

Workforce Development Council of Seattle-King County

Talent Pipeline Study for Manufacturing

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Submitted by:





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EXECUTIVE SUMMARY

Background and Purpose

The Workforce Development Council of Seattle-King County (WDC) is a nonprofit workforce organization aimed at supporting a strong economy. The WDC is headed by private sector leaders and oversees a wide range of workforce initiatives and programs. Improving skill development, aligning educators with the public workforce system and private employers, and preparing young people for employment in the workforce are key goal areas of the council. In order to better anticipate and plan for forthcoming labor shortages or surpluses, the WDC has commissioned a talent pipeline analysis of the county's manufacturing sector.

Methods

The manufacturing sector comprises manufacturing activities for all durable and non-durable goods in the area, from aerospace—the region's largest manufacturing employer—to seafood processing and plastics manufacturing.

The analysis draws from data published by the Washington State Employment Security Department (ESD), the Bureau of Labor Statistics (BLS) and the National Center for Education Statistics (NCES).

Program completion data used in this analysis is published by the National Center for Education Statistics in the Integrated Postsecondary Education Data System (IPEDS). It is important to note that IPEDS data is published by academic year—which straddles two calendar years—and for the purposes of workforce analysis, completions during academic year 2012-2013 are matched to calendar year 2013, when most individuals who complete programs begin seeking employment.

The data for employment are defined by the four-digit North American Industry Classification System (NAICS) and the data for occupations is defined by the six-digit Standard Occupational Classification (SOC) system. These classifications help frame the demand portion of the analysis, and economic forecasts adhere to these codes. The supply portion of the analysis draws on data that count graduates by degree and unemployment insurance claimants by previous occupation.

Key Findings

King County's manufacturing sector is a significant employer in the region, representing 105,790 employees in 2013. Total employment in manufacturing occupations is slated to grow at a compound annual growth rate (CAGR) of 0.9%. Growth among the core manufacturing occupations through 2023 is expected to total 1,815 jobs per year throughout all industries, including existing employees regularly exiting

employment to retire, move, or change jobs, but not employees who change jobs within the same occupation and area. A machinist who takes another machinist job at a different company in the same area, for example, would not be counted, but a machinist who takes a supervisor position at the same company would.

The **Talent Pipeline Dashboard** on the following page describes occupational employment in the manufacturing sector grouped by educational requirement and ranked by average annual openings within the sector from 2018 to 2023. The expected CAGR for each occupation from 2013 to 2023 is displayed to show how fast occupations are expected to grow relative to each other.

Total supply, composed of new graduates and existing unemployment insurance claimants, is compared with each occupation to illustrate where supply shortfalls and surpluses can be expected. Graduates from local institutions will supply 519 qualified workers each year. Unemployed workers suitable for employment in manufacturing, those whose most recent occupation was within manufacturing, will average 463 workers annually. This leaves a net annual gap of 834 jobs; local supply is expected to meet 54% of demand in manufacturing occupations within the sector.

Occupational shortfalls are anticipated for jobs that require on-the-job training. With annual demand of 1,248 positions and total local supply of 425 workers, there is an estimated annual shortfall of 823 positions. Machinist occupations are expected to experience the greatest annual shortages among on-the-job training occupations with 15 of 117 annual openings accounted for with local supply.

Jobs that require an associate degree or Postsecondary Award, which represent approximately 7% of annual openings in the industry, are expected to experience an oversupply of 7 workers per year; supply will be roughly 105% of demand. First-line supervisors are slated to experience an undersupply of 64 occupations per year, the greatest in the category. Local industrial engineering technician supply, however, is expected to exceed demand by 72 occupations.

Positions that require a bachelor's degree, roughly 24% of annual demand, will be undersupplied by an estimated 18 workers per year. The greatest shortage in this category is among industrial engineers with just 9 of 103 annual openings supplied by local sources.

Across all core occupations, the industry is expected to experience a shortfall of 834 positions per year based on local supply.

King County Manufacturing Talent Pipeline

On-the-Job Training

Annual Average Demand and Supply All Occupations by Education	Occupation Ranked by Annual Openings (2018-2023)	Employment		CAGR 2013-2023	Annual Demand and Supply, 2018-2023	
		2013	2023		Scale: 0 - 150 annual openings in sector	Gap
<p>Demand: 1,248 Supply: 425 Graduates: 142 UI Claims: 283</p>	1 Machinists	3,252	3,812	1.6%	Demand: 117 Supply: 15	(102)
	2 Team Assemblers	4,230	4,739	1.1%	Demand: 86 Supply: 0	(86)
	3 Inspectors, Testers, Sorters, Samplers, and Weighers	4,080	4,542	1.1%	Demand: 85 Supply: 0	(85)
	4 Aircraft Structure, Surfaces, Rigging, and Systems Assemblers	3,571	3,653	0.2%	Demand: 79 Supply: 0	(79)
	5 Shipping, Receiving, and Traffic Clerks	5,906	6,507	1.0%	Demand: 68 Supply: 0	(68)
	6 Purchasing Agents, Except Wholesale, Retail, and Farm Products	4,740	5,305	1.1%	Demand: 58 Supply: 6	(52)
	7 Industrial Machinery Mechanics	1,722	2,094	2.0%	Demand: 54 Supply: 4	(50)
	8 Welders, Cutters, Solderers, and Brazers	1,972	2,361	1.8%	Demand: 53 Supply: 68	15
	9 Electrical and Electronic Equipment Assemblers	2,029	2,380	1.6%	Demand: 49 Supply: 0	(49)
	10 Production, Planning, and Expediting Clerks	3,368	3,818	1.3%	Demand: 48 Supply: 19	(29)
	11 Bakers	2,912	3,385	1.5%	Demand: 48 Supply: 12	(36)
	12 Meat, Poultry, and Fish Cutters and Trimmers	1,867	1,847	-0.1%	Demand: 42 Supply: 29	(13)
	13 Food Batchmakers	1,114	1,218	0.9%	Demand: 41 Supply: 20	(21)
	14 Packaging and Filling Machine Operators and Tenders	1,488	1,732	1.5%	Demand: 36 Supply: 0	(36)
	15 Structural Metal Fabricators and Fitters	610	735	1.9%	Demand: 35 Supply: 0	(35)
	16 Computer-Controlled Machine Tool Operators, Metal and Plastic	1,006	1,001	0.0%	Demand: 35 Supply: 0	(35)
	17 Assemblers and Fabricators, All Other	2,101	2,553	2.0%	Demand: 31 Supply: 4	(27)
	18 Helpers--Production Workers	1,705	1,939	1.3%	Demand: 28 Supply: 0	(28)
	19 Ophthalmic Laboratory Technicians	595	664	1.1%	Demand: 25 Supply: 0	(25)
	20 Engine and Other Machine Assemblers	508	682	3.0%	Demand: 23 Supply: 11	(12)

Associate's degree or Postsecondary Award

Annual Average Demand and Supply All Occupations by Education	Occupation Ranked by Annual Openings (2018-2023)	Employment		CAGR 2013-2023	Annual Demand and Supply, 2018-2023	
		2013	2023		Scale: 0 - 100 annual openings in sector	Gap
<p>Demand: 133 Supply: 140 Graduates: 116 UI Claims: 24</p>	1 First-Line Supervisors of Production and Operating Workers	4,137	4,472	0.8%	Demand: 64 Supply: 0	(64)
	2 Industrial Engineering Technicians	1,064	1,058	-0.1%	Demand: 22 Supply: 94	72
	3 Aircraft Mechanics and Service Technicians	1,310	1,287	-0.2%	Demand: 18 Supply: 0	(18)
	4 Mechanical Drafters	934	996	0.6%	Demand: 13 Supply: 37	24

Bachelor's degree

Annual Average Demand and Supply All Occupations by Education	Occupation Ranked by Annual Openings (2018-2023)	Employment		CAGR 2013-2023	Annual Demand and Supply, 2018-2023	
		2013	2023		Scale: 0 - 110 annual openings in sector	Gap
<p>Demand: 434 Supply: 416 Graduates: 261 UI Claims: 156</p>	1 Industrial Engineers	3,175	3,289	0.4%	Demand: 103 Supply: 9	(94)
	2 Aerospace Engineers	2,942	2,899	-0.1%	Demand: 67 Supply: 47	(20)
	3 Mechanical Engineers	2,472	2,846	1.4%	Demand: 65 Supply: 2	(63)
	4 Electrical Engineers	2,521	2,963	1.6%	Demand: 43 Supply: 11	(32)
	5 Computer Network Architects	2,611	3,027	1.5%	Demand: 35 Supply: 54	19
	6 Logisticians	2,730	2,673	-0.2%	Demand: 32 Supply: 52	20
	7 Budget Analysts	1,162	1,247	0.7%	Demand: 25 Supply: 27	2

Sources: U.S. Bureau of Labor Statistics, 2014; Washington State Employment Security Department, 2014; National Center for Education Statistics Integrated Postsecondary Education System, 2013; Community Attributes, Inc., 2015.

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INTRODUCTION

Background and Purpose

This manufacturing industry talent pipeline analysis will assist the Workforce Development Council of Seattle-King County (WDC) as it plans for forthcoming labor shortages and surpluses within the region. In the years following the initial talent pipeline study in 2011-2012, changes in local industries and the King County economy as a whole have generated interest in updating the data for three important sectors, including manufacturing.

The manufacturing sector in King County employs more than 105,700 people, which represents 8.3% of total King County employment. King County's manufacturing sector encompasses a wide range of employers and occupations, chief among these within King County are aerospace parts and product manufacturers. Manufacturing occupation median annual wages range from a minimum of \$29,840 to a maximum \$135,900, and have an average wage of more than \$50,000.

Knowledge of expected gaps in local demand and supply allows workforce development professionals to collaborate to ensure the region is offering the appropriate mix of educational and training opportunities. Linking educational preparation to occupational demand ensures that a competitive workforce is available to support the regional economy. This analysis aims to increase awareness of the local labor demand and supply chain for manufacturing as well as highlight opportunities for support organizations involved in economic and workforce development.

Methods

The WDC serves King County, Washington's most populous county. Community Attributes' analysis relies on data published by the state of Washington and federal agencies. Specifically, the following data sources form the foundation of the modeling:

- **Occupational estimates and forecasts from the Washington State Employment Security Department (WA ESD) and the Bureau of Labor Statistics.** These data provide current estimates and forecasted demand for occupations in King County and associated educational requirements, as well as occupational wages. Occupational forecasts include openings created by retirements and separations. For this reason, average annual openings are larger than the average of net jobs created over a period of time.
- **Washington unemployment insurance (UI) claims.** These data, also published by WA ESD, provide monthly unemployment

claims and the previous occupations of the claimant by occupation code.

- **Educational attainment data from the National Center for Education Statistics Integrated Postsecondary Education System (IPEDs).** IPEDS provides the number of graduates by educational program, defined according to the Classification of Instructional Programs (CIP), for King County’s higher education institutions as well as a table of equivalences used to translate between educational programs and occupations.

Subsequent sections explain the details and limits of these data. In general, these data provide measures of demand and supply by occupation across industry sectors. The occupations are defined in accordance with the Bureau of Labor Statistics Standard Occupational Classification (SOC) system and industries are delineated using definitions from the North American Industry Classification System (NAICS).

Organization of Report

- **Demand Analysis.** Describes the composition of manufacturing occupational demand in King County.
- **Supply Analysis.** Breaks out the two elements of talent supply: new graduates entering the workforce and the existing pool of unemployment insurance claimants.
- **Supply and Demand.** Examines how local supply is slated to meet occupational demand in King County.
- **Summary of Key Findings.** Assesses in detail the results of the talent pipeline analysis, focusing on key implications for King County.

MANUFACTURING SECTOR OVERVIEW

Determining occupations involved in King County's manufacturing sector starts with developing an operational definition for the industry. The North American Industry Classification System (NAICS) groups industries in increasingly specific segments from the two-digit to the six-digit level. For the purposes of this analysis manufacturing is defined by all four-digit NAICS codes nested within the two-digit industries 31, 32, and 33, covering all durable and non-durable product manufacturing. NAICS 33 is the largest of these sectors with 78,600 jobs in King County in 2013, followed by NAICS 31 at 15,520 and NAICS 32 at 11,670 jobs (**Exhibits 1 and 2**).

Exhibit 1. King County Manufacturing NAICS 31 and 32 by Employment, 2013

Four Digit NAICS	Description	Estimated Jobs in King County, 2013
3117	Seafood Product Preparation and Packaging	3,520
3118	Bakeries and Tortilla Manufacturing	3,250
3121	Beverage Manufacturing	2,250
3119	Other Food Manufacturing	1,340
3152	Cut and Sew Apparel Manufacturing	1,130
3116	Animal Slaughtering and Processing	830
3149	Other Textile Product Mills	760
3115	Dairy Product Manufacturing	750
3114	Fruit and Vegetable Preserving and Specialty Food Manufacturing	740
3113	Sugar and Confectionery Product Manufacturing	480
3141	Textile Furnishings Mills	200
3169	Other Leather and Allied Product Manufacturing	140
3111	Animal Food Manufacturing	110
3132	Fabric Mills	20
31 Subtotal		15,520
3231	Printing and Related Support Activities	3,280
3261	Plastics Product Manufacturing	2,210
3272	Glass and Glass Product Manufacturing	1,280
3222	Converted Paper Product Manufacturing	1,260
3273	Cement and Concrete Product Manufacturing	1,010
3219	Other Wood Product Manufacturing	470
3256	Soap, Cleaning Compound, and Toilet Preparation Manufacturing	470
3254	Pharmaceutical and Medicine Manufacturing	400
3279	Other Nonmetallic Mineral Product Manufacturing	380
3211	Sawmills and Wood Preservation	210
3274	Lime and Gypsum Product Manufacturing	160
3255	Paint, Coating, and Adhesive Manufacturing	120
3259	Other Chemical Product and Preparation Manufacturing	100
3221	Pulp, Paper, and Paperboard Mills	90
3262	Rubber Product Manufacturing	80
3241	Petroleum and Coal Products Manufacturing	70
3251	Basic Chemical Manufacturing	50
3271	Clay Product and Refractory Manufacturing	30
32 Subtotal		11,670

Sources: U.S. Bureau of Labor Statistics, 2014; Washington State Employment Security Department, 2014; Community Attributes, Inc., 2015.

The largest sector by employment in NAICS 33 is aerospace product and parts manufacturing, which represents 44,910 out of 105,790 jobs in King County manufacturing in 2013, or 42% of King County manufacturing employment (**Exhibit 2**).

Exhibit 2. King County Manufacturing NAICS 33 by Employment, 2013

Four Digit NAICS	Description	Estimated Jobs in King County, 2013
3364	Aerospace Product and Parts Manufacturing	44,910
	Navigational, Measuring, Electromedical, and Control Instruments	
3345	Manufacturing	4,170
3399	Other Miscellaneous Manufacturing	4,170
3339	Other General Purpose Machinery Manufacturing	3,600
3323	Architectural and Structural Metals Manufacturing	2,380
3391	Medical Equipment and Supplies Manufacturing	1,750
3344	Semiconductor and Other Electronic Component Manufacturing	1,650
	Machine Shops; Turned Product; and Screw, Nut, and Bolt	
3327	Manufacturing	1,540
3341	Computer and Peripheral Equipment Manufacturing	1,390
3366	Ship and Boat Building	1,380
3328	Coating, Engraving, Heat Treating, and Allied Activities	1,350
3361	Motor Vehicle Manufacturing	1,040
	Household and Institutional Furniture and Kitchen Cabinet	
3371	Manufacturing	850
3359	Other Electrical Equipment and Component Manufacturing	830
3363	Motor Vehicle Parts Manufacturing	820
3335	Metalworking Machinery Manufacturing	770
3342	Communications Equipment Manufacturing	690
3329	Other Fabricated Metal Product Manufacturing	600
3332	Industrial Machinery Manufacturing	600
3312	Steel Product Manufacturing from Purchased Steel	540
3353	Electrical Equipment Manufacturing	390
3372	Office Furniture (including Fixtures) Manufacturing	380
3352	Household Appliance Manufacturing	370
3333	Commercial and Service Industry Machinery Manufacturing	320
3315	Foundries	310
3324	Boiler, Tank, and Shipping Container Manufacturing	240
	Ventilation, Heating, Air-Conditioning, and Commercial Refrigeration	
3334	Equipment Manufacturing	240
3331	Agriculture, Construction, and Mining Machinery Manufacturing	230
3321	Forging and Stamping	210
3343	Audio and Video Equipment Manufacturing	160
	Engine, Turbine, and Power Transmission Equipment	
3336	Manufacturing	150
3379	Other Furniture Related Product Manufacturing	150
3325	Hardware Manufacturing	100
3351	Electric Lighting Equipment Manufacturing	90
3362	Motor Vehicle Body and Trailer Manufacturing	90
3322	Cutlery and Handtool Manufacturing	50
3326	Spring and Wire Product Manufacturing	30
3346	Manufacturing and Reproducing Magnetic and Optical Media	30
3369	Other Transportation Equipment Manufacturing	30
	33 Subtotal	78,600
	Manufacturing Total	105,790

Sources: U.S. Bureau of Labor Statistics, 2014; Washington State Employment Security Department, 2014; Community Attributes, Inc., 2015

Another way to define the King County manufacturing sector is to identify the primary occupations that compose the sector. **Exhibits 3 and 4** lay out the occupations that define manufacturing in King County. Assembling the list began by examining the code system that the Bureau of Labor Statistics uses for occupations and grouping them according to their concentrations within the NAICS-defined manufacturing sector.

Occupations with fewer than 300 employees, less than 30% concentration in the sector, or with no projected annual openings are excluded from the analysis, as they are not considered primary to the sector. The primary occupations identified represent only a portion of employment within the manufacturing sector. These occupations are highlighted for this analysis because they represent the core skills that define employment within the manufacturing sector. Overall employment within the manufacturing sector includes employment in other occupations that are not primary to the sector. Additionally, primary manufacturing occupations are also employed in industries other than manufacturing throughout King County.

SOC codes that begin with the prefix 51 indicate production occupations, and these occupations represent 36,196 out of 58,424 jobs in the sector. Among SOC 51 manufacturing occupations 11,851 jobs are employed outside of the manufacturing sector, out of a total of 48,047 jobs within these occupations. (**Exhibits 3 and 4**).

Exhibit 3. Manufacturing Occupations, Employment in Cluster and Total Employment, SOC 51, King County, 2013

SOC	Occupation	Employment in Cluster	Employment in Other Industries	Total Employment	Share in Cluster
51-2011	Aircraft Structure, Surfaces, Rigging, and Systems	3,515	1	3,516	100%
51-2092	Team Assemblers	3,200	961	4,161	77%
51-4041	Machinists	2,934	312	3,246	90%
51-1011	First-Line Supervisors of Production and Operating Workers	2,930	1,071	4,001	73%
51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	2,339	1,662	4,001	58%
51-2022	Electrical and Electronic Equipment Assemblers	1,816	257	2,073	88%
51-3022	Meat, Poultry, and Fish Cutters and Trimmers	1,286	426	1,712	75%
51-3011	Bakers	1,180	1,676	2,856	41%
51-4121	Welders, Cutters, Solderers, and Brazers	1,112	764	1,876	59%
51-6031	Sewing Machine Operators	1,025	282	1,307	78%
51-4011	Computer-Controlled Machine Tool Operators, Metal and	992	6	998	99%
51-5112	Printing Press Operators	934	374	1,308	71%
51-3092	Food Batchmakers	931	170	1,101	85%
51-9111	Packaging and Filling Machine Operators and Tenders	885	606	1,491	59%
51-4031	Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic	869	195	1,064	82%
51-9198	Helpers--Production Workers	858	820	1,678	51%
51-2099	Assemblers and Fabricators, All Other	767	1,268	2,035	38%
51-4072	Molding, Coremaking, and Casting Machine Setters, Operators, and Tenders, Metal and Plastic	677	0	677	100%
51-4081	Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic	625	14	639	98%
51-9083	Ophthalmic Laboratory Technicians	550	37	587	94%
51-2041	Structural Metal Fabricators and Fitters	543	70	613	89%
51-9121	Coating, Painting, and Spraying Machine Setters, Operators, and Tenders	506	50	556	91%
51-2031	Engine and Other Machine Assemblers	502	27	529	95%
51-4033	Grinding, Lapping, Polishing, and Buffing Machine Tool Setters, Operators, and Tenders, Metal and Plastic	482	3	485	99%
51-9032	Cutting and Slicing Machine Setters, Operators, and	474	78	552	86%
51-4111	Tool and Die Makers	471	2	473	100%
51-9196	Paper Goods Machine Setters, Operators, and Tenders	442	11	453	98%
51-9122	Painters, Transportation Equipment	440	547	987	45%
51-4021	Extruding and Drawing Machine Setters, Operators, and Tenders, Metal and Plastic	433	0	433	100%
51-9041	Extruding, Forming, Pressing, and Compacting Machine Setters, Operators, and Tenders	369	22	391	94%
51-9023	Mixing and Blending Machine Setters, Operators, and	367	41	408	90%
51-9022	Grinding and Polishing Workers, Hand	357	13	370	96%
51-2091	Fiberglass Laminators and Fabricators	355	9	364	98%
51-9081	Dental Laboratory Technicians	352	53	405	87%
51-2023	Electromechanical Equipment Assemblers	341	0	341	100%
51-7011	Cabinetmakers and Bench Carpenters	337	23	360	94%
51 Subtotal		36,196	11,851	48,047	75%

Sources: U.S. Bureau of Labor Statistics, 2014; Washington State Employment Security Department, 2014; Community Attributes, Inc., 2015.

Occupations in a number of other SOC categories are also significantly represented in King County's manufacturing sector. Occupations in SOC 17, for example, which includes all engineering occupations, account for 9,640 jobs among King County manufacturing occupations. Occupations in information technology, logistics, and management round out the core occupational composition of King County manufacturing. Overall, 65% of employment in manufacturing occupations is in the manufacturing sector. (Exhibit 4).

Exhibit 4. Manufacturing Occupations, Employment in Cluster and Total Employment, All Other SOCs, King County, 2013

SOC	Occupation	Employment in Cluster	Employment in Other Industries	Total Employment	Share in Cluster
17-2112	Industrial Engineers	2,784	359	3,143	89%
17-2011	Aerospace Engineers	2,068	805	2,873	72%
17-2141	Mechanical Engineers	1,201	1,281	2,482	48%
17-3026	Industrial Engineering Technicians	978	79	1,057	93%
17-2071	Electrical Engineers	970	1,529	2,499	39%
17-2131	Materials Engineers	668	31	699	96%
17-3013	Mechanical Drafters	606	299	905	67%
17-3021	Aerospace Engineering and Operations Technicians	365	175	540	68%
	17 Subtotal	9,640	4,558	14,198	68%
13-1081	Logisticians	2,121	525	2,646	80%
13-1023	Purchasing Agents, Except Wholesale, Retail, and Farm	1,854	2,846	4,700	39%
13-2031	Budget Analysts	466	708	1,174	40%
	13 Subtotal	4,441	4,079	8,520	52%
43-5071	Shipping, Receiving, and Traffic Clerks	1,921	4,086	6,007	32%
43-5061	Production, Planning, and Expediting Clerks	1,188	2,182	3,370	35%
	43 Subtotal	3,109	6,268	9,377	33%
49-9041	Industrial Machinery Mechanics	948	710	1,658	57%
49-2091	Avionics Technicians	838	86	924	91%
49-3011	Aircraft Mechanics and Service Technicians	683	636	1,319	52%
	49 Subtotal	2,469	1,432	3,901	63%
15-1143	Computer Network Architects	958	1,649	2,607	37%
15-2031	Operations Research Analysts	414	878	1,292	32%
	15 Subtotal	1,372	2,527	3,899	35%
11-3051	Industrial Production Managers	781	170	951	82%
47-2211	Sheet Metal Workers	416	966	1,382	30%
	All Occupations	58,424	31,851	90,275	65%

Sources: U.S. Bureau of Labor Statistics, 2014; Washington State Employment Security Department, 2014; Community Attributes, Inc., 2015.

Among manufacturing occupations requiring on-the-job training, median wages range between a high of \$90,330 among purchasing agents, except wholesale, retail, and farm products, to a low of \$29,840 for meat, poultry, and fish cutters and trimmers. The occupation with the greatest employment in the cluster within this group of occupations, for which data is available, is team assemblers and has a median wage of \$39,030 annually. For this occupation the 90th percentile annual wage is \$49,090. The highest 90th percentile annual wage is more than \$107,000, among purchasing agents, except wholesale, retail, and farm products. (**Exhibit 5**).

Exhibit 5. Manufacturing Occupations Median Wage and 90th Percentile Wage, On-the-job Training, Seattle-Tacoma-Bellevue MSA, 2013

SOC	Occupation	Employment in Cluster	Median Wage ↓	90 th Percentile Wage
13-1023	Purchasing Agents, Except Wholesale, Retail, and Farm Products	1,854	\$90,330	\$107,850
49-9041	Industrial Machinery Mechanics	948	\$78,500	\$91,570
51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	2,339	\$78,270	\$91,200
51-9122	Painters, Transportation Equipment	440	\$74,560	\$91,510
47-2211	Sheet Metal Workers	416	\$73,380	\$93,460
43-5061	Production, Planning, and Expediting Clerks	1,188	\$64,900	\$75,280
51-4041	Machinists	2,934	\$59,660	\$79,550
51-4121	Welders, Cutters, Solderers, and Brazers	1,112	\$55,260	\$66,020
51-5112	Printing Press Operators	934	\$49,750	\$58,650
51-9081	Dental Laboratory Technicians	352	\$49,610	\$58,730
51-7011	Cabinetmakers and Bench Carpenters	337	\$48,750	\$57,690
51-2041	Structural Metal Fabricators and Fitters	543	\$48,260	\$58,900
51-4021	Extruding and Drawing Machine Setters, Operators, and Tenders, Metal and Plastic	433	\$47,910	\$64,840
51-9196	Paper Goods Machine Setters, Operators, and Tenders	442	\$46,630	\$56,590
51-4031	Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic	869	\$46,140	\$71,130
51-2031	Engine and Other Machine Assemblers	502	\$45,790	\$49,630
51-9032	Cutting and Slicing Machine Setters, Operators, and Tenders	474	\$44,800	\$52,770
51-4081	Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic	625	\$44,610	\$61,470
43-5071	Shipping, Receiving, and Traffic Clerks	1,921	\$43,560	\$53,560
51-9023	Mixing and Blending Machine Setters, Operators, and Tenders	367	\$43,080	\$60,810
51-9083	Ophthalmic Laboratory Technicians	550	\$42,700	\$46,580
51-2023	Electromechanical Equipment Assemblers	341	\$41,410	\$48,310
51-9121	Coating, Painting, and Spraying Machine Setters, Operators, and Tenders	506	\$40,690	\$47,140
51-2022	Electrical and Electronic Equipment Assemblers	1,816	\$40,060	\$48,430
51-4033	Grinding, Lapping, Polishing, and Buffing Machine Tool Setters, Operators, and Tenders, Metal and Plastic	482	\$39,940	\$57,520
51-2092	Team Assemblers	3,200	\$39,030	\$49,090
51-9022	Grinding and Polishing Workers, Hand	357	\$37,640	\$52,940
51-4072	Molding, Coremaking, and Casting Machine Setters, Operators, and Tenders, Metal and Plastic	677	\$37,250	\$46,760
51-3092	Food Batchmakers	931	\$36,740	\$45,960
51-9041	Extruding, Forming, Pressing, and Compacting Machine Setters, Operators, and Tenders	369	\$36,360	\$42,530
51-2091	Fiberglass Laminators and Fabricators	355	\$35,890	\$45,830
51-2099	Assemblers and Fabricators, All Other	767	\$35,590	\$50,270
51-9111	Packaging and Filling Machine Operators and Tenders	885	\$35,530	\$43,720
51-6031	Sewing Machine Operators	1,025	\$34,460	\$38,630
51-3011	Bakers	1,180	\$34,060	\$42,440
51-9198	Helpers--Production Workers	858	\$32,250	\$38,630
51-3022	Meat, Poultry, and Fish Cutters and Trimmers	1,286	\$29,840	\$38,090
51-4011	Computer-Controlled Machine Tool Operators, Metal and Plastic	992	*	*
51-2011	Aircraft Structure, Surfaces, Rigging, and Systems Assemblers	3,515	*	*
51-4111	Tool and Die Makers	471	*	*

Note: * indicates that data is suppressed by the U.S. Bureau of Labor Statistics in order to comply with nondisclosure rules. Due to data limitations median and 90th percentile wages are those for the matching occupation in the Seattle-Tacoma-Bellevue MSA, and are considered representative of wages in King County. Sources: U.S. Bureau of Labor Statistics, 2014; Community Attributes, Inc., 2015.

Median wages in the manufacturing sector are higher among occupations requiring an associate degree or Postsecondary Award or bachelor's degree. Annual median wages among these occupations range from \$68,680 to \$135,900. The manufacturing occupation with the highest annual wage is industrial production managers at \$135,900. Due to nondisclosure rules, not all wage data is available for all SOC codes. (Exhibit 6).

Exhibit 6. Manufacturing Occupations Median Wage and 90th Percentile Wage, Associate Degree of Postsecondary Award and Bachelor's Degree, Seattle-Tacoma-Bellevue MSA, 2013

SOC	Occupation	Employment in Cluster	Median Wage ↓	90 th Percentile Wage
Associate's degree or Postsecondary Award				
17-3013	Mechanical Drafters	606	\$92,550	\$106,480
51-1011	First-Line Supervisors of Production and Operating	2,930	\$68,680	\$109,690
17-3026	Industrial Engineering Technicians	978 *	*	*
49-3011	Aircraft Mechanics and Service Technicians	683 *	*	*
49-2091	Avionics Technicians	838 *	*	*
17-3021	Aerospace Engineering and Operations Technicians	365 *	*	*
Bachelor's degree				
11-3051	Industrial Production Managers	781	\$135,900	\$164,580
15-1143	Computer Network Architects	958	\$134,730	\$153,570
17-2071	Electrical Engineers	970	\$127,610	\$149,460
17-2141	Mechanical Engineers	1,201	\$114,630	\$140,870
15-2031	Operations Research Analysts	414	\$103,390	\$121,480
13-2031	Budget Analysts	466	\$94,670	\$114,030
17-2112	Industrial Engineers	2,784 *	*	*
17-2011	Aerospace Engineers	2,068 *	*	*
13-1081	Logisticians	2,121 *	*	*
17-2131	Materials Engineers	668 *	*	*

Note: * indicates that data is suppressed by the U.S. Bureau of Labor Statistics in order to comply with nondisclosure rules. Due to data limitations median and 90th percentile wages are those for the matching occupation in the Seattle-Tacoma-Bellevue MSA, and are considered representative of wages in King County. Sources: U.S. Bureau of Labor Statistics, 2014; Community Attributes, Inc., 2015.

Within the manufacturing sector, occupations requiring a bachelor's degree have the highest annual average wage, greater than \$101,000. The average wage for the manufacturing sector is almost \$51,000 annually. The average annual wage among manufacturing sector occupations is slightly lower than the annual average wage for the entire Seattle-Tacoma-Bellevue MSA. (Exhibit 7).

Exhibit 7. Comparative Average Wages, King County and Seattle-Tacoma-Bellevue MSA, 2013

	Employment	Average Wage
King County Manufacturing Sector		
On-the Job Training Occupations	39,593	\$41,651
Associate's degree or Postsecondary Award Occupations	6,400	\$72,072
Bachelor's degree Occupations	12,431	\$101,100
Manufacturing Sector Total	58,424	\$50,788
Seattle-Tacoma-Bellevue MSA	1,761,920	\$57,370

Note: due to data limitations median and 90th percentile wages are those for the matching occupation in the Seattle-Tacoma-Bellevue MSA, and are considered representative of wages in King County. Sources: U.S. Bureau of Labor Statistics, 2014; Community Attributes, Inc., 2015.

**Exhibit 8. Manufacturing Occupational Employment in Other Industries,
2013**

Sector	Manufacturing Occupation Employment in Industry
Employment Services	3,551
Architectural and engineering services	2,354
Management of Companies & Enterprises	1,680
Grocery stores	1,523
Machinery and supply merchant wholesalers	1,135
Building equipment contractors	1,093
Local Government Other	1,009
Computer systems design and related services	844
Grocery and Related Product Wholesalers	840
Food Services and Drinking Places	825
Electronic markets and agents and brokers	788
Scientific research and development services	623
Automotive repair and maintenance	613
Federal Government	601
Scheduled air transportation	596
Commercial equip. merchant wholesalers	544
Education	531
Wireless telecommunications carriers	519
All Other Industries	12,182
Total	31,851

Sources: U.S. Bureau of Labor Statistics, 2014; Washington State Employment Security Department, 2014; Community Attributes, Inc., 2015.

A significant number of manufacturing occupations are represented in non-manufacturing industries. Overall, 31,851 individuals are employed in manufacturing occupations in non-manufacturing industries. Chief among these industries is Employment Services, which employs 3,551 individuals in manufacturing occupations. (**Exhibit 8**).

Exhibit 9. Manufacturing Occupation Employment in Other Industries, 2013

Occupation	Employment in Other Industries	Top Other Industry
Shipping, Receiving, and Traffic Clerks	4,086	Electronic Shopping and Mail-Order Houses
Purchasing Agents, Except Wholesale, Retail, and Farm Products	2,846	Management of Companies and Enterprises
Production, Planning, and Expediting Clerks	2,182	Management of Companies and Enterprises
Bakers	1,676	Grocery Stores
Inspectors, Testers, Sorters, Samplers, and Weighers	1,662	Employment Services
Computer Network Architects	1,649	Computer Systems Design and Related Services
Electrical Engineers	1,529	Architectural, Engineering, and Related Services
Mechanical Engineers	1,281	Architectural, Engineering, and Related Services
Assemblers and Fabricators, All Other	1,268	Employment Services
First-Line Supervisors of Production and Operating Workers	1,071	Grocery Stores
Sheet Metal Workers	966	Building Equipment Contractors
Team Assemblers	961	Machinery, Equipment, and Supplies Merchant Wholesalers
Operations Research Analysts	878	Insurance Carriers
Helpers--Production Workers	820	Employment Services
Aerospace Engineers	805	Architectural, Engineering, and Related Services
Welders, Cutters, Solderers, and Brazers	764	Employment Services
Industrial Machinery Mechanics	710	Machinery, Equipment, and Supplies Merchant Wholesalers
Budget Analysts	708	Education
Aircraft Mechanics and Service Technicians	636	Scheduled Air Transportation
Packaging and Filling Machine Operators and Tenders	606	Employment Services
All Other Occupations	4,747	
Total	31,851	

Sources: U.S. Bureau of Labor Statistics, 2014; Washington State Employment Security Department, 2014; Community Attributes, Inc., 2015.

Manufacturing occupational employment in other industries is primarily concentrated in a few large occupations. Shipping, receiving, and traffic clerks, the occupation with the largest employment outside of manufacturing, represents 4,086 out of 31,851 jobs in other industries, chief among other industries is electronic shopping, and mail-order houses. (**Exhibit 9**).

DEMAND ANALYSIS: KING COUNTY MANUFACTURING OCCUPATIONAL FORECASTS

Total occupational demand for occupations that match to the King County manufacturing industry is expected to reach 2,974 average annual openings from 2018 through 2023. Total occupational demand covers demand across all industries in King County, including but not exclusive to manufacturing. Within the manufacturing sector annual average openings are projected to be 1,815. The occupation with the greatest anticipated annual openings is shipping, receiving, and traffic clerks with 213 projected openings overall and 68 openings within the sector. The occupation with the greatest number of average annual openings in the sector is machinists with 117 annual openings each year. (Exhibit 10).

Exhibit 10. King County Manufacturing Occupational Demand per Year, 2018 and 2023

SOC	Occupation	Estimated Employment 2018	Estimated Employment 2023	Average Annual Openings (2018-2023)	Average Annual Openings in Cluster (2018-2023)	CAGR (2018-2023)
43-5071	Shipping, Receiving, and Traffic Clerks	6,293	6,507	213	68	0.7%
13-1023	Purchasing Agents, Except Wholesale, Retail, and Farm Products	5,032	5,305	148	58	1.1%
51-9061	Inspectors, Testers, Sorters, Samplers, and	4,311	4,542	145	85	1.0%
43-5061	Production, Planning, and Expediting Clerks	3,612	3,818	136	48	1.1%
17-2141	Mechanical Engineers	2,649	2,846	134	65	1.4%
51-4041	Machinists	3,596	3,812	129	117	1.2%
51-3011	Bakers	3,221	3,385	116	48	1.0%
17-2112	Industrial Engineers	3,196	3,289	116	103	0.6%
51-2092	Team Assemblers	4,533	4,739	112	86	0.9%
17-2071	Electrical Engineers	2,725	2,963	111	43	1.7%
15-1143	Computer Network Architects	2,806	3,027	95	35	1.5%
49-9041	Industrial Machinery Mechanics	1,917	2,094	95	54	1.8%
17-2011	Aerospace Engineers	2,865	2,899	93	67	0.2%
51-4121	Welders, Cutters, Solderers, and Brazers	2,194	2,361	90	53	1.5%
51-1011	First-Line Supervisors of Production and Operating Workers	4,341	4,472	88	64	0.6%
51-2099	Assemblers and Fabricators, All Other	2,334	2,553	81	31	1.8%
51-2011	Aircraft Structure, Surfaces, Rigging, and Systems Assemblers	3,540	3,653	79	79	0.6%
13-2031	Budget Analysts	1,198	1,247	63	25	0.8%
15-2031	Operations Research Analysts	1,414	1,546	63	20	1.8%
51-9111	Packaging and Filling Machine Operators and	1,624	1,732	60	36	1.3%
47-2211	Sheet Metal Workers	1,670	1,785	58	17	1.3%
51-3022	Meat, Poultry, and Fish Cutters and Trimmers	1,805	1,847	56	42	0.5%
51-2022	Electrical and Electronic Equipment Assemblers	2,225	2,380	56	49	1.4%
51-9198	Helpers--Production Workers	1,818	1,939	54	28	1.3%
51-3092	Food Batchmakers	1,176	1,218	49	41	0.7%
13-1081	Logisticians	2,663	2,673	40	32	0.1%
51-2041	Structural Metal Fabricators and Fitters	694	735	40	35	1.2%
51-4011	Computer-Controlled Machine Tool Operators, Metal and Plastic	996	1,001	35	35	0.1%
49-3011	Aircraft Mechanics and Service Technicians	1,308	1,287	34	18	-0.3%
51-9083	Ophthalmic Laboratory Technicians	637	664	27	25	0.8%
11-3051	Industrial Production Managers	1,052	1,078	26	21	0.5%
	All Other Occupations (25)	16,933	17,174	332	287	0.3%
	Total	96,378	100,571	2,974	1,815	0.9%

Sources: U.S. Bureau of Labor Statistics, 2014; Washington State Employment Security Department, 2014; Community Attributes, Inc., 2015.

SUPPLY ANALYSIS: AVAILABILITY OF REGIONAL TALENT AND EMPLOYABLE WORKFORCE

Local workforce supply is composed of two elements: the entry of new graduates into the talent pool and the existing talent pool of unemployed persons actively seeking employment. Qualified graduates are drawn from NCES data through a match of CIP codes to SOC codes and adjusted according to workforce-wide occupational demand. Unemployment insurance claimants are organized by most recent occupation (SOC) and represent the second element of supply. It is important to note that changes in migration can affect changes in supply and demand.

Local Graduates

The National Center for Education Statistics standardizes educational curricula with Classification of Instructional Program (CIP) codes. Each CIP code maps to multiple SOC codes because graduates from the same program go on to employment in a range of occupations. At the same time, each occupation draws graduates from several relevant CIPs. For example, graduates from airframe mechanics and aircraft maintenance technology/technician programs who are qualified to work as aircraft structure, surfaces, rigging, and systems assemblers are also qualified to work as aircraft mechanics and service technicians and avionics technicians. The latter two occupations are further supplied by graduates from two additional educational programs, aircraft powerplant technology/technician and avionics maintenance technology/technician programs. This illustrates the complicated network of matches between educational programs and occupations. (Exhibit 11).

Exhibit 11. Other Occupational Matches for Graduates Qualified to Work as Aircraft Structure, Surfaces, Rigging, and Systems Assemblers

CIP	Description	SOC	Description
47.0607	Airframe Mechanics and Aircraft Maintenance Technology/Technician.	51-2011	Aircraft Structure, Surfaces, Rigging, and Systems Assemblers
47.0608	Aircraft Powerplant Technology/Technician.	49-3011	Aircraft Mechanics and Service Technicians
47.0609	Avionics Maintenance Technology/Technician.	49-2091	Avionics Technicians

Sources: National Center for Education Statistics Integrated Postsecondary Education System, 2013; Community Attributes, Inc., 2015.

The next step in determining how many graduates will be able to fill anticipated occupational shortfalls in the King County manufacturing sector is summarizing all CIP codes across educational institutions that match to one or more manufacturing occupations.

Graduate data is tied to the primary location of the educational institution. For this reason, institutions primarily located in adjacent counties that have programs in King County are not attached to King County, but to the institution’s primary location.

Taken together, local educational institutions conferred degrees or awards to 6,488 individuals in 2013 in CIPs that match to one or more manufacturing occupation(s). Many of these graduates, however, will not seek employment in King County after graduating. Others will seek employment in occupations outside of the manufacturing sector; this number represents the largest possible pool of new graduates from King County who are qualified to work in manufacturing occupations. (**Exhibit 12**).

Exhibit 12. Total Graduates by CIP Codes that Match to One or More Manufacturing Occupation(s), King County, 2013

CIP	Description	Graduates
52.0201	Business Administration and Management, General.	2,006
52.0101	Business/Commerce, General.	704
52.0301	Accounting.	492
11.0901	Computer Systems Networking and Telecommunications.	348
52.0801	Finance, General.	340
48.0508	Welding Technology/Welder.	329
14.1001	Electrical and Electronics Engineering	313
11.0101	Computer and Information Sciences, General.	251
14.1901	Mechanical Engineering.	207
48.0501	Machine Tool Technology/Machinist.	200
12.0501	Baking and Pastry Arts/Baker/Pastry Chef.	193
11.0103	Information Technology.	156
15.0613	Manufacturing Engineering Technology/Technician.	134
15.1301	Drafting and Design Technology/Technician, General.	108
14.0201	Aerospace, Aeronautical and Astronautical/Space Engineering.	101
15.1302	CAD/CADD Drafting and/or Design Technology/Technician.	88
47.0603	Autobody/Collision and Repair Technology/Technician.	87
14.1801	Materials Engineering.	78
11.1001	Network and System Administration/Administrator.	56
52.0203	Logistics, Materials, and Supply Chain Management.	54
14.0901	Computer Engineering, General.	51
14.3501	Industrial Engineering.	51
11.1003	Computer and Information Systems Security/Information Assurance.	43
11.0501	Computer Systems Analysis/Analyst.	26
15.1306	Mechanical Drafting and Mechanical Drafting CAD/CADD.	15
52.0304	Accounting and Finance.	15
48.0703	Cabinetmaking and Millwork.	14
52.0409	Parts, Warehousing, and Inventory Management Operations.	10
47.0303	Industrial Mechanics and Maintenance Technology.	9
52.0205	Operations Management and Supervision.	8
14.3701	Operations Research.	1
Total		6,488

Sources: National Center for Education Statistics Integrated Postsecondary Education System, 2013; Community Attributes, Inc., 2015.

Due to data limitations, especially a lack of data linking high school graduates who do not matriculate into a higher education institution and then secure occupations, the supply of local high school graduates who are interested in positions that require on-the-job training cannot be estimated. Some postsecondary award and bachelor's programs, however, do match to on-the-job training occupations for which past graduates have gone on to work in on-the-job training positions. Not all training programs that would qualify an individual for these positions are included in IPEDS data, and, as a result, the talent pool available for employers looking to fill positions that require on-the-job training is understated.

The University of Washington Seattle Campus graduated the most students qualified to work in manufacturing occupations, 1,877 in 2013. Combined with its Bothell campus, the University of Washington provided 2,376 graduates to the talent pool in 2013. (**Exhibit 13**).

**Exhibit 13. King County's Educational Institutions by Graduates
Qualified for Manufacturing Occupations, 2013**

Institution	Graduates Qualified for Manufacturing Occupations
University of Washington-Seattle Campus	1,877
City University of Seattle	706
Seattle University	536
University of Washington-Bothell Campus	499
Green River Community College	492
Seattle Community College-South Campus	334
Bellevue College	293
Lake Washington Institute of Technology	262
Highline Community College	210
Shoreline Community College	180
DeVry University-Washington	176
Seattle Community College-North Campus	160
Renton Technical College	128
Seattle Pacific University	120
Le Cordon Bleu College of Culinary Arts-Seattle	105
ITT Technical Institute-Seattle	75
Bainbridge Graduate Institute	71
University of Phoenix-Western Washington Campus	64
Cascadia Community College	62
The Art Institute of Seattle	42
Seattle Central College	40
Northwest University	33
Argosy University-Seattle	16
Antioch University-Seattle	4
DigiPen Institute of Technology	2
Bakke Graduate University	1
Total	6,488

Sources: National Center for Education Statistics Integrated Postsecondary Education System, 2013; Community Attributes, Inc., 2015.

In order to determine how many graduates are likely to fill core occupations in the King County manufacturing sector, graduates were totaled by every combination of CIP and SOC. Each combination is adjusted to match the ratio of occupational demand to total occupational demand for all possible occupations matching to that CIP, estimating how many graduates would be able to obtain employment in each available occupation. Each estimate is multiplied by 70%, which represents the approximate share of local graduates who work in the area after graduation. Finally, the number of graduates expected to seek work locally

is adjusted again to account for the number of local graduates who can be expected to fill positions within the manufacturing sector.

This methodology yields 142 graduates in 2013 that map to occupations that require on-the-job training and can be expected to seek employment locally and within the manufacturing sector. These occupations are, however, undercounted due to the lack of information linking programs to occupations outside of IPEDS. In 2013, 11 SOCs in this category were supplied by graduates in King County. (**Exhibit 14**).

IPEDS data is available only through the 2012-2013 academic year. Although these individuals completing programs in 2013 would be expected to seek work in 2013, this data provides a picture of what educational programs can be expected to look like in future years if current conditions do not change.

Apprenticeships are not included among the graduate supply estimates. The primary feature of an apprenticeship program is on-the-job training. Therefore, these individuals are already counted among the individuals employed in the sector. If they were to be added to the talent pool calculations they would be double-counted within this analysis.

Exhibit 14. Manufacturing Occupations by Total Graduates, On-the-job Training, King County, 2013

SOC	Description	All Graduates	Graduates after 70% retention	Graduates in Cluster
51-4121	Welders, Cutters, Solderers, and Brazers	165	115	68
51-3011	Bakers	41	29	12
51-4021	Extruding and Drawing Machine Setters, Operators, and Tenders, Metal and Plastic	15	11	11
51-4033	Grinding, Lapping, Polishing, and Buffing Machine Tool Setters, Operators, and Tenders, Metal and Plastic	15	11	11
51-4081	Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic	15	11	11
51-4041	Machinists	15	11	10
51-4031	Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic	15	11	9
51-9122	Painters, Transportation Equipment	22	15	7
43-5061	Production, Planning, and Expediting Clerks	10	7	2
51-7011	Cabinetmakers and Bench Carpenters	2	2	2
49-9041	Industrial Machinery Mechanics	2	1	1
51-6031	Sewing Machine Operators	0	0	0
51-4111	Tool and Die Makers	0	0	0
51-9196	Paper Goods Machine Setters, Operators, and Tenders	0	0	0
51-2091	Fiberglass Laminators and Fabricators	0	0	0
51-9023	Mixing and Blending Machine Setters, Operators, and Tenders	0	0	0
51-2023	Electromechanical Equipment Assemblers	0	0	0
51-4072	Molding, Coremaking, and Casting Machine Setters, Operators, and Tenders, Metal and Plastic	0	0	0
51-9041	Extruding, Forming, Pressing, and Compacting Machine Setters, Operators, and Tenders	0	0	0
51-9032	Cutting and Slicing Machine Setters, Operators, and Tenders	0	0	0
51-9022	Grinding and Polishing Workers, Hand	0	0	0
51-2031	Engine and Other Machine Assemblers	0	0	0
51-5112	Printing Press Operators	0	0	0
47-2211	Sheet Metal Workers	0	0	0
51-3022	Meat, Poultry, and Fish Cutters and Trimmers	0	0	0
51-9081	Dental Laboratory Technicians	0	0	0
51-9121	Coating, Painting, and Spraying Machine Setters, Operators, and Tenders	0	0	0
51-3092	Food Batchmakers	0	0	0
51-9083	Ophthalmic Laboratory Technicians	0	0	0
51-2099	Assemblers and Fabricators, All Other	0	0	0
51-9198	Helpers--Production Workers	0	0	0
51-2041	Structural Metal Fabricators and Fitters	0	0	0
51-4011	Computer-Controlled Machine Tool Operators, Metal and	0	0	0
51-9111	Packaging and Filling Machine Operators and Tenders	0	0	0
51-2022	Electrical and Electronic Equipment Assemblers	0	0	0
13-1023	Purchasing Agents, Except Wholesale, Retail, and Farm	0	0	0
43-5071	Shipping, Receiving, and Traffic Clerks	0	0	0
51-2011	Aircraft Structure, Surfaces, Rigging, and Systems Assemblers	0	0	0
51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	0	0	0
51-2092	Team Assemblers	0	0	0
On-the-Job Training Subtotal		318	223	142

Sources: National Center for Education Statistics Integrated Postsecondary Education System, 2013; Community Attributes, Inc., 2015.

Due to the nature of the data recorded by IPEDS, information on graduates is more complete for occupations that require an associate degree or Postsecondary Award or bachelor's degree. In 2013, 116 graduates were qualified for manufacturing occupations in the former

category, and an additional 261 graduates were qualified for manufacturing occupations in the latter category, again after retention. (Exhibit 15).

Exhibit 15. Manufacturing Occupations by Total Graduates, Associate’s Degree or Postsecondary Award and Bachelor’s Degree, King County, 2013

SOC	Description	All Graduates	Graduates after 70% retention	Graduates in Cluster
17-3026	Industrial Engineering Technicians	134	94	87
17-3013	Mechanical Drafters	63	44	29
51-1011	First-Line Supervisors of Production and Operating Workers	0	0	0
17-3021	Aerospace Engineering and Operations Technicians	0	0	0
49-2091	Avionics Technicians	0	0	0
49-3011	Aircraft Mechanics and Service Technicians	0	0	0
Associates degree or Postsecondary Award Subtotal		197	138	116
11-3051	Industrial Production Managers	226	158	130
15-1143	Computer Network Architects	212	148	54
17-2011	Aerospace Engineers	87	61	44
13-2031	Budget Analysts	81	57	22
17-2071	Electrical Engineers	25	17	7
17-2141	Mechanical Engineers	7	5	2
17-2131	Materials Engineers	1	1	1
17-2112	Industrial Engineers	0	0	0
13-1081	Logisticians	0	0	0
15-2031	Operations Research Analysts	0	0	0
Bachelors degree Subtotal		638	447	261
Grand Total		1,153	807	519

Sources: National Center for Education Statistics Integrated Postsecondary Education System, 2013; Community Attributes, Inc., 2015.

Unemployment Insurance

The second key element of supply is the pool of unemployment insurance (UI) claimants whose previous occupations match to those in King County’s manufacturing sector. Due to nondisclosure rules, not all UI data is available for every SOC. These SOC codes can be estimated by leveraging known unemployment totals and disclosed data from previous years. Additionally, in order to capture the expected unemployment rate in future the ratio of a ten year average of forecasted unemployment rates, from the Puget Sound Economic Forecaster, and the current unemployment rate from BLS is used. This method helps complete the expectation for future UI claimants. The ten year average of forecasted unemployment rates is 108.9% of the March 2015 unemployment rate of 4.1%.

There is a projected total of 391 individuals claiming unemployment insurance who were previously employed in a manufacturing occupation in King County that required on-the-job training. Among these 391 UI claimants, 283 can be expected to fill openings within the manufacturing sector. Across 19 occupations, the greatest source of claimants was from cutting, punching, and press machine operators, and tenders with 83

claimants, of which 68 can be expected to fill openings within the manufacturing sector. (Exhibit 16).

Exhibit 16. Unemployment Insurance Claimants by Previous SOC, King County

SOC	Description	Total Qualified Unemployment Insurance Claimants	Unemployment Insurance Claimants In Sector
51-4031	Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic	83	68
51-6031	Sewing Machine Operators	71	55
43-5061	Production, Planning, and Expediting Clerks	47	17
51-3022	Meat, Poultry, and Fish Cutters and Trimmers	39	29
51-3092	Food Batchmakers	24	20
51-4111	Tool and Die Makers	20	20
51-9023	Mixing and Blending Machine Setters, Operators, and Tenders	16	15
13-1023	Purchasing Agents, Except Wholesale, Retail, and Farm Products	15	6
51-2031	Engine and Other Machine Assemblers	12	11
47-2211	Sheet Metal Workers	12	4
51-2099	Assemblers and Fabricators, All Other	11	4
51-9122	Painters, Transportation Equipment	7	3
51-4033	Grinding, Lapping, Polishing, and Buffing Machine Tool Setters, Operators, and Tenders, Metal and Plastic	5	5
51-9041	Extruding, Forming, Pressing, and Compacting Machine Setters, Operators, and Tenders	5	5
49-9041	Industrial Machinery Mechanics	5	3
51-4041	Machinists	5	5
51-9196	Paper Goods Machine Setters, Operators, and Tenders	4	4
51-2023	Electromechanical Equipment Assemblers	4	4
51-4072	Molding, Coremaking, and Casting Machine Setters, Operators, and Tenders, Metal and Plastic	4	4
On-the-Job Training Subtotal		391	283

Sources: Washington State Employment Security Department, 2015; Community Attributes, Inc., 2015.

There are an expected 232 UI claimants whose previous occupation was in a manufacturing position that required an associate degree or Postsecondary Award or a bachelor's degree in manufacturing in King County. Out of the total UI claims in these positions 180 can be expected to work within the manufacturing sector in King County. The occupation with the most claimants among this grouping was logisticians, with 65 individuals. Together with on-the-job training, a total of 623 people match to manufacturing occupations in the UI claim portion of occupational supply, of which 463 can be expected to fill openings within the sector. (Exhibit 17).

Exhibit 17. Unemployment Insurance Claimants by Previous SOC, King County

SOC	Description	Total Qualified Unemployment Insurance Claimants	Unemployment Insurance Claimants In Sector
17-3021	Aerospace Engineering and Operations Technicians	13	9
17-3013	Mechanical Drafters	12	8
17-3026	Industrial Engineering Technicians	8	7
Associate's degree or Postsecondary Award Subtotal		33	24
13-1081	Logisticians	65	52
17-2131	Materials Engineers	46	44
11-3051	Industrial Production Managers	45	37
13-2031	Budget Analysts	12	5
17-2071	Electrical Engineers	12	5
17-2112	Industrial Engineers	10	9
15-2031	Operations Research Analysts	5	2
17-2011	Aerospace Engineers	4	3
Bachelor's degree Subtotal		199	156
Grand Total		623	463

Sources: Washington State Employment Security Department, 2015; Community Attributes, Inc., 2015.

The combination of local graduates and unemployment insurance claimants defines talent supply for the region. Within King County there are a total of 519 local graduates and 463 unemployment insurance claimants that can be expected to fill positions within the King County manufacturing sector (**Exhibit 18**).

Exhibit 18. Total Talent Supply, King County

Source of Supply	Qualified Workers
On-the-Job Training	142
Associate's degree or Postsecondary Award	116
Bachelors degree	261
Graduates Subtotal	519
Unemployment Insurance Claimants	463
Grand Total	981

Sources: National Center for Education Statistics Integrated Postsecondary Education System, 2013; Washington State Employment Security Department, 2015; Community Attributes, Inc., 2015

SUPPLY AND DEMAND

Combining the elements of expected supply with projected demand yields annual occupational gaps. **Exhibit 19** summarizes graduate supply, total demand, UI claimant supply, interim gaps, and total gaps for each manufacturing occupation within the manufacturing sector that requires on-the-job training.

With 142 graduates and 283 UI claimants, core manufacturing occupations have a total projected annual supply of 425 people. Total demand for these occupations, however, is estimated at 1,248 positions yearly. This means, on average, the sector can expect an annual shortfall of local talent of 823 positions per year. The greatest absolute final gap in this category is among machinists, with an annual shortfall of 102 employees. Several of these occupations are slated to experience an oversupply of local talent. The greatest of these is projected to occur in cutting, punching, and press machine setters, operators, and tenders, with an anticipated oversupply of 63 qualified workers per year. (**Exhibit 19**).

Exhibit 19. Annual Supply and Demand, On-the-job Training, Manufacturing Occupations, King County

Occupation	Total Graduate Supply	Total Demand	Interim Gap	Total UI Claims Supply	Final Gap↓
Machinists	10	117	(107)	5	(102)
Team Assemblers	0	86	(86)	0	(86)
Inspectors, Testers, Sorters, Samplers, and Weighers	0	85	(85)	0	(85)
Aircraft Structure, Surfaces, Rigging, and Systems Assemblers	0	79	(79)	0	(79)
Shipping, Receiving, and Traffic Clerks	0	68	(68)	0	(68)
Purchasing Agents, Except Wholesale, Retail, and Farm Products	0	58	(58)	6	(52)
Industrial Machinery Mechanics	1	54	(53)	3	(50)
Electrical and Electronic Equipment Assemblers	0	49	(49)	0	(49)
Bakers	12	48	(36)	0	(36)
Packaging and Filling Machine Operators and Tenders	0	36	(36)	0	(36)
Structural Metal Fabricators and Fitters	0	35	(35)	0	(35)
Computer-Controlled Machine Tool Operators, Metal and Plastic	0	35	(35)	0	(35)
Production, Planning, and Expediting Clerks	2	48	(46)	17	(29)
Helpers--Production Workers	0	28	(28)	0	(28)
Assemblers and Fabricators, All Other	0	31	(31)	4	(27)
Ophthalmic Laboratory Technicians	0	25	(25)	0	(25)
Food Batchmakers	0	41	(41)	20	(21)
Coating, Painting, and Spraying Machine Setters, Operators, and Tenders	0	18	(18)	0	(18)
Dental Laboratory Technicians	0	17	(17)	0	(17)
Sheet Metal Workers	0	17	(17)	4	(13)
Printing Press Operators	0	13	(13)	0	(13)
Meat, Poultry, and Fish Cutters and Trimmers	0	42	(42)	29	(13)
Engine and Other Machine Assemblers	0	23	(23)	11	(12)
Grinding and Polishing Workers, Hand	0	10	(10)	0	(10)
Cutting and Slicing Machine Setters, Operators, and Tenders	0	9	(9)	0	(9)
Extruding, Forming, Pressing, and Compacting Machine Setters, Operators, and Tenders	0	13	(13)	5	(8)
Molding, Coremaking, and Casting Machine Setters, Operators, and Tenders, Metal and Plastic	0	12	(12)	4	(8)
Cabinetmakers and Bench Carpenters	2	7	(5)	0	(5)
Electromechanical Equipment Assemblers	0	8	(8)	4	(4)
Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic	11	14	(3)	0	(3)
Fiberglass Laminators and Fabricators	0	2	(2)	0	(2)
Mixing and Blending Machine Setters, Operators, and Tenders	0	16	(16)	15	(1)
Painters, Transportation Equipment	7	9	(2)	3	1
Extruding and Drawing Machine Setters, Operators, and Tenders, Metal and Plastic	11	10	1	0	1
Paper Goods Machine Setters, Operators, and Tenders	0	2	(2)	4	2
Grinding, Lapping, Polishing, and Buffing Machine Tool Setters, Operators, and Tenders, Metal and Plastic	11	12	(1)	5	4
Welders, Cutters, Solderers, and Brazers	68	53	15	0	15
Tool and Die Makers	0	2	(2)	20	18
Sewing Machine Operators	0	3	(3)	55	52
Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic	9	13	(4)	68	63
On-the-Job Training Subtotal	142	1,248	(1,106)	283	(823)

Sources: U.S. Bureau of Labor Statistics, 2014; Washington State Employment Security Department, 2015; National Center for Education Statistics Integrated Postsecondary Education System, 2013; Community Attributes, Inc., 2015.

Positions that require an associate degree or Postsecondary Award are projected to experience a total oversupply of 7 workers per year. This is primarily due to one occupational category with an oversupply, industrial engineering technicians, and one occupation with a significant undersupply, first-line supervisors of production and operating workers. A similar dynamic is at play among occupations that require a bachelor's degree, where an oversupply of industrial production managers is balanced by large gaps in other occupations. Taken together, all occupations that require a bachelor's degree are expected to experience a total shortfall of 18 positions annually. Across all three occupational groupings, 834 positions are slated to go unfilled by local talent per year. (Exhibit 20).

Not all occupations within an educational grouping are substitutable. An oversupply in one occupation may not necessarily be countered by an undersupply in another occupation. Although the educational requirement may be the same, the actual degree or skills may not be the same between occupations. For this reason it is important to have a detailed account of supply and demand for each primary occupation in order to anticipate and plan for labor surpluses and shortages in the future.

Exhibit 20. Annual Supply and Demand, Associate Degree or Postsecondary Award and Bachelor's Degree, Manufacturing Occupations, King County

Occupation	Total Graduate Supply	Total Demand	Interim Gap	Total UI Claims Supply	Final Gap ↓
First-Line Supervisors of Production and Operating Workers	0	64	(64)	0	(64)
Aircraft Mechanics and Service Technicians	0	18	(18)	0	(18)
Avionics Technicians	0	9	(9)	0	(9)
Aerospace Engineering and Operations Technicians	0	7	(7)	9	2
Mechanical Drafters	29	13	16	8	24
Industrial Engineering Technicians	87	22	65	7	72
Associate's degree or Postsecondary Award Subtotal	116	133	(17)	24	7
Industrial Engineers	0	103	(103)	9	(94)
Mechanical Engineers	2	65	(63)	0	(63)
Electrical Engineers	7	43	(36)	5	(32)
Aerospace Engineers	44	67	(23)	3	(20)
Operations Research Analysts	0	20	(20)	2	(18)
Budget Analysts	22	25	(3)	5	2
Computer Network Architects	54	35	19	0	19
Logisticians	0	32	(32)	52	20
Materials Engineers	1	23	(22)	44	21
Industrial Production Managers	130	21	109	37	146
Bachelor's degree Subtotal	261	434	(173)	156	(18)
Grand Total	519	1,815	(1,296)	463	(834)

Sources: U.S. Bureau of Labor Statistics, 2014; Washington State Employment Security Department, 2015; National Center for Education Statistics Integrated Postsecondary Education System, 2013; Community Attributes, Inc., 2015.

SUMMARY OF KEY FINDINGS

Key Findings

The manufacturing sector in King County is projected to experience an average of 1,815 openings per year from 2018 to 2023, with these occupations growing in total from 96,378 jobs in 2018 to 100,571 jobs in 2023, an annual growth rate of 0.9%.

Manufacturing occupations in King County's manufacturing sector can expect an annual local supply of 463 UI claimants and 519 graduates that both match to manufacturing occupations and can be expected to stay in the area after graduating (**Exhibit 21**).

Exhibit 21. Summary of Annual King County Manufacturing Sector Talent Supply, 2018-2023

Projected Talent Supply (Annual)	
Unemployed	463
Newly-Trained Candidates	519

Sources: Washington State Employment Security Department, 2015; National Center for Education Statistics Integrated Postsecondary Education System, 2013; Community Attributes, Inc., 2015.

The industry will experience a total annual shortage of 835 workers per year from 2018 to 2023. This means that approximately 55% of annual openings are expected to be filled from local sources. (**Exhibit 22**).

Exhibit 22. Summary of Annual King County Manufacturing Sector Talent Supply and Demand, 2018-2023

Annual Surplus or (Shortage)	
Total Openings (Demand)	1,815
Total Supply	980
Surplus or (Shortage)	(835)

Sources: U.S. Bureau of Labor Statistics, 2014; Washington State Employment Security Department, 2015; National Center for Education Statistics Integrated Postsecondary Education System, 2013; Community Attributes, Inc., 2015.

Demand for occupations that require on-the-job training is the highest among educational requirement categories, with total demand of 1,248 workers. After subtracting graduate and UI claimant supply, a shortfall of 823 jobs is revealed. Positions that require a bachelor's degree have a projected annual demand of 434 annual workers, which, after subtracting local supply, has a gap of 18 unfilled positions annually. Positions that require an associate degree or Postsecondary Award have a total demand

of 133 employees per year, which is slated to be oversupplied by local talent. (Exhibit 23).

Exhibit 23. Summary of Annual Talent Supply and Demand by Education Requirement, 2018-2023

Educational Requirement	Total Graduate Supply	Total Demand	Interim Gap	Total UI Claims Supply	Final Gap
On-the-Job Training	142	1,248	(1,106)	283	(823)
Associate's degree or Postsecondary Award	116	133	(17)	24	7
Bachelor's degree	261	434	(173)	156	(18)
Total	519	1,815	(1,296)	463	(834)

Sources: U.S. Bureau of Labor Statistics, 2014; Washington State Employment Security Department, 2015; National Center for Education Statistics Integrated Postsecondary Education System, 2013; Community Attributes, Inc., 2015.