	11	2.6	2.1	\$21.97	3%	36	26,318
Timber Tract Operations	55	7	5	6.9	2.9	\$35.75	18%	80	57,474
Forest Nurseries and Gathering of Forest Products	94	0	(9)	2.8	3.0	\$10.69	20%	27	30,281
Core Totals	7,310	(412)	(133)	2.3	1.9	\$20.78	12%	56,693	1,400,791
Inputs	2,361	367	102	2.2	1.5	\$30.26	46%	345,340	446,949
Purchasers and Distributors	8,994	602	166	2.0	1.8	\$21.12	36%	258,786	1,551,032
TDL	2,733	65	(121)	1.8	1.6	\$20.42	11%	93,521	376,257
Cluster Total	21,398	622	13	2.1	1.8	\$21.92	26%	754,339	3,775,028

Source: EMSI Complete Employment – 1.2012; EMSI input-output model calculations

LIFE SCIENCES

Core industries within the life sciences cluster are involved in the development and manufacturing of health-care products, such as electromedical products, as well as specialty and niche medical services, such as laboratories, diagnostic imaging, and kidney dialysis centers. Industries providing administrative and engineering services are represented in the industrial inputs, whereas medical facilities such as dentists play the role of purchasers and distributors.

The core industries, driven by the diagnostic imaging and kidney dialysis centers, have the highest average wages in the cluster. The cluster as a whole is expected to experience job growth from 2012 to 2018. The core industries, primarily doctor offices and hospitals, account for 45% of this growth. The core industries and industrial inputs contribute the most to the cluster's positive shift share. Within the core industries, this is mostly attributed to offices of physicians and hospitals.

Offices of physicians and general medical hospitals drive the output of the core industries. Also, as seen in the table, they import large levels of their requirements into the region, although the imports represent roughly 40% and 15% of their

requirements, respectively. A few core industries, such as medical laboratories, import more than their total output into the region. Such industries represent opportunities for further development. Detailed supply chain data for the cluster are available in Appendix C.

As a whole, the life sciences cluster requires a highly skilled workforce, one of the highest out of all of the identified targeted industry clusters. This was measured through the workforce compatibility metric, which takes into account the higher-skilled labor needs of an industry (see Appendix B for a definition). As displayed in Table 15 of Appendix E, the occupation analysis confirmed these data—the majority of priority occupations require higher levels of postsecondary education. Priority occupations include physicians and surgeons, nurses, medical assistants, medical secretaries, and nursing aides. Regional postsecondary programs were available for most of the priority occupations, with the exception of those requiring a first professional degree such as physicians and surgeons.

TABLE 4: LIFE SCIENCES CLUSTER SUMMARY

DESCRIPTION	2012 JOBS	2012–18 JOB CHANGE	2012–18 SHIFT SHARE	JOBS MULTIPLIER	EARNINGS MULTIPLIER	2011 INDUSTRY AVERAGE WAGE	% OCCS HIGH WAGE	TOTAL IMPORTS (K)	TOTAL SALES (K)
CORE									
Medical Laboratories	22	1	(4)	1.7	1.4	\$26.47	45%	27,634	1,825
Other Scientific and Technical Consulting Services	294	53	(51)	1.4	1.4	\$15.10	49%	23,574	18,012
Electromedical and Electrotherapeutic Apparatus Mfg	25	11	8	1.6	1.5	\$19.82	37%	11,792	2,716
Diagnostic Imaging Centers	18	1	(3)	2.0	1.4	\$33.50	52%	12,137	1,928
R&D in the Physical, Engineering, and Life Sciences	447	55	(2)	1.8	1.4	\$23.50	63%	43,618	38,347
Environmental Consulting Services	238	33	(23)	1.5	1.4	\$18.34	55%	6,971	18,252
Offices of Physicians	2,938	589	131	1.8	1.4	\$29.44	40%	190,530	348,130
General Medical & Surgical Hospitals	4,733	459	101	2.0	1.5	\$28.50	50%	106,640	652,701
Kidney Dialysis Centers	119	57	27	2.1	1.4	\$36.20	47%	1,071	12,741
Ophthalmic Goods Mfg	26	9	9	1.7	1.5	\$16.62	48%	4,237	3,515
Offices of All Other Misc Health Practitioners	900	161	25	1.4	1.4	\$14.66	59%	1,196	48,437
Core Totals	9,760	1,429	217	1.8	1.4	\$26.67	48%	429,398	1,146,604
Inputs	4,443	937	236	1.6	1.4	\$22.23	36%	337,731	397,913
Purchasers and Distributors	5,681	710	(94)	1.5	1.4	\$16.83	32%	32,338	407,105
TDL	2,620	61	(115)	1.8	1.6	\$20.57	10%	60,475	365,249
Cluster Total	22,504	3,137	244	1.7	1.5	\$22.60	38%	859,943	2,316,871

Source: EMSI Complete Employment – 1.2012; EMSI input-output model calculations

CHEMICAL PRODUCT AND PLASTICS MANUFACTURING

This group of industries is comprised of activities focused on the production of value-add chemicals, such as basic inorganic and organic chemical manufacturing, as well as the production of various plastic products, including bottles, plumbing fixtures, and pipes. Inputs to these industries include plastics material and resin products, as well as the research and development and engineering services behind the manufacturing. Purchasers are mostly within other manufacturing and industrial industries.

The chemical product and plastics manufacturing cluster as a whole is projected to see job growth from 2012 to 2018. The core industries are expected to decline slightly, whereas the purchasers will see the most growth. The cluster also shows highly positive comparative effects; again, the purchasers are the strongest in this regard. The positive shift share value for the core industries can primarily be attributed to glass product manufacturing and all other basic inorganic chemical manufacturing.

Purchasers and distributors by far drive the cluster in terms of levels of output. This is mostly attributed to indus-

tries using products from the core industries such as hospitals, crop production, and sawmills. Quantitatively, the core industries import little into the region (\$26,382,000), which represents around 30% of their total requirements. However, it must be noted that the core industries currently are smaller and do not have a large presence within the region. Industrial inputs, on the other hand, import almost 70% of their requirements. Detailed supply chain data for the cluster are available in Appendix C.

In general, the core industries within the chemical product and plastics manufacturing cluster require on-the-job training, especially moderate-term on-the-job training (see Table 16 in Appendix E). Since the core industries are currently not well established within the region, there are not many jobs, nonetheless annual job openings, within the priority occupations. Of the priority occupations, chemical plant and systems operators are the only ones requiring higher education and skills levels, but no relevant postsecondary education programs are present within the region.

TABLE 5: CHEMICAL PRODUCT AND PLASTICS MANUFACTURING CLUSTER SUMMARY

DESCRIPTION	2012 JOBS	2012-18 JOB CHANGE	2012-18 SHIFT SHARE	JOBS MULTIPLIER	EARNINGS MULTIPLIER	2011 INDUSTRY AVERAGE WAGE	% OCCS HIGH WAGE	TOTAL IMPORTS (K)	TOTAL SALES (K)
CORE									
Glass Product Mfg Made of Purchased Glass	514	65	85	2.0	1.7	\$19.80	14%	614	93,506
All Other Misc Chemical Product and Preparation Mfg	122	(12)	(25)	3.0	2.2	\$25.89	57%	1,623	75,403
All Other Basic Inorganic Chemical Mfg	67	(23)	(13)	5.2	2.2	\$51.16	25%	13,961	89,090
All Other Basic Organic Chemical Mfg	40	23	28	1.7	1.5	\$17.90	19%	3,430	4,896
Other Pressed and Blown Glass and Glassware Mfg	13	3	9	2.0	1.8	\$20.04	10%	5,002	3,017
Plastics Bottle Mfg	83	(35)	(44)	1.9	1.5	\$25.67	100%	1,081	26,292
Plastics Pipe and Pipe Fitting Mfg	124	(7)	(5)	1.8	1.5	\$22.58	59%	494	35,853
Plastics Plumbing Fixture Mfg	85	(68)	(31)	1.8	1.7	\$16.84	99%	177	23,133
Core Totals	1,048	(54)	4	2.3	1.8	\$23.00	39%	26,382	351,191
Inputs	3,714	366	101	1.7	1.5	\$21.81	35%	408,375	406,989
Purchasers and Distributors	13,255	860	847	2.0	1.7	\$21.11	26%	189,556	1,980,050
TDL	2,620	61	(115)	1.8	1.6	\$20.57	10%	60,475	365,249
Cluster Total	20,637	1,233	837	1.9	1.6	\$21.26	26%	684,787	3,103,479

Source: EMSI Complete Employment – 1.2012; EMSI input-output model calculations

IT/TELECOMMUNICATIONS

The IT/telecommunications core industries consist of industries specializing in performing computer programming and data processing related services, including custom services, internet hosting, and other computer-related services. This sector is particularly entrepreneurial-focused, given the high number of proprietors and self-employed jobs. The industrial inputs revolve around engineering, administrative, and other service-based industries required by the core industries, and the purchasers include a variety of industries, such as hospitals, that require IT/telecommunications services.

The cluster is projected to grow quite substantially between 2012 and 2018. Computer systems design services is one of the driving industries within the core industries; it accounts for the majority of the core industry projected job growth and it also has the highest shift share effect. It is also one of the drivers behind the high average wages for the core industries, along with computer facilities management services. Overall, the cluster as a whole has the highest average wage compared to all of the other identified clusters.

Several of the core industries, such as software publishers

and custom computer programming services, import more of their requirements into the region than they produce in output. These represent opportunities for development, particular in terms of how they support other industries within the purchasing industries. The purchasing industries drive the cluster in terms of levels of output, and includes hospitals, physician offices, sawmills, and financial services. Detailed supply chain data for the cluster are available in Appendix C.

As a whole, as measured by the workforce compatibility metric, the IT/telecommunications cluster requires one of the most highly skilled workforces out of all of the identified targeted industry clusters. This was confirmed through the occupation analysis (see Table 17 in Appendix E), which found that the majority of priority occupations require higher levels of postsecondary education. Priority occupations include network systems analysis, computer software engineers, computer programmers, and several other occupations requiring specific IT or computer-based skills. Programs are available in the region for almost all of the priority occupations.

TABLE 6: IT/TELECOMMUNICATIONS CLUSTER SUMMARY

DESCRIPTION	2012 JOBS	2012-18 JOB CHANGE	2012-18 SHIFT SHARE	JOBS MULTIPLIER	EARNINGS MULTIPLIER	2011 INDUSTRY AVERAGE WAGE	% OCCS HIGH WAGE	TOTAL IMPORTS (K)	TOTAL SALES (K)
CORE									
Wired Telecomm. Carriers	529	11	22	3.4	2.2	\$28.20	51%	190,786	197,849
Wireless Telecomm. Carriers	117	(4)	(4)	2.6	1.9	\$25.15	38%	57,142	37,257
Data Processing, Hosting, and Related	121	16	(7)	1.7	1.7	\$13.70	8%	76,867	11,588
Computer Systems Design Services	724	243	87	1.8	1.4	\$31.62	52%	42,359	76,210
Software Publishers	162	31	7	2.5	1.8	\$24.68	61%	113,639	38,130
Custom Computer Programming Services	427	47	(32)	1.5	1.4	\$19.08	35%	97,075	30,129
Other Computer Related Services	151	(35)	(34)	1.7	1.4	\$27.42	46%	5,000	14,140
Computer Facilities Mgmt Services	55	5	7	1.9	1.4	\$34.61	60%	2,456	6,233
Computer/Office Machine Repair and Maintenance	121	4	9	1.5	1.4	\$16.09	29%	1,696	9,909
Core Totals	2,407	318	56	2.2	1.6	\$25.99	45%	587,021	421,445
Inputs	4,787	852	172	1.6	1.4	\$18.86	33%	393,963	365,542
Purchasers and Distributors	14,500	1,912	944	2.3	1.5	\$35.14	36%	359,844	2,591,239
TDL	2,620	61	(115)	1.8	1.6	\$20.57	10%	60,475	365,249
Cluster Total	24,314	3,143	1,056	2.1	1.5	\$29.46	33%	1,401,303	3,743,475

Source: EMSI Complete Employment – 1.2012; EMSI input-output model calculations

BOUNDARY SPANNERS

Through the consulting team’s data analysis, it became clear that several industries are present in multiple clusters. These have been termed as “boundary-spanning” industries. These industries present unique development opportunities. Through the targeting of these boundary spanning industries, developmental impacts could be seen throughout several clusters, not just one. Note that these industries can play different roles within the supply chains of different clusters.

Select industries appearing in multiple clusters are presented in Table 7 and graphically displayed in Figure 2. These industries all serve as a core industry in at least one of the clusters. The clusters they appear in as well as the role they play in the respective cluster are also listed in the table. Appendix G contains the full list of boundary-spanning industries, including those that only act as inputs or purchasers for clusters, as well as those providing transportation, distribution, and logistics services to each cluster.

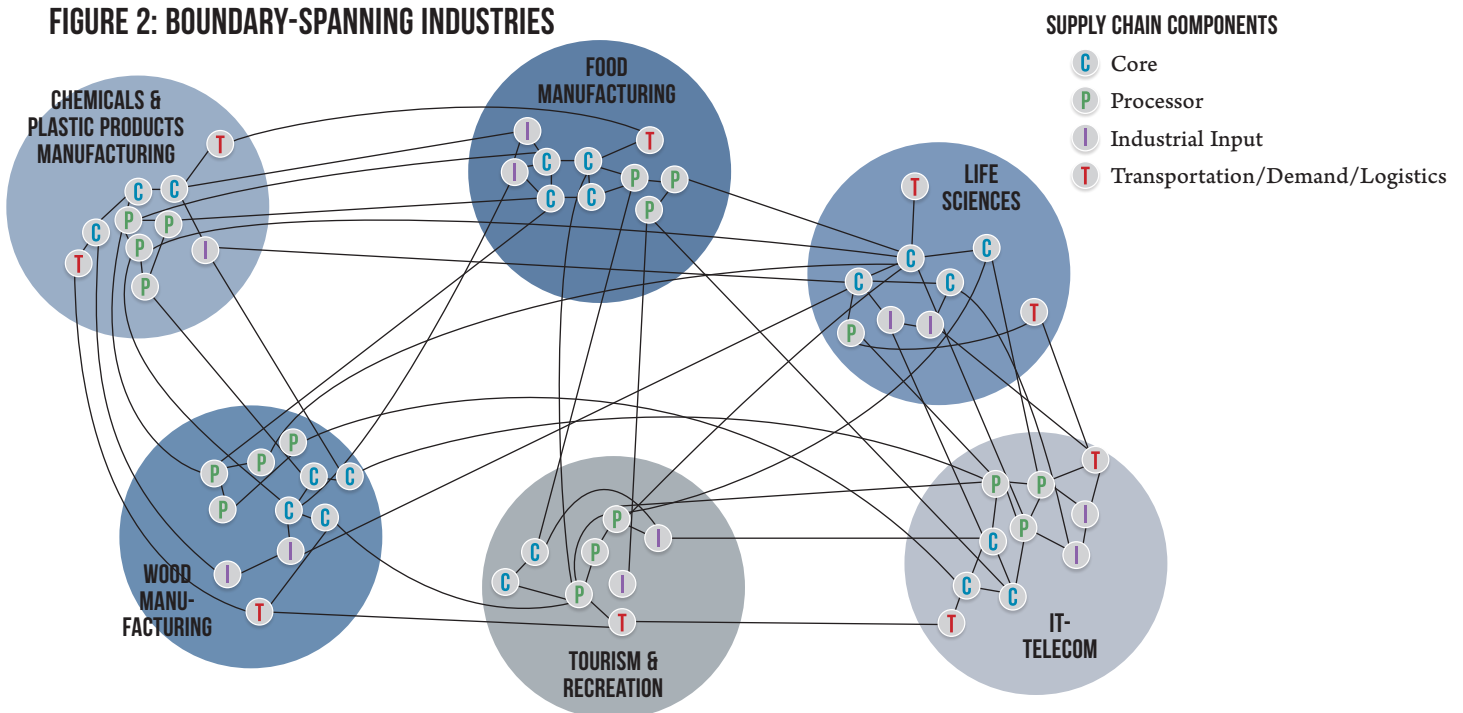
As displayed in the table, one industry acting as a core industry for one cluster can act as an input or purchaser in other clusters. For example, the fruit and vegetable canning industry is one of the core industries in the food production cluster. Their daily operations also require corrugated and solid fiber box manufacturing products, which is one of the core industries in the wood and paper products manufactur-

TABLE 7: SELECTED BOUNDARY-SPANNING INDUSTRIES

DESCRIPTION	ROLE IN SUPPLY CHAIN	CLUSTER
Fruit and Vegetable Canning	Core	Food
	Purchaser/distributor	Wood Product
	Purchaser/distributor	Chemical
Soft Drink Manufacturing	Core	Food
	Purchaser/distributor	Wood Product
	Purchaser/distributor	Chemical
	Industrial input	Tourism
Corrugated and Solid Fiber Box Manufacturing	Core	Wood Product
	Industrial input	Food
	Industrial input	Chemical
Plastics Bottle Manufacturing	Core	Chemical
	Industrial input	Food
Computer Systems Design Services	Core	IT
	Industrial input	Life Sciences
	Industrial input	Tourism

ing cluster. Therefore, fruit and vegetable canning also shows up as a purchaser/distributor in the wood and paper product manufacturing cluster, whereas corrugated and solid fiber box manufacturing shows up as an industrial input in the food production cluster.

FIGURE 2: BOUNDARY-SPANNING INDUSTRIES



CONCLUSION

Regional cluster identification and strategy alignment involves close and candid collaboration between regional leaders, decision-makers, and stakeholders to determine a mutually beneficial path for regional growth and development. The Pacific Mountain region's leaders included representation from economic development, workforce development, education/training, business associations. Through a data-driven decision-making process, the leadership selected the following five key target clusters: food manufacturing, wood products manufacturing, life sciences, chemical and plastic products manufacturing, and IT/telecommunications. These clusters show strong potential for growth and diversification of the regional economy, but require the regional leaders to pool resources and champion initiatives to assist the growth of local businesses and entrepreneurs, recruit new industry, and leverage other opportunities for economic growth.

Specific strategies and opportunities include coordination with other regional stakeholders, such as the following: research and development in food safety at Washington

State University's extension campus and agricultural research station; Joint Base Lewis McChord (JBLM) activities and training, as well as separating service men with diversified training and skill sets; business incubation for small R&D companies, manufacturers and technology firms at locations such as Satsop Business Park.

Ultimately, the data-driven content and strategies in this report provide a foundation for identifying opportunities for development, prioritizing strategies and action items, and tracking progress toward achieving cluster specific job and value creation outcomes.³ The information presented does not represent an exhaustive assessment of development opportunities. As the leadership begins to execute strategies and economic conditions continue to change, new opportunities and strategies will likely emerge. The consulting team recommends that the leadership team leverage the applicable data and strategies as well as update data and information, as new opportunities emerge.

³ Data, analysis, cluster-relevant connections, and supply-chain opportunities are highlighted for each sector. Further quantitative assessment is also available in the appendices below.

APPENDIX A: STRATEGY ALTERNATIVES MATRIX

FOOD MANUFACTURING

REGIONAL STRENGTHS	GAPS/OPPORTUNITIES	STRATEGIC APPROACHES/INITIATIVES
<ul style="list-style-type: none"> • Highest total sales output for all clusters (\$4B/yr) • Employment grew by 1,000 (2007–12)—35,500 jobs supported (note: just under 10,000 jobs are in “core” ag industries, which also accounted for 50% of job growth) • Forecast 2012–18 emp. growth of 1,500 (about 680 in core industries) • Among core industries, crop production and animal production show strongest 2012–18 shift share at 614 and 410, respectively • Purchaser/distributor industries represent \$33M in annual sales from core industries—restaurants represent about \$18M of that total; and health care facilities about \$4M • Among core food manufacturing sectors, the most prolific exporters (capital importers) are fresh and frozen seafood processing (2.21% of total regional exports) and crop production (2.11%) 	<ul style="list-style-type: none"> • Core group requires approx. \$340M to meet output levels—\$100M of that total input is imported from outside region • Most leakage occurs at industrial output level—<i>e.g.</i>, animal food manufacturing, syrup and concentrate, <i>etc.</i> (\$80.5M) • At \$32.5M, other animal food manufacturing represents the single largest local import (almost double the next highest import) • Other supply chain imports (est. annual): Core—\$15M; TDL—\$4M; purchaser/distributor—\$1.5M • While there has been a significant uptick in wholesale trade agents and brokers (81 new establishments, 2001–11), nearly half of local requirement—about \$8M is imported from outside region • Shellfish canning and fresh and frozen seafood manufacturing have the highest 2012 location quotients (23.67 and 22.81), but negative shift share projections for 2012–18 (-3 and -38) 	<ul style="list-style-type: none"> • Develop a food safety/food security initiative to help expand employment, protect viability of core industries and prevent loss from bad food distributed at market—coordinate with IMPACT Washington to elevate issue/opportunity and marshal resources (LEWIS EDC) • Provide policy advocacy and technical assistance for food suppliers • Ensure balance in critical area rules to protect growers without unnecessarily impacting other job and revenue producers (ongoing Board discussion) • Reduce barriers to organic certification and provide a replicable template for success in the organic market • Partner with WSU Extension offices and other partners to develop a stop-leakage strategy targeting our dependence on external supplies of corn syrup, concentrate and other industrial inputs • Research other animal food manufacturing to identify potential local opportunities • Facilitate succession planning for crop producers, shellfish producers and other core industries to ensure the long-term viability of the cluster • Help market local food (farm to fork) to local hoteliers, restaurants; and (other institutions) • Top projected annual openings for sector: farmers and ranchers; farmworkers and laborers, crop, nursery, and greenhouse; fishers and related fishing workers; farm, ranch, and other agricultural managers; farmworkers, farm and ranch animals; meat, poultry, and fish cutters and trimmers

WOOD PRODUCTS MANUFACTURING

REGIONAL STRENGTHS	GAPS/OPPORTUNITIES	STRATEGIC APPROACHES/INITIATIVES
<ul style="list-style-type: none"> • Highest overall LQ of all six industry clusters (7.38) • Highest exporter cluster (capital importer) at nearly 15% of regional total • Despite the overall downturn in forest products industry, several local industries maintain high national location quotients (LQs): softwood veneer and plywood manufacturing (34.42); pulp mills (26.71); sawmills (23.12); and engineered wood member (except truss manufacturing (20.63) • Strongest jobs and earnings multiplier effect, followed by IT/telecom and chemical products, <i>et al.</i> • Second highest total output sales after food manufacturing, but highest output per job (\$176K) • Most jobs lost 2007-12 forecast to be regained 2012-18 (about 600) • By far the largest purchaser and supplier of goods and services among all six target clusters (\$427M of \$502M required inputs provided by core local industries; sales from local core industries totals nearly \$380M ... next highest sales total from local core is \$169M lower) • Only 15% of core industry inputs are imported from outside region—with the next lowest total being food manufacturing at 30% (<i>i.e.</i>, wood products core sectors are indispensable to local supply chain) • Just over 7K jobs in wood products manufacturing help support an additional 14K jobs in supply chain industries 	<ul style="list-style-type: none"> • Employment decline realized and projected in most core industries; only 4 of 23 core industries expected to grow jobs • Only two core industries have and/or will generate significant employment opportunities between 2007 and 2018: wood container and pallet manufacturing (237 jobs); and custom architectural and millwork manufacturing (82 jobs) • Timber tract operations trails only logging and sawmills in percent of total regional exports, and has among the highest jobs and earning multipliers as well as output per job (over \$1M) for just 71 jobs including 1099 workers • The most significant supply chain imports: wholesale trade agents and brokers (\$8.7M); engineering services (\$7M); adhesive manufacturing (\$5.7M) • Among core industries, the highest percentage of imports are in: wood preservation (66% or \$1.2M); and paper mills—excluding newsprint (42% or \$2M) • In the TDL component of supply chain, notable annual out of region sales include: general freight trucking-local (\$2.8M); freight transportation arrangement (\$2.1M); and specialized freight—except used goods trucking, long-distance (\$1.9M) • Core industries with the greatest disparity between skilled labor needed and available local workforce (by % gap): timber tract operations (37%); support activities for forestry (32%); wood kitchen cabinet and countertop manufacturing (31%); custom architectural woodwork and millwork manufacturing (11%) 	<ul style="list-style-type: none"> • Find ways to market (or find new markets for) forest product goods (partner with the Forest Stewardship Council and other certifying associations to identify additional timber tract and value added opportunities) • Develop a security investment pool to fund advocacy or emergency support measures that protect critical core and supply chain industries (look at regional investment fund) • Identify and develop cross-walk training for separating JBLM personnel in core industries that have high projected annual openings for skilled jobs • Support land use regulations and land use designations that allow for wood products manufacturing throughout region—protect industrial and manufacturing sites • Research and potentially establish Innovation and Partnership Zone (IPZ) designation in all five counties • Identify opportunities to provide more locally-sourced shipping and specialty freight services • Work with core industries to reduce imports for wood preservation and paper mills • Recruit and/or train carpenters and specialty woodworkers (partner with GHC, New Market, SPSCC, <i>et al.</i>) • Top projected annual openings for sector: logging equipment operators; sawing machine setters; operators, and tenders, wood; laborers and freight, stock, and material movers, hand; industrial truck and tractor operators; woodworking machine setters, operators, and tenders, except sawing

LIFE SCIENCES

REGIONAL STRENGTHS	GAPS/OPPORTUNITIES	STRATEGIC APPROACHES/INITIATIVES
<ul style="list-style-type: none"> • Largest job growth 2007-12 (2,612—twice as many as any other sector) • Among largest projected job growth 2012-18 (3,137) • One-third of projected job growth to occur in three core sectors: office of physicians (589); general medical and surgical hospitals (459); and miscellaneous and health practitioners (161) • Strong shift share (244), average LQ (1.03) • LQ particularly high for HMO medical centers (2.87) and miscellaneous and health practitioners (2.1) • Highest percentage of high-wage occupations (37.5%) • Relatively high number of entrepreneurial (1099 worker) jobs (5,188 compared to 22,504 total sector jobs) 	<ul style="list-style-type: none"> • 16% gap in skilled work force need (38%) and local availability (22%) • 50% of this cluster's requirements are imported • Most significant core industry imports: medical laboratories (92%); diagnostic imaging centers (81%); electromedical and electrotherapeutic apparatus manufacturing (80%) • As a group, the eleven core industries import more than \$8M annually to meet their output requirements • The entire cluster supply chain imports over \$22M • \$13M of the above total comes at the industrial input level (administrative management and general management consulting services \$6.5M; all other plastics manufacturing \$3.1M; engineering services \$1.6M) • Nearly another \$1M is imported for dental lab services • Gaps in workforce compatibility are particularly wide for: R&D in the physical, engineering, and life sciences (except biotech) (30% gap); general medical and surgical hospitals (26%) • One notable exception to the imports trend is kidney dialysis centers, which in addition to experiencing job and wage growth, and boasting the highest average industry wage, purchase 95% of output requirements from other core industries (about \$1.5M) 	<ul style="list-style-type: none"> • Promote the adoption of land use policies that accommodate flexible zoning required for life sciences synergy—i.e., must be able to support R&D, office, long term rehabilitative care, etc. • Inventory and expand regional capacity for large data transfer rates and speeds • Identify long term care needs required in support of personnel exiting military service—e.g., military is requiring holistic healing for trauma victims that cannot be treated at Madigan facilities • Research and pursue opportunities to build presence of medical and dental laboratories and diagnostic imaging centers; viability of recruiting or growing electrotherapeutic apparatus manufacturer • Coordinate with local health care providers to understand and address significant importation of administrative and general management services • Coordinate with local health care providers to develop a strategic approach to closing gap in trained personnel for engineering, general medical and surgical hospitals • Identify and develop cross-walk employment opportunities in growing life sciences occupations for JBLM personnel and spouses • Top projected annual openings for sector: registered nurses; medical assistants; medical secretaries; clinical, counseling, and school psychologists; receptionists and information clerks; management analysts; physicians and surgeons, all other; licensed practical and licensed vocational nurses; nursing aides, orderlies, and attendants

CHEMICAL PRODUCTS MANUFACTURING

REGIONAL STRENGTHS	GAPS/OPPORTUNITIES	STRATEGIC APPROACHES/INITIATIVES
<ul style="list-style-type: none"> • Core sector produces \$351M in output, which in turn directly supports 1,048 jobs (note: output per worker is highest among all other sectors) • Higher core sector jobs multiplier (2.28) indicates relatively strong inter-industry connectivity, even though sector is largely capital • The all other basic organic chemical manufacturing core sector is driven by Ch2o Inc.; Halosource; Forsecoc; Lafarge North America Criteria • High location quotients for: glass product (LQ 9.9) plastics pipe and pipe fitting (LQ 3.91) and plastics plumbing fixtures (LQ 5.85), which are all very concentrated in the region (businesses example: Advanced Drainage Systems) • Almost 40% of occupations in the core chemical product and plastic sector are high-paying occupations (e.g., \$25+/hr) • Strong workforce skills alignment to industry needs 	<ul style="list-style-type: none"> • Plastic bottles and basic inorganic chemical and glass product manufacturing serve as key boundary-spanning industries for wood products and food production • Growth in the above chemical manufacturing industries could likely be tied to growth of the boundary spanning sectors • Most of what the core sectors produce within the region is consumed in the region and not exported • Industrial inputs within the cluster are importing 80% of their required inputs (i.e., chemical products supply chain has gaps) • Core sector imports over \$17M in plastics material and resin manufacturing • Cluster projected to see job growth, but core sectors are projected to slightly decline (though building up supporting and purchasing sectors could boost core) • The cluster is largely characterized by established companies and not entrepreneurs and sole proprietors • R&D in the sector could provide opportunities for small business development 	<ul style="list-style-type: none"> • Improve community awareness of and support for this low-profile industry sector by promoting its critical role in the supply chain, high wages, and job multiplier effect • Reduce regulatory barriers to entry (note: chemical and plastics can struggle with environmentalists and NIMBY opponents) • Work with local educational institutions to build partnerships with research universities and core sector employers to create momentum, increase viability of region as home for creative class • Support/protect rail infrastructure and access • Incubate startup manufacturers and supply chain industries, with and emphasis on reducing the importation of industrial inputs—significant R&D opportunities for small businesses in sector • Research, target and recruit satellite supply chain firms that can build cluster outputs • Identify and develop cross-walk training for separating JBLM personnel in core industries that have high projected annual openings for skilled jobs • Identify critical sectors for import substitution/gap closure (e.g. other pressed and blown glass; plastics material and resin; flat glass manufacturing; basic organic chemical manufacturing) • Explore potential of convening manufacturers to identify supply chain gaps/linkages • Top projected annual openings for sector (mostly supply-chain vs. core industry): general and operations managers; accountants and auditors; network and computer systems administrators

IT/TELECOMMUNICATIONS

REGIONAL STRENGTHS	GAPS/OPPORTUNITIES	STRATEGIC APPROACHES/INITIATIVES
<ul style="list-style-type: none"> Cluster has one of the highest job multipliers at 2.09 Also rates high in total percent of exports (>11%), sales (\$3.7B), output per job (>\$153K); entrepreneurial jobs (6,500); and projected 2012–18 job change (3,143) Very strong location quotient (3.10) and astronomical 2012–18 shift share (1056) Among the highest rankings in clusters with high wage occupations and wage growth Added 39 establishments between 2007–11 (after correcting for exiting establishments) The core sector computer system design services alone accounts for 38 new establishments and 262 new jobs—and is forecast to be the largest job growth sector 2012–18 (243 additional jobs) Of note, the core industries in this cluster benefit from over \$11M in sales to investment advice supply chain partner (purchaser/distributor)—nearly a quarter of ALL sales from core group 	<ul style="list-style-type: none"> Imports 55% of output requirements (among the highest of all clusters) Major core industry importers: wired telecom providers (\$11M); wired telecom providers – except satellite (\$2.5M); computer system design services (\$1.2M); software publishers (\$774K); and custom computer programming services (\$588K) Major supply chain importers: engineering services (\$7.2M); administrative management and general management consulting (\$1.8M) Of note, two industrial input sectors import nearly 100% of output requirements: printed circuit assembly and other communication and energy wire manufacturing (totaling just under \$1M combined) Largest overall compatible workforce gap (18%), exceeding even life sciences There are significant gaps in workforce compatibility in specific clusters: computer system design services (64% gap); other computer related services (61%); software publishers (59%); custom computer programming services (54%); computer facilities management services (52%) Some of the above supply chain providers will be difficult if not impossible to replicate locally; others offer a readily-available labor marketing opportunity that can reduce imports and increase local jobs, wages and sales 	<ul style="list-style-type: none"> Inventory, package and market locally available office space to IT/telecom businesses looking to grow or relocate—with emphasis on fiber-served, now-vacant government offices Determine telecom capacity to support and site rural telework centers Market Washington State Information Services facility (Olympia) to data ware-housers/computer system management firms Small business tech innovation center/incubator to build momentum in cluster (part of amenity package) Market existing, and supplement where needed, training programs that prepare local workers for high-skilled IT jobs with high annual projected openings—<i>i.e.</i>, computer software engineers; network systems and data communications analysts; network and computer systems administrators Coordinate with regional backbone communications infrastructure providers to ensure adequate capacity to serve high bandwidth users in growing industry cluster Top projected annual openings for sector: network systems and data communications analysts; computer software engineers, systems software; computer systems analysts

TOURISM AND RECREATION

REGIONAL STRENGTHS	GAPS/OPPORTUNITIES	STRATEGIC APPROACHES/INITIATIVES
<ul style="list-style-type: none"> • This cluster is projected to see the most job growth from 2012–18 among all clusters (3,380 jobs) • Despite the economic downturn, the cluster added almost 2,000 new jobs (2007-12), primarily in the core and industry input segments of the cluster • Growth in core industries will be driven by sporting goods stores and hotels • Entrepreneurial activity is the highest out of all potential clusters, especially in core and industrial input industries • Core industry entrepreneurial activity is driven by independent artists/performers, novelty stores and photographers • Casinos and casino hotels are estimated to be the largest industry in the region (no consistent data available to confirm) • Fish/seafood market has one of the highest concentrations out of the core industries • Almost 1 in 4 workers have skill sets that are highly compatible to tourism and recreation • Visitor spending accounts for over \$375M in earnings in the region 	<ul style="list-style-type: none"> • Core and industrial input industries are currently importing around 60% of their requirements (approx. \$7.3M in imports) • Sporting goods stores are growing in the number of jobs (255 new jobs since 2007 and projected to add another 111 by 2018), but shrinking in the number of establishments (lost 8 establishments since 2007), suggesting a consolidation of the industry in the area • Casinos and casino hotels are a growing presence in the region, with data indicating relatively strong wages (little additional data available from tribes at present) • Over 33% of jobs (3,106) in the core tourism and recreation industries are estimated to be entrepreneurial/sole proprietor (1099 workers) • Despite significant growth in non-casino hotels (409 new jobs since 2007), the number of hotel establishments has declined by 10, suggesting a consolidation in the market • Core industries import about \$1.8M of their \$3.2M in output requirements, with hotels purchasing the most out of region 	<ul style="list-style-type: none"> • Cluster dropped from regional strategy/action framework based on significant tribal data gaps and dominance of supply chain vs. core industry. Individual counties to pursue locally-appropriate strategies separately or collaboratively where appropriate • Small business/incubator space • Opportunities for artists to have studio space • Additional events/amenities to further expand lodging, visitor spending • Coordination (training, <i>etc.</i>) among tribes who are hiring new workers • Outreach to hoteliers about opportunities to buy local

APPENDIX B: VARIABLES AND CLUSTER SELECTION PROCESS

As mentioned in the industry cluster data analysis section, EMSI looked at several metrics when evaluating all industries within the region. Definitions for each of those metrics are provided below:

Historical Job Growth and Current Size: Measures the current employment and past performance of an industry sector and identifies whether industries have been growing/declining/emerging and the rate of change.

Future Job Growth Projection: Incorporates historical growth and performance with additional factors and expectations of growth/decline at a larger geographic scale (*i.e.*, state or nation-wide and even global expectations). Industry projection rates are based off of Florida's Department of Economic Opportunity – Labor Market Statistics Center projections and adjusted to current employment estimates.

Industry Concentration (Location Quotient): The location quotient variable is a comparative statistic used to calculate relative employment concentration of a given industry against the average employment of the industry in a larger geography (*e.g.*, nation). Industries with a higher location quotient (usually greater than 1.2) indicate that a region/state has a comparative advantage or specialization in the production of that good or service.

Industry Competitiveness Effect (Shift-Share Analysis): A standard method of regional economic analysis that attempts to separate regional job growth into its component causes. The three main causes identified are the “national growth effect,” which is regional growth that can be attributed to the overall growth of the entire U.S. economy; the “industrial mix effect,” which is regional growth that can be attributed to positive trends in the specific industry or occupation at a national level; and the “regional competitiveness effect,” which is growth that cannot be explained by either overall or industry-specific trends. A positive value indicates that an industry has a regional competitive advantage compared to the nation. Note: Positive shift share values do not explain why an industry has a competitive advantage, only that there are potential factors that contribute to the industry's ability to outperform the national average rate of growth/decline.

Job Multiplier Effects: A jobs multiplier indicates how impor-

tant an industry is in regional job creation. For example, a jobs multiplier of 3 would mean that for every job created by that industry, 2 other jobs would be created in other industries (for a total of 3 jobs). Higher job multipliers in industries that are associated with higher average wages tend to have larger positive impacts on an economy.

Entrepreneurial Growth Potential: Entrepreneurship contributes to economic growth by creating new businesses. Through EMSI's data system, it is possible to separate jobs in the region that are characterized as traditional employment and those that are characterized as proprietor or entrepreneurial. Those in traditional employment are captured by W-2 payrolls, whereas proprietors file Schedule C forms with the IRS (after getting 1099-MISC forms). Typically, proprietors are also not covered by unemployment insurance unlike traditional employees. Note: EMSI uses a combination of data sources, including Bureau of Labor Statistics, Bureau of Economic Analysis and IRS, to capture all of these elements.

Earnings Multiplier Effects: An earnings multiplier indicates the level of additional earnings associated with adding one new dollar of earnings to an industry in an economy. This variable is important in understanding how targeted investment in an industry (especially higher-paying industries) affects the overall quality of jobs created.

Industry Average Wage: This metric is calculated based on an industry staffing pattern and the average occupational wage associated with that staffing pattern. The industry average wages provides a perspective on the quality of jobs within a given industry, answering the question of whether the industry typically provides family-sustaining wages. This was further broken down by looking at the percentage of mid-wage occupations in the industry (defined as between \$18.50-\$25.00 per hour) and the percentage of high-wage occupations in the industry (defined as being over \$25.00 per hour). Finally, in order to see whether wages have been increasing or decreasing, the percentage change in wages from 2007-2011 was also calculated.

Research and Development (R&D) occupations: This metric is calculated based on industry staffing patterns and represents the percentage of occupations within the industry that can

be classified as STEM occupations. The U.S. Department of Labor defines about 110 occupation codes as STEM.

Establishments: This metric looks at the level of change in business numbers within the industry from 2007-2011. The level of change in establishments can be a factor in determining the stage of an industry. For example, if the number of establishments declined while job numbers remained strong, then the industry could be consolidating.

Workforce Compatibility: The compatibility metric is derived from a proprietary dataset developed by EMSI, which utilizes measured O*NET occupational competencies to identify similarities in skill sets. The metric in this analysis is important for one reason, specifically to provide an understanding of the capabilities of a region/state's workforce to fill the labor needs within a given industry, especially the higher-skilled labor needs (measured using O*NET job zone codes 3 and higher). For example, if half of an industry's labor needs are high-skill workers and a third of the regional workforce can fill those labor needs, we would conclude that the industry is a good fit for the region's workforce capabilities.

Level of output: This variable was measured in two ways for this analysis—output in terms of sales and output in terms of the level of sales per job. Measured using an input-output model, output in terms of sales calculates the level of sales the industry is generating within the region. Note that sales figures, unlike income figures, do leak out of the region. Since employment levels vary significantly between industries, production output amounts also vary. To account for this and provide a comparable metric, output per job was calculated.

Export Orientation: This variable can be measured in more

than one way. Through the development of an input-output model, metrics estimating export amounts can be calculated for each six-digit NAICS code. Since employment levels vary significantly between industries, production output and export amounts also vary. To account for this and provide a comparable metrics, percentage of all exports was calculated. Industries that predominately export their product bring new money into the economy, which in turn drive many other local sectors and service providers. Furthermore, export-oriented industries that require less labor input per unit of output can generate significant amounts of new dollars for an economy through job and output growth. Knowing these sectors helps to understand the economic benefits gained from targeted sector strategies.

Excess Demand (regional imports): Measured using an input-output model, excess demand can also be viewed as regional imports. The model calculates the level of inputs the core industries require to make their outputs (total requirements). The model then also calculates local absorption to see how much of those requirements are available within the region. Therefore, regional imports, or excess demand, is calculated by determining how much of a good or service is purchased from outside the area and can indicate the area's inability to produce its own supply. The consulting team cautions against over-interpreting this variable, as cross-hauling (inter-regional and inter-state trade) does exist due to specialization in other areas. However, if a region or state has a high level of industry requirements and is only producing a small portion of output to meet those requirements with the remaining amount being imported, then an opportunity may exist to further develop that particular industry. This would be considered a demand-driven industry development approach.

APPENDIX C: DETAILED CLUSTER TABLES

Throughout the main body of the report, cluster data were aggregated by one of four roles in the supply chain: the core industries; inputs (raw materials and industrial inputs); TDL; and purchasers and distributors. Only detailed core industry data were presented at that time, but this appendix presents detailed cluster data for all of the cluster roles for the priority metrics. Detailed cluster data for all of the metrics are provided in separate Excel tables. The last two columns of these tables contain supply chain data. Throughout the report, imports and sales were presented for the region as a whole; however, here in the appendix they refer to the specific cluster.

For the food production cluster, the core industries as a whole represent the highest number of sales from the core

group. Therefore it is apparent by looking at the supply chain for the cluster that the core industries buy and sell a lot with each other, even more so than with the purchasing industries. In particular, excluding animal production, the seafood processing industry and the frozen, fruit, vegetable, and juice manufacturing industry buy the most from the other core industries. The core industries they are buying the most from are the crop production and fishing industries. In terms of the level of imports, industrial inputs are importing the highest amount into the region. They are importing around 65% of their requirements, or what they need to create their output. As seen here, this is driven by flavoring syrup/concentrate manufacturing, glass container manufacturing, and pesticide manufacturing.

TABLE 8: FOOD PRODUCTION DETAILED CLUSTER DATA

DESCRIPTION	2012 JOBS	2012-18 JOB CHANGE	2012-18 SHIFT SHARE	JOBS MULTI-PLIER	EARNINGS MULTI-PLIER	2011 INDUS-TRY AVERAGE WAGE	% OCGS HIGH WAGE	CORE IMPORTS (K)	SALES FROM CORE (K)
CORE									
Animal Production	2,754	384	410	1.6	1.8	\$11.71	6%	4,097	67,426
Crop Production	3,736	419	615	1.5	1.8	\$10.01	4%	3,713	13,345
Support Activities for Animal Pro-duction	221	32	13	1.1	1.3	\$8.58	5%	2,936	25
Fruit and Vegetable Canning	123	(16)	(8)	3.7	2.7	\$25.03	16%	1,432	10,274
Wineries	133	29	13	2.5	2.7	\$15.04	6%	815	6,282
Coffee and Tea Mfg	62	11	5	2.5	2.8	\$11.84	21%	441	2,641
Fresh and Frozen Seafood Processing	944	23	(38)	2.6	2.8	\$11.74	15%	383	37,255
Finfish Fishing	552	(83)	(36)	1.3	1.3	\$17.37	7%	351	3
Shellfish Fishing	680	(15)	32	1.3	1.3	\$15.27	11%	286	3
All Other Miscellaneous Food Mfg	39	(7)	(4)	4.3	3.1	\$21.09	25%	249	3,464
Soft Drink Mfg	145	(10)	(12)	3.4	2.3	\$25.59	23%	240	2,071
Frozen Fruit, Juice, and Vegetable Mfg	266	(2)	29	3.6	2.8	\$20.33	18%	218	15,496
Dried and Dehydrated Food Mfg	106	5	19	2.7	2.6	\$16.23	16%	96	6,693
Seafood Canning	91	(38)	(3)	2.2	2.7	\$9.66	15%	75	3,166
Breweries	65	(46)	(47)	2.1	2.1	\$15.13	22%	39	1,065
Ice Mfg	29	0	(1)	1.8	2.4	\$10.18	5%	19	144
Core Totals	9,946	686	988	1.8	1.9	\$12.29	8%	15,388	169,352
INDUSTRIAL INPUTS									
Other Animal Food Mfg	11	(1)	(1)	2.2	2.2	\$13.70	11%	32,512	1,396
Flavoring Syrup and Concentrate Mfg	0	0	0	1.8	2.0	\$14.60	9%	17,112	0

DESCRIPTION	2012 JOBS	2012-18 JOB CHANGE	2012-18 SHIFT SHARE	JOBS MULTIPLIER	EARNINGS MULTIPLIER	2011 INDUSTRY AVERAGE WAGE	% OCCS HIGH WAGE	CORE IMPORTS (K)	SALES FROM CORE (K)
Pesticide and Other Agricultural Chemical Mfg	1	0	(0)	2.7	1.9	\$38.02	0%	10,778	1
Wholesale Trade Agents and Brokers	731	181	34	2.6	1.6	\$37.84	42%	8,042	58
Glass Container Mfg	0	0	0	1.8	1.4	\$0.00	0%	5,412	0
Meat Processed from Carcasses	62	(5)	(9)	3.9	3.3	\$14.98	24%	2,913	12,924
Corrugated and Solid Fiber Box Mfg	151	(44)	(27)	3.6	2.4	\$31.77	98%	1,189	8
Metal Can Mfg	91	(35)	(28)	2.1	1.5	\$34.99	46%	804	4
Fresh Fruit and Vegetable Merchant Wholesalers	44	18	13	1.6	1.6	\$15.51	16%	782	1
Plastics Bottle Mfg	83	(35)	(44)	1.9	1.5	\$25.67	100%	759	2
Other Grocery and Related Products Merchant Wholesalers	359	65	41	2.0	1.6	\$23.71	18%	144	21
Industrial Inputs Totals	1,533	144	(21)	2.5	1.8	\$31.36	44%	80,448	14,416
PURCHASERS AND DISTRIBUTORS									
Perishable Prepared Food Mfg	16	(5)	(7)	2.8	3.1	\$12.18	14%	1,053	448
Hotels (except Casino Hotels) and Motels	2,146	87	(8)	1.5	1.8	\$9.05	24%	209	1,152
Full-Service Restaurants	5,106	29	(355)	1.4	1.6	\$8.15	2%	99	10,344
Dry, Condensed, and Evaporated Dairy Product Mfg	4	(4)	(4)	6.9	2.9	\$39.71	3%	76	4,329
Supermarkets and Other Grocery (except Convenience) Stores	3,039	(238)	(328)	1.5	1.5	\$12.75	6%	39	1,275
Food Service Contractors	489	55	(5)	1.3	1.6	\$8.24	4%	33	1,005
Limited-Service Restaurants	4,633	145	(166)	1.3	1.6	\$6.25	2%	26	7,228
Ice Cream and Frozen Dessert Mfg	6	(5)	(5)	6.6	2.7	\$47.29	2%	20	1,177
Retail Bakeries	116	10	13	2.8	3.9	\$9.55	16%	7	621
General Medical and Surgical Hospitals (Private)	4,733	459	101	2.0	1.5	\$28.50	50%	5	3,900
Snack and Nonalcoholic Beverage Bars	1,144	84	(69)	1.3	1.6	\$5.98	2%	2	1,620
Purchasers Totals	21,432	617	(834)	1.5	1.6	\$12.89	16%	1,568	33,100
TDL									
General Freight Trucking, Local	308	(67)	(78)	1.6	1.7	\$14.42	2%	1,715	1
General Freight Trucking, Long-Distance, Less Than Truckload	255	64	41	2.0	1.6	\$22.59	3%	693	1
General Freight Trucking, Long-Distance, Truckload	742	15	(28)	1.9	1.7	\$20.45	3%	683	2
General Warehousing and Storage	555	44	(18)	1.6	1.4	\$18.11	11%	406	0
Rail Transportation	222	10	9	2.9	1.8	\$42.90	67%	331	1
Specialized Freight (except Used Goods) Trucking, Local	538	(5)	(42)	1.8	1.7	\$16.60	5%	131	1
TDL Totals	2,620	61	(115)	1.8	1.6	\$20.57	10%	3,958	6
Cluster Total	35,531	1,508	18	1.7	1.7	\$14.08	14%	101,362	216,875

Source: EMSI Complete Employment – 1.2012; EMSI input-output model calculations

Similar to the food production cluster, there is a lot of buying and selling activity occurring among the core industries in the wood product and paper manufacturing cluster. As with the food production cluster, this can be attributed to the different supply chain roles present within the core industries. For example, the different wood manufacturing industries are primarily buying from the sawmill industry, and

the sawmill industry from the logging industry. Furthermore, the purchasers and distributors include food production core industries such as soft drink manufacturing. These industries are primarily buying from the corrugated and fiber box manufacturing industry, and represent boundary-spanning industries, discussed earlier in the report.

TABLE 9: WOOD PRODUCT AND PAPER MANUFACTURING DETAILED CLUSTER DATA

DESCRIPTION	2012 JOBS	2012-18 JOB CHANGE	2012-18 SHIFT SHARE	JOBS MULTIPLIER	EARNINGS MULTIPLIER	2011 INDUSTRY AVERAGE WAGE	% OCGS HIGH WAGE	CORE IMPORTS (K)	SALES FROM GROUP (K)
CORE									
Logging	1,663	(222)	(155)	2.2	1.7	\$20.86	9%	11,374	8,020
Wood Preservation	25	3	3	1.9	2.0	\$14.86	10%	6,655	1,274
Sawmills	2,341	(58)	206	2.7	2.0	\$23.54	9%	4,813	250,741
Paper (except Newsprint) Mills	58	(51)	(35)	2.6	2.0	\$26.25	8%	4,116	2,082
Paperboard Mills	38	(30)	(26)	3.5	1.9	\$44.84	95%	1,894	5,227
Other Millwork (including Flooring)	112	(46)	(25)	1.7	2.0	\$11.99	7%	1,025	2,216
Wood Window and Door Mfg	251	(91)	(64)	2.2	2.0	\$17.10	13%	828	7,742
Hardwood Veneer and Plywood Mfg	198	76	68	2.2	2.0	\$17.42	3%	506	6,626
Softwood Veneer and Plywood Mfg	578	(79)	(170)	2.5	2.0	\$22.68	4%	367	29,788
Corrugated and Solid Fiber Box Mfg	151	(44)	(27)	3.6	2.4	\$31.77	98%	266	16,890
Cut Stock, Resawing Lumber, and Planing	47	(26)	(21)	2.1	2.0	\$17.40	9%	189	1,610
Wood Kitchen Cabinet and Counter-top Mfg	238	(2)	(7)	1.7	1.6	\$16.87	11%	171	2,245
Wood Container and Pallet Mfg	204	114	53	1.9	2.1	\$12.27	8%	145	1,535
Pulp Mills	207	7	8	3.2	2.1	\$30.83	8%	101	15,873
Custom Architectural Woodwork and Millwork Mfg	47	64	40	2.3	3.1	\$9.82	37%	64	750
Support Activities for Forestry	622	6	(12)	1.2	1.3	\$12.99	17%	64	3
All Other Miscellaneous Wood Product Mfg	47	(9)	(4)	2.2	2.1	\$18.21	6%	56	1,354
Coated and Laminated Paper Mfg	60	11	14	2.1	2.0	\$18.71	0%	52	1,742
Truss Mfg	79	(27)	(10)	1.9	2.1	\$12.96	48%	29	1,409
Prefabricated Wood Building Mfg	96	0	25	1.7	2.0	\$11.56	9%	7	1,402
Engineered Wood Member (except Truss) Mfg	99	(15)	11	2.6	2.1	\$21.97	3%	2	4,281
Timber Tract Operations	55	7	5	6.9	2.9	\$35.75	18%	0	1,249
Forest Nurseries and Gathering of Forest Products	94	0	(9)	2.8	3.0	\$10.69	20%	0	686
Core Totals	7,310	(412)	(133)	2.3	1.9	\$20.78	12%	32,725	364,745
INDUSTRIAL INPUTS									
Wholesale Trade Agents and Brokers	731	181	34	2.6	1.6	\$37.84	42%	8,706	397
Engineering Services	696	95	18	2.0	1.4	\$32.77	58%	6,988	74
Reconstituted Wood Product Mfg	0	0	(0)	2.1	1.7	\$21.10	4%	6,110	33
Adhesive Mfg	0	0	0	2.5	1.8	\$0.00	0%	5,660	0
R&D in the Physical, Engineering, and Life Sciences	447	55	(2)	1.8	1.4	\$23.50	63%	1,483	88

DESCRIPTION	2012 JOBS	2012-18 JOB CHANGE	2012-18 SHIFT SHARE	JOBS MULTIPLIER	EARNINGS MULTIPLIER	2011 INDUSTRY AVERAGE WAGE	% OCCS HIGH WAGE	CORE IMPORTS (K)	SALES FROM GROUP (K)
Commercial and Industrial Machinery and Equipment Repair and Maintenance	296	32	29	1.5	1.4	\$16.68	17%	875	19
All Other Basic Inorganic Chemical Mfg	67	(23)	(13)	5.2	2.2	\$51.16	25%	392	102
Lumber, Plywood, Millwork, and Wood Panel Merchant Wholesalers	124	27	37	1.7	1.6	\$17.06	23%	376	38
Industrial Inputs Totals	2,361	367	102	2.2	1.5	\$30.26	46%	30,590	750
PURCHASERS AND DISTRIBUTORS									
Hotels (except Casino Hotels) and Motels	2,146	87	(8)	1.5	1.8	\$9.05	24%	883	1,064
Commercial Lithographic Printing	123	(4)	17	1.8	1.7	\$17.95	51%	192	1,289
Soft Drink Mfg	145	(10)	(12)	3.4	2.3	\$25.59	23%	10	2,713
General Medical and Surgical Hospitals (Private)	4,733	459	101	2.0	1.5	\$28.50	50%	9	1,157
Fruit and Vegetable Canning	123	(16)	(8)	3.7	2.7	\$25.03	16%	4	1,439
Glass Product Mfg Made of Purchased Glass	514	65	85	2.0	1.7	\$19.80	14%	1	1,059
Frozen Fruit, Juice, and Vegetable Mfg	266	(2)	29	3.6	2.8	\$20.33	18%	0	2,192
Fresh and Frozen Seafood Processing	944	23	(38)	2.6	2.8	\$11.74	15%	0	1,944
Purchasers Totals	8,994	602	166	2.0	1.8	\$21.12	36%	1,100	12,859
TDL									
General Freight Trucking, Local	308	(67)	(78)	1.6	1.7	\$14.42	2%	2,834	49
Freight Transportation Arrangement	63	5	(1)	1.6	1.5	\$17.59	34%	2,124	6
Specialized Freight Trucking, Long-Distance	50	(1)	(5)	1.7	1.7	\$16.59	4%	1,878	9
General Freight Trucking, Long-Distance, Less Than Truckload	255	64	41	2.0	1.6	\$22.59	3%	1,146	58
General Freight Trucking, Long-Distance, Truckload	742	15	(28)	1.9	1.7	\$20.45	3%	1,129	165
Rail Transportation	222	10	9	2.9	1.8	\$42.90	67%	754	770
General Warehousing and Storage	555	44	(18)	1.6	1.4	\$18.11	11%	524	72
Specialized Freight (except Used Goods) Trucking, Local	538	(5)	(42)	1.8	1.7	\$16.60	5%	216	103
TDL Totals	2,733	65	(121)	1.8	1.6	\$20.42	11%	10,605	1,233
Cluster Total	21,398	622	13	2.1	1.8	\$21.92	26%	75,020	379,586

Source: EMSI Complete Employment – 1.2012; EMSI input-output model calculations

The life sciences core industries account for the highest level of sales from the core group, meaning they are buying and selling a lot with each other. In particular, offices of physicians and general medical and surgical hospitals are buying the most from the other core industries, especially from kidney dialysis centers. In terms of the level of imports, industrial

inputs are importing the highest amount into the region. In percentage terms, they are importing around 64% of their requirements. As seen in the table below, this is driven by administrative and general management consulting services, all other plastics product manufacturing, and engineering services.

TABLE 10: LIFE SCIENCES DETAILED CLUSTER DATA

DESCRIPTION	2012 JOBS	2012-18 JOB CHANGE	2012-18 SHIFT SHARE	JOBS MULTIPLIER	EARNINGS MULTIPLIER	2011 INDUSTRY AVERAGE WAGE	% OCCS HIGH WAGE	CORE IMPORTS (K)	SALES FROM GROUP (K)
CORE									
Medical Laboratories	22	1	(4)	1.7	1.4	\$26.47	45%	2,868	28
Other Scientific and Technical Consulting Services	294	53	(51)	1.4	1.4	\$15.10	49%	1,346	26
Electromedical and Electrotherapeutic Apparatus Mfg	25	11	8	1.6	1.5	\$19.82	37%	1,297	20
Diagnostic Imaging Centers	18	1	(3)	2.0	1.4	\$33.50	52%	1,261	30
R&D in the Physical, Engineering, and Life Sciences	447	55	(2)	1.8	1.4	\$23.50	63%	580	180
Environmental Consulting Services	238	33	(23)	1.5	1.4	\$18.34	55%	388	24
Offices of Physicians	2,938	589	131	1.8	1.4	\$29.44	40%	172	1,218
General Medical and Surgical Hospitals	4,733	459	101	2.0	1.5	\$28.50	50%	87	2,938
Kidney Dialysis Centers	119	57	27	2.1	1.4	\$36.20	47%	79	189
Ophthalmic Goods Mfg	26	9	9	1.7	1.5	\$16.62	48%	5	3
Offices of All Other Misc. Health Practitioners	900	161	25	1.4	1.4	\$14.66	59%	1	170
Core Totals	9,760	1,429	217	1.8	1.4	\$26.67	48%	8,083	4,826
INDUSTRIAL INPUTS									
Administrative and General Management Consulting Services	1,161	363	38	1.6	1.5	\$20.88	55%	6,554	90
All Other Plastics Product Mfg	35	9	14	2.8	1.8	\$31.81	10%	3,123	15
Engineering Services	696	95	18	2.0	1.4	\$32.77	58%	1,668	396
Dental Laboratories	76	(9)	(12)	2.0	1.7	\$17.79	43%	826	7
Computer Systems Design Services	724	243	87	1.8	1.4	\$31.62	52%	783	279
All Other Professional, Scientific, and Technical Services	1,545	197	109	1.3	1.4	\$12.08	4%	97	30
Freestanding Ambulatory Surgical and Emergency Centers	206	39	(17)	2.1	1.4	\$37.27	47%	90	440
Industrial Inputs Totals	4,443	937	236	1.6	1.4	\$22.23	36%	13,142	1,258
PURCHASERS AND DISTRIBUTORS									
HMO Medical Centers	449	25	(73)	1.5	1.4	\$17.47	53%	160	393
Outpatient Mental Health and Substance Abuse Centers	480	51	41	1.6	1.4	\$20.48	53%	108	487
Veterinary Services	667	137	27	1.4	1.4	\$13.15	24%	25	120
Offices of Dentists	1,535	233	37	1.6	1.4	\$19.77	33%	5	438
Offices of Physical, Occupational and Speech Therapists, and Audiologists	588	92	(47)	1.5	1.4	\$18.33	54%	2	155
Nursing Care Facilities	1,962	172	(79)	1.5	1.4	\$14.30	18%	1	232
Purchasers Totals	5,681	710	(94)	1.5	1.4	\$16.83	32%	300	1,826

DESCRIPTION	2012 JOBS	2012-18 JOB CHANGE	2012-18 SHIFT SHARE	JOBS MULTIPLIER	EARNINGS MULTIPLIER	2011 INDUSTRY AVERAGE WAGE	% OCCS HIGH WAGE	CORE IMPORTS (K)	SALES FROM GROUP (K)
TDL									
General Freight Trucking, Local	308	(67)	(78)	1.6	1.7	\$14.42	2%	299	16
General Warehousing and Storage	555	44	(18)	1.6	1.4	\$18.11	11%	181	18
General Freight Trucking, Long-Distance, Less Than Truckload	255	64	41	2.0	1.6	\$22.59	3%	121	18
General Freight Trucking, Long-Distance, Truckload	742	15	(28)	1.9	1.7	\$20.45	3%	119	52
Rail Transportation	222	10	9	2.9	1.8	\$42.90	67%	37	37
Specialized Freight (except Used Goods) Trucking, Local	538	(5)	(42)	1.8	1.7	\$16.60	5%	23	33
TDL Totals	2,620	61	(115)	1.8	1.6	\$20.57	10%	780	174
Cluster Total	22,504	3,137	244	1.7	1.5	\$22.60	38%	22,306	8,084

Source: EMSI Complete Employment – 1.2012; EMSI input-output model calculations

Unlike the previously discussed clusters, there is not as much buying and selling occurring between the core industries in the chemical product and plastics manufacturing cluster. Rather, core industries from the other clusters are buying from the chemical product and plastics manufacturing cluster, particularly from the plastics bottle manufacturing and basic organic chemical manufacturing industries. Out of

this cluster's core industries, glass product manufacturing is buying the most from the other core industries. Industrial inputs are importing the largest amount into the region; around 80% of their total requirements. As seen in the table below, this is primarily due to plastics material and resin manufacturing.

TABLE 11: CHEMICAL PRODUCT AND PLASTICS MANUFACTURING DETAILED CLUSTER DATA

DESCRIPTION	2012 JOBS	2012-18 JOB CHANGE	2012-18 SHIFT SHARE	JOBS MULTIPLIER	EARNINGS MULTIPLIER	2011 INDUSTRY AVERAGE WAGE	% OCGS HIGH WAGE	CORE IMPORTS (K)	SALES FROM GROUP (K)
CORE									
Glass Product Mfg Made of Purchased Glass	514	65	85	2.0	1.7	\$19.80	14%	209	4,691
All Other Miscellaneous Chemical Product and Preparation Mfg	122	(12)	(25)	3.0	2.2	\$25.89	57%	239	2,858
All Other Basic Inorganic Chemical Mfg	67	(23)	(13)	5.2	2.2	\$51.16	25%	187	2,402
All Other Basic Organic Chemical Mfg	40	23	28	1.7	1.5	\$17.90	19%	3,102	1,953
Other Pressed and Blown Glass and Glassware Mfg	13	3	9	2.0	1.8	\$20.04	10%	2,351	12
Plastics Bottle Mfg	83	(35)	(44)	1.9	1.5	\$25.67	100%	16	656
Plastics Pipe and Pipe Fitting Mfg	124	(7)	(5)	1.8	1.5	\$22.58	59%	99	411
Plastics Plumbing Fixture Mfg	85	(68)	(31)	1.8	1.7	\$16.84	99%	2	298
Core Totals	1,048	(54)	4	2.3	1.8	\$23.00	39%	6,204	13,281
INDUSTRIAL INPUTS									
Research and Development in the Physical, Engineering, and Life Sciences (except Biotechnology)	447	55	(2)	1.8	1.4	\$23.50	63%	1,616	86
Engineering Services	696	95	18	2.0	1.4	\$32.77	58%	1,167	68
Plastics Material and Resin Mfg	0	0	0	2.4	1.6	\$34.74	53%	17,203	43
Corporate, Subsidiary, and Regional Managing Offices	843	55	(4)	1.8	1.4	\$27.41	46%	6,193	10
All Other Professional, Scientific, and Technical Services	1,545	197	109	1.3	1.4	\$12.08	4%	86	5
Instruments and Related Products Mfg for Measuring, Displaying, and Controlling Industrial Process Variables	32	8	8	2.5	1.7	\$34.79	55%	681	3
Flat Glass Mfg	0	0	(0)	2.4	1.8	\$37.04	5%	3,806	0
Corrugated and Solid Fiber Box Mfg	151	(44)	(27)	3.6	2.4	\$31.77	98%	202	135
Industrial Inputs Totals	3,714	366	101	1.7	1.5	\$21.81	35%	30,955	350
PURCHASERS AND DISTRIBUTORS									
Soft Drink Mfg	145	(10)	(12)	3.4	2.3	\$25.59	23%	1	6,038
Sawmills	2,341	(58)	206	2.7	2.0	\$23.54	9%	5	3,611
Pulp Mills	207	7	8	3.2	2.1	\$30.83	8%	0	3,026
Crop Production	3,736	419	615	1.5	1.8	\$10.01	4%	31	2,297
Light Truck and Utility Vehicle Mfg	100	(60)	(20)	1.6	1.4	\$23.22	13%	0	2,285
General Medical and Surgical Hospitals (Private)	4,733	459	101	2.0	1.5	\$28.50	50%	2	811

DESCRIPTION	2012 JOBS	2012-18 JOB CHANGE	2012-18 SHIFT SHARE	JOBS MULTIPLIER	EARNINGS MULTIPLIER	2011 INDUSTRY AVERAGE WAGE	% OCCS HIGH WAGE	CORE IMPORTS (K)	SALES FROM GROUP (K)
Offices of Dentists	1,535	233	37	1.6	1.4	\$19.77	33%	0	107
Fruit and Vegetable Canning	123	(16)	(8)	3.7	2.7	\$25.03	16%	1	297
Boat Building	160	(103)	(47)	1.8	1.7	\$18.80	15%	0	248
All Other Motor Vehicle Parts Mfg	175	(11)	(35)	2.4	2.0	\$20.51	29%	11	152
Purchasers Totals	13,255	860	847	2.0	1.7	\$21.11	26%	52	18,871
TDL									
General Freight Trucking, Long-Distance, Truckload	742	15	(28)	1.9	1.7	\$20.45	3%	140	96
General Freight Trucking, Long-Distance, Less Than Truckload	255	64	41	2.0	1.6	\$22.59	3%	142	34
General Warehousing and Storage	555	44	(18)	1.6	1.4	\$18.11	11%	90	31
General Freight Trucking, Local	308	(67)	(78)	1.6	1.7	\$14.42	2%	352	28
Specialized Freight (except Used Goods) Trucking, Local	538	(5)	(42)	1.8	1.7	\$16.60	5%	27	60
Rail Transportation	222	10	9	2.9	1.8	\$42.90	67%	230	57
TDL Totals	2,620	61	(115)	1.8	1.6	\$20.57	10%	981	305
Cluster Total	20,637	1,233	837	1.9	1.6	\$21.26	26%	38,193	32,808

Source: EMSI Complete Employment – 1.2012; EMSI input-output model calculations

Since the IT/telecommunications core industries are very interlinked with each other, they are buying and selling a lot amongst each other. However, purchasers and distributors buy more from the core industries. As seen in the table below, this is primarily due to hospitals and investment

advice industries. Quantitatively, the core industries import the most into the region. However, in percentage terms, this is less than 50% of their requirements. Industrial inputs, on the other hand, import around 70% of their requirements, primarily in terms of administrative and engineering services.

TABLE 12: IT/TELECOMMUNICATIONS DETAILED CLUSTER DATA

DESCRIPTION	2012 JOBS	2012-18 JOB CHANGE	2012-18 SHIFT SHARE	JOBS MULTIPLIER	EARNINGS MULTIPLIER	2011 INDUSTRY AVERAGE WAGE	% OCCS HIGH WAGE	CORE IMPORTS (K)	SALES FROM GROUP (K)
CORE									
Wired Telecomm Carriers	529	11	22	3.4	2.2	\$28.20	51%	11,040	13,014
Wireless Telecomm Carriers (except Satellite)	117	(4)	(4)	2.6	1.9	\$25.15	38%	3,327	2,525
Data Processing, Hosting, and Related Services	121	16	(7)	1.7	1.7	\$13.70	8%	1,371	352
Computer Systems Design Services	724	243	87	1.8	1.4	\$31.62	52%	831	1,278
Software Publishers	162	31	7	2.5	1.8	\$24.68	61%	774	464
Custom Computer Programming Services	427	47	(32)	1.5	1.4	\$19.08	35%	589	287
Other Computer Related Services	151	(35)	(34)	1.7	1.4	\$27.42	46%	201	290
Computer Facilities Management Services	55	5	7	1.9	1.4	\$34.61	60%	96	113
Computer and Office Machine Repair and Maintenance	121	4	9	1.5	1.4	\$16.09	29%	12	60
Core Totals	2,407	318	56	2.2	1.6	\$25.99	45%	18,241	18,384
INDUSTRIAL INPUTS									
Engineering Services	696	95	18	2.0	1.4	\$32.77	58%	7,207	1,144
Administrative and General Mngt Consulting Services	1,161	363	38	1.6	1.5	\$20.88	55%	1,813	566
Office Administrative Services	581	76	4	1.5	1.4	\$15.40	22%	1,151	292
All Other Telecomm	30	7	2	2.2	2.1	\$16.85	43%	971	397
R&D in the Physical, Engineering, and Life Sciences	447	55	(2)	1.8	1.4	\$23.50	63%	535	520
All Other Professional, Scientific, and Technical Services	1,545	197	109	1.3	1.4	\$12.08	4%	200	351
Graphic Design Services	252	52	14	1.3	1.4	\$9.93	14%	577	62
Printed Circuit Assembly (Electronic Assembly) Mfg	1	0	1	1.2	1.3	\$13.54	24%	478	0
Other Communication and Energy Wire Mfg	0	0	0	1.7	1.4	\$28.87	30%	466	0
Internet Publishing and Broadcasting and Web Search Portals	74	7	(11)	2.0	1.6	\$28.17	39%	223	260
Industrial Inputs Totals	4,787	852	172	1.6	1.4	\$18.86	33%	13,622	3,593
PURCHASERS AND DISTRIBUTORS									
Telemarketing Bureaus and Other Contact Centers	828	168	95	1.3	1.4	\$10.60	15%	218	579
Investment Advice	1,185	391	165	3.8	1.5	\$94.83	28%	122	11,087
Computer and Computer Peripheral Equipment and Software Merchant Wholesalers	791	210	269	4.6	1.6	\$87.34	51%	18	2,552
Offices of Physicians	2,938	589	131	1.8	1.4	\$29.44	40%	9	1,608

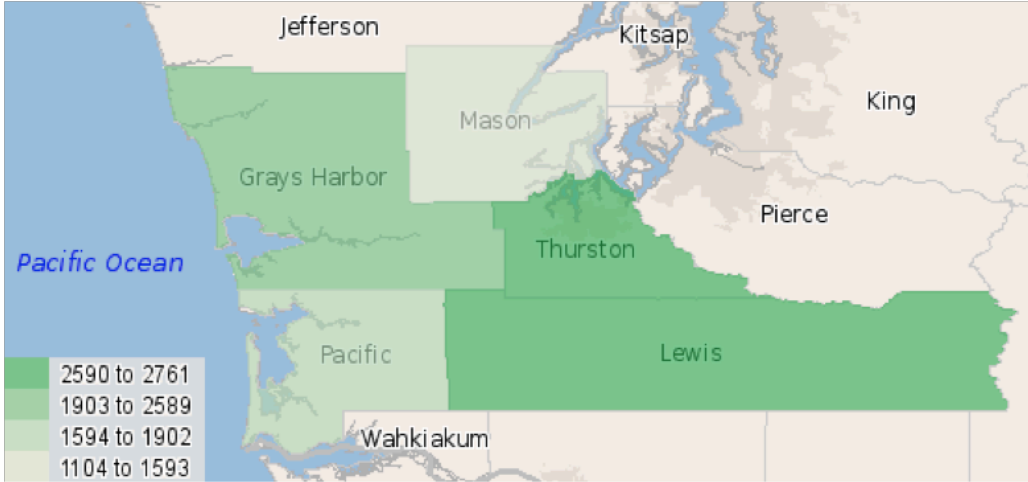
DESCRIPTION	2012 JOBS	2012-18 JOB CHANGE	2012-18 SHIFT SHARE	JOBS MULTIPLIER	EARNINGS MULTIPLIER	2011 INDUSTRY AVERAGE WAGE	% OCCS HIGH WAGE	CORE IMPORTS (K)	SALES FROM GROUP (K)
General Medical and Surgical Hospitals (Private)	4,733	459	101	2.0	1.5	\$28.50	50%	8	3,216
Sawmills	2,341	(58)	206	2.7	2.0	\$23.54	9%	2	2,826
Offices of Dentists	1,535	233	37	1.6	1.4	\$19.77	33%	0	579
Computer Training (Private)	149	(80)	(60)	3.4	1.4	\$83.84	35%	0	939
Purchasers Totals	14,500	1,912	944	2.3	1.5	\$35.14	36%	376	23,385
TDL									
General Freight Trucking, Long-Distance, Less Than Truckload	255	64	41	2.0	1.6	\$22.59	3%	21	184
General Warehousing and Storage	555	44	(18)	1.6	1.4	\$18.11	11%	60	173
General Freight Trucking, Local	308	(67)	(78)	1.6	1.7	\$14.42	2%	51	155
General Freight Trucking, Long-Distance, Truckload	742	15	(28)	1.9	1.7	\$20.45	3%	20	519
Rail Transportation	222	10	9	2.9	1.8	\$42.90	67%	9	630
Specialized Freight (except Used Goods) Trucking, Local	538	(5)	(42)	1.8	1.7	\$16.60	5%	4	325
TDL Totals	2,620	61	(115)	1.8	1.6	\$20.57	10%	165	1,985
Cluster Total	24,314	3,143	1,056	2.1	1.5	\$29.46	33%	32,405	47,348

Source: EMSI Complete Employment – 1.2012; EMSI input-output model calculations

APPENDIX D: EMPLOYMENT DISTRIBUTION

This appendix contains GIS maps for every cluster displaying the employment distribution across the five counties in the region.

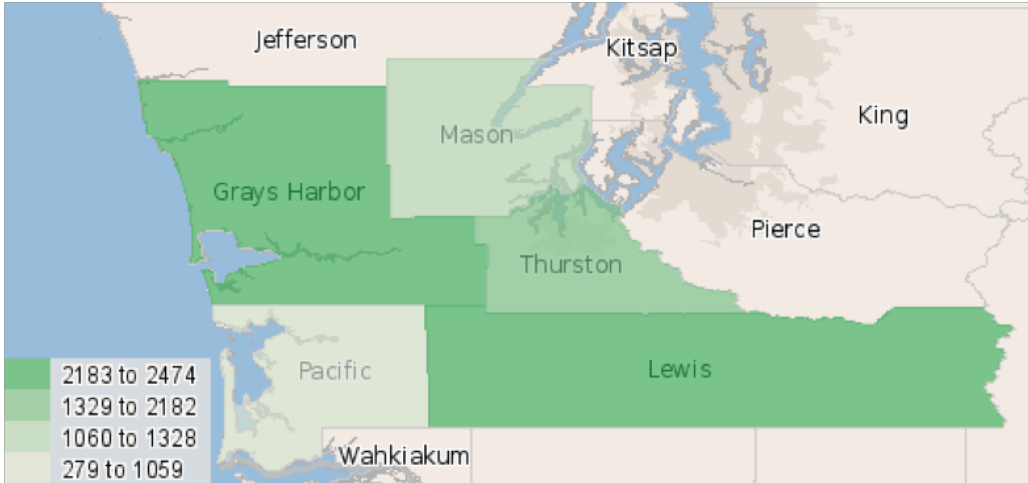
FIGURE 3: FOOD PRODUCTION



COUNTY	2012 JOBS
Thurston	2,761
Lewis	2,590
Grays Harbor	1,903
Pacific	1,594
Mason	1,104

Source: EMSI Complete Employment – 1.2012

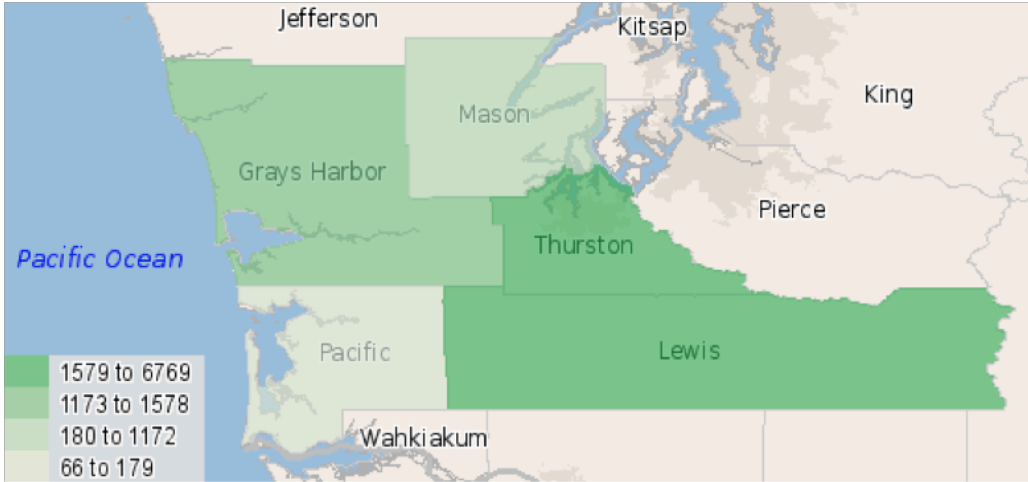
FIGURE 4: WOOD PRODUCT AND PAPER MANUFACTURING



COUNTY	2012 JOBS
Lewis	2,474
Grays Harbor	2,183
Thurston	1,329
Mason	1,060
Pacific	279

Source: EMSI Complete Employment – 1.2012

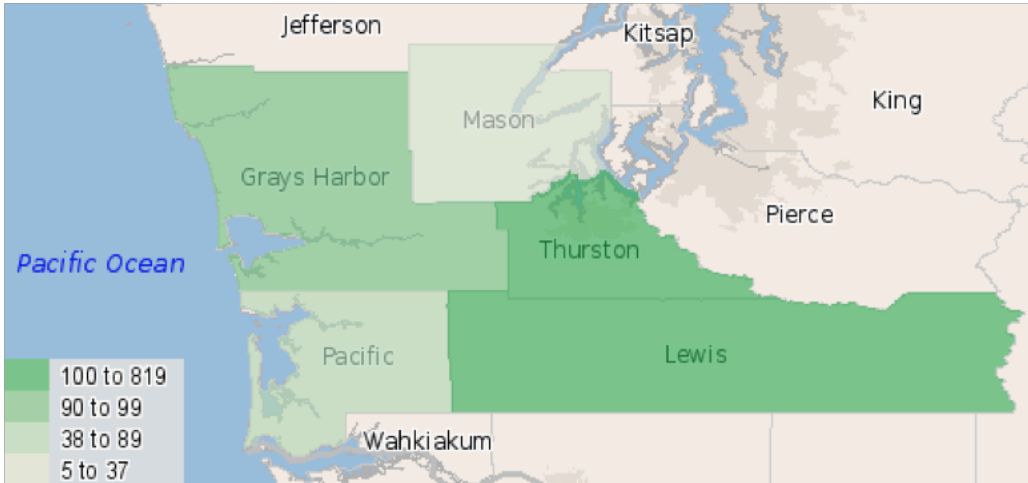
FIGURE 5: LIFE SCIENCES



COUNTY	2012 JOBS
Thurston	6,769
Lewis	1,579
Grays Harbor	1,173
Mason	180
Pacific	66

Source: EMSI Complete Employment – 1.2012

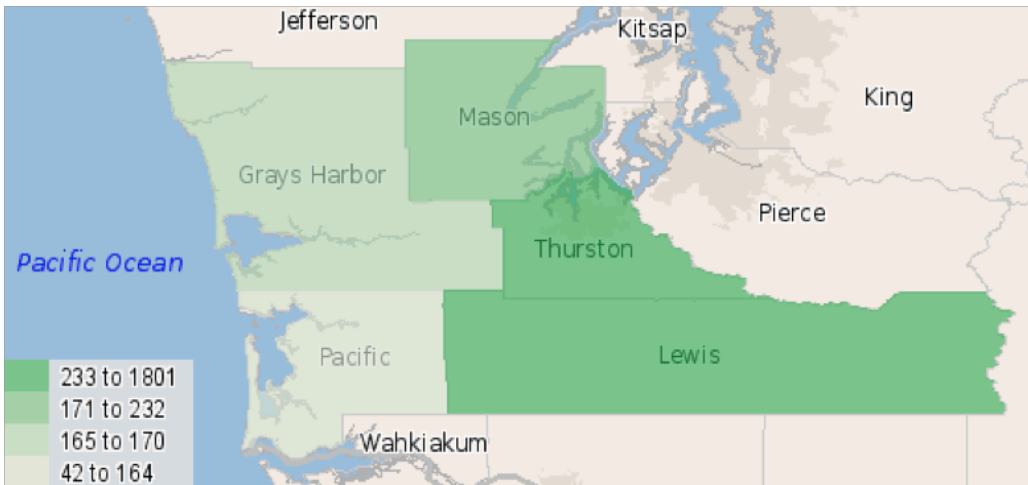
FIGURE 6: CHEMICAL PRODUCT AND PLASTICS MANUFACTURING



COUNTY	2012 JOBS
Thurston	819
Lewis	100
Grays Harbor	90
Pacific	38
Mason	<10

Source: EMSI Complete Employment – 1.2012

FIGURE 7: IT/TELECOMMUNICATIONS



COUNTY	2012 JOBS
Thurston	1801
Lewis	233
Mason	171
Grays Harbor	165
Pacific	42

Source: EMSI Complete Employment – 1.2012

APPENDIX E: CLUSTER OCCUPATION OVERVIEW

The consultants used EMSI industry staffing pattern data to estimate the number of people employed in a given occupation within each set of core industries. The occupations were prioritized by the number of jobs within the core industries and the level of education typically required for the occupation. Also, the occupations were broken out by whether they are “primary” or “secondary” occupations. Primary occupations mean the workers require cluster-specific skillsets. For example, in the IT/telecommunications cluster, computer programmers are considered a primary occupation because they must have a high level of understanding of computers and information systems. Secondary occupations, on the other hand, are those necessary to support the core industries but do not require cluster-specific skillsets. For example,

accountants are needed within the information technology cluster, but do not require specific skills such as knowledge of computer programming languages.

The following tables display the top primary and secondary occupations found within each cluster. Further analysis was also done to see whether a relevant regional postsecondary education program exists in the region for the occupation, and if so, the number of people completing degrees for that program. By comparing the number of annual openings for an occupation with the number of people completing the necessary degrees for that occupation, it can be determined whether the region is supplying enough workers for the occupations critical for the core industries.

TABLE 13: FOOD PRODUCTION OCCUPATION AND EDUCATION OVERVIEW

OCCUPATION	2012 JOBS IN CORE INDUSTRIES	ANNUAL OPENINGS†	% OF THE JOBS ACROSS ALL INDUSTRIES	MEDIAN HOURLY EARNINGS	EDUCATION LEVEL	COMPLETIONS
Farmers and Ranchers	4,105	86	98%	\$8.76	Long-term OTJ training	1
Farmworkers and Laborers, Crop, Nursery, and Greenhouse	1,140	70	85%	\$10.44	Short-term OTJ training	–
Fishers and Related Fishing Workers	859	24	96%	\$15.55	Mod-term OTJ training	1
Farm, Ranch, & Other Agricultural Managers	180	11	95%	\$28.64	Bachelor’s + and work exp.	–
Farmworkers, Farm and Ranch Animals	200	12	86%	\$10.30	Short-term OTJ training	–
Managers, All Other*	130	115	5%	\$22.28	Work exp. in related occ.	228
First-Line Supervisors/Managers of Farming, Fishing, and Forestry Workers	96	14	25%	\$27.75	Vocational	–
Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products*	65	64	4%	\$21.22	Work exp. in related occ.	1
Truck Drivers, Heavy and Tractor-Trailer*	77	76	3%	\$18.71	Short-term OTJ training	92
Truck Drivers, Light or Delivery Services*	52	35	4%	\$13.95	Short-term OTJ training	92
Maintenance and Repair Workers, General*	55	41	3%	\$17.87	Mod-term OTJ training	–
Bookkeeping, Accounting, & Auditing Clerks*	75	50	3%	\$15.82	Mod-term OTJ training	84
Inspectors, Testers, Sorters, Samplers, and Weighers*	42	8	13%	\$19.55	Mod-term OTJ training	–
General and Operations Managers*	31	47	2%	\$42.38	Bachelor’s + and work exp.	209
First-Line Supervisors/Managers of Production and Operating Workers*	46	7	9%	\$28.82	Work exp. in related occ.	–
Top Occupation Totals	7,153	660	32%	\$11.63		708**

* Secondary occupation

** Represents duplication in program completions for critical occupations

† Represents annual openings across all industries, not just within the cluster

Source: EMSI Complete Employment - 2012.1 and IPEDS.

TABLE 14: WOOD PRODUCT AND PAPER MANUFACTURING OCCUPATION AND EDUCATION OVERVIEW

OCCUPATION	2012 JOBS IN CORE INDUSTRIES	ANNUAL OPENINGS†	% OF THE JOBS ACROSS ALL INDUSTRIES	MEDIAN HOURLY EARNINGS	EDUCATION LEVEL	COMPLETIONS
Logging Equipment Operators	641	20	99%	\$18.90	Mod-term OTJ training	-
Sawing Machine Setters, Operators, and Tenders, Wood	574	19	99%	\$20.90	Mod-term OTJ training	-
Woodworking Machine Setters, Operators, and Tenders, Except Sawing	401	11	94%	\$15.55	Mod-term OTJ training	-
Logging Workers, All Other	259	9	100%	\$17.73	Mod-term OTJ training	-
Truck Drivers, Heavy and Tractor-Trailer*	290	76	11%	\$18.71	Short-term OTJ training	92
First-Line Supervisors/Managers of Farming, Fishing, and Forestry Workers	214	14	55%	\$27.75	Vocational	-
Fallers	199	6	99%	\$19.53	Mod-term OTJ training	-
Team Assemblers*	218	20	29%	\$13.59	Mod-term OTJ training	-
Cabinetmakers and Bench Carpenters	142	7	78%	\$13.70	Long-term OTJ training	-
Log Graders and Scalers	112	4	97%	\$25.26	Mod-term OTJ training	-
Forest and Conservation Workers	140	5	77%	\$16.01	Mod-term OTJ training	2
Millwrights	103	3	71%	\$22.06	Long-term OTJ training	-
General and Operations Managers*	63	47	4%	\$42.38	Bachelor's + and work exp.	209
Foresters	52	4	26%	\$25.31	Bachelor's	2
Conservation Scientists	26	3	16%	\$29.31	Bachelor's	2
Top Occupation Totals	3,434	248	41%	\$19.57		307**

Source: EMSI Complete Employment - 2012.1 and IPEDS.

** Represents duplication in program completions for critical occupations

† Represents annual openings across all industries, not just within the cluster

Source: EMSI Complete Employment - 2012.1 and IPEDS.

TABLE 15: LIFE SCIENCES OCCUPATION AND EDUCATION OVERVIEW

OCCUPATION	2012 JOBS IN CORE INDUSTRIES	ANNUAL OPENINGS†	% OF THE JOBS ACROSS ALL INDUSTRIES	MEDIAN HOURLY EARNINGS	EDUCATION LEVEL	COMPLETIONS
Registered Nurses	1,562	112	53%	\$34.09	Associate's	112
Medical Assistants	517	34	66%	\$15.47	Mod-term OTJ training	38
Medical Secretaries	572	37	55%	\$17.34	Mod-term OTJ training	15
Clinical, Counseling, & School Psychologists	323	32	43%	\$30.24	Doctoral	60
Management Analysts*	245	78	16%	\$28.05	Bachelor's + and work exp.	155
Physicians and Surgeons, All Other	260	14	74%	\$69.68	First professional	-
Nursing Aides, Orderlies, and Attendants	245	40	16%	\$11.62	Vocational	232
Radiologic Technologists and Technicians	170	7	78%	\$28.30	Associate's	-
Physician Assistants	99	7	73%	\$40.75	Master's	-
Family and General Practitioners	115	7	71%	\$71.08	First professional	-
Surgical Technologists	101	7	71%	\$18.67	Vocational	1
Medical Records and Health Information Technicians	127	9	53%	\$14.98	Associate's	20
First-Line Supervisors/Managers of Office and Administrative Support Workers*	131	51	8%	\$21.61	Work exp. in related occ.	25
Computer Software Engineers, Sys. Software*	97	31	8%	\$40.71	Bachelor's	6
Network & Computer Sys. Administrators*	94	34	7%	\$31.73	Bachelor's	9
Top Occupation Totals	4,658	500	33%	\$29.91		673**

* Secondary occupation

** Represents duplication in program completions for critical occupations

† Represents annual openings across all industries, not just within the cluster

Source: EMSI Complete Employment - 2012.1 and IPEDS.

TABLE 16: CHEMICAL PRODUCT AND PLASTICS MANUFACTURING OCCUPATION AND EDUCATION OVERVIEW

OCCUPATION	2012 JOBS IN CORE INDUSTRIES	ANNUAL OPENINGS†	% OF THE JOBS ACROSS ALL INDUSTRIES	MEDIAN HOURLY EARNINGS	EDUCATION LEVEL	COMPLETIONS
Chemical Plant and System Operators	60	3	71%	\$26.65	Long-term OTJ training	-
Team Assemblers*	62	20	8%	\$13.59	Mod-term OTJ training	-
Extruding and Drawing Machine Setters, Operators, and Tenders, Metal and Plastic	47	3	43%	\$11.29	Mod-term OTJ training	-
Maintenance and Repair Workers, General*	33	41	2%	\$17.87	Mod-term OTJ training	-
Sales Representatives, Wholesale & Mfg, Except Technical and Scientific Products*	18	64	1%	\$21.22	Work exp. in related occ.	1
Molding, & Casting Machine Setters, Operators, and Tenders, Metal & Plastic	18	2	30%	\$13.07	Mod-term OTJ training	-
Inspectors, Testers, Sorters, and Samplers*	24	8	7%	\$19.55	Mod-term OTJ training	-
First-Line Supervisors/Managers of Production and Operating Workers*	40	7	8%	\$28.82	Work exp. in related occ.	-
Industrial Production Managers*	16	5	11%	\$37.88	Work exp. in related occ.	155
Mixing & Blending Machine Setters, Operators, and Tenders	15	2	24%	\$18.10	Mod-term OTJ training	-
Extruding, Forming, Pressing, and Compacting Machine Setters, Operators, and Tenders*	17	2	23%	\$12.54	Mod-term OTJ training	-
General and Operations Managers*	14	47	1%	\$42.38	Bachelor's + and work exp.	209
Industrial Machinery Mechanics*	12	6	7%	\$19.40	Long-term OTJ training	-
Accountants and Auditors*	11	62	1%	\$25.39	Bachelor's	18
Network & Computer Sys. Administrators*	12	34	1%	--	Bachelor's	9
Top Occupation Totals	399	306	4%	\$20.04		392**

Source: EMSI Complete Employment - 2012.1 and IPEDS.

** Represents duplication in program completions for critical occupations

† Represents annual openings across all industries, not just within the cluster

Source: EMSI Complete Employment - 2012.1 and IPEDS.

TABLE 17: IT/TELECOMMUNICATIONS OCCUPATION AND EDUCATION OVERVIEW

OCCUPATION	2012 JOBS IN CORE INDUSTRIES	ANNUAL OPENINGS†	% OF THE JOBS ACROSS ALL INDUSTRIES	MEDIAN HOURLY EARNINGS	EDUCATION LEVEL	COMPLETIONS
Network Sys. & Data Communications Analysts	173	22	45%	\$23.43	Bachelor's	9
Computer Software Eng., Systems Software	362	31	29%	\$40.71	Bachelor's	6
Computer Systems Analysts	120	14	36%	\$31.60	Bachelor's	4
Computer Programmers	123	8	43%	\$32.01	Bachelor's	12
Computer Support Specialists	101	23	14%	\$22.22	Associate's	9
Computer Software Engineers, Applications	84	9	37%	\$33.76	Bachelor's	6
Customer Service Representatives	54	93	3%	\$13.19	Mod-term OTJ training	1
Network & Computer Systems Administrators	128	34	9%	\$31.73	Bachelor's	9
Telecommunications Equipment Installers and Repairers, Except Line Installers	103	4	57%	\$28.68	Vocational	-
Computer, Automated Teller, and Office Machine Repairers	68	5	45%	\$13.70	Vocational	-
Telecom. Line Installers and Repairers	91	4	56%	\$23.19	Long-term OTJ	-
Computer & Information Scientists, Research	18	2	40%	\$40.93	Doctoral	10
Graphic Designers*	15	20	4%	\$16.71	Bachelor's	2
Business Operations Specialists, All Other*	12	29	1%	\$28.17	Bachelor's	-
Bookkeeping, Accounting, & Auditing Clerks*	17	50	1%	\$15.82	Mod-term OTJ training	84
Top Occupation Totals	1,469	348	13%	\$29.93		152**

* Secondary occupation

** Represents duplication in program completions for critical occupations

† Represents annual openings across all industries, not just within the cluster

Source: EMSI Complete Employment - 2012.1 and IPEDS.

APPENDIX F: TOURISM AND RECREATION

This cluster takes into account the strong presence of tribal casinos and the tourism opportunities presented by the plethora of outdoor activities available in the region. The core industries therefore range from gambling to camping to sporting to creative to accommodation industries. The industrial inputs include the support activities necessary for these core industries. Industries benefiting from tourism, such as restaurants, represent the purchasing industries.

There is one caveat before diving into the cluster data results: casino hotels and other gambling industries owned by tribal entities are not required to report data to the federal government. This presented a challenge in collecting the necessary data for creating a better understanding of the presence of this cluster in the region. Where possible, data were filled in by a few of the tribal entities; however, it remains somewhat incomplete.

The tourism and recreation cluster as a whole is the largest out of all of the identified targeted industry clusters and is expected to see the most job growth from 2012 to 2018. This is primarily because it includes industries that typically have large employment levels, such as hospitals, hotels, restaurants, and independent artists. However, the cluster also has one of the lowest wages out of all of the others, and the core industries rank fairly low in terms of the presence of

occupations with high wages.

The lack of tribal entity data contributed to low levels of reported imports (requirements) and sales. From the available information, with the exception of hotels, there is not much buying and selling occurring within the core industries. In terms of purchasing industries, as presented in Table 19, the core industries sell the most to full-service restaurants. High levels of imports are mostly attributed to independent artists, writers, and performers within the core industries, and administrative and general management consulting within the industrial input industries.

In general, the majority of occupations within the tourism and recreation cluster require short- and long-term on-the-job training. The priority occupations mostly require acquired skills or talent, such as musicians/singers, photographers, actors, cooks, writers, and artists. Regional programs are available for musicians/singers and cooks. Other priority occupations are writers/authors, art directors, and gaming dealers; these do require postsecondary education, but there are currently no relevant programs within the region. The secondary occupations include retail salespersons, hotel clerks, bookkeeping clerks, and various other service industry workers. Postsecondary programs are only available for office and bookkeeping clerks.

TABLE 18: TOURISM AND RECREATION CLUSTER SUMMARY

DESCRIPTION	2012 JOBS	2012-18 JOB CHANGE	2012-18 SHIFT SHARE	JOBS MULTIPLIER	EARNINGS MULTIPLIER	2011 INDUSTRY AVERAGE WAGE	% OCCS HIGH WAGE	TOTAL IMPORTS (K)	TOTAL SALES (K)
CORE									
Independent Artists, Writers, and Performers	1,212	21	(40)	1.1	1.4	\$4.34	3%	16,481	30,121
Hotels (except Casino Hotels) and Motels	2,146	87	(8)	1.5	1.8	\$9.05	24%	78,804	166,629
Casino Hotels	0	0	0	1.5	1.4	\$0.00	0%	43,471	-
Musical Groups and Artists	47	7	(1)	1.2	1.5	\$6.52	3%	9,376	1,067
Other Spectator Sports	258	74	35	1.1	1.4	\$2.22	2%	3,121	2,235
Theater Companies & Dinner Theaters	104	16	7	1.3	1.5	\$8.14	20%	5,076	3,253
Racetracks	176	15	5	1.1	1.4	\$2.25	3%	1,031	1,701
Casinos (except Casino Hotels)	2,435	(1)	(2)	2.4	1.4	\$54.97	9%	7,242	2,274
All Other Amusement and Recreation Industries	324	59	21	1.2	1.5	\$4.89	7%	3,915	7,668
Photography Studios, Portrait	280	69	25	1.1	1.4	\$4.98	5%	2,104	4,009

DESCRIPTION	2012 JOBS	2012-18 JOB CHANGE	2012-18 SHIFT SHARE	JOBS MULTIPLIER	EARNINGS MULTIPLIER	2011 INDUSTRY AVERAGE WAGE	% OCCS HIGH WAGE	TOTAL IMPORTS (K)	TOTAL SALES (K)
Scenic and Sightseeing Transportation, Water	70	17	4	1.5	1.5	\$14.27	17%	291	4,527
Art Dealers	126	10	10	1.2	1.5	\$6.44	1%	1,081	4,265
Sporting Goods Stores	618	111	43	1.4	1.6	\$9.75	9%	1,101	35,476
Gift, Novelty, and Souvenir Stores	701	5	96	1.2	1.6	\$4.54	3%	826	19,418
Historical Sites	26	1	(2)	1.3	1.4	\$8.71	28%	713	965
Other Gambling Industries	165	22	(38)	1.4	1.5	\$14.02	16%	366	11,847
RV (Recreational Vehicle) Parks and Campgrounds	192	7	(15)	1.4	1.8	\$7.79	7%	179	14,307
Fish and Seafood Markets	68	7	8	1.3	1.5	\$6.54	6%	81	2,661
Nature Parks and Other Similar Institutions	19	(4)	(6)	1.4	1.4	\$12.68	63%	42	1,116
Bed-and-Breakfast Inns	63	4	4	1.4	1.7	\$8.83	5%	106	4,740
Additional tribal information	59								
Core Totals	9,089	527	146	1.6	1.5	\$19.80	11%	175,407	318,278
Inputs	6,225	1,598	420	1.5	1.4	\$14.84	27%	297,849	461,671
Purchasers and Distributors	21,240	1,194	(348)	1.7	1.6	\$18.82	20%	389,864	2,214,447
TDL	2,620	61	(115)	1.8	1.6	\$20.57	10%	60,475	365,249
Cluster Total	39,174	3,380	103	1.6	1.5	\$18.53	19%	923,594	3,359,644

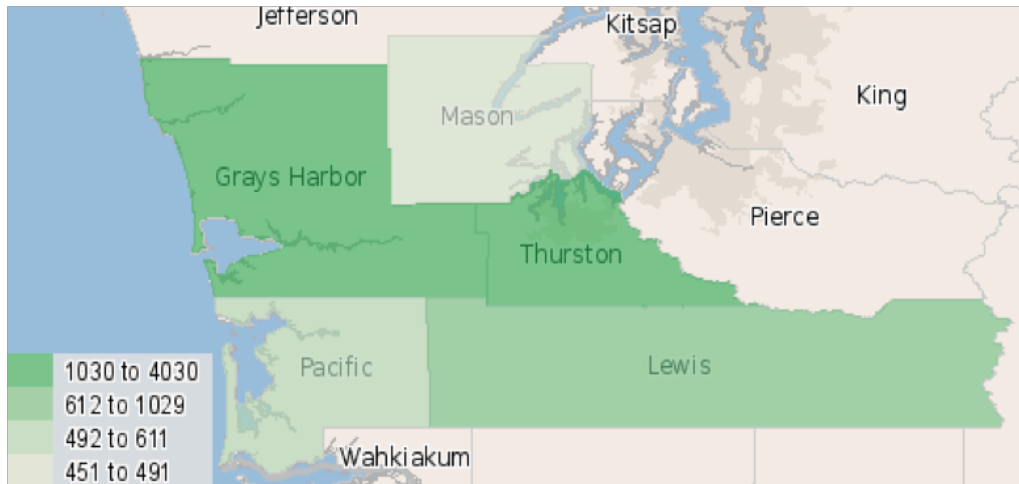
Source: EMSI Complete Employment – 1.2012; EMSI input-output model calculations

TABLE 19: TOURISM AND RECREATION DETAILED CLUSTER DATA

DESCRIPTION	2012 JOBS	2012-18 JOB CHANGE	2012-18 SHIFT SHARE	JOBS MULTIPLIER	EARNINGS MULTIPLIER	2011 INDUSTRY AVERAGE WAGE	% OCCS HIGH WAGE	CORE IMPORTS (K)	SALES FROM GROUP (K)
CORE									
Independent Artists, Writers, and Performers	1,212	21	(40)	1.1	1.4	\$4.34	3%	1,140	55
Hotels (except Casino Hotels) and Motels	2,146	87	(8)	1.5	1.8	\$9.05	24%	308	658
Casino Hotels	0	0	0	1.5	1.4	\$0.00	0%	170	0
Musical Groups and Artists	47	7	(1)	1.2	1.5	\$6.52	3%	87	90
Other Spectator Sports	258	74	35	1.1	1.4	\$2.22	2%	72	31
Theater Companies & Dinner Theaters	104	16	7	1.3	1.5	\$8.14	20%	47	278
Racetracks	176	15	5	1.1	1.4	\$2.25	3%	20	24
Casinos (except Casino Hotels)	2,435	(1)	(2)	2.4	1.4	\$54.97	9%	7	11
All Other Amusement and Recreation Industries	324	59	21	1.2	1.5	\$4.89	7%	7	16
Photography Studios, Portrait	280	69	25	1.1	1.4	\$4.98	5%	6	20
Scenic and Sightseeing Transportation, Water	70	17	4	1.5	1.5	\$14.27	17%	3	7
Art Dealers	126	10	10	1.2	1.5	\$6.44	1%	1	4
Sporting Goods Stores	618	111	43	1.4	1.6	\$9.75	9%	1	35
Gift, Novelty, and Souvenir Stores	701	5	96	1.2	1.6	\$4.54	3%	1	18
Historical Sites	26	1	(2)	1.3	1.4	\$8.71	28%	1	1
Other Gambling Industries	165	22	(38)	1.4	1.5	\$14.02	16%	0	52

DESCRIPTION	2012 JOBS	2012-18 JOB CHANGE	2012-18 SHIFT SHARE	JOBS MULTIPLIER	EARNINGS MULTIPLIER	2011 INDUSTRY AVERAGE WAGE	% OCCS HIGH WAGE	CORE IMPORTS (K)	SALES FROM GROUP (K)
RV Parks and Campgrounds	192	7	(15)	1.4	1.8	\$7.79	7%	0	24
Fish and Seafood Markets	68	7	8	1.3	1.5	\$6.54	6%	0	2
Nature Parks and Other Similar Institutions	19	(4)	(6)	1.4	1.4	\$12.68	63%	0	1
Bed-and-Breakfast Inns	63	4	4	1.4	1.7	\$8.83	5%	0	10
Additional tribal information	59								
Core Totals	9,089	527	146	1.6	1.5	\$19.80	11%	1,873	1,336
INDUSTRIAL INPUTS									
Administrative and General Management Consulting Services	1,161	363	38	1.6	1.5	\$20.88	55%	2,516	243
Marketing Consulting Services	342	124	20	1.4	1.4	\$15.50	50%	797	52
Temporary Help Services	1,126	402	229	1.3	1.4	\$9.85	24%	700	215
Landscaping Services	1,657	345	59	1.2	1.4	\$7.34	3%	609	92
Office Administrative Services	581	76	4	1.5	1.4	\$15.40	22%	451	140
Computer Systems Design Services	724	243	87	1.8	1.4	\$31.62	52%	185	583
Food Service Contractors	489	55	(5)	1.3	1.6	\$8.24	4%	122	70
Soft Drink Mfg	145	(10)	(12)	3.4	2.3	\$25.59	23%	33	68
Industrial Inputs Totals	6,225	1,598	420	1.5	1.4	\$14.84	27%	5,412	1,463
PURCHASERS AND DISTRIBUTORS									
Full-Service Restaurants	5,106	29	(355)	1.4	1.6	\$8.15	2%	366	717
Limited-Service Restaurants	4,633	145	(166)	1.3	1.6	\$6.25	2%	95	501
Computer and Computer Peripheral Equipment and Software Merchant Wholesalers	791	210	269	4.6	1.6	\$87.34	51%	13	654
Supermarkets and Other Grocery Stores	3,039	(238)	(328)	1.5	1.5	\$12.75	6%	9	239
General Medical and Surgical Hospitals (Private)	4,733	459	101	2.0	1.5	\$28.50	50%	4	485
Offices of Physicians	2,938	589	131	1.8	1.4	\$29.44	40%	4	536
Purchasers Totals	21,240	1,194	(348)	1.7	1.6	\$18.82	20%	491	3,133
TDL									
General Warehousing and Storage	555	44	(18)	1.6	1.4	\$18.11	11%	181	36
General Freight Trucking, Local	308	(67)	(78)	1.6	1.7	\$14.42	2%	95	24
General Freight Trucking, Long-Distance, Truckload	742	15	(28)	1.9	1.7	\$20.45	3%	39	80
General Freight Trucking, Long-Distance, Less Than Truckload	255	64	41	2.0	1.6	\$22.59	3%	39	28
Specialized Freight (except Used Goods) Trucking, Local	538	(5)	(42)	1.8	1.7	\$16.60	5%	7	50
Rail Transportation	222	10	9	2.9	1.8	\$42.90	67%	5	104
TDL Totals	2,620	61	(115)	1.8	1.6	\$20.57	10%	366	322
Cluster Total	39,174	3,380	103	1.6	1.5	\$18.53	19%	8,141	6,254

FIGURE 8: TOURISM AND RECREATION



COUNTY	2012 JOBS
Thurston	4,030
Grays Harbor	1,030
Lewis	612
Pacific	492
Mason	451

Source: EMSI Complete Employment – 1.2012

TABLE 20: TOURISM AND RECREATION OCCUPATION AND EDUCATION OVERVIEW

OCCUPATION	2012 JOBS IN CORE INDUSTRIES	ANNUAL OPENINGS†	% OF THE JOBS ACROSS ALL INDUSTRIES	MEDIAN HOURLY EARNINGS	EDUCATION LEVEL	COMPLETIONS
Retail Salespersons	630	243	10%	\$10.31	Short-term OTJ training	-
Hotel, Motel, and Resort Desk Clerks	352	21	94%	\$9.50	Short-term OTJ training	-
Musicians and Singers	361	16	75%	\$14.27	Long-term OTJ training	3
Photographers	237	53	20%	\$13.76	Long-term OTJ training	-
Writers and Authors	299	14	65%	\$14.10	Bachelor's	-
Lodging Managers	186	8	77%	\$14.44	Work exp. in related occ.	-
Art Directors	154	7	69%	\$12.82	Bachelor's + and work exp.	-
Actors	87	5	70%	\$12.96	Long-term OTJ training	-
Managers, All Other*	64	115	3%	\$22.28	Work exp. in related occ.	228
Gaming Dealers	50	19	15%	\$11.36	Vocational	-
Cooks, Restaurant	82	37	7%	\$11.81	Long-term OTJ training	5
Artists and Related Workers, All Other	81	3	78%	\$8.22	Long-term OTJ training	-
Entertainers and Performers, Sports and Related Workers, All Other	60	4	54%	\$15.43	Long-term OTJ training	-
Bookkeeping, Accounting, and Auditing Clerks*	66	50	2%	\$15.82	Moderate-term OTJ training	84
Office Clerks, General*	45	87	1%	\$13.52	Short-term OTJ training	9
Top Occupation Totals	2,754	682	13%	\$12.51		329**

* Secondary occupation

** Represents duplication in program completions for critical occupations

† Represents annual openings across all industries, not just within the cluster

Source: EMSI Complete Employment - 2012.1 and IPEDS.

APPENDIX G: BOUNDARY-SPANNING INDUSTRIES

As discussed in the section on boundary spanners, several industries were identified as being present in multiple clusters. While a selected list was included in Table 21, the following table includes all of those industries. Note that some of the industries serve as a part of the core industries in at least

one sector, while other industries serve only input, purchasing, or TDL roles. They are listed in order of NAICS code, and not necessarily by the level of perceived importance by the consulting team.

TABLE 21: BOUNDARY-SPANNING INDUSTRIES

NAICS CODE	DESCRIPTION	ROLE IN SUPPLY CHAIN	CLUSTER
111000	Crop Production	Core	Food Production
		Purchaser/distributor	Chemical Manu
311411	Frozen Fruit, Juice, and Vegetable Manufacturing	Core	Food Production
		Purchasers/distributors	Wood Product
311421	Fruit and Vegetable Canning	Core	Food Production
		Purchasers/distributors	Wood Product
		Purchaser/distributor	Chemical Manu
311712	Fresh and Frozen Seafood Processing	Core	Food Production
		Purchasers/distributors	Wood Product
312111	Soft Drink Manufacturing	Core	Food Production
		Purchasers/distributors	Wood Product
		Purchaser/distributor	Chemical Manu
		Industrial input	Tourism
321113	Sawmills	Core	Wood Product
		Purchaser/distributor	Chemical Manu
		Purchaser/distributor	IT
		Purchaser/distributor	Tourism
322110	Pulp Mills	Core	Wood Product
		Purchaser/distributor	Chemical Manu
322211	Corrugated and Solid Fiber Box Manufacturing	Core	Wood Product
		Industrial Input	Food Production
		Industrial input	Chemical Manu
325188	All Other Basic Inorganic Chemical Manufacturing	Core	Chemical Manu
		Industrial Input	Wood Product
326160	Plastics Bottle Manufacturing	Industrial Input	Food Production
		Core	Chemical Manu
327215	Glass Product Manufacturing Made of Purchased Glass	Core	Chemical Manu
		Purchasers/distributors	Wood Product
541512	Computer Systems Design Services	Core	IT
		Industrial input	Life Sciences
		Industrial input	Tourism

NAICS CODE	DESCRIPTION	ROLE IN SUPPLY CHAIN	CLUSTER
541712	R&D in the Physical, Engineering, and Life Sciences	Core	Life Sciences
		Industrial Input	Wood Product
		Industrial input	Chemical Manu
		Industrial input	IT
621111	Offices of Physicians (except Mental Health Specialists)	Core	Life Sciences
		Purchaser/distributor	IT
		Purchaser/distributor	Tourism
622110	General Medical and Surgical Hospitals (Private)	Core	Life Sciences
		Purchasers/distributors	Wood Product
		Purchaser/Distributor	Food Production
		Purchaser/distributor	Chemical Manu
		Purchaser/distributor	IT
		Purchaser/distributor	Tourism
721110	Hotels (except Casino Hotels) and Motels	Core	Tourism
		Purchasers/distributors	Wood Product
		Purchaser/Distributor	Food Production
722110	Full-Service Restaurants	Purchaser/Distributor	Food Production
		Purchaser/distributor	Tourism
722211	Limited-Service Restaurants	Purchaser/Distributor	Food Production
		Purchaser/distributor	Tourism
722310	Food Service Contractors	Industrial input	Tourism
		Purchaser/Distributor	Food Production
423430	Computer and Computer Peripheral Equipment and Software Merchant Wholesalers	Purchaser/distributor	IT
		Purchaser/distributor	Tourism
425120	Wholesale Trade Agents and Brokers	Industrial Input	Food Production
		Industrial Input	Wood Product
445110	Supermarkets and Other Grocery (except Convenience) Stores	Purchaser/Distributor	Food Production
		Purchaser/distributor	Tourism
482110	Rail Transportation	TDL	Food Production
		TDL	Wood Product
		TDL	Life Sciences
		TDL	Chemical Manu
		TDL	IT
		TDL	Tourism
484110	General Freight Trucking, Local	TDL	Food Production
		TDL	Wood Product
		TDL	Life Sciences
		TDL	Chemical Manu
		TDL	IT
		TDL	Tourism
484121	General Freight Trucking, Long-Distance, Truckload	TDL	Food Production
		TDL	Wood Product
		TDL	Life Sciences
		TDL	Chemical Manu
		TDL	IT
		TDL	Tourism

NAICS CODE	DESCRIPTION	ROLE IN SUPPLY CHAIN	CLUSTER
484122	General Freight Trucking, Long-Distance, Less Than Truckload	TDL	Food Production
		TDL	Wood Product
		TDL	Life Sciences
		TDL	Chemical Manu
		TDL	IT
		TDL	Tourism
484220	Specialized Freight (except Used Goods) Trucking, Local	TDL	Food Production
		TDL	Wood Product
		TDL	Life Sciences
		TDL	Chemical Manu
		TDL	IT
		TDL	Tourism
493110	General Warehousing and Storage	TDL	Food Production
		TDL	Wood Product
		TDL	Life Sciences
		TDL	Chemical Manu
		TDL	IT
		TDL	Tourism
541330	Engineering Services	Industrial Input	Wood Product
		Industrial input	Life Sciences
		Industrial input	Chemical Manu
		Industrial input	IT
541611	Administrative Management and General Management Consulting Services	Industrial input	Life Sciences
		Industrial input	IT
		Industrial input	Tourism
541990	All Other Professional, Scientific, and Technical Services	Industrial input	Life Sciences
		Industrial input	Chemical Manu
		Industrial input	IT
561110	Office Administrative Services	Industrial input	IT
		Industrial input	Tourism
621210	Offices of Dentists	Purchaser/distributor	Life Sciences
		Purchaser/distributor	Chemical Manu
		Purchaser/distributor	IT