



The Pennsylvania **Green** Job Skills Survey Report

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Executive Summary

This report summarizes the results of a green skills survey of employers in Pennsylvania.

Survey Goals

The primary goals of the survey were to:

1. Identify the skills and knowledge sets for those currently employed in green occupations; and
2. To understand changes anticipated by employers as green policies and practices change in the future.

The survey was built upon two earlier Pennsylvania reports that provided a foundation for the study of green jobs and current information about green occupations. This report shows employers' perspectives on the skills and knowledge sets needed for those employed in green occupations.

The survey had a 64.3 percent response rate. The responses from employers showed a consistent understanding of green practices, skill expectations for their employees, and how they will provide green and other training for their employees.

The survey opened by asking for the job titles of positions where work in green categories was essential in 2010. The survey then asked about new job titles and their corresponding minimum education requirements, wage range and promotional paths. In order to understand opportunities for training, the survey asked employers about any special requirements (i.e., licenses, certifications or other training) and specific green technical skills required for each job title.

The next section of the survey asked employers several questions regarding their firm and their need for training resources. We asked employers if they think their firms' green practices will increase or not and what percent of their employees will need green skills or knowledge. Questions also explored which jobs are changing or in decline due to green practices. We asked about training resources and what school programs could help job candidates be better

prepared to work in their company. The survey concluded by asking employers what barriers they had in their implementation of green practices.

The survey had a total of eighteen questions. Many of these questions were open-ended where the employer could write out an answer. While the survey results section of this report summarizes the responses with narrative, tables and charts, we also provide a complete sorted list of the actual responses for the most important questions.

Summary Results

We mailed the survey only to employers who were already identified as having jobs performing green activities. Ninety-eight percent of the employers expected their green practices would either stay the same or increase. Consistent with employers' expectation of general growth in green practices, they expected increased demand for green-skilled employees. As a whole, employers thought that 38.1 percent of current positions would change due to green practices.



Employers frequently noted that general green knowledge, basic skills, math skills, general business skills, common sense and a solid work ethic are the core requirements for employees involved in green activities.

Executive Summary

While many employees involved in green activities need special training, often through a university or vocational college, 45.7 percent of the green employers had either no education requirements or required only a high school/GED diploma. Employers noted that they require their employees involved in green activities to have many skills of a general nature as well as basic skills. Employers frequently noted that general green knowledge, basic skills, math skills, general business skills, common sense and a solid work ethic are the core requirements for employees involved in green activities.

A majority of employers (60.3 percent) reported that their job candidates did not lack any green-related skills or areas of knowledge. Green skills requirements were headed up by special industry certifications such as the Leadership in Energy and Environmental Design (LEED). However, also high on the list was obtaining a Commercial Driver's License (CDL), Class A or B.

The survey probed employers about how they now train their staff and what training resources might they consider as their green training needs escalate. Often (39.8 percent of the time) employers felt that green training can be done in-house or on the job. Employers looked to trade and union sources, industry associations and manufacturers' training for a substantial amount of green training.

When it came to where employers were looking for training providers, employers were quite practical stating multiple sources and "wherever we can find it." Their sources need to be up-to-date and relevant to their specific industry and green activity. Traditional sources for training were the default. Computer-based training or government-provided training was low on the list of potential training providers.

The final question pertained to barriers standing in the way of implementing green practices. Lumping together costs, internal budgets, funding and the current state of the economy provided the common denominator for employers as the biggest barriers (with 61.0 percent of the responses). Government regulations accounted for only 16.1 percent of the barriers. Staffing and training issues made up a small minority (5.9 percent).

A quote from one of the employers makes a nice closing statement:

"Currently do not have any barriers, but there will be the need for more technical knowledge as the industry matures and expands."



Introduction and Background

The Commonwealth of Pennsylvania initiated research into green industries and occupations with its report *The Pennsylvania Green Jobs Report 1*, published in January 2010. That report looked at how well Pennsylvania identified green jobs, how they were categorized and produced employment projections by industry and occupation.

The Pennsylvania Green Jobs Report Part 1¹

Foundational work conducted by the Department of Labor & Industry included reviews of relevant research and discussions with industry that resulted in a definition of green jobs for Pennsylvania. Industry employers reviewed and confirmed the final definition. During the survey process, we asked employers to review the definition of green jobs and self-report how many of their employees were working in six core green areas.

Green jobs are jobs that employ workers in producing or offering products or services in six core areas. These areas were:

- Promote energy efficiency
- Contribute to the sustainable use of resources or renewable energy
- Prevent pollution
- Clean up the environment
- Promote the reduction of harmful emissions
- Provide green education/training, awareness or compliance

Appendix A has additional information from this report.

The Pennsylvania Green Jobs Survey Report²

This second study regarding Pennsylvania green jobs used a scientific survey to measure employment in green jobs. A total of 14,619 employers covering all of the state's industries participated in the survey. We weighted the survey results to represent the distribution of green jobs across the broader population of employers. This enabled us to compute statewide estimates of green jobs by industry sector and occupation.

The results showed an estimated 183,029 green jobs in Pennsylvania, – 3.4 percent of the total employment in the state. We found green jobs in each of the six core areas represented in the state's definition, and we found these jobs in varying concentrations in all industries in the state. One out of every five responding companies employs workers in green jobs, and small companies with less than 50 employees report that they have green jobs more often than large firms.

Green jobs exist in all industry sectors of Pennsylvania; however, the bulk of this employment occurs in relatively few sectors. The top six industries account for three-quarters of all green jobs; the three largest industries – construction;



“50 percent of workers in this field will be retiring in the next few years. The 1972 EPA clean water act means that all the employees currently in these positions are retiring now. This field needs more workers.”

¹The Pennsylvania Green Jobs Report Part 1, January 2010.

²The Pennsylvania Green Jobs Survey Report, December 2010.

Section 1 – Introduction and Background

manufacturing; and professional, scientific & technical services – account for more than half of all green jobs. As a percent of total employment, the proportion of green jobs varies greatly by industry sector, from a high of nearly 19 percent for construction, to a low of just one tenth of one percent in the health care & social assistance industry sector.

Green jobs also tend to be concentrated within relatively few occupations. The top 25 occupations include more than half of all green jobs in the state. The top five occupations combined constitute about one-fifth of all green jobs: production workers; heating, air conditioning and refrigeration mechanics and installers; carpenters; electricians; and retail salespersons.



The top 25 occupations include more than half of all green jobs in the state.

Growth in Green Jobs

Overall, employers estimate green job growth at 6.2 percent annually over the next two years, resulting in 23,232 positions. This growth forecast may be due to an increase in new green jobs, a shift in the work of existing employees into jobs considered green, or both. Growth is forecast across most green occupations, with increases expected in 20 of the 25 most common green jobs. These forecasts probably reflect a conservative estimate, since the survey does not take into account openings due to attrition and retirements. Also, no attempt was made to estimate additional jobs through indirect or induced employment that may be associated with current or future employment in green jobs.

Appendix B displays additional information from The Pennsylvania Green Jobs Survey Report.

Green Jobs

Study Results from Previous Pennsylvania Green Jobs Reports

The Pennsylvania Green Jobs Report Part 1 grouped green jobs into three categories:

- **Emerging** – These positions are either new enough, or growing in number to such an extent that current statistical job categories traditionally tracked by labor statisticians don't include them.
- **Evolving** – The majority of green jobs are in manufacturing and construction; however, many of them require new skills specific to the green sector. For example, construction workers skilled in commercial building may need new skills to become expert retrofitters.
- **Traditional** – These are occupations in green industries whose job duties are not changing significantly. Examples of these occupations include refuse & recyclable materials collectors and surveyors.³

The Pennsylvania Green Jobs Survey Report showed where green jobs currently exist and how employers expect them to change. The survey results describe how green jobs are distributed across industries, occupations and regions of the state.⁴ The results covered the following topics:

- Distribution of green jobs among green core areas
- Green jobs by company size
- Summary of green jobs by industry sector
- Summary of green jobs by occupation
- Green employment forecasts by occupation
- Breakdowns of green jobs by workforce investment area
- Skills and certifications for the green workforce

Employment Estimates and Forecasts

Each state participates in the Bureau of Labor Statistics (BLS) Occupational Employment Statistics (OES) program. This program conducts a semi-annual survey designed to produce estimates of employment and wages for about 800 occupations. Each state uses the results of the OES survey to prepare ten-year occupational projections.

For the 81 green occupations, the survey estimates 2,309 openings due to growth. The survey estimates a much higher count, 11,654, for average annual openings due to replacements. Replacements include those openings due to retirement, disability, death or withdrawal for personal reasons.

Appendix C displays the Pennsylvania employment estimates for 2008 and projections for 2018 for the 81 identified green occupations.



There are traditional occupations in green industries whose job duties are not changing significantly, such as refuse and recyclable materials collectors and surveyors.

³*The Pennsylvania Green Job Report Part 1*, January 2010, Page 12

⁴*The Pennsylvania Green Jobs Survey Report*, December 2010.

Employer Green Jobs Skills Survey

Introduction and Purpose of Employer Green Jobs Skills Survey

As a follow-up to the Pennsylvania Green Jobs Survey study, we sent a second survey to those Pennsylvania employers who participated in the Jobs Survey. The purpose of this second survey is to help learn about the associated skills sets and training needs for workers employed in green industries and occupations. The data collected targets workforce development practitioners and educators to help them prepare businesses and job seekers for opportunities within the green economy.

Pennsylvania policy makers seek to align public policy investments and business activities with the anticipated positive benefits to Pennsylvania's economy.



The purpose of this second survey is to help learn about the associated skills sets and training needs for workers employed in green industries and occupations.

Survey Methodology and Response

The Pennsylvania Green Jobs Skills Survey began with a list of all job titles identified as green jobs by employers, resulting in 6,152 job titles. We reduced this number by 87 because of various reasons. We sent the second survey to all employers of these job titles who participated in the first Pennsylvania Green Jobs Survey.

Employers responded with 3,898 job titles (held by 1,983 separate employers) and provided a response rate of 64.3 percent. This response rate included all useable and some incomplete responses. Fifty-eight percent of the employers had only one job title in the survey. One employer had 24 job titles.

Appendix D describes additional methodology and survey response information. *Appendix O* displays the survey form.

Survey Results

Green Jobs

The survey asked employers to list the job titles of all employees involved in green activities. The ten most frequent job titles (and their count) were:

1. HVAC Specialist	136
2. Electrician	115
3. Civil Engineer	112
4. Architect	104
5. Carpenter	101
6. Project Manager	94
7. Plumber	81
8. Mechanical Engineer	78
9. Sales Representative	76
10. Electrical Engineer	65

These ten job titles accounted for 24.7 percent of the total 3,898 job titles. The complete list of job titles involved in green activities and the counts as reported by employers is found in *Appendix P*.

We asked employers for the number of new positions in their firm within the last year.

- 84.4 percent reported that they had no new positions within the last year
- 8.6 percent reported that they had only one new position



Not only is there a growth expectation for small employers; there are increases in green job titles through the medium-sized and larger employers.

Photo by ©iStock/Lisa F. Young

We asked employers how many employees they currently had with that job title. For 40 percent of the firms, there was only one person with that job title; another 14.6 percent had two people with that job title. The complete distribution of the count of current employees is found in *Table 1*.

Table 1

Current Employees with Surveyed Job Title

Current Employees	Employer Response Count	Percent Responses
1 Employee	1,558	40.0%
2 Employees	568	14.6%
3-5 Employees	831	21.3%
6-10 Employees	461	11.8%
11-25 Employees	313	8.0%
26 or more Employees	164	4.2%
Total Employer Responses	3,895	100.0%

Note: Data may not add due to rounding.

We asked employers to estimate the number of employees in the job title they expected to have in two years. A few employers (4.2 percent) expected to reduce to no employees in two years. A little over thirty percent (30.3 percent) expected to have only one employee.

Table 2

Estimates of Green Employees in Two Years

Current Employees	Employer Response Count	Percent Responses
0 Employees	155	4.2%
1 Employee	1,111	30.3%
2 Employees	531	14.5%
3-5 Employees	868	23.6%
6-10 Employees	500	13.6%
11-25 Employees	334	9.1%
26 or more Employees	172	4.7%
Total Employer Responses	3,671	100.0%

Compared to the current employee count, where forty percent of employers have one employee, employers are expecting a growth of employees in the green practices job titles. Not only is there a growth expectation for small employers; there are increases in green job titles through the medium-sized and larger employers, as can be seen in the side-by-side comparison in *Table 3* and visually in *Figure 1*.

Section 4 – Survey Results

Table 3

Side-by-side Comparison (*Tables 1 and 2*) of Current Green Employee Count and Estimate of Employee Count in Two Years

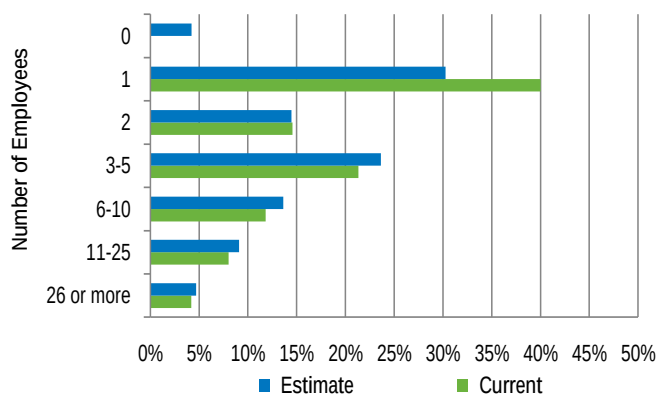
Employee Count	Response to Current Percent	Response to Estimate in 2 Years
0 Employees	0.0%	4.2%
1 Employee	40.0%	30.3%
2 Employees	14.6%	14.5%
3-5 Employees	21.3%	23.6%
6-10 Employees	11.8%	13.6%
11-25 Employees	8.0%	9.1%
26 or more Employees	4.2%	4.7%
Total Employer Responses	100.0%	100.0%

Note: Data may not add due to rounding.

Figure 1 displays the comparison of the current count of employees with the two-year estimate.

Figure 1

Side-by-side Comparison of Current Green Employee Count with Estimate of Employee Count in Two Years



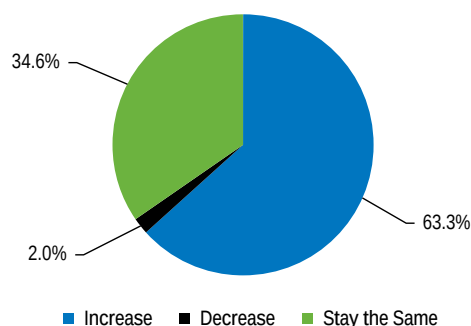
Most of the employers expected to have the same number of employees in the surveyed job title in two years as they currently have. There were more employers expecting growth in the number of employees than expecting a decrease. Employers' responses to some growth are consistent with Pennsylvania's Occupational Employment Projections as noted in *Appendix C*.

Growth in Firms' Green Practices

It is important for policymakers to know the expectations of employers for their firms' green practices in the future. A majority of employers (63.3 percent) expect increases in green practices for their firms; only 2.0 percent expect a decrease. The remainder of the firms (34.6 percent) expects their firm's green practices to remain the same. This information is consistent with what employers said about their estimates for employee count in two years (*Figure 2*).

Figure 2

Employers' Two-Year Expectations for Growth in Green Practices



Educational Qualifications

For each job title identified by employers as involved with green activities, we asked employers for the minimum education requirement for that position. *Table 4* and *Figure 3* reports their responses.

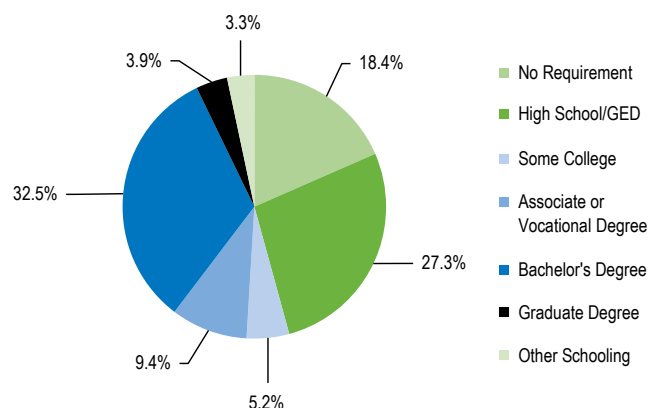
Table 4

Minimum Education Requirements for Employees Involved in Green Activities

Education Requirement	Employer Response Count	Percent Responses
No requirement	708	18.4%
High school/GED	1,050	27.3%
Some college	200	5.2%
Associate or Vocational Degree	361	9.4%
Bachelor's Degree	1,248	32.5%
Graduate Degree	148	3.9%
Other schooling	128	3.3%
Total Employer Responses	3,843	100.0%

Figure 3

Employers' Response to Minimum Education Requirements for Employees Involved in Green Activities



Special Requirements for Green Jobs

We asked employers if there were any required special licenses, certificates or other training required for those positions where employees are involved with green activities. Over half, 60 percent, of the green-job employees had such a requirement. The top ten special requirements (and their count) were as follows:

1. Commercial Driver's License (CDL) Class A or B 183
2. On-the-job training 167
3. Professional Engineer (PE) 145
4. Various state certifications and licenses 94
5. LEED certification 64
6. Teachers' certificate 57
7. HVAC certification 54
8. Refrigerant certifications 48
9. Electrical license 27
10. Plumber's license 25

Table 5 summarizes all of the employer responses for special requirements.

Over 38 percent (777 respondents) of the requirements were in those industries that have most of the emphasis on green technology. While certificates or licenses may require taking a class, 12.5 percent of the special requirements were obtained through on-the-job training. Engineers usually had professional license requirements and were 11.8 percent of those having special requirements. Another source of specific certification or license comes from product manufacturers (3.9 percent of all of the jobs).

Special requirements also include non-specific certifications (10.9 percent), various miscellaneous requirements (10.1 percent) and various college courses or degrees (8.2 percent).

More directly addressing green technology are those jobs involved with green or environmental technology and hazardous materials. Those requirements together totaled 4.2 percent (2.5 percent for hazardous materials and 1.7 percent for general green or environmental jobs).

Table 5

Employers' Special Requirements

Requirements	Employer Response Count	Percent Responses
Specific green industries	777	38.4%
On-the-job training	254	12.5%
Engineer	238	11.8%
Non-specific certifications	220	10.9%
Miscellaneous requirements	204	10.1%
College courses and degrees	166	8.2%
Product-specific requirements	79	3.9%
Hazardous materials requirements	51	2.5%
Green and environment requirements	35	1.7%
Total Employer Responses	2,024	100.0%

Table 6 has a breakdown of the special licenses, certification or other training requirements for those workers in the major green industries. Nearly half (46.7 percent) were for workers in the building and construction industry.

Table 6

Employers' Special Requirements for Green Industries

Specific Green Industry Requirements	Employer Response Count	Percent Responses
Building & Construction	363	46.7%
Mechanical & Equipment Operators	229	29.5%
Pollution (air, water and land)	117	15.1%
Electrical & Electronics	55	7.1%
Energy	13	1.7%
Total Employer Responses For Specific Green Industries	777	100.0%

Note: Data may not add due to rounding.

Appendix E shows detailed responses.

Section 4 – Survey Results

Specific Green Skills Required

The survey asked employers if there were specific green technical skill requirements for the green job employees. Over one third, 39.5 percent of the employers (1,227) reported that green technical skills were required. The top ten specifically listed green technical skills (and their counts) were:

1.	LEED	96
2.	Environmental knowledge	84
3.	Job requirements	61
4.	OSHA	55
5.	Green knowledge	53
6.	Energy efficiency skills	49
7.	Math and mechanical skills	36
8.	HVAC	28
9.	EPA certifications	27
10.	Solar energy knowledge	24

Table 7 summarizes the responses. The four specific green industries make up nearly 50 percent (49.5 percent) of all of the green requirements. Various miscellaneous skills of a general nature accounted for 20.4 percent of the green skill requirements. Another 14.4 percent of the respondents noted very specific regulations or required certificates.

Basic skills (such as a general understanding of environmental issues and green technology), made up 7.7 percent. Three technical areas (engineer/technology, electrical/electronic and computer skills) totaled 8.1 percent.

Table 7

Employers Showing Specific Green Skills Required

Green Skills	Employer Response Count	Percent Responses
Specific green industries	607	49.5%
Miscellaneous	250	20.4%
Certification and regulation requirements	177	14.4%
Basic skills	94	7.7%
Engineer & Miscellaneous Technical	49	4.0%
Electrical & Electronics	26	2.1%
Computer skills	24	2.0%
Total Employer Responses	1,227	100.0%

Note: Data may not add due to rounding.

Table 8 shows a breakdown of the four Specific Green Industries.

Table 8

Employers' Specific Green Skills for Major Green Industries

Specific Green Industries' Green Certificates	Employer Response Count	Percent Responses
Building & Construction	224	36.9%
Pollution (air, water and land)	172	28.3%
Mechanical, Materials and Equipment	107	17.6%
Energy	104	17.1%
Total Employer Responses	607	100.0%

Note: Data may not add due to rounding.

Detailed responses are listed in *Appendix F*

Wage Ranges

The survey asked employers to provide the wage ranges for green job employees. Employers provided 2,873 responses with wage information. The average low-end wages were \$15.76 for hourly employees and \$44,793 for annual low-end annual salaries.

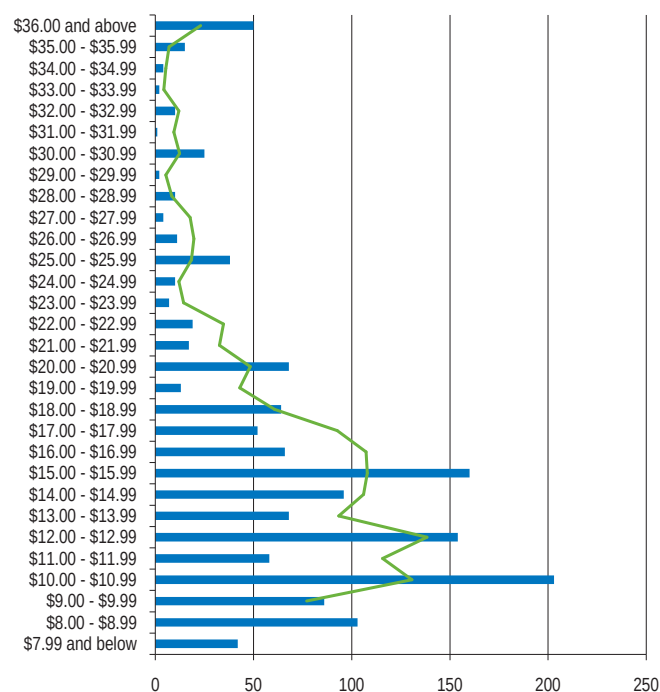
Figure 4 shows the distribution of low-end hourly wages. A 3-period moving average is overlaid on the distribution. There are three peak hourly wage groups:

- \$10.00 to \$10.99 with 13.9 percent (203) of employers providing an hourly wage
- \$12.00 to \$13.99 with 10.6 percent (154) of employers providing an hourly wage
- \$15.00 to \$15.99 with 11.0 percent (160) of employers providing an hourly wage

Over one third, 35.5 percent, of employers provide an hourly wage in one of these three hourly wage groups. Figure 4 shows the distribution of low-end hourly wages for green job employees.

Figure 4

Employers' Response Regarding Low-end Hourly Wages for Green Job Employees



Since employers were asked to provide wage ranges for each job title, we can compare the low-end wage with the high-end wage. For those employers paying hourly wages, while the low-end wage averaged \$15.76, the high-end wage average was \$23.67.

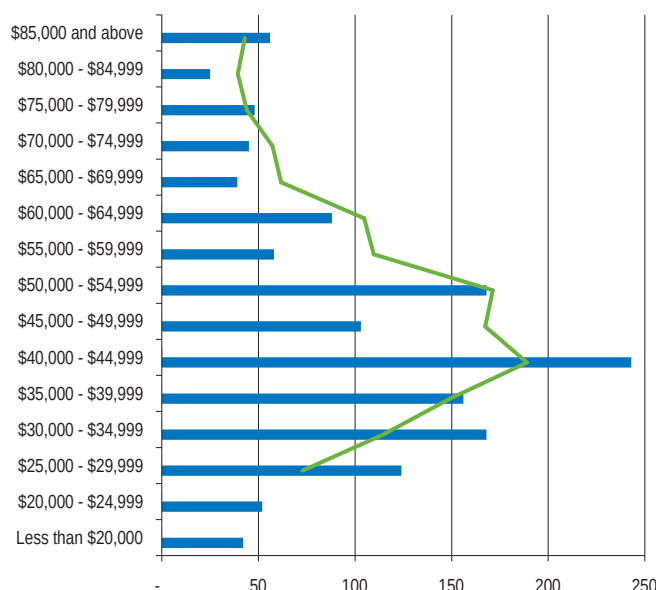


The low-end and high-end wage rates were compared for hourly wages and annual salaries showing opportunity for wage progression among green job titles.

Slightly less than half (49.3 percent) of the employers provided annual salary information instead of hourly wages. *Figure 5* shows the distribution of low-end annual salaries. A 3-period moving average is overlaid on the distribution. There is one peak annual salary group, \$40,000 to \$44,999, with 17.2 percent (243) of employers providing this annual salary.

Figure 5

Employers' Response Regarding Low-end Annual Salaries for Green Job Employees



For those employers providing annual salaries, the low-end average annual salary was \$44,793 and the high-end average annual salary was \$68,808.

Figure 6 compares the low-end to the high-end hourly wages. It is apparent that there is considerable opportunity for wage progression for these green job titles.

While the low-end hourly wage count drops off at around \$18.00 per hour, the high-end wage rate has counts in the upper \$19.00 per hour to \$27.00 per hour rate.

Figure 6
Comparison of Low-end Wage Rates with High-end Wage Rates

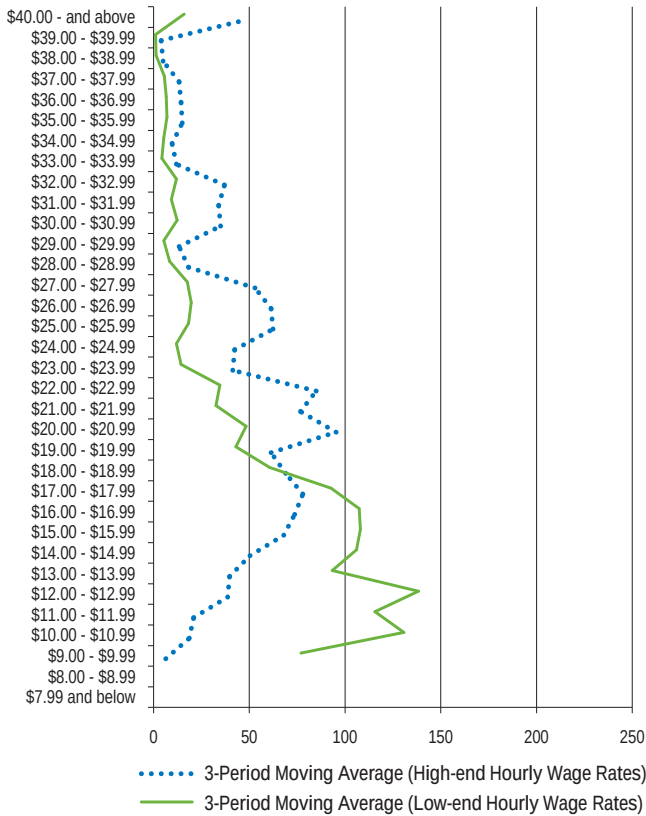
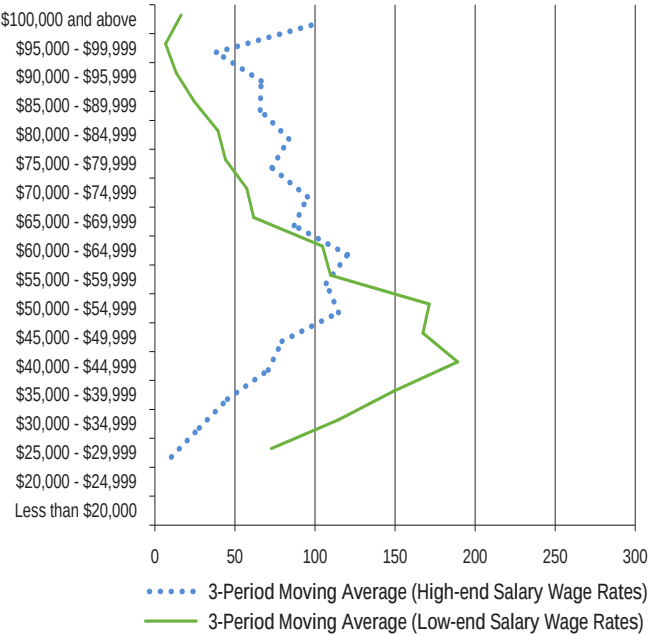


Figure 7 compares low-end annual salaries with the high-end annual salaries. Similar to what we saw with the hourly wage rates, while the low-end annual salaries centered at \$40,000 to \$50,000 per year, the high-end annual salaries peaked at the \$50,000 to \$65,000 per year.



Figure 7
Comparison of Low-end Annual Salaries with High-end Annual Salaries



Appendix G provides the tables of hourly wages and annual salaries.

Career Ladders

The survey asked employers to identify the promotional opportunity for each of the green job titles. They listed a next-level position for 1,619 job titles. The most frequently noted positions (850 of the 1,619 job titles) were for the following seventeen positions (and their count).

1. Supervisor	138
2. Project Manager	130
3. Promotion available	123
4. Foreman	115
5. Manager	110
6. Professor	28
7. Lead	27
8. Senior Engineer	26
9. Senior Project Manager	21
10. Crew Chief	19
11. Director	18
12. Sales Manager	18
13. Partner/Owner	16
14. Truck Driver	16
15. Associate	15
16. Principal	15
17. Superintendent	15

Appendix H Shows a complete list of the survey responses.

Most Needed Skills for Green Jobs

The survey asked employers what green-related skills or areas of knowledge did they find most often lacking in job candidates for green jobs. Many of the respondents, 39.7 percent (count of 950) listed a skill or a knowledge area lacking in job candidates.

1. Environmental regulations, green knowledge and basic skills	39
2. General green knowledge	38
3. Work ethic	35
4. LEED Certificate	32
5. Customer service	26
6. Math skills	24
7. Common sense	22
8. Direct experience	21
9. Communication skills	14
10. Building skills	12

Table 9 summarizes all of the responses. The largest group is for specific industry skills with 27.8 percent of the responses. Three groups can be combined linking common sense, a practical application of skills, along with a work ethic, for a total of 28.6 percent of the responses. Two other groups can be combined bringing together a lack of green knowledge with green technologies to total 17.9 percent.

Table 9
Employers Showing Most Needed Skills for Green Jobs

Green Skills Lacking	Employer Response Count	Percent Responses
Specific industry skills lacking	264	27.8%
Common sense and basic skills	144	15.2%
General green knowledge	111	11.7%
Proper certification and education	92	9.7%
Customer service and communication	86	9.1%
Practical applications	76	8.0%
Understanding green technology	59	6.2%
Work ethics	51	5.4%
General business skills	37	3.9%
Product knowledge	30	3.2%
Total Employer Responses	950	100.0%

Note: Data may not add due to rounding.

Table 10 lists a distribution by major green industries

Table 10
Employers Showing Skills Lacking by Major Green Industries

Green Skills Lacking	Employer Response Count	Percent Responses
Energy	53	20.1%
Miscellaneous industries	51	19.3%
Building & Construction	49	18.6%
Non-specific industries	46	17.4%
Pollution (air, water and land)	35	13.3%
Mechanical & Equipment Operators	30	11.4%
Total Green Sectors Skills Lacking	264	100.0%

Note: Data may not add due to rounding.

Appendix I provides a complete list of skills found lacking in job candidates.

Section 4 – Survey Results

Projected Need for Green Skills

The survey also asked employers what percent of their employees they expect will require green skills or knowledge during the next two years. Their responses are as follows:

Table 11

Employers' Expectations of Employee Green Skill Requirements or Knowledge

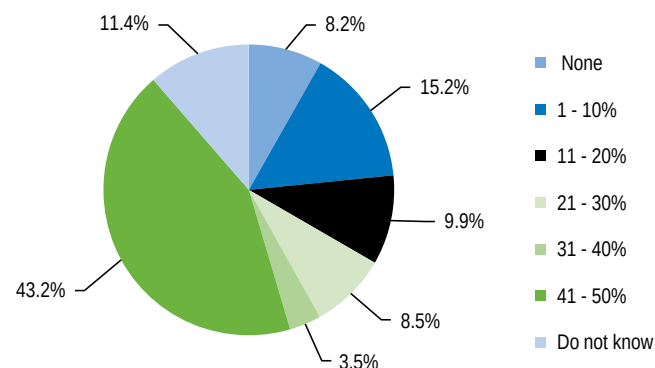
Category	Employer Response Count	Percent Responses
None	234	8.2%
1 - 10%	433	15.2%
11 - 20%	283	9.9%
21 - 30%	243	8.5%
31 - 40%	101	3.5%
41 - 50%	1,231	43.2%
Do not know	324	11.4%
Total Employer Responses	2,849	100.0%

Note: Data may not add due to rounding.

The largest category, by far, were the employers expecting that 41 to 50 percent of their employees would need training. *Figure 8* gives a visual display of *Table 11*.

Figure 8

Employers' Response Regarding Expectations of Employee Green Skill Requirements or Knowledge



Green Training Currently Utilizing

The survey asked employers what green training sources they currently utilize. Almost three-quarters of the employers, 1,806 (or 70.9 percent of those responding to this question), reported that they currently use green training sources. The most highly-noted green training sources were:

1.	In house training	436
2.	On-the-job training	120
3.	LEED training	71
4.	Vehicle manufacturer	68
5.	University	63
6.	Community college	50
7.	Manufacturer training	42
8.	On-the-job with certifications from independent parties	37
9.	College or university programs	36
10.	DEP (Department of Environmental Protection) seminars	36

Table 12 displays a summary of all of the responses. On-the-job training accounts for 39.8 percent of all of the training sources. The combination of building associations along with various other professional, trade and union associations accounted for another 21.4 percent of training sources. The four groups: colleges/universities; manufacturers; government; and computer-based training, accounted for less than ten percent of the training sources each.

Table 12

Current Green Training Sources

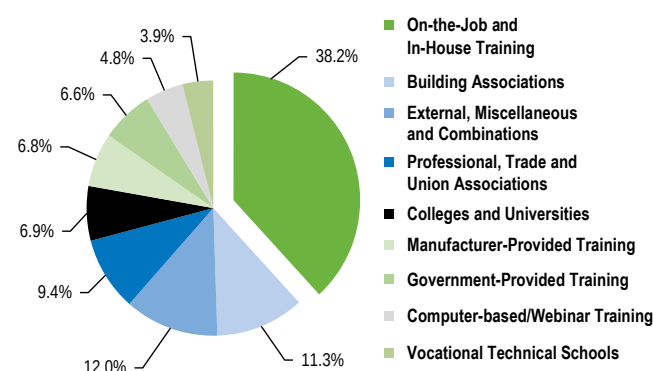
Green Training Sources	Employer Response Count	Percent Responses
On-the-job and in-house training	718	38.2%
Building associations	212	11.3%
External, miscellaneous and combinations	226	12.0%
Professional, trade and union associations	176	9.4%
Colleges and universities	130	6.9%
Manufacturer-provided training	128	6.8%
Government-provided training	125	6.6%
Computer-based/webinar training	91	4.8%
Vocational Technical Schools	74	3.9%
Total Employer Responses	1,806	100.0%

Note: Data may not add due to rounding.

Figure 9 displays the importance of on-the-job or in-house training.

Figure 9

Employers' Response on Current Green Training Sources



Appendix J displays the full set of survey responses.

Desired Training

The survey then asked employers what types of training they would like to see school programs include to better prepare job candidates for their company. There were 1,244 responses to this question. The most highly-noted types of training they would like to see were:

- | | |
|--|----|
| 1. Basic math skills | 73 |
| 2. Green practices in general | 42 |
| 3. Increased emphasis on mathematics and science, verbal and language skills | 37 |
| 4. Work ethics | 32 |
| 5. HVAC skills | 27 |
| 6. LEED Certification/education | 23 |
| 7. Reading, writing and arithmetic (core fundamentals) | 23 |
| 8. Effective communications training | 21 |
| 9. Business skills | 16 |
| 10. Basic computer training | 13 |

All of the responses are summarized in Table 13. A little over one-third, 34.5 percent (or 429) of the employers noted Industry-specific training. Over a quarter, 28.8 percent (or 358 responses), listed basic skills of math, reading and writing, combined with work ethics. General green and sustainability training were listed by 10.9 percent of the

employers. Some employers (9.0 percent) stressed that the training needs to be focused on practical applications. Some employers (8.4 percent) noted that their desired training be from a vocational or trade school. Business skills, computer skills and customer service skills were a small but significant set of responses.

Table 13

Employers' Desired Training of Employees

Desired Training	Employer Response Count	Percent Responses
Industry specific	429	34.5%
Basic skills	358	28.8%
General green & sustainability	136	10.9%
Practical applications	112	9.0%
Vocational technical schools	104	8.4%
Business skills	46	3.7%
Computer skills	29	2.3%
Customer service skills	30	2.4%
Total Employer Responses	1,244	100.0%

The 429 employers who listed industry-specific training can be broken down into the following sub-categories.

Table 14

Employers' Desired Training by Sector

Desired Training by Sector	Employer Response Count	Percent Responses
Miscellaneous Industries	131	30.5%
Building & Construction	125	29.1%
Energy	98	22.8%
Pollution (air, water, and land)	54	12.6%
Electricity & Electronics	21	4.9%
Total Employer Responses	429	100.0%

Note: Data may not add due to rounding.

Appendix K shows a complete list of these training programs.

Green Training Resources

The survey provided specific categories of green training resources for employers to indicate those they would consider using. Employers could indicate more than one source of

Section 4 – Survey Results

training resources. Over two thousand, (2,087) employers provided a response; of this number 105 (or 5.0 percent) said they would not consider any of the training resources listed.

The training resource, vocational technical schools, headed the list with a count of 949 (or 45.5 percent). Slightly more than one-fifth of the employers would consider using Public Workforce System.

Table 15 and Figure 10 display the responses.

Table 15

Training Resources Employers Would Consider Using Outside Their Company

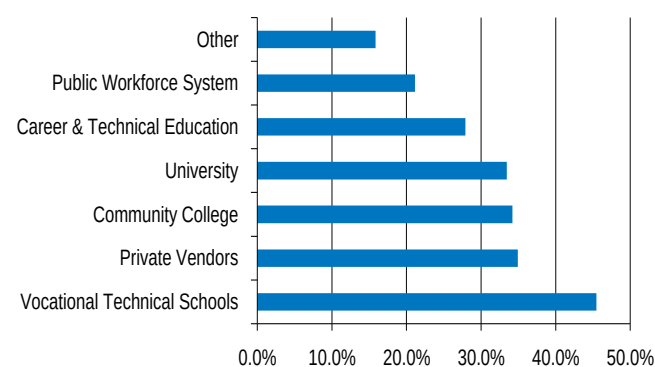
Training Resource	Employer Response Count	Percent Responses
Vocational technical schools	949	45.5%
Private vendors	729	34.9%
Community college	714	34.2%
University	698	33.4%
Career & technical education	582	27.9%
Public workforce system	441	21.1%
Other	331	15.9%
Total Employer Responses	2,087	

Notes: Data may not add due to rounding.

The count does not add up to the Total Employer Responses and the percents do not add up to 100 percent because more than one category of training could be selected by an employer.

Figure 10

Training Resources Employers Would Consider Outside Their Company



Those employers responding with an “Other” noted the following specific green training resources they would consider:

- Green conferences, particularly those they learn about from their business associations
- LEED certification training
- Vocational and trade associations
- College, university and community college classes
- State-sponsored classes
- Manufacturer and industry training

The survey asked employers if they would like to be contacted about green training resources. Just over four hundred (403) employers said that they would like to be contacted. This question was in the survey not so much for analysis but for providing assistance to employers now.

Decline in Jobs Due to Green Practices

The survey asked employers to identify any occupations/jobs declining due to implementation of green practices. Only 140 employers (6.1 percent of those responding to this question) listed jobs in decline due to green practices.

The top responses (and their count) are as follows:

- | | |
|--|---|
| 1. Coal industries | 8 |
| 2. Billing and Purchasing Clerks | 7 |
| 3. Construction | 7 |
| 4. General Operations and Maintenance | 6 |
| 5. All | 5 |
| 6. All engineering related | 5 |
| 7. Land development - lots of regulations | 5 |
| 8. EPA reg c02 - will affect larger plants and companies | 4 |
| 9. Machinery Operators | 4 |
| 10. Agriculture jobs | 3 |

A summary of these declining jobs is found in Table 16.

Table 16

Employers' Response Regarding Declining Jobs Due to Green Practices

Declining Jobs	Employer Response Count	Percent Responses
Miscellaneous non-technical	42	30.0%
Building & Construction	25	17.9%
Pollution (air, water & land)	23	16.4%
Energy	23	16.4%
Miscellaneous Technicians	16	11.4%
Mechanical & Equipment Operators	11	7.9%
Total Employer Responses	140	100.0%

Appendix L shows a complete list of survey responses.

Over a third of the employers (38.1 percent or 852 employers) said they expected some existing positions would change as a result of green practices. The top responses (and their count) on changes of existing positions were:

1. All positions would change	87
2. Purchasing, Sales	59
3. Project Manager	44
4. Environmental compliance and environmental monitoring, operations	37
5. Architects	36
6. HVAC	33
7. Electrician	29
8. Maintenance Worker	21
9. Cost Estimators	14
10. Civil Engineer	12

Table 16 has a summary of all the positions that employers thought would change the most due to green practices. The building & construction industry accounted for the largest number with 21.0 percent of all of the responses. The jobs thought to change were quite scattered across jobs. Management jobs accounted for 14.0 percent of the responses while the category of jobs with low skill requirements came in at 2.2 percent.

Table 17

Jobs Changing Due to Green Practices

Jobs Changing	Employer Response Count	Percent Responses
Building & Construction	179	21.0%
Management	119	14.0%
Non specific	102	12.0%
Direct green	101	11.9%
Office Workers	80	9.4%
Mechanical/Equipment Operators	71	8.3%
Miscellaneous Technicians	54	6.3%
Engineers	54	6.3%
Pollution (air, water & land)	27	3.2%
Energy industry	25	2.9%
Recycling	21	2.5%
Jobs with low skills requirements	19	2.2%
Total Employer Responses	852	100.0%

Appendix M displays a complete list of survey responses of jobs where change is expected.

Barriers to Implement Green Practices

The survey asked employers if they had barriers that stand in their way of implementing green practices. While the wording of the responses varied considerably, the top five response categories were:

- Cost (cost benefit or return-on-investment analysis)
- Financial or funding barriers
- Company budget issues
- Government regulations, in particular Department of Transportation Rules
- The economy and the current recessionary effects
- Client awareness or buy-in to green practices

Nearly two-thirds (64.0 percent) did not have any barriers. For the third of employers (36.0 percent) who did have barriers, the major categories of responses are listed in Table 18.

Section 4 – Survey Results

Table 18

Barriers to Implement Green Practices

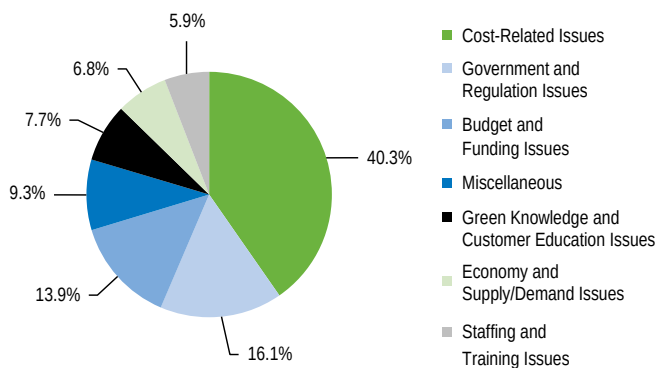
Barriers	Response Count	Response Percent
Cost-related issues	425	40.3%
Government and regulation issues	170	16.1%
Budget and funding issues	146	13.9%
Miscellaneous	98	9.3%
Green knowledge and customer education issues	81	7.7%
Economy and supply/demand issues	72	6.8%
Staffing and training issues	62	5.9%
Total Employer Responses	1,054	100.0%

Most of those employers who mentioned barriers had issues with the costs, finances or the economy (61.0 percent).

The following figure shows the relative size of these cost/financial/economy barriers compared to the other barriers.

Figure 11

Employers' Response Showing Barriers to Implementing Green Practices



Appendix N shows a complete list of barriers as listed by the employers.

Overall Conclusions

1. The top ten green job titles were heavily represented by building and construction occupations. The job titles were, for the most part, skilled technicians usually obtained after a university education or experience in a specific trade. Nearly fifty percent (46.7 percent) of the employers in building and construction industries had special requirements.
2. The surveyed employers were selected because they had already participated in green activities; all but 2.0 percent expected their green practices would either stay the same or increase.
3. A university degree was required for 36.4 percent of green employees. A larger percentage had no requirement or high school/GED diploma at 45.7 percent.
4. There were many types of professional licenses or certificates required of green employees. Only 12.5 percent of the employers could meet their green requirements through on-the-job training.
5. While LEED certification headed up the list of specific green skills required of employees in green practices, employers noted that there are many skills of a general nature as well as basic skills that are required of employees involved in green activities. Notable for not showing up high on the critical skills list are computer skills.
6. The average low-end wage was \$15.76 per hour or \$44,793 for those paying annual salaries.
7. Employers, for the most part, knew the next position level (promotion) for their green employees. While the job titles of green workers were mostly of a skilled/technical nature, most of the promotional opportunities were in management/supervisory positions. In particular project manager positions were often mentioned requiring a solid understanding of the technologies involved in green activities as well as being able to manage staff and work processes.
8. The most-needed skills for green occupations show a balance between specific industry skills, basic skills and a general green knowledge. As with all employers, the foundation of basic skills along with a work ethic sets the opportunities for adding specific green skills and practical on-the-job experience.
9. Employers understood that employees will increasingly need green skills or knowledge in the future. However, that was not always the case; 23.4 percent of employers felt that only a small number of their employees (ten percent or less of their staff) would need green skills.
10. Employers often felt (39.8 percent of the time) that green training can be done in house or on-the-job. Employers looked to trade and union, industry associations, and manufacturer's training for a substantial amount of green training. Employers had small expectations for government-provided training or computer-based training.
11. The types of training desired by employers begin with the basic skill sets, particularly training employees to understand how to make practical applications of their skills. Green skills were seen by employers as important knowledge and part of those basic skills. Specific industry skills or technology skills would then be added to the foundational skills set.
12. Employers were open to where they find training providers. There is a wide variety of sources that they would consider for training. Vocational technical schools led the list of training providers employers would consider.
13. Employers understood that the demand for qualified green employees is going to increase. Only 6.1 percent of employers felt there would be a decline in occupations due to green practices. Employers recognized that many occupations will not change due to green practices; 38.1 percent of employers said some positions will change due to green practices.
14. When it comes to barriers to implement green practices, employers were quite united in focusing on costs, internal budgets, funding issues and the current state of the economy as the critical barrier.

Appendix A – Summary Extractions from The Pennsylvania Green Jobs Report Part 1⁵

Introduction

Pennsylvania's effort to improve its information on green industries and jobs is a part of Pennsylvania's Labor Market Improvement Grant, a \$1.25 million competitive American Recovery and Reinvestment Act, or ARRA, grant awarded to the Pennsylvania Department of Labor & Industry. A core goal of this grant is to reduce the gap between traditional labor market data and the information needs of employers, educators and workers. Pennsylvania wants the additional green labor market data it collects to support better decisions by public- and private-sector partners about economic development activities and investments in education, training and careers that prepare Pennsylvania's green workforce for the future.

Over the past five years, Pennsylvania has established an active network of more than 70 industry partnerships that bring together employers (and in some cases, labor unions) to identify common skills requirements in key industries and to communicate those needs to stakeholders to guide policy and program decisions to support development of the state's green economy. Eight of Pennsylvania's industry partnerships have already delivered green training to meet growing markets and workforce demand in clean manufacturing, construction, energy efficiency and utilities.

Defining Green-Economy Jobs

Foundational work conducted by the Department of Labor & Industry included reviews of relevant research and discussions with industry that resulted in a definition of green jobs for Pennsylvania. Preliminary versions of the definition were reviewed and modified based on additional input from employers, research experts and stakeholders, resulting in the following definition:

Green jobs are jobs that employ workers in producing or offering products or services that:

- Promote energy efficiency
- Contribute to the sustainable use of resources or renewable energy
- Prevent pollution
- Clean up the environment
- Promote the reduction of harmful emissions
- Provide green education/training, awareness or compliance

Green Jobs Industry Sectors

Pennsylvania's green jobs are located, primarily, in five industry sectors:

1. Energy Efficiency
2. Renewable Energy
3. Clean Transportation
4. Pollution
5. Agriculture & Resource Conservation

Green Occupations Categories

Three categories were identified to summarize green occupations:

1. *Emerging*: including occupations such as energy auditors of buildings and other systems, wind technicians working with wind turbines, geothermal installers, solar panel installers
2. *Evolving*: including occupations such as construction workers skilled in commercial building, who are mastering new skills, allowing them to become expert conservation retrofitters
3. *Traditional*: including occupations such as construction laborers working on green building job sites, machinists making parts for wind turbines, refuse & recyclable materials collectors

⁵The Pennsylvania Green Jobs Report Part 1, January 2010.

Appendix B – The Pennsylvania Green Jobs Survey Report (Summary Extracted from the Report)⁶

Introduction

The primary goal of the *Green Jobs Survey* was to identify the number of green jobs that exist within the state's economy, and to establish a baseline measure that can be used to track industry and job growth over time. The survey built upon related research that helped to define and identify the kinds of industries and jobs that characterize the green economy, while also clarifying the needs and challenges of the state's green workforce.

This report provided a valuable benchmark for understanding the current composition of the state's green economy as well as helping to guide future efforts to support future growth in green jobs across Pennsylvania.

The Context for Green-Economy Jobs

The Pennsylvania Green Jobs Report, Part 1 defined green jobs, identified five broad industry sectors and projected \$10 billion in public and private investment in the state's green economy. While this report provided baseline information, critical questions remained unanswered. The purpose of the *Green Jobs Survey* was to follow up on this initial research in order to answer several questions relating to the green economy: Where are Pennsylvania's green employers now and in two years from now? What jobs are green and what is the demand? What skills and certifications are associated with these jobs?

The culmination of these efforts will be the development and deployment of a green career tool designed to assist job seekers in finding employment in the green economy. This tool will serve as a comprehensive resource containing all relevant data collected by Labor & Industry on the green economy, in order to aid job seekers in making informed career and educational decisions.

⁶The Pennsylvania Green Jobs Survey Report, December 2010.

Survey Protocol Development

Referencing the state's definition and the six core areas for green jobs, the survey asked employers to identify how many of their employees currently work in green jobs by job title. Employers were responsible for identifying which of their jobs were green jobs. Employers were also asked to estimate the number of employees in each job title they expect to have in two years. The survey further asked employers to list any specific green skills, basic skills and certifications needed among employees that constitute their green workforce.

Following completion of the survey process, existing data on industry-sector type, occupation and geographical location were integrated into the database to enable breakout analyses of the results for these variables. We used the six-category green jobs definition to design the survey and act as the basis for collecting information about occupational titles and estimating the number of green jobs by industry sector. The definition allowed for the inclusion of direct green jobs (employees who directly produce a green product or provide a service, such as solar panel technician or an environmental engineer) as well as some occupations that support green economy growth, such as educators or trainers. Prior research identified a series of industry sectors and sub-sectors that we expected would hold the majority of green jobs. This study confirmed that, in most cases, these selections were correct.

Survey Administration

The sample included private- and public-sector employers representing all industry sectors in Pennsylvania. A total of 14,619 usable surveys were received, which represents a participation rate of over 64 percent.

Data Analysis

Nearly 21 percent of the 14,619 employers who submitted usable surveys reported that they had employees in green jobs that related to one or more of the six core areas identified in the state definition. The survey results were subsequently weighted using standard statistical methods

to represent the relative distribution of green jobs across the broader population of employers. This approach enabled the computation of statewide estimates of the number of green jobs by industry sector and occupation.

Study Results

This survey provides an overview of green jobs in Pennsylvania. It pinpoints where green jobs currently exist and how employers expect them to change. The survey results describe how green jobs are distributed across industries, occupations and regions of the state. The results covered the following topics:

- Distribution of green jobs among green core areas
- Green jobs by company size
- Summary of green jobs by industry sector
- Summary of green jobs by occupation
- Green employment forecasts by occupation
- Breakdowns of green jobs by workforce investment area
- Skills and certifications for the green workforce

Appendix C - Employment Estimates (2008) and Forecast (2018) of Green Occupations

Pennsylvania Occupational Employment – 81 Green Occupations Estimated 2008/Projected 2018

SOC CODE	OCCUPATIONAL TITLE	EMPLOYMENT			AVERAGE ANNUAL OPENINGS		
		ESTIMATED 2008	PROJECTED 2018	PERCENT CHANGE	DUE TO GROWTH ¹	DUE TO REPLACEMENT ²	TOTAL ³
00-0000	Total, All Occupations	6,234,130	6,382,170	2.37	31,472	138,100	169,572
	81 Green Occupations	695,680	702,950	1.05	2,309	11,654	13,963
11-3051	Industrial Production Managers	6,560	5,830	-11.13	0	226	226
11-3071	Transportation, Storage, & Distribution Managers	3,610	3,730	3.32	13	107	120
11-9011	Farm, Ranch, & Other Agricultural Managers	14,350	16,930	17.98	257	105	362
11-9012	Farmers & Ranchers	29,250	30,010	2.60	76	263	339
11-9021	Construction Managers	10,270	11,280	9.83	100	159	259
11-9041	Engineering Managers	5,530	5,350	-3.25	0	112	112
11-9121	Natural Sciences Managers	1,460	1,590	8.90	13	32	45
13-1111	Management Analysts	26,260	26,410	0.57	15	448	463
17-1011	Architects	5,390	5,560	3.15	17	102	119
17-1012	Landscape Architects	830	860	3.61	2	16	18
17-1021	Cartographers & Photogrammetrists	280	300	7.14	2	9	11
17-1022	Surveyors	2,100	2,280	8.57	18	65	83
17-2021	Agricultural Engineers	90	90	0.00	0	2	2
17-2041	Chemical Engineers	1,320	1,370	3.79	5	34	39
17-2051	Civil Engineers	12,150	13,030	7.24	88	320	408
17-2071	Electrical Engineers	5,700	5,590	-1.93	0	132	132
17-2072	Electronics Engineers	6,300	6,240	-0.95	0	146	146
17-2081	Environmental Engineers	2,910	3,200	9.97	29	85	114
17-2112	Industrial Engineers	9,650	10,880	12.75	122	232	354
17-2131	Materials Engineers	1,470	1,410	-4.08	0	34	34
17-2141	Mechanical Engineers	9,290	8,870	-4.52	0	202	202
17-3022	Civil Engineering Technicians	2,940	2,920	-0.68	0	57	57
17-3023	Electrical & Electronic Engineering Technicians	7,560	7,010	-7.28	0	148	148
17-3024	Electro-Mechanical Technicians	710	640	-9.86	0	14	14
17-3025	Environmental Engineering Technicians	1,550	1,650	6.45	10	30	40
17-3026	Industrial Engineering Technicians	4,010	3,980	-0.75	0	78	78
17-3027	Mechanical Engineering Technicians	1,920	1,920	0.00	0	37	37
17-3031	Surveying & Mapping Technicians	1,720	1,790	4.07	8	32	40
19-1013	Soil & Plant Scientists	230	240	4.35	1	7	8
19-1031	Conservation Scientists	560	560	0.00	0	17	17

Appendix C

SOC CODE	OCCUPATIONAL TITLE	EMPLOYMENT			AVERAGE ANNUAL OPENINGS		
		ESTIMATED 2008	PROJECTED 2018	PERCENT CHANGE	DUE TO GROWTH ¹	DUE TO REPLACEMENT ²	TOTAL ³
19-1032	Foresters	490	470	-4.08	0	14	14
19-2031	Chemists	5,070	5,230	3.16	16	134	150
19-2032	Materials Scientists	690	700	1.45	2	18	20
19-2041	Environmental Scientists & Specialists	1,890	2,020	6.88	14	49	63
19-2042	Geoscientists	690	740	7.25	4	18	22
19-2043	Hydrologists	170	180	5.88	1	4	5
19-3051	Urban & Regional Planners	1,650	1,710	3.64	7	49	56
19-4011	Agricultural & Food Science Technicians	610	630	3.28	2	10	12
19-4031	Chemical Technicians	4,620	4,740	2.60	12	154	166
19-4091	Environmental Science & Protection Technicians	1,330	1,410	6.02	8	51	59
19-4093	Forest & Conservation Technicians	110	110	0.00	1	4	5
25-9021	Farm & Home Management Advisors	1,220	1,180	-3.28	0	17	17
27-1021	Commercial & Industrial Designers	2,420	2,350	-2.89	0	64	64
27-1025	Interior Designers	2,030	2,080	2.46	5	54	59
37-3011	Landscaping & Groundskeeping Workers	46,520	50,590	8.75	408	614	1,022
45-2092	Farmworkers & Laborers - Crop, Nursery, & Greenhouse	34,910	39,630	13.52	472	874	1,346
45-4011	Forest & Conservation Workers	520	570	9.62	4	20	24
47-1011	Supervisors - Construction Trades & Extraction Workers	20,060	20,550	2.44	49	280	329
47-2031	Carpenters	55,080	55,670	1.07	58	745	803
47-2061	Construction Laborers	39,010	40,230	3.13	122	294	416
47-2111	Electricians	26,340	26,350	0.04	1	678	679
47-2121	Glaziers	1,460	1,420	-2.74	0	25	25
47-2131	Insulation Workers, Floor, Ceiling, & Wall	520	510	-1.92	0	12	12
47-2132	Insulation Workers, Mechanical	780	780	0.00	0	18	18
47-2152	Plumbers, Pipefitters, & Steamfitters	15,030	15,410	2.53	38	310	348
47-2181	Roofers	5,200	5,300	1.92	10	119	129
47-4011	Construction & Building Inspectors	5,690	6,250	9.84	56	105	161
47-4041	Hazardous Materials Removal Workers	830	800	-3.61	0	18	18
49-1011	Supervisors - Mechanics, Installers, & Repairers	14,920	14,760	-1.07	0	350	350
49-2094	Elec. Repairers - Commercial & Industrial Equipment	4,730	4,930	4.23	20	160	180
49-2095	Elec. Repairers - Powerhouse, Substation, & Relay	1,120	930	-16.96	0	38	38
49-9012	Control & Valve Installers & Repairers	830	790	-4.82	0	15	15
49-9021	Heating, A/C & Refrigeration Mechanics/Installers	14,570	14,870	2.06	30	256	286
49-9041	Industrial Machinery Mechanics	16,240	17,540	8.00	130	271	401

SOC CODE	OCCUPATIONAL TITLE	EMPLOYMENT			AVERAGE ANNUAL OPENINGS		
		ESTIMATED 2008	PROJECTED 2018	PERCENT CHANGE	DUE TO GROWTH ¹	DUE TO REPLACEMENT ²	TOTAL ³
49-9042	Maintenance & Repair Workers, General	65,710	66,250	0.82	55	162	217
49-9051	Electrical Power-Line Installers & Repairers	4,640	4,640	0.00	1	146	147
51-1011	Supervisors - Production & Operating Workers	30,790	27,460	-10.82	0	515	515
51-2022	Electrical & Electronic Equipment Assemblers	9,270	6,510	-29.77	0	158	158
51-2031	Engine & Other Machine Assemblers	1,150	970	-15.65	0	27	27
51-4041	Machinists	20,660	19,400	-6.10	0	319	319
51-4121	Welders, Cutters, Solderers & Brazers	18,330	16,780	-8.46	0	388	388
51-4193	Plating & Coating Machine Oprs.	2,040	1,740	-14.71	0	61	61
51-8012	Power Distributors & Dispatchers	430	350	-18.60	0	15	15
51-8013	Power Plant Oprs.	2,290	2,100	-8.30	0	79	79
51-8021	Stationary Engineers & Boiler Oprs.	1,230	1,220	-0.81	0	21	21
51-8091	Chemical Plant & System Oprs.	2,070	1,870	-9.66	0	57	57
51-9011	Chemical Equipment Oprs. & Tenders	4,020	3,850	-4.23	0	92	92
51-9061	Inspectors, Testers, Sorters, Samplers, & Weighers	23,270	20,430	-12.20	0	345	345
51-9141	Semiconductor Processors	490	410	-16.33	0	8	8
53-7072	Pump Oprs.	480	450	-6.25	0	19	19
53-7081	Refuse & Recyclable Material Collectors	5,490	5,570	1.46	7	149	156

Notes: Data may not add to totals due to rounding. Confidential data and occupations with employment less than 50 are not shown but are included in all sub-total and total employment values.

¹Labor force growth openings, except for cases of negative growth where growth openings are expressed as zero.

²Labor force net replacements due to death, retirement, disability, or withdrawal for personal reasons.

³Total openings equal replacements plus annual growth.

Source: Center for Workforce Information & Analysis, State of Pennsylvania <http://www.paworkstats.state.pa.us/gsipub/index.asp?docid=412>

Appendix D

Employer Survey Methodology and Response Rates Details

The Pennsylvania Green Jobs Skills Survey began with a list of 6,152 job titles identified as green jobs by employers. We reduced this number by 87 because of various reasons. All employers of these job titles who participated in the first Job Survey were contacted with a second survey.

We asked employers to list the job titles of essential employees who worked in green categories in 2010. We asked employers to exclude consultants, outside contractors, vendors and others not considered employees. Employers responded with 3,898 green-activity job titles; compared to the initial count of 6,152 green-activity job titles gives a response rate of 64.3 percent. This response rate includes all useable and incomplete responses.

The 3,898 job titles were employed by 1,983 separate employers. Fifty-eight percent of the employers had only one job title being surveyed. One employer had 24 job titles.

PA Skills Survey		
May 6 Survey Status	Responses	Percent
Useable Response	3,691	91.0%
Incomplete Response	207	5.1%
Refusal	71	1.8%
Invalid Location/Ph#	66	1.6%
Out of Business	11	0.3%
Inactive	5	0.1%
Out of State	2	0.0%
Duplicate	3	0.1%
Total	4,056	100.0%
Sample		6,152
Surveys		3,898
Deletions		87
Response Rate		64.3%

Within the 3,898 useable surveys, each question could be answered or not answered by the employer. The following table shows individual question response rates:

NUMBER	QUESTION	RESPONSES	RESPONSE OF "NONE"	TOTAL RESPONSES	RESPONSE RATES
1	Number of new positions within the last year	3,793	0	3,793	97.3%
2	Current employees in position	3,895	0	3,895	99.9%
3	Employees in position in two years	3,671	0	3,671	94.2%
4	Minimum education requirement	3,843	0	3,843	98.6%
5	List any required special licenses, certifications or other training	2,024	1,347	3,371	86.4%
6	Specific green technical skills required	1,227	1,879	3,106	79.7%
7	Promotion position at the next level (title)	1,619	1,182	2,801	71.9%
8	Wage Range (Hourly or Annual Salary)	2,873		2,873	73.7%
9	What green-related skills or areas of knowledge do you find most often lacking in job candidates?	950	1,440	2,390	61.3%
10	During the next two years, do you expect your firm's green practices to: increase, decrease, or remain the same?	2,841	0	2,841	72.9%
11	In the next two years, what percent of your employees do you expect will require green skills or knowledge? (check boxes)	2,849	0	2,849	73.1%
12	What green training sources do you currently utilize?	1,806	743	2,549	65.4%
13	What types of training would you like to see school programs include to better prepare job candidates for your company?	1,244	954	2,198	56.4%
14	What green training resources outside your company would you consider? (check boxes)	2,087	105	2,192	56.2%
15	Would you like to be contacted for these services? (and method for contact)	403	0	403	10.3%
16	Please identify any occupations/jobs declining due to implementation of green practices.	140	2,140	2,280	58.5%
17	Which existing positions do you envision will change the most as a result of green practices?	852	1,383	2,235	57.3%
18	Do you have barriers that stand in your way of implementation of green practices?	1,054	1,871	2,925	75.0%

Appendix E

Appendix E

Survey Responses – Special Requirements

Question: *List any required special licenses, certifications or other training.*

SPECIFIC GREEN INDUSTRIES	
BUILDING AND CONSTRUCTION	COUNT
LEED Certification	64
HVAC Certification	54
Plumber's License	25
Architect	23
Architects License	22
BA Architecture	9
Carpenter License	7
Asbestos Worker Certification	6
LEED Accredited Association, Green Associate Certificate	6
LEAD Certification	6
Inspector Certification, NAHB (National Association of Home Builders)	5
LEED - AP	5
Master Plumber License	5
BPI Training	4
Steamfitters, welding/gas, LEED training	4
CIH	3
AA Business/Construction Management	3
Contractors License	3
Excavator Operator Certification, CDL	3
GBC (Green Building Council)	3
"IGSHPA (International Ground Source Heat Pump) Association"	3
Journeyman or Master Plumber License	3
Landscape Architect License	3
NCARB (National Council of Architectural Registration Boards)	3
Professional Registration after 4 years experience, LEED Certified	3
Real Estate License	3
Welding & Pipefitting & Drafting Experience	3
CIH Certified Industrial Hygienist	3
Industrial Hygienist Certification	3
American Institute of Architects certified	2

American Society of Landscape Architects	2
Apprentice Electrician Education and 5 years on-the-job training	2
BA Construction Management	2
Building Inspector Licenses	2
Building Performance Institute (BPI) Certifications	2
CEN Certified, LEED ACCREDITED CLEP	2
Certified Electrician	2
EE, HVAC	2
Flooring Certification	2
Home Improvement and General Contractors license	2
Paving Experience & On the Job	2
PE and LEED preferred	2
PE/PLS	2
Pipe laying and trench experience	2
Septic Tank Endorsement	2
Landscape Designer	2
American Windows and Doors Training and Masters Vinyl and Siding Institute Training	1
Apprentice Plumber Certificate	1
Architecture/ Green Building Studies/Environmental Science and Policies	1
BA Building Automation	1
Blue Prints, Drafting, Fabrication, Pipefitting	1
Building experience or knowledge	1
Certified as Public Housing Manager	1
Certified in Building Automation	1
Certified Interior Designer, LEED AP, State Professional Architects License	1
Construction experience	1
Energy efficient building skills	1
LEED AP, CEM (Certified Energy Manager), PE	1
LEED Cert, Architect License	1
LEED Cert, ASID American Society of Interior Designer	1
LEED Certification, Professional Engineer License	1
LEED Certification, Union Apprenticeship Certification	1
LEED, Registered Landscape architect	1

MA Architectural, Mechanical Degree	1
Master Contractor License	1
National Home Inspector	1
Office experience in the construction industry	1
On-the-Job, construction management experience	1
Pipe laying and reading blueprints and measurements	1
Prior construction experience	1
Professional Architect License	1
Registered Building Contractor, Cert. Lead Contractor	1
Roof Certified pesticide training	1
Site construction plans, survey document preparation	1
Sustainable building advisor (program), LEED knowledge, naira (National Assoc. Rem.), Energy Auditor	1
Union Member, LEED Certification	1
Union Member, Licensed as Journeyman Plumber	1
Union Trained/Construction Knowledge	1
US Green Building Council Certification	1
USGBC/LEED technology	1
Weatherization/Lead Removal Certificate	1
Degree in construction	1
Interior Design certified training	1
Master Plumber License, Warm Air License, Boiler License	1
Specialized air conditioning training	1
General Contractor State License	1
Installation methods	1
LSRP (License Site Remediation Professional)	1
Total	363

MECHANICAL AND EQUIPMENT OPERATORS	COUNT
Commercial Driver's License, Class A or B	183
Factory training of the special products they use	6
Fork Lift Certificate	6
Machinery Licenses	5
On-the-Job, CDL Class A or B, Tanker Endorsement	5
Mechanical training	3
Agriculture, mechanical background	3
Equipment Operator experience	2
Equipment training	2
Prior experience and Heavy Equipment Operator License	2

On-the-job and mechanical skills	2
Machinist License	1
Master Mechanic Certification	1
Mechanical repair experience	1
Millwright education	1
On-the-job, Forklift Certification, Knowledge of plastics and decipher color of plastics	1
Trucking License	1
Vec. License, Utilities Certification	1
CDL Class B With Tanker Endorsement	1
Machine Design, Specialty in Automation and Control	1
AAS Electro Mechanical	1
Total	229

POLLUTION (AIR, WATER AND LAND)	COUNT
EPA Certified	15
Professional Geologist	11
Wastewater and Septic training	10
Environmental and Geo technology	6
MSHA (Mine, Safety and Health Administration, Department of Labor) training	6
Safety Inspection and Emissions Inspection	5
Emission Control and Freon Recovery Certification	3
Emissions and Inspections Licenses	3
Landfill training/experience	3
PHD in Geography	3
USDA/EPA	3
Water Testing Certificate	3
Certified Manager of Landfill Operations, Waste Water Treatment Plant Operator License	2
Certified MSHA	2
Certified on refrigerants	2
Emission control testing	2
Groundwater association, conferences, certified in Geothermal	2
Surface Mine training	2
Water Management degree	2
Wetland training - Hydrology	2
AA Water Works or 2 years of college in the same field	1
BA Earth Sciences/Hydro Geology degree	1
Certification Fusion of Geothermal	1

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Conservation resources and management	1
CRC Certification water mitigation, smoke, odor, and carpet certifications	1
DEPA training	1
Earth Science and Biology training	1
Earthworks excavating	1
Emission Repair License	1
Geo Environmental Degree	1
Geologist EPA Registration	1
Geologist through the state of PA	1
Geology, Chemistry, Biology, or Geology degree	c
Licensed Geologist	1
Masters in Geography	1
On-the-job, Water Works License	1
OSHA and MSHA Safety training	1
PHD in Conservation and Environmental Studies	1
PHD in Environmental Studies	1
PHD in Geology	1
Professional Hydrologist License	1
Professional Land Surveyor (PLS)	1
PSMA Sewage Enforcement training	1
Pump Stations and Wastewater License	1
Stream Restoration	1
Treatment Operator License	1
Waste Water Treatment	1
Waste Water Treatment experience and a sales background	1
Water Biology	1
Water Resource Management	1
Total	117

ELECTRICAL AND ELECTRONICS	COUNT
Electrical License	27
Electrical Engineering Degree	6
BA Electrical Engineering Degree	2
Electrician Degree	2
Journeyman Electrician Certification	2
Electrical/Instrumentation (E&I)	1
Electrician Certificate	1
Electrician License, Solar Installer License	1
Electronics	1
Licensed Electrician	1

Lineman Certificate	1
MA Electrical Engineering	1
Master Electrician License	1
On-the-job training, Electrician Certification	1
Plumbing, electrical maintenance	1
Prior Electrician experience	1
Professional Electrical Engineering Degree	1
Professional Electrical/Mechanical Engineering Degree	1
Read wiring schematics	1
High Voltage Certification	1
Department of Labor's apprenticeship program for electricians	1
Total	55

ENERGY	COUNT
Solar Installation Certification/NABSEEP	6
BA Energy/Mechanical Engineer Degree	1
Energy Auditor Certification	1
Energy Manager certification	1
Geothermal Training	1
NGPOS, Natural Gas Plant Operations Specialists Cert.	1
Certification in Energy Management	1
Ethanol training	1
Total	13

ON-THE-JOB TRAINING	COUNT
On the job training	167
College Degree, On-the-job training	10
Sales experience and product knowledge	4
Horticulture experience	3
Dependant on job	2
Field training	2
Foreman experience	2
Hands-on training	2
Hospitality Industry	2
Intern Development Program	2
Management experience	2
Marketing, Management experience	2
On-the-job and forklift training	2

On The Job and Management Experience	2
On The Job, Estimator and Management	2
On The Job, Mechanical and Supervisory Experience	2
On The Job, UST, AST Certification	2
Professional Experience	2
Sales and Product Knowledge	2
Training on site	2
vegetables and small fruit growing	2
On The Job, Accounting Experience	2
Pre Qualifying Test, Math	2
Air Force Pump Experience	1
Bonded	1
CNC Set-Up	1
CNC Training/2 years experience	1
ECU Points per year	1
Green products knowledge	1
HR Experience	1
Internal training for cleaning equipment	1
Leadership Experience	1
Liquids experience	1
Maintenance	1
Management, Nitrogen, Electric Pump Knowledge	1
On The Job and Knowledge of Multiple State Rules and Regulations	1
On The Job and Plant Knowledge	1
On the Job and Safety Training	1
On the Job Experience Well Control School, CPR, First Aid, Blood Board Pathogen Course	1
On the job, PROP(Pennsylvania Recycling Program	1
On The Job, Reclamation	1
On The Job, Supervisory Training	1
Painting Experience	1
PBA, UCC, On the job training	1
Physically fit	1
Procurement experience	1
Product Knowledge	1
Real Estate Experience, Business and Earth Sciences Courses	1
Seminars thru the State Association	1
Service Training	1
Social service background (experience & training)	1
Supervisory experience	1
Technical School or 5 Years Experience	1

Training in agricultural and development communities	1
On The Job, Plant Operator License	1
Total	254

ENGINEER	COUNT
Professional Engineer (PE)	145
BA Civil Engineering	17
Engineer License	14
EIT Certification	12
American Society of Mechanical Engineers Certification	10
BA Mechanical Engineering Degree	7
Engineering Degree	5
NICET (National Institute for Certification in Engineering Technologies)	4
BA Engineering	3
Environmental Engineering Degree	3
Mechanical Engineer	2
Professional Engineers	2
ASME Certification	1
BA Chemical Engineer	1
BSEE, Environmental Engineer degree, PE License....	1
Certificate of competency, chief engineer	1
Class 2 Sta Engineer (NIULPE-national institute for uniform licensing of power engineers)	1
Engineering Background	1
Engineer-in-Training (EIT), Professional Engineer (PE)	1
Licensed professional engineer	1
LPE	1
PHD in Civil Engineering	1
Professional engineer license, certified industrial hygienist	1
Specialized Engineering	1
Marine engineer	1
SE Fundamental engineering certificate	1
Total	238

NON-SPECIFIC CERTIFICATIONS	COUNT
State Certifications & Licenses	94
Union Apprenticeship Program	24

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Apprenticeship program	20
Journeyman License	12
DOT Certified CDL	8
OSHA certification	8
On The Job and OSHA Training	6
On The Job, Computer Skills	6
Science Certification	6
Manufacturer's Certifications	5
Operator certification	4
Edison Williams Tech Training	3
Office Applications & Comm. Skill	3
State license	3
Union member	3
Department of Labor & Industry Certifications	2
Trade School	2
Certified Inspection, On the job training	1
Civil Service Test - same as 1	1
Credits per year continuing	1
EIA standard certifications	1
Interpreting computer generated statistical data, Quality control methods	1
Local municipalities licenses	1
Maryland & West Virginia licenses	1
On The Job and FSC Certification	1
Operations systems license through PA	1
Registered Apprentice/Journeymen	1
Various Training through the company	1
Total	220

MISCELLANEOUS REQUIREMENTS	COUNT
Blasting Certification/ FBI Background check	13
Business Management	12
Nutrient management certification	11
AICP	9
CADD Training	9
NATE Certified	9
NABCEP Certification	6
Computer Skills, Excel	5
CEM, CBCP	4
DEP Certification, Underground installation certification, underground removal certification	4
PG	4

Professional Recyclers of Pennsylvania Training	4
Boiler Certifications, Sheet Metal License	3
Captain License, Merchant Marine License	3
Filter plant operator	3
First Aid CPR Card	3
FSC Certification	3
Geologist	3
IICRC (Institute of Inspection, Cleaning & Restoration Certification); In-house mold mitigation training	3
WWTPO license	3
APA, AICP, PP Cert., GIS.	2
ASE	2
Compressed Gas Training, Well Control School, CPR, First Aid, Blood Board Pathogen Course	2
Design courses for trade	2
Funeral director license	2
Geo Certification, State	2
GIS Certification	2
Hygienist certification	2
Internal combustion training	2
Law Cert	2
National Assessment Institute (NAI) certified	2
Prefer Materials Management Certificate	2
QSEI - Quality Source Testing Individual	2
RETA Course	2
Surveyor License	2
TABB (Testing, Adjusting, Balancing Bureau) Supervisor Certification	2
TPO license	2
ACI certification	1
AIA	1
AMEX	1
ASHI Certified	1
ASQ certification	1
BOCA or Equivalent	1
Cert. in Chemical Technology + Technician	1
Certification in Nutrient Management	1
Certified Project Designers	1
Certified Safety Specialist	1
Certified Welders	1
Certified Wildlife Biologist	1
Chemical Training and Certification	1
Code Enforcement Associates	1

Collections systems license through PA	1
DPI certified	1
Drafting training	1
Emergency Decent, Rigging, Soil	1
Fishery Experience and a Propagation license	1
Food Handling Certification	1
Forester	1
GIT (in-training), PCPG	1
IDP, State Registered	1
L, C stamps	1
Law enforcement code exp.	1
Licensed chemist	1
NABB, NCARD, IDP Credit	1
NAC Certification	1
NACE CIP LEVEL 1 SSPC-C3	1
NARI assoc membership help full	1
NASP or OSHA Cert.	1
National Registry of Radiation Protection Technologists certification	1
NCIDA NIA	1
NIA Cert helpful	1
OSHA certification to teach regulations, first-aid, and AED/CPR	1
OSHA Certifications, CPR/First Aid Certification	1
Out of state drilling license	1
Paramedic License preferred	1
PEG	1
PENDOT inspector	1
Pittsburgh Institute of Mortuary Science/ Business management degree	1
Planning Certification AICP	1
PLC Program training, PIITO +	1
PPP	1
Pre-treating facility inspection cert	1
PSLS, Professional State Land Surveyors license....	1
Public Dual Specialist Nutrient Management Certification, PA Engineering Job Approval Authorization	1
RA	1
Reasonable Suspicion Training	1
RLA	1
Secondary principal	1
SFI	1
Sheet Metal License	1

Specialized courses/current enrollment in industrial hygienist program	1
SSI	1
Welding Certification	1
Total	204

COLLEGE COURSES AND DEGREES	COUNT
Teachers certificate	57
BA Environmental Science	13
BA Business Management	6
Chemistry & Bio. chemistry	6
BA Biology, microbiology, or environmental science degree	5
Environmental degree studies	5
Accounting/Math skills	4
BA Environmental Safety	4
Professional License, Masters Degree	4
BA Forestry Degree	3
BA Project Management	3
Forestry Technical Degree	3
Masters degree	3
PHD Chemistry	3
PhD in Biology	3
AA Accounting	2
AA Forestry	2
BA Graphic Art Degree	2
Cert., continuing ED. required	2
Certified Teacher	2
MA Environmental Sciences	2
PHD Certificate	2
AA Degree Science, Math, Computer Skills	1
AA in Environmental Degree	1
AA Oil and Gas, Project Management Experience	1
AA Surveying Degree	1
Accounting College Degree, On The Job	1
BA Agriculture	1
BA Animal Biology	1
BA Public Administration, Environmental Planning	1
BA, Experience in Regulatory Affairs	1
College Accounting Course	1
College Course in Computer, Business, On The Job	1
College Courses in Chemistry and Science	1

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College Degree, PHR Certification	1
MA in Historic Preservation and Planning	1
Masters in Biology	1
Masters in Economics	1
Masters in Philosophy	1
Masters in Political Science	1
Master's License	1
PHD 2 masters	1
PHD Biology	1
PHD in Business Administration and Management	1
PhD in Chemistry	1
PHD in Economics	1
PHD in Education/Psychology, Teaching, Administration of Educational Activities	1
PHD in English Literature	1
PHD in Health Studies	1
PHD in Marketing/Communications	1
PHD in Philosophy	1
PHD in Political Science	1
Total	166

PRODUCT-SPECIFIC REQUIREMENTS	COUNT
Refrigerant Certifications	48
Pesticide Certification	12
Freon License, LEED Certificate	4
CertainTeed GAF,, Firestone, Carlyle	1
Certification to apply pesticide	1
CPA, in house training	1
Current Training modules (Firestone)	1
Dewatering technician & operators license (preferred)	1
Gas line Certification Freon Certification Freon Act	1
License (Chemicals and Pesticides)	1
Microsoft, VM (Server Software Application)	1
OSHA 500/510, Asbestos Supervisor License, Asbestos Inspector License	1
Primavera Software Training	1
Programmable Logic Controller Technician certificate	1
Radon Certified and Septic Certified	1
Refrigeration License	1
Registration for Bee Site and Prior Experience	1

Six sigma certification or lean manufacturing certifications	1
Total	79

HAZARDOUS MATERIALS REQUIREMENTS	COUNT
Hazmat, OSHA	9
OSHA 40 hour hazardous waste operations training requirement annually	6
OSHA certification (HAZWOPER); Asbestos inspection certification; EPA accredited training/ certification, Radon testing certification	6
EPA, Lead based paint Certified, State Certified	4
ISO 1401, Hazardous WOP	4
Lead Abatement Permits	4
OSHA Training/Certification, Hazardous Waste Operations and Emergency Response Training/ Certification (HAZWOPER), EPA Regulation Training/Certification	4
Certified in Lead Safe work practices	3
HAZWOPER Training, OSHA Training	2
lead base paint cert	2
Air monitoring license	1
Certified Hazardous Materials Management	1
Certified Utilities administrator national safety council OSHA	1
Hazardous Waste Operations and Emergency Response (HAZWOPER) Training/Certification, Environmental Protection Agency Training/Certification	1
Miners, hazmat training	1
Opacity, Hazmat, EE	1
Residential Code training, Lead abatement certificate	1
Total	51

GREEN AND ENVIRONMENT REQUIREMENTS	COUNT
NEC Code, State Cert.	11
Sustainable forestry classes	4
LEAN (Labor Environment Action Network) Certified	4
Certified Green Technician	2
Wildlife/Environmental Sciences Degree	2
Environmental training once hired	2
Certified Conservation Planner	1
Conservation Planning thru USDA	1

Environmental certification test	1
Environmental Compliance Certification	1
Environmental Department and OSHA	1
Environmental Laws	1
Exemption Affidavit DL-15	1
Green Risk Cert	1
Recycling Laws	1
Penn. Professional Recycler	1
Total	35

Appendix F

Survey Responses – Specific Skills

Question: *Specific green technical skills required (please list the skills).*

SPECIFIC GREEN INDUSTRIES	
BUILDING AND CONSTRUCTION	COUNT
LEED	96
HVAC	28
Building practices, knowledge of green building products, knowledge of LEED rating system, knowledge of passive solar heating/cooling techniques	21
Lead abatement knowledge, installation knowledge	13
Carpentry skills	12
Green Building Advantage Environmental Training	7
Construction and maintenance	5
Windows and insulation.	4
design school skills are considered green	3
LEED projects	3
Pipe sizing, fittings	3
USGBC, LEED Cert.	3
Architect Degree	2
AutoCAD	2
Computer Aided Design (CAD)	2
Drafting Certificate	2
Bachelor Degree in Science/Construction	1
Building strategies (mold, dust) air quality logistics scheduling	1
BPI Training, DCEP	1
BPI, RESNET, LEED Certified	1
Building practices & codes	1
Certified green professional NAHB	1
Commercial Roofing Experience	1
Framing skills, math, general plumbing knowledge	1
Heating and Air Conditioning Systems	1
HERS RATER Certification/BPI/Energy Auditing	1
LEED rating	1
Mason apprenticeship	1
MBSA and NAHB	1
Paint, HVAC training	1
Roofing, plastering	1

Structural loads, energy values and plant systems	1
USGBC Knowledge	2
Total	224

POLLUTION (AIR, WATER AND LAND)	COUNT
Waste water technology	30
Recycling Knowledge	22
Hazardous waste and material training	13
Pollution control experience	13
Waste Management	13
Erosion and Sedimentation Control, Environmental, Wetlands Protection, Mine Land Reclamation	9
Freon Recovery Certification	8
Land reclamation	7
Refrigerant Recovery	6
Septic waste system and Environmental. standards	6
Resource sustainability	5
Air Quality Controls	4
Soil Management/Erosion Control	4
Storm water regulations	4
Geography and Environmental Sciences	3
Plants & soils	3
Wetland Training	3
Conservation	2
Nutrient fertilize engineer technique skills storm water plans environmental	2
Stream assessments, watershed management planning, coordinating stream monitoring programs	2
Cleanup	1
Combustion and Emissions	1
Corrosion Detection	1
Emissions License	1
Geologist Registration	1
Grease waste management	1
Green House Gas Impacts	1

Groundwater or classifying soils	1
PA Act 101 of 1988, Municipal Waste Planning, Recycling and waste reduction Act, Daupin County Ordinance 9-2004	1
Regulatory and compliance, pollution abatement	1
Transportation & pollution prevention	1
Treatment plants	1
Water License	1
Total	172

MECHANICAL AND EQUIPMENT OPERATORS	COUNT
Math and mechanical skills	36
Materials Knowledge	11
Equipment Skills	10
Sustainable Materials	10
Plumbing trade, hydraulics	5
Paint Product Knowledge	4
Echo safe painting	3
Metal types	3
Welding, Understanding of Combustion Theory	3
Asphalt to stay green	2
Concrete and soil testing certifications	2
Effective use of Tools and Materials, Knowledge of Measuring and Cutting Tools	2
Applicator License	1
ASME	1
Bio-fuel understanding organic chemistry vehicle and fluid knowledge	1
Boiler operations (basic electric, hydraulic, schematics)	1
Design, analyze, and maintain complex mechanical systems	1
Drive & lift weight & mechanical knowledge	1
LEAN Manufacturing	1
Fabrics, broad loom weaving	1
Equipment requirements	1
Repairing bio-diesel trucks and rental equipment that runs on it	1
Skidder operator, saw usage	1
Soldering	1
Steel and Iron Materials	1
Textile knowledge	1
Tool usage	1

Troubleshooting machinery	1
Total	107

ENERGY	COUNT
Energy Efficiency skills	49
Solar Energy Knowledge	24
Geothermal knowledge	8
Energy Audit Certification	7
Petroleum Industry Knowledge	3
Power plant operations	3
Facilities management, including energy needs	2
Gas industry	2
International Energy Conservation Code	2
Association of Energy Engineers certification	1
CWD/Geothermal Knowledge	1
Energy, energy conservation, solar (assistance with grants)	1
Power/Waste experience	1
Total	104

MISCELLANEOUS	COUNT
Environmental Knowledge	84
Job requirements	61
Green Knowledge	53
Forestry industry	5
Miner Safety Training	4
Organic Farm Certification	4
Ecology & Environmental Biology	3
Farming	3
Fertilizer & Pesticide License	3
Seeding, Tree Planting	3
Agronomics	2
Animal bi-products, environmental care	2
Green burials	2
Timber market; clear cut, removal	2
Anaerobic Digester Training	1
Carpet Manufacturer Knowledge	1
Cattle grazing	1
CEM	1
Composting knowledge	1
Landscape Architectural Registration	1

Appendix F

Lawn & Turf maintenance skills	1
MGAPR Mushroom Growers Assoc. Practices (Environmental . Knowledge)	1
MGMT System, Environ. Awareness	1
Mix pesticides	1
Mulch making	1
NCDIQ	1
Photovoltaic training/experience; high efficiency lighting requirements	1
RESNET	1
Retro fitting led lights	1
SAE (Supervised Agriculture Experience)	1
SSPC	1
Sustainability processes	1
Train employees on plat industrial hygiene	1
Total	250

CERTIFICATION AND REGULATION REQUIREMENTS	COUNT
OSHA	55
EPA Certifications	27
DOT Regulations	14
DEP Certification	6
MSHA	6
Certification	5
RRP Certification	5
NEBCEP	4
PET Certification	4
Standard regulations and agency policies	4
NABCEP Certification	3
NATE certified	3
Teacher Certificate in Environmental Education	3
CMSP, MSHA Certification	2
DOT, Hazmat, EPA	2
Green Advantage Certification	2
Horticulture skills	2
Pass the series test	2
Pesticides	2
PMSA Certified	2
SFI Certification	2
UST Certification	2
SARA title III	1
AP college course cert	1

EMS Certification	1
EVA. degree if area of work	1
Federal & State	1
FSC	1
Government mandates	1
Hazardous Tanker Endorsement	1
Hazmat License, Tanker Endorsement	1
HBA, AEE	1
Health codes knowledge	1
NIULPE certification	1
PA Commercial Applicator Certificate	1
PEPA Regulations	1
PG License	1
Proactive reporting to government agencies	1
Professional Surveying Certificate	1
Project Design License	1
Regulatory issues	1
TRIDIUM Certification	1
Total	177

BASIC SKILLS	COUNT
Technology	8
Chemical handling for field crews	7
Safety	6
Physically fit	5
Business background	4
Calculations	4
On the job program specific training	4
Sampling techniques	4
ACI Certification, CDL A or B	5
Journeyman License	3
Non-profit organization experience	3
Specific Industry Equipment, Specific Industry Experience	3
Writing skills	3
Communication and networking skills	2
Continuing education	2
Customer service, craftsmanship	2
Good people skills, organizational skills	2
Market knowledge, growing skills	2
Meter reading	2
Project management experience	2

Science Degree	2
Trades knowledge, organizational skills	2
Union does all the education	2
Contract knowledge & customer service skills & computer skills	1
Controls tuning	1
General knowledge of processes	1
Industry	1
Craftsmanship	1
Maintain equipment to provide accurate readings and analysis	1
People	1
Remediation knowledge	1
School administrator	1
Selling customer on green products	1
Semi-skilled labor	1
Special education cert in some circumstances	1
Successful Completion of Training Courses	1
Supervisory knowledge (doesn't need current licenses himself)	1
Take direction from supervisor, math skills, using hand tools	1
Total	94

ENGINEER AND MISCELLANEOUS TECHNICAL	COUNT
Engineering	13
Blueprint Reading	8
Chemical engineer or environmental engineer	8
Professional Engineer Degree	3
Mapping	2
Certificate in Environmental Engineering	1
3 D Modeling	1
ASE Certification	1
Automation and interface components operator	1
CAD	1
CAD CNC Router	1
CEU (Continue Education Units). Need to take 24 classes every two years to sign off on projects. PA engineering law.	1
Environmental impact from designs	1
Fabrication analysis	1
Field and laboratory sampling techniques, underground tank licensing	1

IPM Technician Certified	1
ISO14000	1
Plant operations	1
Racking system knowledge experience	1
Site Design Skills	1
Total	49

ELECTRICAL AND ELECTRONICS	COUNT
Electrical skills	19
Electronic systems knowledge	5
Electrical Engineering, Environmental Engineering Knowledge	1
Electrical License	1
Total	26

COMPUTER SKILLS	COUNT
Computer Science	16
Excel, Word, Communication, Analytical, Problem Solving, People	2
Distributed Computer Control (DCC) system and all associated equipment	1
Driving record, knowledge of high efficiency equipment, working knowledge of computers, sales background	1
Distributed Computer Control (DCC) system and all associated equipment	1
Good working knowledge of both commercial and residential systems, computer background	1
Computer	1
VM software reduces server space many servers on 1	1
Total	24

Appendix G

Survey Responses – Wage Ranges

Employers provided a wage range for each green job title.

LOW-END HOURLY WAGES FOR GREEN JOBS		
HOURLY WAGE	EMPLOYER RESPONSE COUNT	RESPONSE PERCENT
\$7.99 and below	42	2.9%
\$8.00 - \$8.99	103	7.1%
\$9.00 - \$9.99	86	5.9%
\$10.00 - \$10.99	203	13.9%
\$11.00 - \$11.99	58	4.0%
\$12.00 - \$12.99	154	10.6%
\$13.00 - \$13.99	68	4.7%
\$14.00 - \$14.99	96	6.6%
\$15.00 - \$15.99	160	11.0%
\$16.00 - \$16.99	66	4.5%
\$17.00 - \$17.99	52	3.6%
\$18.00 - \$18.99	64	4.4%
\$19.00 - \$19.99	13	0.9%
\$20.00 - \$20.99	68	4.7%
\$21.00 - \$21.99	17	1.2%
\$22.00 - \$22.99	19	1.3%
\$23.00 - \$23.99	7	0.5%
\$24.00 - \$24.99	10	0.7%
\$25.00 - \$25.99	38	2.6%
\$26.00 - \$26.99	11	0.8%
\$27.00 - \$27.99	4	0.3%
\$28.00 - \$28.99	10	0.7%
\$29.00 - \$29.99	2	0.1%
\$30.00 - \$30.99	25	1.7%
\$31.00 - \$31.99	1	0.1%
\$32.00 - \$32.99	10	0.7%
\$33.00 - \$33.99	2	0.1%
\$34.00 - \$34.99	4	0.3%
\$35.00 - \$35.99	15	1.0%
\$36.00 and above	50	3.4%
Total	1,458	100.0%

HIGH-END HOURLY WAGES FOR GREEN JOBS		
HOURLY WAGE	EMPLOYER RESPONSE COUNT	RESPONSE PERCENT
\$7.99 and below	0	0.0%
\$8.00 - \$8.99	4	0.3%
\$9.00 - \$9.99	15	1.1%
\$10.00 - \$10.99	37	2.7%
\$11.00 - \$11.99	11	0.8%
\$12.00 - \$12.99	68	4.9%
\$13.00 - \$13.99	40	2.9%
\$14.00 - \$14.99	43	3.1%
\$15.00 - \$15.99	121	8.7%
\$16.00 - \$16.99	57	4.1%
\$17.00 - \$17.99	56	4.0%
\$18.00 - \$18.99	94	6.8%
\$19.00 - \$19.99	34	2.4%
\$20.00 - \$20.99	158	11.4%
\$21.00 - \$21.99	38	2.7%
\$22.00 - \$22.99	59	4.2%
\$23.00 - \$23.99	27	1.9%
\$24.00 - \$24.99	41	2.9%
\$25.00 - \$25.99	119	8.5%
\$26.00 - \$26.99	24	1.7%
\$27.00 - \$27.99	16	1.1%
\$28.00 - \$28.99	15	1.1%
\$29.00 - \$29.99	9	0.6%
\$30.00 - \$30.99	81	5.8%
\$31.00 - \$31.99	12	0.9%
\$32.00 - \$32.99	18	1.3%
\$33.00 - \$33.99	6	0.4%
\$34.00 - \$34.99	5	0.4%
\$35.00 - \$35.99	34	2.4%
\$36.00 - \$36.99	4	0.3%
\$37.00 - \$37.99	2	0.1%
\$38.00 - \$38.99	9	0.6%
\$39.00 - \$39.99	1	0.1%
\$40.00 - and above	134	9.6%
Total	1,392	100.0%

LOW-END ANNUAL SALARIES FOR GREEN JOBS		
ANNUAL SALARY	EMPLOYER RESPONSE COUNT	RESPONSE PERCENT
Less than \$20,000	42	3.0%
\$20,000 - \$24,999	52	3.7%
\$25,000 - \$29,999	124	8.8%
\$30,000 - \$34,999	168	11.9%
\$35,000 - \$39,999	156	11.0%
\$40,000 - \$44,999	243	17.2%
\$45,000 - \$49,999	103	7.3%
\$50,000 - \$54,999	168	11.9%
\$55,000 - \$59,999	58	4.1%
\$60,000 - \$64,999	88	6.2%
\$65,000 - \$69,999	39	2.8%
\$70,000 - \$74,999	45	3.2%
\$75,000 - \$79,999	48	3.4%
\$80,000 - \$84,999	25	1.8%
\$85,000 and above	56	4.0%
Total	1,415	100.0%

HIGH-END ANNUAL SALARIES FOR GREEN JOBS		
ANNUAL SALARY	EMPLOYER RESPONSE COUNT	RESPONSE PERCENT
Less than \$20,000	9	0.7%
\$20,000 - \$24,999	10	0.7%
\$25,000 - \$29,999	12	0.9%
\$30,000 - \$34,999	61	4.5%
\$35,000 - \$39,999	63	4.7%
\$40,000 - \$44,999	88	6.5%
\$45,000 - \$49,999	87	6.4%
\$50,000 - \$54,999	169	12.5%
\$55,000 - \$59,999	65	4.8%
\$60,000 - \$64,999	127	9.4%
\$65,000 - \$69,999	69	5.1%
\$70,000 - \$74,999	90	6.7%
\$75,000 - \$79,999	60	4.4%
\$80,000 - \$84,999	101	7.5%
\$85,000 - \$89,999	36	2.7%
\$90,000 - \$94,999	62	4.6%
\$95,000 - \$99,999	17	1.3%
\$100,000 and above	227	16.8%
Total	1,353	100.0%

Appendix H

Survey Responses – Promotions

Question: Promotion – Position(s) at the next level (title)

POSITION TITLE	COUNT
Supervisor	139
Project Manager	130
Promotion available	123
Foreman	115
Manager	110
Senior Engineer	29
Professor	28
Lead	27
Senior Project Manager	24
Crew Chief	19
Director	18
Sales Manager	18
Partner/Owner	16
Senior	16
Truck Driver	16
Associate	15
Principal	15
Superintendent	15
Architect 1 or 2	14
Journeyman	14
Principle project biologist 1,2,3	13
First Line Supervisor	12
General Manager	12
President	12
Carpenter	11
District Manager	11
Equipment Operator	10
Executive Director	10
Maintenance Manager	10
Project Engineer	10
Vice President	10
Lead Carpenter	9
Senior manager	9
Service Manager	9
Engineer 2	8

Estimator	8
Plant Manager	8
Project Architect	8
Regional Manager	8
Department Manager	7
Engineer	7
Master Plumber	7
Environmental Engineer	6
Level 4	6
Shop Foreman	6
Assistant Project Manager	5
Driver	5
Electrician	5
Project supervisor	5
Senior Scientist	5
Trainer Manager	5
Vice President of Operations	5
Administrator/Manager	4
Apprentice, journeyman	4
Environmental Manager	4
HVAC Technician	4
HVAC Technician II	4
Production Manager	4
Senior Designer	4
Senior Environmental Scientist	4
Senior technician	4
Accountant	3
Company Officer	3
Conservation District Manager	3
Control Board Operator	3
Designer Engineer	3
Electrician Supervisor	3
Executive Secretary	3
Fabricator	3
Journeyman Electrician	3

Journeyman Plumber	3
Lab Tech	3
Lead Architect	3
Lead Engineer	3
Lead HVAC Installer/Technician	3
Lead Labor	3
Lead Specialist	3
Machinist	3
Maintenance	3
Maintenance Worker 2 or 3	3
Mechanic	3
Operator	3
Plumber	3
Production Supervisor	3
Retired	3
Safety Manager	3
Senior Architect	3
Senior Mechanical Engineer	3
Shift Supervisor	3
Shop Manager	3
Site Project Manager	3
Team Leader	3
Technician	3
Utility Operator	3
Administrative Assistant	2
Area Supervisor	2
Assistant director	2
Associate Professor	2
CAD Designer	2
Civil Engineer II	2
Corporate	2
Design Engineer	2
Director of Engineering	2
Director of marketing	2
Director of Solar	2
Drill operator	2
Driver Supervisor	2
Educator	2
Engineer Designer	2
Engineer Drawer	2
Engineer manager	2
Environmental Specialist	2

Facility Manager	2
Field Installer	2
Field Supervisor	2
Full Vice President	2
Heavy Equipment Operator	2
HVAC Service Technician	2
Intern to Lead	2
Journey Man to Lead	2
Junior Project Management	2
Lead Draftsman	2
Lead Estimator	2
Lead Sales Rep	2
Maintenance Mechanic	2
Maintenance Technician	2
Master	2
Master Electrician	2
Operator 2	2
Operator to Lead to Regional Manager	2
Plant Supervisor	2
Principal Architect	2
Professional Engineer	2
Project Development Manager	2
Recycling Manager	2
Resource Conservation Specialist 2	2
Science Teacher Step 2	2
Section Chief	2
Senior Coordinating Engineer	2
Senior Electrician	2
Senior Estimator	2
Senior Geologist	2
Senior Programmer	2
Senior Project Engineer	2
Staff Architect	2
Surveyor Manager	2
Technician Levels: A, B, C	2
VP Marketing	2
VP of Engineering	2
Supervisor	1
Account Manager	1
Advancement possibility	1
Air Quality Mgr	1
Architectural Designer	1

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Architectural Engineer	1
Asbestos worker supervisor	1
Assembler 2 or 3	1
Assistant District/Program Manager	1
Assistant foreman	1
Assistant in training	1
Assistant Resident Engineer	1
Assistant to certified applicator	1
Associate Architect	1
Back Plant Operator	1
Beginner to lead	1
Billing Supervisor	1
Biologist	1
Biologist 2	1
Bookkeeper	1
Branch Manager	1
Building Superintendent	1
Care of livestock	1
Carpenter Helper	1
Carpenter Manager, Construction Manager	1
CDLB	1
Certified Industrial Hygienist	1
CFO, Controller	1
Chemist	1
Chief Engineer	1
Chief Estimator	1
Chief Operator	1
Chief Surveyor	1
CIP level 3	1
Civil Engineer	1
Civil Engineer Designer or Project Manager	1
Client Services	1
Collector can promote to driver, nothing higher	1
Commercial manager	1
Compliance Officer	1
Computer Hardware Engineer 2	1
Computer Programmer 2	1
Cooperate Environmental	1
Corporate Safety Department	1
Corporate environmental manager	1
Could not think of one	1
Cross-train for plumbing	1

Curator	1
Dean	1
Deputy Executive Director	1
Design Specialist	1
Dir of Environmental Health & Safety	1
Director of Client Services	1
Director of HR (Corporate)	1
Director of Lean Services	1
Director of Natural Resources Programs	1
Director Of Operations	1
Director of Support Services	1
Director of Training	1
Dispatch	1
Drafter	1
Drafter II	1
Driver level 2	1
Driver to service to tester	1
Electrical Contractor	1
Electrical Designer	1
Electrical Engineer	1
Electrical Engineer 2	1
Electrical Engineer Manager	1
Energy Auditor	1
Engineer Coordinator	1
Engineer in training	1
Environmental Consultant	1
Environmental Engineer II	1
Environmental Health and Safety Specialist	1
Environmental Project Manager	1
Environmental Scientist	1
Equipment Manager	1
Extrusion Technician	1
Field Manager	1
Field Service Tech 2 and 3	1
Forester	1
General Manager - Maintenance	1
Geologist	1
Geologist 2	1
Hazmat Technician	1
Head Administrator	1
Health and Safety Specialist	1
Helpers to electricians	1

HR Manager	1
HVAC Installer A	1
HVAC Service Manager	1
HVAC Supervisor	1
HVAC Testing & Balancing Supervisor	1
If available	1
Increase in pay	1
Industrial Hygienist	1
Inside sales	1
inspector or enforce officer	1
Installation Foreman	1
Installation Technician II	1
Installation/Service Manager	1
Installer	1
Job bonuses	1
Journeyman, Supervisor	1
Lab Supervisor	1
Laborer to Carpenter	1
Laborer/Truck Driver	1
Landscape Architect II	1
Landscape Architect Manager	1
Larger Truck Driver	1
Lead Accountant	1
Lead Consultant	1
Lead Driver	1
Lead Foreman	1
Lead Welder	1
Lead Woodworking Machine Operator	1
Level 1 Technician	1
Lineman	1
Machine Adjuster Trainee 1	1
Manager of Engineers	1
Managing engineer	1
Manufacturing Manager	1
Marine Captain	1
Master Journeyman	1
Materials Handler	1
Mgr of Hazardous Materials	1
Office Administrative	1
Officer - President/Vice President	1
Open your own Location	1
Operations Supervisor	1

Operator 3	1
Outside Sales Representative	1
Pipe Fitter	1
Planner	1
Planning Director	1
Plant Operator	1
Plant Operator 2	1
Precast Lead Man	1
president of sales	1
Principal Engineer	1
Principal/Associate	1
Professional Geologist	1
Project Designer	1
Quality Control Inspector, Energy Audit Manager	1
Quality Engineer	1
Quality technician, Super	1
Recycle Driver	1
Refrigeration Technician	1
Regional Agronomy Director	1
Registered architect	1
Registered Surveyor	1
Research & Development Director	1
Retail Manager	1
Rig Operator	1
Road Supervisor	1
Roofer	1
Salvage Master	1
Scientist II	1
Secretary	1
Senior Admin Assistant	1
Senior Area Forestry Supervisor	1
senior biologist	1
Senior Chemical Engineer	1
Senior Chemist	1
Senior Civil Engineer	1
Senior consultant	1
Senior Developer	1
Senior driller	1
Senior Electrical Engineer	1
Senior Field Supervisor	1
Senior Fire Protection Engineer	1
Senior Geospatial Analyst	1

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Senior Health Physicist	1
Senior HVAC	1
Senior hydrologist	1
Senior Inspector	1
Senior Interior Designer	1
Senior Lab Tech	1
Senior Network Engineer	1
Senior Outreach Specialist	1
Senior Plumbing Engineer	1
Senior Production Manager	1
Senior Project Development Manager	1
Senior Sales Agent	1
Senior Surveyor	1
Service Technician	1
Shift operator	1
Solar Photovoltaic Installer II	1
Specialist 1 to 2 to 3	1
Staff Supervisor	1
Steel Project Manager	1
Structural Engineer Manager	1
Supervisors Assistant	1
Survey Manager	1
Technical Inspector	1
Technician to specialist to manager	1
Territory manager	1
Tieman	1
Traffic Signal Technician II, III	1
Truck Driver/Equipment Operations	1
Utility General Support 1	1
Vice President/management	1
VP of HR	1
Warehouse Foreman	1
Warehouse Supervisor	1
Waste Water Manager	1
Wastewater Treatment Manager	1
Weatherization Coordinator	1
Welder	1
Well Drill	1
Total	1,619

Appendix I

Survey Responses – Lacking Green Skills

Question: *What green-related skills or areas of knowledge do you find most often lacking in job candidates?*

SPECIFIC GREEN INDUSTRIES	
COMMON SENSE AND BASIC SKILLS	COUNT
Math skills	49
Common Sense	22
Basic Knowledge	11
Analytical thinking and skills	4
Basic mechanical skills & tool usage	4
Creativity	4
Basic Education	3
Driver's License	3
Cooperation, Leadership training	2
General Safety awareness, Geometry	2
Knowledge Awareness	2
No common sense	2
Problem diagnosis, can't use metering equipment	2
Professional Appearance	2
Desire, creativity and interest in community development projects	1
Driving economically	1
Entry level knowledge	1
Everything	1
Finding people that want to work in this area	1
How to do the job to set standards	1
How to use basic hand tools	1
Interest, no respect for equipment	1
It's not just book, but what is going on in the world	1
Knowledge and Awareness	1
Knowledge of handling cleaning supplies	1
Labor skills	1
Lack of general knowledge	1
Lack of positions industry not growing fast enough. Basic working knowledge.	1
Lack of professionalism	1
Life Skills, Money Management	1
Logical thinking - analytical thinking	1
Minimum Education Level	1

Modify driving habits saving fuel	1
Not familiar with tools	1
Not well educated in general	1
Overall awareness	1
Passing a drug and alcohol test	1
Problem solving	1
Route Memory, Common Sense	1
Safety Rules, Hazardous Gases Knowledge	1
Think on their feet, make things work well, interact with client	1
Time management	1
Timeliness, People Skills, Clean Records, Non Alcoholics, Trustworthiness	1
Understanding and taking direction	1
Working well with others	1
Transportation	1
Total	144

GENERAL GREEN KNOWLEDGE	COUNT
General green knowledge	38
Current green knowledge	7
Ability to understand the impact of the environmental issues	6
General training in green practices; LEED Certification	6
Knowledge and Understanding of the Environment, Math, Science (Physics)	6
Both experience/education in recycling together, most have one or the other	5
Energy conservation knowledge	4
Environmental Knowledge	4
General knowledge of sustainability/how to integrate into their jobs	4
The fact that there is even a category called "green skills".	4
Basic Green	3

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Any green skills	2
Recycling knowledge is severely lacking	2
They do not know what Green is all about.	2
An appreciation of "sustainability"	1
Best Practices for Environmental Protection in the Mushroom Farm Community	1
Experience in dealing with Green	1
Lack of General Knowledge about new energy efficient power sources	1
No applicants have the green skills at all	1
Not up on the latest knowledge of green practices	1
Overall Green Technology	1
Overall knowledge of green industry	1
Recycling Habits and Rules	1
Recycling materials and preventing waste of materials.	1
Recycling Separation	1
Reuse of existing materials	1
Sensitivity to green related activities	1
Understanding energy efficiency	1
Understanding of Conservation	1
Understanding of environmental hands on practices for urban area	1
Understanding of green practices	1
Understanding of green skills	1
Total	111

PROPER CERTIFICATION AND EDUCATION	COUNT
LEED Certificate	32
Education (job related)	12
Missing some of the required certifications	4
Certification for Emission control	3
EPA LEAD Certification	3
LEAN enterprise training	3
Must be steamfitter union member	3
Required Green Certifications, LEED Certifications	3
Licenses, Certifications	2
Candidates who go through the state training rather than just standard BPI training	1
Certification	1
Chemical Engineering degrees	1
Classroom management skills	1

Courses on soil	1
Desire to continue learning	1
Environmental Protection Agency knowledge	1
Equipment knowledge -- higher end equipment (Volvo vs. caddy)	1
Highly skilled - lack of training	1
In-house trained	1
IPM Certification	1
Job Related Knowledge and Education	1
Knowledge of the environment; math; physics	1
Knowledge of thermal dynamics	1
LEED trained	1
Less education is better in these particular jobs	1
Many environmental engineering programs inadequate. Candidates need more chemistry and above average math skills.	1
Mechanical engineering and how it applies to conservation of built resources	1
New technology and science	1
No PA DEP Cert. from state	1
OSHA 10 Training	1
Required licenses	1
Restoring Certifications	1
Technical Training	1
Training	1
Under qualified	1
US citizens with the green skills/LEED certification is rare	1
Total	92

CUSTOMER SERVICE AND COMMUNICATION	COUNT
Customer service	26
Communication skills	14
Marketing skills	9
Proper English, spelling, punctuation	7
Writing	7
Reading and English skills	5
Sales Experience	3
Follow through	2
Report writing	2
Technical writing and communication	2
Effective Communication skills	1

Entry teachers need guidelines re social networking	1
Experience working closely with government agencies and in this industry in general.	1
Presentation and communication skills	1
Proficient writing	1
Social skills. Customer Service.	1
Speaking English	1
Taking instructions	1
Write and promote green to clients	1
Total	86

PRACTICAL APPLICATIONS	COUNT
Direct experience	21
Moving from the classroom to the office	7
Exaggerated experience	6
Experience, Trainable	4
On the job experience about green initiatives	4
Practical experience	4
Practical experience, construction	4
Hands on experience	3
Need experience	3
Internship field work	2
Past experience	2
Book learning without experience (know how, but can't actually do it)	1
Come out of college with terminology not hands on experience	1
Converting field work to finished product	1
Experience, professional development	1
Few have full project work from start to finish as an intern.	1
May have degree but not relevant for the position	1
Midlevel positions need field experience, which makes the "book learning" more practical	1
More internships needed	1
Must be journeyman union member	1
Not interested in learning, think they know it already	1
Not many people have lead experience	1
Not recycling/reusing materials	1
Past work experience outside of educational field	1
Putting the whole package together with Environment... rules & regulations.	1

Small company that those they hire when they have jobs are very qualified	1
They think they know more than they do	1
Total	76

UNDERSTANDING GREEN TECHNOLOGY	COUNT
Environmental regulation/compliance knowledge, understanding of potential environmental concerns/ issues, mathematical and science skills	39
Determining green technology cost effectiveness	5
Agricultural Production Experience/Regulatory Knowledge	3
Knowledge of state regulations	2
Root regulation understanding	1
Regulatory background, appliance of regulation	1
Proper disposal of construction materials	1
Overall PAD Regulations	1
New Regulations	1
Legal statutory requirements on waste management air	1
Lack of knowledge of environmental impact	1
Knowledge of Government regulations.	1
Knowledge of environmental regulation	1
Knowledge of Codes	1
Total	59

WORK ETHICS	COUNT
Work ethic	35
Willingness to earn their way, need for productivity	1
Unrealistic expectations of starting salaries	1
Trades getting older, younger people not joining; everyone wants to sit behind a computer	1
People really don't want to work; if they can't get prevailing wage, they prefer unemployment	1
No one wants to log anymore	1
Need basic work ethics more than knowledge of green	1
Don't want to get their hands dirty	1
Awareness to want to work	6
Ambition	1
Ability to perform manual labor	1

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Not prepared for job interview, not really interested in hard work or in getting dirty	1
Total	51

BUSINESS SKILLS	COUNT
Computer skills	10
Business Experience	8
Cost effective "green technology"	6
Practicality - sense of economics	5
Finance area	2
General knowledge of the current market demand	2
GIS geographic information system.	2
Bookkeeping	1
Knowledge of what to accept or collect	1
Total	37

PRODUCT KNOWLEDGE	COUNT
Knowledge of products	8
Specific projects already completed	6
New Technologies	4
Product knowledge, and awareness	4
An understanding of how the building itself can help save on energy and not just the products/appliances	3
New product knowledge	2
Current Technologies, Training and Knowledge of Products and Equipment	1
Modeling of product	1
Understanding product installation	1
Total	30

ENERGY	COUNT
Energy Modeling	4
Green Energy Experience	4
Renewable energy experience, mid level candidates are hard to find	4
Solar Energy	4
Geothermal Training	3
Basic Lighting Practices	2
Energy Efficiency Inspector	2

Energy Engineering, Energy Auditing	2
General familiarity of biodiesel	2
How alternative energy markets work (wind turbine, solar farms)	2
Solar knowledge	2
Structural Engineer design requirements adding more work in the ALT. energy area.	2
APU Units Auxiliary Power Units	1
Calculating actual energy	1
Energy saving techniques	1
Evaluation and acquisition of oil and gas prospects	1
Experience in the Nuclear Industry	1
Experience in wind turbines	1
Experience with solar technology and geothermal	1
Knowledge of energy efficient construction	1
Knowledge of Green Energy	1
Knowledge of solar energy.	1
knowledge of solar power and implications	1
Not enough familiarity with energy consumption and energy efficient technology.	1
Photovoltaic solar knowledge	1
Power plant systems	1
Renewable energy skills	1
Solar and geothermal	1
Solar Energy Knowledge	1
Solar Energy Sciences	1
Solar energy.	1
Understanding Geothermal	1
Total	53

MISCELLANEOUS INDUSTRIES	COUNT
Pharmaceutical sustainability practice	4
How to organic farm	3
Battery manufacturing	2
Electrical knowledge	2
Plumbing	2
Anoxic collection system methods	1
Basic electrical skills	1
Difference between types of metals	1
Disposal of Asbestos	1
Disposal of electronic devices, appropriate; facilities education/energy efficient	1

Effective insulation methods	1
Electronics	1
Forestry Experience	1
General drilling skills	1
Hama training	1
Handling of Freon	1
Hazard material and response	1
Hazmats, currently have to be trained in house	1
How to create good mulch	1
Identifying metals	1
Insulating techniques & knowledge of new installation techniques	1
Insulation Assemblies	1
Knowledge of electrical systems	1
knowledge of electronic, and pneumatic theory, application	1
Knowledge of Materials	1
knowledge of new Hybrid cars	1
Knowledge of scrap metal, lack of experience	1
Knowledge sustainability as well as current materials and methods available	1
Lacking experience of Insulation techniques	1
landfill hazard, methane gas, metal in the water	1
Lawn & Turf maintenance skills (Horticulture)	1
Materials handling	1
Metals knowledge	1
New Thermo-acoustic Technologies	1
Organic skills	1
Pasture care and knowledge of the horses	1
Pesticide License, sprayers	1
Pharmaceutical sustainability	1
Pruning skills	1
Skills set for draperies (separate from clothes sewing)	1
Sustainability matters in surveying	1
Understanding of new technologies	1
Utilizing heavy oil remains	1
Total	51

BUILDING AND CONSTRUCTION	COUNT
Building skills	12
HVAC	9

Efficient home building methods	2
General Construction Knowledge	2
Accounting Principles, CAD drawing	1
AutoCAD experience	6
Experience in Finish Carpentry	1
Finding people with trade skills	1
Green building skills	1
Industrial or commercial (more involved than residential)	1
Installing Heaters	1
Knowing good environmental. building skills	1
Knowledge of The Drywall Process	1
Lack of green building knowledge	1
Need plumbing knowledge in addition to HVAC	1
Practical implementation of LEED building	1
Prior building skills	1
Qualified roofers and carpenters in the green industry	1
Quality building skills	1
Sustainability of resources and repair of broken pipe lines. (Environmental . Spill removal)	1
Tank less water heater installation	1
Utility installation knowledge	1
Window Installs	1
Total	49

NON-SPECIFIC GREEN INDUSTRIES	
MISCELLANEOUS REMAINING RESPONSES	COUNT
Industry Experience	7
Technical Trade Skills	6
Chemistry, knowledge and background of basic principles	3
Safety and fire fighting training	3
Systems Development, Multi-tasking Skills	3
Geological software and databases	2
BIO-Eco skills with renewable resources	1
Broad knowledge of industry and technology	1
Chemical process simulator (education needs diversity in simulator. software used)	1
Computer, electronics	1
Engineering practices	1
Engineering, Cost Benefits analysis and calculation	1

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Environment Design	1
Experience in specialized field, reliability analysis	1
Experience with terminology	1
General trade knowledge	1
Good understanding of resource use	1
Knowledge of Chemicals	1
Knowledge of sustainability	1
lack of knowledge on how to be more sustainable for our industry and knowledge of products	1
Newer technologies, materials	1
Not up-to-date on latest tech	1
Prior green experience	1
Specific Industry Equipment Experience	1
Specific Industry Experience	1
Sustainable Design	1
Up-to-date on current practice	1
VM ware	1
Total	46

POLLUTION (AIR, WATER AND LAND)	COUNT
Knowledge of local watershed and water quality issues	6
Water/Waste Water Processes	5
Health/Pollution	3
Conservation Planning, erosion control	2
Field experience and how to notice green washing	2
Not educated on equipment spills	2
Storm water and erosion	2
General emissions knowledge	1
General understanding of safe waste disposal.	1
Knowledge of Clean Technology for the Waste Water industry	1
knowledge of waste regulation and proper disposal	1
Knowledge of wetlands, endangered species, slope protection, clean streams and storm order management.	1
Responding to Incidents and Cleanups	1
Stack testing (i.e. smoke/emission stacks etc.)	1
Understanding environmental issues (soil and water), background in soils and land preservation	1
Understanding of oil and waste disposal	1
Very few trained in air pollution control	1
Waste Management	1

Water Quality skills	1
Water Treatment	1
Total	35

MECHANICAL AND EQUIPMENT OPERATORS	COUNT
Engine Operational Theory	4
Low combustion understanding, stoichiometry	4
Mechanical aptitude	2
Mechanical skills	2
Mechanical, Plumping, HVAC, Electrical	2
Welding Skills, Practical Experience	2
experience in equipment repair	1
General knowledge of metals	1
Good mechanical and electrical skills	1
Higher Efficient Equipment, Product Knowledge and Understanding, Safety Issues (associated with products)	1
Hire MEP firms (Mechanical, Electrical and Plumbing Engineer)	1
Machine experience	1
Operating Vessels	1
Operation of treatment equip	1
Service and Installation Knowledge	1
Stationary source testing	1
Tune up skills for max eff. running	1
Understanding equipment & systems (similar to mechanical engineers)	1
Unfamiliar with machinery	1
Value of metal types	1
Total	30

Appendix J

Survey Responses – Current Green Training Sources

Question: What green training sources do you currently utilize?

SPECIFIC INDUSTRY TRAINING SOURCES	
ON-THE-JOB TRAINING	COUNT
In house training	436
On the Job Training	120
Internal resources during on-the-job training, customized internal training, some positions require certifications from independent parties	37
In House Training With Vendor Support	15
Corporate Office	7
In-House Energy Saving Training, Green Associations	5
In-House Training, Manufacturers' and Industry Conferences and Training	5
In-House Training, Vendor Training	5
Factory Schools	4
In-house; Industry Conferences; Center of Environmental Research & Education	4
OJT, private vendors	4
On site Compliance Training	4
on the job training, Northeast Energy Association, seminars, green bldg council	4
Internal, conferences, seminars, AIA	3
on the job, Red Cross, OSHA	3
Industry Standards & Best Practices; Workshops; Seminars	2
In-house training, vendors training	2
knowledge of the fellow engineers representative	2
Articles	1
Awareness resources	1
Basic Knowledge of Plants	1
Book through LEED ID and Practice	1
common sense	1
Company's Product/Service Training Classes	1
Current information from newspapers and articles.	1
Environmental Regulations, internally	1
Hands on training from other carpenters in the industry	1

In house	1
in-house for State cert. for sprayers	1
In-house training, LEED certification	1
In-house training, national employment development staff trainings, training through partner companies	1
In-house training, online research, and trade publications	1
In-house training, seminars from Depart of Community and Economic Development	1
In-house training, state sponsored seminars.	1
in-house, car manufacture data	1
in-house, national buying group, trade associations	1
in-house, webinars, seminars	1
Internal	1
Internal training, local green building alliance, USGBC webinars, conferences, publications	1
Journals/publications	1
keeping up with current	1
Literature to stay up to date on regulations/ requirements	1
Magazines and Classes where products are purchased and in house.	1
on going training for yearly certification	1
On the Job Training, New Lead Law Training	1
on the job, Army Core of Engineers, private	1
On the job, Vendor training	1
Pay for internal training	1
Personal library of recourses	1
prior experience	1
private classes in area	1
Publications	1
Publications, HUD training	1
Publications, literature, and continuing education credits	1
Reading journals/articles to keep up with new requirements	1

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Reading new documents, journals,	1
Reading new literature from EPA	1
recycler trade magazine	1
RESNET, On the job training	1
self & organic farming trade magazine	1
Seminars, in house	1
Seminars, Industry Books, Industry Magazines	1
Skill works, math, calculation, health & safety training	1
Small company stays up to industry standards	1
They are given an amount of money and they can use it for continued education of their choice	1
Train in house	1
Training comes from corporate in England	1
Training in house for business laws	1
Usually taught on the job	1
Very little	1
Waste to energy	1
We distribute knowledge through pamphlets and workers are aware information	1
what is needed for equipment	1
Workshops, journals, round tables,	1
Total	718

BUILDING ASSOCIATIONS	COUNT
LEED training	71
US Green Building Council and continuing education	39
Independent Study, Vendors, Green Building Council	15
National Association of Home Builders	8
American Institute of Architects	6
Green building design assoc, LEED design assoc	6
Industry (sub, assoc of energy engineer)	5
Green Building Alliance, United States Green Building Council & American Institute of Architects	4
Webinars- USGBC, internal training	4
Industry Associations (LEED)	3
US Green Building Council Trainings, Local Colleges	3
Building Performance Institute (BPI)	2
Courses from LEED council organizations	2

Geothermal and Solar Training, Green Plumber Courses	2
Green Magazines, LEAD Classes	2
US Green Building Institute	2
ABC Keystone	1
ABC Keystone Builder association, will have LEED Certified agent	1
AIA Product seminars/Self Study	1
AIA PROGRAM	1
AIA programs	1
AIA, USGBC, Manufacturing representatives, Engineering Consultants	1
Any LEED related courses	1
Architects, Construction Companies	1
Associated builders contractors	1
Association of Energy Engineers, US Green Building Council (associated chapters), American Society for Heating/Refrigeration and Air Conditioning Engineers (ASHRAE) (HAZRA)	1
BPI cert	1
Chambers of Commerce, Home Builders Association	1
Classes and seminars on building codes	1
Comes through Home Builders Association, seminars/classes	1
Construction Association	1
Construction Codes Academy (PCCA)	1
Consultants, Outside Architects	1
Green Building Certification Institute, Green Build (AIA convention), Build Pittsburgh (through AIA), Green Building Alliance of Pittsburgh, Passive House (Carnegie Mellon)	1
HVAC	1
In-House Certified Instructor, Building Performance Institute (BPI), Affordable Comfort Institute (AFI)	1
LEED	1
Local college, Union apprenticeship program	1
Local green building counsel	1
NARI building Assoc. material and Trade publications	1
National Home Builders Association classes	1
National Roofing Association	1
PA & US green bldg assoc, education seminar for architects online	1
PA Builders Association	1

Solar Power Energy Classes, LEED Certification Classes	1
Sprinkler installation	1
State Online, USGB Leed Information	1
State Ordered Training, Weatherization Training	1
Tree Hugger, Eco Forum, Green Build Alliance, CDC's, Inhabitant, Good. Is	1
U.S. Green Building Council (USGBC), Professional Associations	1
US Green Building Council, Delaware Green Building Council, Universities	1
US Green Building Council, Red Vector Online Training	1
USGBC/Forestry Schools	1
Yes, US Green Building Council, local Green Building Council	1
Total	212

EXTERNAL, MISCELLANEOUS AND COMBINATIONS	COUNT
Seminars/conferences	26
Outside Vendors	16
Career/Technical	10
Geothermal Training	9
Continuing education	8
Workforce Redevelopment	6
Periodic courses/seminars devoted to green engineering	6
International Society of Arboriculture, Operating Engineers (Union), Department of Agriculture	6
Private vendors	5
Periodic courses /seminars on green engineering	5
Local Seminars	5
industry Associations, Vendors, Voc/Tech Schools, Colleges, Universities	5
Lead paint course	5
Workshops	4
Varies	4
Retired Gov. Regulators	4
Industry Assoc., Vendors, Colleges & Universities	4
Current Solar Technology Seminars	4
Combustion "know how" training, off site supplier, seminars,	4

PJM	3
McCutchinson Company	3
Solar Classes	2
Relies on schools	2
REC(Renewable Energy Center)	2
QFS 9000 Training Initiatives	2
Outside vendor conferences	2
Lead Abatement	2
jot, conservancies	2
Green Conferences	2
Field Day training	2
experienced farmers	2
Environmental groups no name to mention	2
Ashrae Training, on the job,	2
LEAD Training, In-House Training	2
When new legislation comes into play, HVAC "clinics" are held for certification.	1
Well drillers training course	1
Training from product vendors	1
Training Classes, Educational Courses (related to the job)	1
Technical society air and waste management training	1
SSPC	1
Shoeko Training, Pierce Phelps, Water Furnace Geo-thermal	1
SFI	1
Seminars, Green Team Meetings,	1
Schools (Geothermal and Heating Systems)	1
Schools	1
ROSGEN Training, NRCS	1
Refrigerant Recovery, Lay-Out Project Training, Bottle Discarding for Welders	1
Public Vendors	1
Public expos, Seminars	1
private vendor (installing solar panels)	1
Private business that offer green products/services, bring them in to train staff	1
PLC Training	1
Pennlink, Pasbo	1
PEDCA certification and trainings	1
PE Continuing Education	1
PADA workshops	1

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Outside Vendor	1
nreca - national association, seminars	1
National Seminars	1
National Electrical Code (classes/ 4x yr)	1
Material handling	1
Machinery vendor	1
Local training	1
License refresher courses	1
Key Stone Classes in Lead Paint and Refrigerants	1
jot, vendor, solar & geothermal	1
jot, vendor seminars	1
ISO certification	1
home energy team	1
GSPC	1
Green Risk Certification	1
Geothermal Ground source Training	1
Fill Trex, Public Vendors	1
Energy Efficiency	1
energy education	1
EMG International Media	1
DVGBC	1
Ducane Light, outside companies	1
DPI certification	1
Cooperative extensions	1
Consultant who comes in on a monthly basis for IMP	1
Chamber green events, workshops	1
certified training program	1
CDL training school	1
BOCA or Equivalent	1
Blair Water Authority, water conservation; Pittsburgh Children's Training on conservation	1
ASLA continuing education, conferences, seminars	1
ASE certified emissions training	1
ARC schooling	1
APR Supply Co.	1
Any that are available	1
AD Hoc basis, Seminar	1
Total	226

PROFESSIONAL, TRADE AND UNION ASSOCIATIONS	COUNT
Trade Associations	28
Union Training	23
Apprenticeship program	17
Pennsylvania Association of Environmental Laboratory	6
Professional Recyclers of PA	5
Professional society - sponsored courses, internal training	5
PROP - Professional Recyclers of Pennsylvania	5
Recycle Board	5
IGSHPA	4
ASHRAE assoc (engineer member assoc), HVAC industry seminar with emphasis on green and LEED	3
Forestry associations	3
GBCI	3
IBP Geothermal Training Classes	3
Natural and PA Rural Electrical Corporation Association (NRECA PRECA)	3
OSHA Training	3
State Emission control certification test	3
American Society of Civil Engineering, local universities	2
FSC(Forest Stewardship Council, for certified wood), KCMA (Kitchen and Cabinet Makers Association) Internet	2
IBEW (Union)	2
Supply House Training	2
Triangle Tech	2
Union, National Environmental Balancing Bureau (NEBB), Sheet Metal Association	2
Union, Online Sources, Local Sales Representatives	2
Utility company	1
Access to various associations	1
agriculture centers & associations (green and organic)	1
American Industrial Hygiene Association	1
American Petroleum Industry	1
American Waterworks Association, PA Waterworks Association, PA Municipal Authority	1
Banking associations	1

Cert. programs, I.E. Laborers district council of western PA	1
Certified Occupational Safety school	1
Conservation District, ASCE	1
Educational Seminars	1
Energy Audit Certification, National Resources Conservation Service (NRCS)	1
Independent school office association - PAISBOA	1
industry knowledge through ISA (International sign association)	1
Industry trade association	1
International (union)	1
International society of Arbor Culture; Operating engineers (union); dept of Ag	1
Local affiliations	1
Local business solar panels, const trade manual	1
Memberships	1
Mushroom council, Mushroom Growers Assoc.	1
National Bio Diesel Board other schools Iowa, Idaho	1
National Society of Professional Engineers (NSPE)	1
National training conferences	1
NICET(National Institute for Certification in Engineering Technologies)	1
Ohio Florist Association	1
PA Environmental Water Association	1
PA Green Alliance	1
PA groundwater association conferences, certification in geothermal	1
Parents/Green Committee Leaders	1
Pennsylvania Manufactures" Association, Vendor Classes	1
Plumbers Union Classes	1
Professional Recycler. Program	1
Professional development	1
PSMA	1
Saturn Online, Solar Energy International, Pure Energy, PA Home Energy, Independent companies who offer Building Science or Renewable Training.	1
Seminars/conferences by industry, environmental protection training courses	1
Service providers, colleges (symposiums), NIST (National Institute Standards and Technology)	1
Solar Energy International. Manufacture training courses.	1

Three Rivers Wet Weather (storm water control seminar)	1
Training through the union	1
Vendors, trade associations, local trade supervisory committees	1
Working with non-profit "green" organizations on projects	1
Total	176

COLLEGES AND UNIVERSITIES	COUNT
University	63
College or University programs	36
Boots on the Roof, Alter University	8
Penn State	6
OJT, PA state (mushroom short course)	2
Relies on college or university to properly train student	2
College engineering students	1
Indiana University	1
Penn State Applied Research Facilities	1
Penn State Coop	1
Penn State Co-op Extension	1
Pennsylvania State University, Marcellus Shale	1
Philadelphia University	1
Regional workshops , university classes	1
Relies on higher education	1
Seminar/Out-of- state college	1
Sustainable Forestry Initiative (SFI)	1
Sustainable forestry initiative, college courses that apply to logging	1
Williamsport College	1
Total	130

MANUFACTURER-PROVIDED TRAINING	COUNT
Vehicle manufacture	68
Manufacturer training	44
Supplier Training Classes	5
jot, manufacturers	2
Product Information	2
Distributors & Manufactures training	1
Electrical supply houses	1
Famous Supply Company	1

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Lead Paint and Solar Training from manufactures'.	1
Sales representatives	1
Solar Photovoltaic Panel manufacturer-provided trainings; NABCEP training/certification	1
Training with energy efficiency products manufactures'.	1
Total	128

GOVERNMENT-PROVIDED TRAINING	COUNT
DEP(Department of Environmental Protection) Seminars	36
State (deep)	11
Government (DEP, EPA)	7
State and non-profit training resources	6
State Training	6
State Department Training	5
Workers comp training committee on safety	5
PA state, USDA	4
PDOT training, US army corp. of engineers	4
Swamp school courses, Department of Environmental Protection, county sponsored programs	4
Government	3
Green advantage Environment certification program thru Govt.	3
Dept of Interior	3
County Conservation District	2
Government required training	2
OSHA	2
"science it's elementary" (state DOE)	1
All required federal and state training	1
Certifications that are offered by the Government	1
Certified emissions training	1
Conservation District, DEP Seminars	1
Department of Ecology	1
Department of environmental protection seminars	1
Dept. of Conservation and Natural Resources	1
Emission control certification test	1
Highway transportation regulations for clean idle equipment	1
Inspection solar agencies	1
Non-profit training, state training	1
PA academic standards for science	1

PA Licensing Board	1
Seminars provided thru the state	1
State (agriculture)	1
State Conservation Commission, Department of Environmental Protection, Natural Resources Conservation Service	1
State Dept of Environmental protection, used, sustainable building practices/program, webinars	1
State epa, vendors, trade associations	1
State licensing	1
State Resources	1
State sponsored dept of environmental protection seminars	1
Total	125

COMPUTER-BASED/WEBINAR TRAINING	COUNT
Online training	24
Conferences and Webinar	12
Webinars, professional development opportunities thru technology	10
Internet	9
Webinars, private vendors/seminars	7
Web based training	6
Webinars	6
Red Vector Online Training	5
Internet, Product Classes	2
Local business associations & webinars	1
On line, Vendor	1
Seminars, Online, Research	1
Seminars, web seminars, advanced education	1
Web based	1
Web trainings, educational events, trade publications, in-house trainer	1
Web, manufacturers	1
Web/ American society of Engineer, local workshop, online university Hz mat	1
Webinars, Delaware Valley Green Building Council	1
Webinars, professional seminars (universities/ colleges)	1
Total	91

VOCATIONAL TECHNICAL SCHOOLS	COUNT
Community College	50
Vo Tech Schools	13
Higher education program	4
Vocational Schools	2
Tech Schools, Commissioners Association	1
Technical Schools	1
Technical/mechanical training school	1
Training through Sustainable Forestry Initiative (SFI)	1
Vo-tech trainings	1
Total	74

Appendix K

Survey Responses – Green Training Desired

Question: *What types of training would you like to see school programs include to better prepare job candidates for your company?*

SPECIFIC INDUSTRIES	
BASIC SKILLS	COUNT
Basic math skills	73
Increased emphasis on mathematics and science, verbal and language skills	37
Work ethics	36
Reading, writing & arithmetic (core fundamentals)	23
Effective communications training	21
Current basic training is good	15
Writing and communication skills	13
Communication skills	12
Safety	10
Teach the basics - reading, writing & arithmetic; don't let the computers do all the work	7
Courses in subject listed	6
Go back to general sciences	5
Speak proper English, general lack of knowledge	5
Analytical skills, Science and Math	4
Basic science and physics	4
Basics	4
Educated in ownership of work they do, better project management skills	4
Standard industrial safety	4
Comprehension (follow job directions)	3
Hard work/ Responsibility	3
Overall Awareness	3
Program is already diverse in teaching and problem solving	3
Affordable cost on good education	2
Basic interview skills, come to work on time, dress appropriately, reading and writing, social skills and work ethic	2
Continuing education	2
English: grammar, spelling	2
General Education (Reading, Writing, Math)	2
Life skills, money management	2

Proper etiquette, courteous, dress professional	2
Reading and Writing skills	2
Time management, priority recognition	2
Attitude and willingness to be part of a team, knowledge that not everyone is entitled to everything	1
Balance checkbook, math skills, knowledge of carpentry tools (levels, squares, etc)	1
Basic Education (Reading, Writing, Math), Life in the Real World	1
Basic Responsibility	1
Better Primary Education	1
Can't listen to music 24 hours a day	1
CDL	1
Character training	1
Chemistry, math, writing, analysis	1
Continue emphasis on technical skills (math & science) coupled with new technologies; more emphasis on communication skills	1
Critical thinking	1
Different sciences, more exposure to students of special needs.	1
Discipline (leave the cell phone alone) & reasoning skills (think without the computer)	1
Driver Knowledge	1
Educated The Kids Without The Modern Devices So They Know How To Do Basic Math and Other Skills On Their Own.	1
Education in the basics. The younger generation can't read or add.	1
emphasize math skills	1
Employees that don't mind working a hard days job for a good days pay	1
English, math, communication	1
Entrepreneur Classes	1
Fall protection	1
Fundamental Skills, Thinking skills	1

General Responsibility	1
General writing skills (how to get your thoughts out in a coherent	1
Geometry, Calculus, Chemistry, Physics	1
Give them a calculator and show them how to use, basic of incoming	1
Greater understanding of ethics and responsibility	1
Hires through Union so everyone is pretty much already qualified	1
How to analyze and fix things	1
Integrity	1
Interpersonal Skills, Communication Skills, Reading, Writing, Math	1
Introduce environmental issues along with Science, Biology education instead of compartmentalizing them.	1
Just graduate	1
Just the basics, don't just push them through	1
Make them read more	1
More science and math skills; back to basics	1
More traditional education, back to fundamentals and hands on projects, practical	1
Motivational skills (self and others)	1
Not prepared for the job they are applying for	1
Professionalism	1
Safety & desire to want to work	1
Science Courses	1
Show up on time	1
Technical math skills and computer skills	1
Whatever they can	1
Total	358

GENERAL GREEN AND SUSTAINABILITY	COUNT
Green practices in general	46
Sustainability design green technology	28
Educate more on recycling	9
Technical Solar Training, Mechanical Systems, Waste Reduction	5
Science studies and Environment education	4
Awareness of different green associations, possibly getting involved while still in school	2
College education which includes the five areas needed for the environmental sciences	2

Environmental/Science	2
Familiar with what green products are available	2
More interaction with state agencies, more specific environmental knowledge/permitting	2
Basic: green living (urban area),	1
Better understanding of environment breaking of bad habits	1
Ecology knowledge	1
Economics of green practice and knowledge of the costs of green services	1
Education of all the Green technology	1
Effects of agents does to the environments	1
Engineering should have an introduction to green design	1
Environmental regulatory courses	1
Environmental Resource Management	1
Environmental solutions based on Eco friendly resources	1
General course practice green at home (it will expand into work lives)	1
General education of sustainability within a science program and carbon footprints	1
Green Packaging Technology	1
High schools have more class work on general environmental issues and awareness. College to teach more coursework in erosion control for landscape architects and environmental engineers.	1
Importance of biofuels and value for future economy why not as popular as petroleum	1
Instruction on the causes and effects of the environmental issues	1
Knowledge of Green Materials (and how to use them)	1
Maintenance Training relating to green technologies	1
More available green training in all areas	1
More detail training in green skills	1
More emphasis on algebra and basic math	1
More emphasis on physics	1
More emphasis on the Sciences and Geography	1
Natural systems understanding	1
Overall concept of how the earth works, impacts on environment	1
Personal Finance MGMT	1

Appendix K

Prepare youth for the future	1
resource conservation	1
Resource Conservation Sustainable Agriculture`	1
Science end of why go green	1
Science,Biology,Geology,Environmental Studies starting at a young age.	1
Taught more plant anatomy and biology, how to conserve by growing more native plants will use less water, Integrated pest management, green greenhouse studies	1
Teaching environmental awareness and promoting good environmental practices in youth.	1
Understanding how it all works as a whole	1
Total	136

PRACTICAL APPLICATIONS	COUNT
More hands on training	13
Practical experience & field co-op training	11
Internships	10
Applied or practical courses with hands on experience outside the classroom	10
Working experience	7
Real-life project or problem (integrated learning)	7
Common Sense training	7
Environmental engineering Sciences and Business what is appropriate and realistic	6
Technical, Mechanical, Blueprints, Machinist Abilities, Practical Experience	4
Increased apprenticeships, and hands on training	4
Experience is better than training.	2
Work study programs at high school and colleges	1
Work experience on actual situation with company	1
Woodshop, hands on work	1
Teach physical work	1
Street Smarts	1
See more Codes taught. Practical Skills with answering phones, customer service.	1
More practical land development and storm water courses	1
More practical knowledge and less theory	1
More practical experience on design and technical influence should be greater than it is	1
More hands on training for carpentry, out of classroom	1

More apprenticeship programs readily available	1
methods that apply to the job	1
Measuring Tools, Practical Experience, Critical Thinking Skills Related to the Job	1
knowledge of handling pesticides and farm fertilizers, including protective clothing and handling	1
Job Training	1
internship? Need practical training, not just book-learning	1
In-House Training	1
Importance of Work experience	1
Health & safety, engineers before out in the field	1
Have more hands on mechanical hands on practical training.	1
Hands-on Experience with Operating Vessels	1
Hands on with soldering, plumbing and electric	1
Government does not need to pay for people to get trained, they can train themselves.	1
Focus on the real world	1
Focus on certifications to actually have skills	1
Field training, resources	1
Field service requires critical thinking, common sense & communications skills	1
Enhancing environmental sciences and formalize the technological training for those fields. Teaching a practical approach to theory to be successful on the field.	1
Convert Books to Real Experience, Practical Knowledge, Internships	1
Common Sense, Real World Application, Advanced Calculus	1
Apprentice/intern: hands on training	1
Total	112

VOCATIONAL TECHNICAL SCHOOLS	COUNT
Hands-on; more technical training for trades	26
Technical Trade Skills and Certifications	18
CAD Training, Math Skills, Writing Skills, Computer Skills	6
Education in Combustion Theory	4
Increased apprenticeships, hands on training, and LEED certification	3
Individual test prep Cert. classes in the mechanic area	3

Knowledge of motors and generators	3
New Technologies, Tools, Processes, and Design	3
Tradesmen Skills, Vocational Training	3
Use more modern equipment when training; keep up with the latest technology	3
Basic tool usage	2
Certification Programs	2
General handyman (need to know a little about a lot)	2
Shop classes	2
Basic Engineering Courses, Static Mechanics, Mechanics of Materials	1
Basic Mechanical Training	1
Basic plumbing	1
Basic Work Skills, Writing, Plumbing, Electrical	1
Better Engineering Background	1
Blue Print Reading, Body Shop Skills	1
co-op training program	1
Electrical & pipe fitting, CAD, Blue print reading	1
Good shop practices	1
Having schools train candidates for proficiency with new tools and technology.	1
High school programs that promote trade labor in a positive light. For trade and vo-tech schools, programs that cover solar energy skills.	1
How to weld, basic machining skills	1
Learn how to use a tape measure, basic measuring and math skills	1
Local vocational tech schools build a house to teach wiring; nonunion apprenticeships	1
Market the trades to high schoolers and stop pushing computers	1
Mechanical & plumbing skills	1
Mechanical Skills	1
More emphasis on trades	1
More hands on skills for students not going on to college.	1
Motor rewinding (electrician) in vocational schools	1
Start vo-tech education earlier (high school), teach everyone a trade in addition to academics	1
Teach more than just the bare minimum at trade schools	1
Thermo dynamics and technical math classes	1
Two Year Carpentry Programs	1
Total	104

BUSINESS SKILLS	COUNT
Business skills	16
Completing Time Records (that are related to payroll)	5
Systems Development, Project Management, General Business Skills	3
Business Etiquette (Related to the Industry)	2
Business management training	2
General knowledge of the current market demand for local region.	2
Organization skills	2
Project management (time & budget & people)	2
Sales skills taught to technical degree majors.	2
Awareness of job market	1
Business ethics	1
Business oriented agriculture and horticulture programs avail	1
Economic analysis of alternatives	1
Estimating labor costs, equipment life	1
How business works	1
Implement company policies	1
Lifecycle with efficiency costs and general cost knowledge for the industry.	1
Money and cost management skills	1
Property Management and Maintenance	1
Total	46

COMPUTER SKILLS	COUNT
Basic computer training	14
Management, Computer, Communication, Social Networking	5
Individual online training/certification courses for specific subject areas with the need arises.	4
CAT skills	2
Data Management	1
More Automation and Control software skills, Mechatronics (Robots)	1
Practical Experience in Programming	1
Reading Technical Work Instructions on the Computer	1
Total	29

Appendix K

CUSTOMER SERVICE SKILLS	COUNT
Customer Service	9
More People Skills	7
Social skills (shake hands, dress properly, interact with client, personal hygiene, get along with team mates, salary must be earned not gifted)	4
Interpersonal Skills	3
Awareness training for customer service	1
Course on how to deal with the government	1
Don't train them to be a roofer, train them to be presentable to the public	1
More global awareness, applying good customer service skills	1
Social skills, reading comprehension	1
Social skills. How to interact with customers.	1
Speaking in public, especially when the public is angry	1
Total	30

MISCELLANEOUS INDUSTRIES	COUNT
Agriculture, Environmental Sciences, Leadership	11
Truck driving	5
Public Administration, political science, government	5
Welding and Fabrication	4
Learn Plastic Extrusion	4
Horticulture education	4
Combustion modeling	4
Refrigeration	3
Lead abatement	3
Regulations and field skills relationship	2
Phoenixville	2
More forestry	2
Mechanical Engineering	2
Hotel and Restaurant Management, Guest Services	2
Green burials in Mortuary Science program	2
Energy Engineering, Energy Auditing, LEED Training	2
Issues with government	2
Urban Planning, Horticulture, Landscape	1
Understanding overall photovoltaic installation	1

Types of metal	1
Training more generalized, would like to see more specific to earth moving, highway construction	1
Test prep for Cert.	1
Technical skills cement, carpenter	1
Technical biological training	1
Teaches engineering and consulting classes	1
Teach art in schools	1
Student Intern Training with Architectural Company's.	1
Stem training(large grant for university and partners), engineering, math	1
Stay up to date on training	1
Stationary source testings	1
Spray painting and dust collection compliance	1
Specifics on permit knowledge, locating updates, regulations	1
Specific Industry Training, Specific Industry Degrees	1
Specialization in an Engineering Field	1
Some engineering skills in forestry school	1
Skills related to working with lead.	1
Simulator for logging equipment and machinery	1
Signaling & train control (there is only 1 college in Wisconsin) and track alignment (there is only 1 college in Montana)	1
Short update programs to keep current	1
Sewing	1
School law/regulation (teachers don't socialize with students, teachers should be careful of their Facebook postings, etc)	1
Reliability analysis, reliability engineering, no one offers it	1
Recycle Knowledge, Knowledge of Properly Separating Items	1
Product/Service Knowledge	1
Process safety engineering	1
Personal Plastic Injection Molding Knowledge	1
Offering courses in drilling skills as there are not many schools that offer this training.	1
New Thermoacoustic Technologies	1
new technology such as hydrofracturing; current training on conservation & protection good but need to learn how to manage resources like water	1

New Technologies	1
More training in exposure measurement	1
More Technical Skills, Blower Door Training	1
More interactions with other disciplines such as engineers and contractors	1
More fire alarm knowledge	1
More Equipment Operator programs	1
More consultants, More push towards state training	1
Millwright Education	1
Mechanical Pressure Vessels	1
Material handling safety	1
Marine Engines	1
Manufacturers, products, service, recycle	1
Machinist Training	1
Lean manufacturing education	1
Interpreting computer-generated statistical data and how to applying quality standards	1
Industry knowledge through ISA (International sign association)	1
Incorporate IR CRC standards and destinations Certification	1
Include OSHA 10 and CPR training	1
How to use water soluble inks	1
Hazardous material handling	1
Handling of Freon	1
General teachers training	1
General Agricultural practices, self	1
Farmer does not really apply	1
Farm programs (FFA, FHA etc)	1
Diversity; child development and maturation	1
Current Industry Equipment Training Courses	1
Civil & Environmental Engineering, more depth	1
Chemistry, Instrument, and Control knowledge	1
Chemistry, field collection techniques, auto CAD (drafting program)	1
Chemical/Mechanical Engineering courses	1
Biological Controls, Mixing fertilizer, irrigation	1
Better training to prepare for exams	1
Better public and private company partnership to help understand all the new laws and regulations	1
Better preparation for professional exams	1
Basic Automotive Knowledge	1
Automation, interface components operator	1

Asphalt and Concrete, Safety	1
Advanced mechanical engineering understanding	1
Above ground tank inspection, Welding	1
Total	131

BUILDING AND CONSTRUCTION	COUNT
HVAC training	33
LEED Certification/education	25
Basic Carpentry Skills, Remolding and Construction Skills	7
Construction Knowledge	7
Carpentry Skills	3
Basic Electrical	2
Building science knowledge	2
Building Technology	2
Efficient home building methods	2
More office related experience and construction knowledge	2
Traditional roofing skills	2
Basic Construction, Roofing, Knowledge of agricultural systems, Electrical Training	1
Basic Electrical/Carpentry	1
building codes, hands-on project to learn on (practical knowledge), math skills	1
Building Structure, Conservation Theories, Energy Principles and Management	1
Carpentry, Auto Body	1
Construction materials and detailing	1
Construction planning & organizational skills	1
Cost benefit analysis training	1
Cost effective decisions in design	1
Courses on what constitutes green building	1
Design studios that incorporate green building design in science & engineering	1
Emissions. Reusable flooring materials and fibers.	1
Emphasize the importance of reclaiming different construction materials/reusable products.	1
Environmental building skills	1
General Architectural Education	1
General Installation techniques, understanding green materials	1
Geometry, math, basic heating construction	1

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Green Products for General Contractors	1
home building codes and skills	1
Home ownership (looking at MLS, financing, and other aspects of buying a home) starting in high school	1
Insulation and Weatherization Courses	1
More architectural programs	1
More education in Civil Engineering and Green Infrastructure and Home energy studies.	1
Motivational supervision	1
Passive home design	1
Physically building prototypes	1
Plumbing	1
Quality building skills	1
RESNET Training, Building Information Modeling (BIM)	1
Safety Courses for Roofers, Computer Courses	1
Simple economics	1
Take school age children on field trips to old historical buildings and relate the architecture and history and the environmental aspects of the building.	1
Teach people to work off the ground on a roof.	1
Teaching about building codes	1
Technical aspects of being a carpenter vs. prebuilt woodworking	1
Trade school to offer a roofing program	1
Understanding of eco-homes	1
Weatherization	1
Total	125

ENERGY	COUNT
Renewable Energy, Green Resources	13
Solar Panel Installation	13
Energy conservation	10
Solar and Wind Energies; Energy Efficient Lighting	8
Engineering schools should include more on renewable energy and power	7
Geothermal Knowledge	7
Currently partnering with local community college to train and recruit next-generation energy workforce	5
Energy Audits	5

Consumer Consumption of Energy Efficient Appliances/Products	3
Energy Efficient Products, Solar Energy, Solar Wiring	2
Energy modeling, integrated design, general environmental science courses requirement	2
Energy, non point pollution, storm water runoff	2
Green energy programs and products and geothermal energy.	2
Growing technologies, solar, wind, and other alternative energy	2
Power plant operations	2
Solar, Geothermal	2
Classes on costs of using green energy vs. other resources	1
DPI certification, energy efficiency training	1
Drill operators for geothermal systems	1
Environmental energy, renewable energy(REX), trading commodities(noxs,oxides), carbon credits	1
Geothermal and photovoltaic skill sets	1
Geothermal heating/cooling, lighting (retrofit and energy savings)	1
Geothermal, job shadowing/drilling	1
Practical instrumentation and process control for green energy	1
Solar Installation Training, Green Garden Roof Installation	1
Solar Training, renewable energy and Building Science training	1
Solar Wind and Biomass Energies	1
Technical electrical and green energy	1
Understanding lighting Industry	1
Total	98

POLLUTION (AIR, WATER, AND LAND)	COUNT
Watershed education and technical training related to environmental issues	16
Better EPA Education	4
Health/Pollution	3
Stack testing (i.e. smoke/emission stacks etc.)	3
Basic knowledge of preserving the environment and prevention of waste.	2
Pollution awareness, Biological process, Green House gas impacts	2

Soil analysis skills & field skills	2
Water related issues, issues with mining	2
Conservation of energy and materials	2
Clean Technology	2
Storm water systems	2
Air pollution control equipment	1
Biosolids management, waste water treatment, and writing skills.	1
Conservation Planning, erosion control; basic environmental/agricultural education/literacy	1
Conservation/Green Production, lab applications	1
General emissions knowledge, promote the industry in a positive light	1
How to better manage residential chemical disposal	1
Knowledge of water systems	1
Landfill gas mngmt experience; heavy equip ops	1
Life of a landfill.	1
Recycling, Water run off how it effects the environment	1
Remedial clean up	1
Soil courses	1
More scientific specifics of waste water management	1
Wetland Training, Air Pollution Control	1
Total	54

ELECTRICAL AND ELECTRONICS	COUNT
Electrical technology	12
Electronics	2
Electrical Codes, hands on experience	1
General wiring	1
Geothermal heating, electrical system efficiency	1
More book knowledge electrical	1
Need both electrical and mechanical training	1
Statewide Electrical Contractors Program	1
Stay on top of technology/electronics	1
Total	21

Appendix L

Survey Responses – Declining Occupations

Question: Please identify any occupations/jobs declining due to implementation of green practices.

MISCELLANEOUS NON-TECHNICAL	COUNT
Billing and purchasing clerks	7
General Operations and Maintenance	6
All	5
Manual Laborers	2
Philadelphia	2
Phoenixville	2
Administrative positions are less prominent due to different ways of doing things than in past	1
All positions, clients just can't afford to be green	1
Any company that isn't willing to make the conversion to green	1
Anything related to "old" technology or more traditional jobs	1
Attendance at the dump	1
Basic industry	1
Bedford	1
Cost adds to the end user. Not enhancing the market and employment.	1
Facility maintenance	1
Hughesville	1
Manufacturing as many jobs will be outsourced because less environmental regulations translate to higher profits.	1
manufacturing jobs	1
My industry as a whole	1
Oil delivery person/technician or anything related	1
Products more than positions	1
Stroudsburg	1
This is a competitive business and the government favors minority owned businesses.	1
Too much regulation causes too much cost, co's will leave - counterproductive	1
Total	42

BUILDING AND CONSTRUCTION	COUNT
Construction	7
Home building	2
Installers	2
Paint and light bulb Industry	2
Carpenters (less wood, more metal)	1
Flooring Companies as a whole, Manufacturers of harmful flooring products (ones that contain VOC's)	1
HVAC	1
Lead paint	1
Manufacturers will use 3d modeling, avoiding drafters and will pre-manufacture large portions of buildings creating less work for craftsman and more work for assemblers.	1
New home construction	1
Plumbing(plastics are too easy and professionalism is lost job done to fast)	1
Remodeling	1
Roofer	1
Window Replacer	1
Wood decking	1
Wood Fences	1
Total	25

POLLUTION (AIR, WATER AND LAND)	COUNT
Land development - lots of regulations	5
EPA reg c02 - will affect larger plants and companies	4
Agriculture jobs	3
Exhaust fan manufacturers, any job dealing with refrigerants	3
Marcellus Shale field laws may effect operator / management positions	2
All in land development	1
Logging	1

Positions were cut due to elevated expenses to provide recycling services to the county	1
Refuse collectors	1
Timbering	1
Trash men	1
Total	23

ENERGY	COUNT
Coal industries	8
Utility Analyst	3
Light bulb manufacturing	2
Utilities, fossil generated energy, projects have fallen off due to CO2 emissions	2
Any solar related positions	1
Coal Mining, Oil Industries, Carbon Businesses	1
Decline people who are getting mining permits.	1
Jobs working with fossil fuels	1
Not a decline, but a shift from nuclear to solar could happen in some areas	1
Old energy technologies (needs to be affordable and maintainable)	1
Other energy resources, not loggers	1
Petroleum industry	1
Total	23

MISCELLANEOUS TECHNICIANS	COUNT
All engineering related	5
manufacturing	2
Anything regulated	1
Inspector positions	1
Old school technologies	1
Ones where applicants are not aware of digital technology	1
Perk cleaning system worker	1
Printers (print shops)	1
Scale down version of tube vendor and neon fabricator	1
Some work is too technical and the staff are not trained so some work is subcontracted out	1
UST Technicians	1
Total	16

MECHANICAL AND EQUIPMENT OPERATORS	COUNT
Machinery operators (moving to no-till)	4
Making of equipment	2
Pneumatics worker	2
Belt driven blower system, standing pilot ignition systems	1
Engineering	1
Repair of older equipment	1
Total	11

Appendix M

Survey Responses – Changing Occupations

Question: Which existing positions do you envision will change the most as a result of green practices?

BUILDING AND CONSTRUCTION	COUNT
Architects	36
HVAC	33
Electrician	29
Maintenance Worker	21
Facilities management	10
Carpenters	7
Construction	6
Plumbers	6
Architects, engineers ,planners	4
Civil Landscape Architects	3
Landscape Architect	3
Roofers	3
Architecture and Engineering	2
Developers	2
Vinyl Decking	2
Construction electricians	1
Construction industry	1
Framers	1
Heating and Air Conditioning Mechanics and Installers	1
Housing Rehab	1
Indoor Air Quality Investigator	1
Outreach specialists; building maintenance	1
Painters	1
Pressure for all positions to receive LEED certification.	1
Project Architects	1
Window Replacer	1
Window, HVAC, Insulation Installers, anyone using green products	1
Total	179

MANAGEMENT JOBS	COUNT
Project Manager	44
Building Foreman, Building Superintendent, Carpenter, Laborer, Precast Fabricators, Project Manager, Steel Erectors, Site Superintendent	11
Installers	11
Management	11
Energy Consultant	10
Project Development Manager, Superintendent	5
Grounds Crew, General Manager	4
HR Manager Position	4
Supervisor	3
Marcellus Shell field laws may effect operator/ management positions	2
Product management and development positions	2
Business owner and operations manager	1
CEO	1
Corp Office, actual business side of operations.	1
Crew Chief	1
Education Coordinator	1
Environmental Director	1
Field Manager and Estimator	1
Forestry Management	1
Housing Director, Assistant Housing Director, Maintenance	1
Production Manager	1
Quality Assurance Inspector, Managers	1
Supervisors/Project Managers	1
Total	119

NON-SPECIFIC JOBS	COUNT
All	87
Funding for infrastructure projects	5
Certifications and training involved due to the constant environmental laws changing.	1

Certifications due to more environmental laws	1
Hopefully make more money	1
It depends on economy and growth you will need more positions due to growth	1
May have to be better trained if equipment becomes more popular	1
More awareness	1
More business	1
More environmental laws	1
More work depending on economy and grants or prices	1
Waiting time for permits will increase	1
Total	102

DIRECT GREEN JOBS	COUNT
Environmental compliance and environmental monitoring, operations	37
Environmental Scientists	8
Environmental Consultant	5
Environmental Monitors	5
Middle class jobs - increase in opportunities for blue collar workers to become green workforce	5
Green skill and/or training current employees for green skills.	4
Health & Safety Coordinator to increase	4
Regulatory Affairs Position	4
Research and development	3
Environmental quality control	2
Safety committees - being proactive about hazards	2
Environmental Biologist	1
Environmental Health and Safety Specialist	1
Governmental requirements	1
Green Marketer	1
Horticultural , Environmental Educators	1
Implement more green practices	1
Increase in HSE Specialists Because of the increasing Regulations	1
More Certifications in the Environmental field due to more laws.	1
Technical Environmentalist	1
Training of laborers in green practices	1
Urban and Regional Planner	1

Utility positions in environmental departments	1
Biologist	1
Science teaching	1
Scientist	1
Teachers	1
Principal	6
Total	101

OFFICE WORKERS	COUNT
Purchasing, Sales	59
Payment clerks (strong shift to online or automatic payments)	7
Office workers	6
Administrative positions	2
IT Workers	2
Marketing	2
Librarian	1
Paper pushers	1
Total	80

MECHANICAL AND EQUIPMENT OPERATORS	COUNT
Print Industry jobs, farming	10
Plant Operator	8
Production Workers	7
Operations Maintenance	6
Technicians	6
Grinder	4
Sheet Metal Worker	4
Industrial Engineer	3
Loggers	3
Automotive in maintenance	2
Equipment Operator	2
Mechanical Service Technician	2
Pump & Tank Installer	2
Refrigeration Installer, Refrigeration Technician	2
skilled laborers (more knowledge)	2
AAS technician field will grow because of the new pollution laws coming into effect.	1
Basic operators, skill pump mechanics, electricians	1
Coal Preparation	1

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Compress Air Technician and Finish Technician	1
Journeyman position the most who are out in the field	1
manufacturer of strapping	1
Mechanics, Installers	1
Small Operators of Surfacing Mining	1
Total	71

MISCELLANEOUS TECHNICIANS	COUNT
Cost Estimators	14
Designers	9
Slightly, overall	8
Lab technicians testing products and materials	5
Non-combustion technology if co2 sequestration mandated	4
Contractors	3
Pesticide sprayers	2
Certified Tank Inspectors	1
Chemical Technician	1
CO 2 Dry cleaning worker	1
Cutting in national forest (vs cutting locally)	1
It will put small businesses out of business	1
Propagation	1
Survey would have to change	1
Truck driver	1
Web based printing will go away.	1
Total	54

ENGINEERS	COUNT
Civil Engineer	12
Engineers	11
Mechanical Engineer	7
Electrical Engineering	5
Environmental Engineer	4
Workload increase for engineer/scientists	4
Service Technicians, Engineers	2
Civil and Environmental Engineer	1
Environmental Engineers	1
Environmental engineers will need LEED knowledge as the practice of industrial reuse begins.	1

Manufacturing engineering and quality control positions	1
New Product Engineer	1
Our roles as engineers will change with a greater focus on the larger picture of sustainability and how each pieces affects the rest of the chain.	1
Professional Engineer practices will do more	1
Project Engineer, depending on Customer requests	1
Structural Engineer	1
Total	54

POLLUTION (AIR, WATER AND LAND)	COUNT
Waste Water Techs	9
Emissions	6
Conservation Program Technician, increased grant requests in the future.	2
Geologist positions	2
Mining Machine Operator	2
Coal jobs	1
Parks & preservation	1
Pollution prevention	1
Wash Alley Operator	1
Water Operators regulations will increase	1
Water retention; overall staff affected	1
Total	27

ENERGY	COUNT
Workers in fossil fuel plants except natural gas (which is less labor intensive)	4
Energy Auditor	3
Gas drilling workers (surveyors)	3
Solar Technicians	3
Builders with solar energy products	2
Field workers needing knowledge in solar energy.	2
Paint and light bulb Industry, can not think of job names but work in water based products and finishing processes for paint and light bulb products will be developed elsewhere	2
Alternate fuel source	1

Fossil Fuel Industries	1
General positions due the change	1
Geothermal Technician, HVAC Technician	1
Solar/electricians	1
Wind, wave energy, solar energy	1
Total	25

RECYCLING JOBS	COUNT
Recycling	8
Refuse collectors	3
Collectors of Recyclables	1
Creative Reuse Pittsburgh, zero landfill Pittsburgh	1
Garbage and Sanitation Engineers	1
Industrial Hygienist	1
Janitorial - more recycling	1
Material handlers - they will start to incorporate other green ideas into their recycling of biosolids, like the creation of biofuels and other ways to reuse waste materials	1
Mechanic recovery requirements	1
Mechanic with older equipment	1
Public works	1
Trash Collectors	1
Total	21

JOBS WITH LOW SKILLS REQUIREMENTS	COUNT
Laborers	10
Truck Drivers	3
Cafeteria workers (housekeepers)	1
Car sales	1
Caretaker	1
Custodian	1
Drivers	1
Farm Worker	1
Total	19

Appendix N

Survey Responses – Green Practices Barriers

Question: *Do you have barriers that stand in your way of implementation of green practices?*

COST-RELATED ISSUES	COUNT
Cost	288
Money	19
Budget	14
Positive cost benefit analysis	11
In less density population areas, it's difficult to recycle profitably	5
ROI on some projects is not there	5
Control costs and emissions, the availability of more fuel-efficient vehicles would be advantageous	4
Replacement cost to customer for a new heating unit	4
Availability of materials within the compliant mileage.	3
Affordability (for customers), Solar Energy is not as cost effective as Geothermal Energy	2
Clients willing to pay the extra money	2
Customers, Costs (for the customers)	2
Other than budget, green practice is a little more expensive and sometimes difficult to maintain.	2
Overall cost of designing green building/facilities, 3x more expensive.	2
Clients willing to pay	2
Costs and economy	2
Perceived cost, education	2
Prices	2
Perception of cost	1
Affordability	1
Car cost to customer	1
Clients, the general public, Money	1
Construction Costs, Client Restraints	1
Cost for customers, less demand because of the expense.	1

Cost is too expensive for new green equipment that has to be purchased due to government mandates; somewhat disagree with this study being conducted considering the economy; did not really want to participate	1
Cost is very high. They need to make it more competitive.	1
Cost of recycling is up to 30% then just putting the waste in a landfill but worth it.	1
Cost of updating equipment, training, and lack of money.	1
Cost to Manufacture Energy Efficient Doors and Windows	1
Cost, client knowledge	1
Cost, documentation of LEED certification	1
Cost, Economy, Government Regulations	1
Cost, extra insurance	1
Cost, High maintenance	1
Cost, LEED is a deterrent because it is more cost	1
Cost, new regulations, political climate	1
Cost, PA programs for grants and funding are a joke.	1
Cost/Legal/Regulatory/Building Codes/Operational Barriers	1
Costs (and the costs for customers and consumers)	1
Costs (associated with heavy work vehicles)	1
Costs of Components and Systems	1
Costs on the Clients side, Knowledge base of our Engineers and Builders	1
Costs tend to rise when going green	1
Costs, Time Management	1
Customer demand, willing to spend the money	1
Customers are not wanting to pay for the higher priced Energy Star and recycled products.	1
Customers need to have the money to spend on EFF. Devices.	1

Dependant on contractor's willingness to pay for green services.	1
Employee costs: Workman's Comp Ins (\$6500/yr per EE), Unemployment Ins , Worker benefits (Ins). It's a big gamble when you hire, first paying Workman's Compensation when you hire, then Unemployment if it does not workout. Why can't they do something about that to help manufacturing and its supporting industries like mine, grow?; Unavailability of working capital from banks to small businesses- inability to secure loans; Cost to my (former) customers of yearly testing, paperwork, permitting. They'd rather burn it on-site because it's cleaner but it got cheaper to truck it away.	1
End User Cost	1
Equipment	1
Green practices are not cost effective for commercial/industrial purposes yet.	1
Green Technology is expensive. Many customers who may want to go green cannot afford it, so they do not go that route.	1
High cost of implementing green practices. She said that later on they will be hiring because their current workforce is getting ready to retire.	1
Industry is not setup efficiently at this time and has produced extra costs as a result.	1
Lead Abatement Cost	1
LEED AP certification is not cheap	1
Material Costs, Implementation Costs, the Market	1
Money Also they had to improve the emissions on the trucks by 20% but spend 20% more on fuel and 30% more on oil so the costs are hurting the company and not helping the environment.	1
Money from the client (project budget)	1
Money, Clientele	1
Money, Government, Taxes	1
Money, or lack thereof; folks sick of hearing about green	1
price of products (green) hard to market. Knowledge of savings.	1
Price of Timber	1
Pricing is high for green products.	1

Pricing of equipment is expensive and the reclamation process is high	1
product cost(high efficiency rebate for furnaces boosted business 2-3 installs per week now back to 1 or 2 per month)	1
Some green practices are counterproductive and not cost effective	1
True cost information on building specifications	1
Up front cost for installation and hiring consultants	1
Wages are based on an average some of there jobs are prevailing wage.	1
Total	425

GOVERNMENT AND REGULATION ISSUES	COUNT
Government regulations	59
DOT Rules and Regulations	19
Legislation (State and Federal)	8
They do a lot jobs in different states and he would like to see more uniform certifications that can be used in other states.	5
Government	4
Small private Energy Companies are being driven out because of all the laws and regulations imposed on them. They do not receive credits like the huge corporations.	4
Lack of understanding from State, Federal, etc. officials of business processes and needs and following standards that are already in place	4
Unrelated Mandatory Certifications for Aerospace, Costs	4
All the paperwork needed to work on a Leed project and the rules and regulations are very time consuming.	3
Chesapeake Bay authorities are taking away the resources we need to grow crops	3
New laws	3
Sometimes customers are mandated to follow regulations but they have no funding source to turn to.	3
IRC and RCC refuse to treat Vinyl with the same rules and regulations as other products.	2
Department of Environmental Protection	2

Appendix N

Getting permits to drill example Indiana abate areas have to be protected due to green initiatives that holds up work production	2
Legality of Solar Projects (contracts)	2
Municipal zoning and incentivizes for green practices are not cost efficient for private enterprises and the tax credits do not cover enough of percentage for expenses; example to get a LEED certification is expensive	2
"Paper Work" Government makes it harder with all the hoops.	1
Additional cost & time to document (LEED)	1
Better EPA rules awareness for builders	1
City needs to enforce the recycling laws.	1
Conflicting requirements state vs. federal	1
Enforcement of the new laws needs to made clearer. They want the issue fixed but they did not tell them how.	1
Gap - good agriculture practices initiatives - sometimes the rules get extreme	1
Government needs to take the pressure off of small shops with 7 employees that gross \$500,000 a year.	1
Green initiatives have forced employees to be more aware of rules for recycling.	1
Jersey has better energy credit program; PA has longer rebate program & it is winding down a bit.	1
Lack of government incentives makes it difficult to compete with non-union firms.	1
Lack of state subsidies, permit difficulty, red tape	1
Lack of understanding from State, Federal, etc. officials of business processes and needs; Officials not following standards that are already in place	1
Legislation Assistance	1
Legislative decisions code changes.	1
Legislative. Wishes commonwealth of PA would be more active in legislation. Renewable portfolio standard, companies only mandated to use .5 solar energy only have to pay a small fine, need bigger fines for companies. Companies not wanting to use solar energy. Coal and Nuclear energy.	1
Local Agencies' Reviews	1
Local or state code, benefit vs. cost explanation to education board	1

Municipal involvement, government regulations, single recycling companies (is generally multiple)	1
Need more balance between regulation and the economy	1
New regulations for electric rate caps projects can last 15-20 years government need to stay consistent with administration	1
No uniform license; varies by city	1
Pending legislation may drastically impact recyclers; need to find a way to make green more affordable	1
Permits through DEP	1
Poor regulations (no set regulations or inspections for geothermal)	1
Rebate for PA, excruciating (paperwork and process is terrible)	1
Red tape and paperwork set forth by the designers, engineers, and government. Says that government bureaucracy has hindered business flow.	1
Regular government regulations(could not list any)	1
Regulations (many tend to conflict with each other); cost (sometimes prohibitive)	1
Regulations are tight in processing	1
Regulations require a certain amount of a limited revenue income	1
Regulations, building practice not very flexible	1
Regulations; mountains of paperwork; government	1
Rules and regulations differ from local municipalities	1
Rules and Regulations that are involved are very costly. The amount of time it takes to get a permit is ridiculous.	1
School Board, everything needs to be approved and preapproved	1
State of Pennsylvania Government	1
Tax credits going away could hurt company	1
Taxes	1
Taxes, State of PA, Money, Empty promises from the government.	1
Township ordinances	1
Total	170

BUDGET AND FUNDING ISSUES	
Financial/Funding	80
Lack of a tax credit for customers buying Energy Efficient Doors.	6
Financial considerations	6
Financial cost to implement green practices is very expensive.	4
Internal budgets	4
Operational budgets	4
funding cuts	3
Working Capital from banks	3
Client's financial status	3
Business Plans	2
Grant Funds	2
Grants for private haulers	2
Ability to get investment dollars & loans	1
Capital	1
Capital/money/funding/financing	1
Client's barriers (finances & education)	1
Clients budget	1
Facility owners/client available funds	1
Finances are sometime too high for firms and jobs example went to a school to get estimate on changes to building it was too expensive for a school budget if green prices are too high for technology then the green job will go away	1
Financial and regulatory barriers	1
Financial risk reward	1
Financial, cost, money	1
Financial, physical location & imagination	1
Financing, tax credits	1
Financing; economic benefit for implementation	1
Funding to complete projects	1
Funding, Lack of State subsidies	1
Funding/grants	1
Government funding and projects	1
Government funding and required state to state certification.	1
Grants and other public funding public run taxes cuts	1
Lack of federal and state funding	1
Lack of state and federal funding for affordable housing in general	1

Limited Funding from the DCR and the Game Commission.	1
Loss of tax credits for Energy Efficient Appliances for 2011.	1
Outsourcing, Customer Funding	1
Petroleum and coal industry. The current Alternative energy portfolio standard does not provide sufficient tax credits. The solar renewable energy credits for producing energy are not enough to create on going revenue.	1
Resources not available in his area	1
Venture, Capital , Management	1
Total	146

MISCELLANEOUS	COUNT
High speed internet to outlying areas	10
Bidding process for projects that are green can be a challenge	5
Customers	4
Availability of materials within the compliant mileage.	3
Age/generation barriers	3
General Barriers (things that are out of their control)	3
No end markets on recycling, can't get any money for it anymore.	3
Beyond the budgetary concerns, knowing when the right time is to implement current technologies.	2
Customer has input into project	2
Union Company	2
Union Employees	2
Customer Demands	1
Economy waste taxpayers money i.e. blue bins have to be purchased in some areas privately	1
"Don't care/understand about all this"	1
A lot of green programs are good, but there are some that are just nonsense. So dealing with the ones that are nonsense gets in the way of the ones that are good.	1
Availability of Products	1
Better Equipment, Financial, More resources to recycle, Bigger Mulching Machines	1
Big Companies Corruptions	1
Big producers of products have clout with local stores	1

Appendix N

Change of routine/fear of change	1
Companies offering 0% interest for upgrading to energy efficient appliances, water heaters, heat pumps are making it so that they are not looking at getting a home inspection	1
Costs, Certifications, Training	1
Costs, lack of experienced contractors.	1
Costs, Mandatory Regulations	1
Costs, Training	1
Customer ignorance, regulations	1
Customer need; profitability	1
Customer satisfaction is our number concern. Whatever the customer wants in our product they receive.	1
Definition it is to broad	1
Disinterest	1
Does not know/remember name of Vendor	1
Doesn't believe in green when the world wakes then we can get back to doing real business	1
Eco friendly resource supply	1
Economics/cost benefit ratio...electric now unregulated in PA and many out-of-state companies are competing to provide cheaper power; New technology will stagnate as everyone wants wind power but no one wants the windmills in their backyard	1
Efficiency bulbs have to be tested, technology for certain areas have to be refined	1
Environmental policies and events generate work	1
Finding green material	1
Governmental support	1
Green products are not working well. The adhesives do not stick well and there have been some problems with the quality of new green carpets. The cost of recycling old carpeting is expensive.	1
They have overdone energy efficient in building area because the structures are too efficient and the homes can't breathe and they produce mold.	1
Lack of communication and opportunity for education	1
Lack of environmentally friendly materials, lack of new technology, and the availability of green materials and technology.	1

Lacking infrastructure	1
land needed for reclamation	1
Lists people make of things to put in vases do not consider the full knowledge of plants.	1
Markets for the recycles, someone willing to take items like concrete locally, have a data base for all sanitation companies to utilize	1
Need effective sprays for bugs	1
Need large arrow over the recycle bin to encourage staff.	1
No demand for it	1
No longer have Sales Agents at the company	1
Not being able to find resources to recycle machine parts	1
Not large enough to be noticed	1
Practices are too stringent.	1
Proactive - solar panels on roof, composting - suggestions are offered through student organizations	1
Projects created by other parties (i.e. cities, county's etc.)	1
Quality of equipment	1
Relies on contractors to handle waste	1
Says that current positions might decline with costly implementations of green.	1
School has a Greening Committee and students, teachers, or parents are all welcome to propose ideas.	1
Science teacher offers weekly "go green" tips	1
Small company; owner has language barrier	1
Stream Costing, Water Quality	1
They are a manufacturing/service company	1
This company acts as subcontractor; the general contractor makes the buying decisions.	1
This is a seasonal business they currently have 0 employees but they can have up to 35-40 employees.	1
Time	1
Unable to do business remotely.	1
Use of coal in their facility.	1
Will be generating their own electricity by this summer.	1
Work Processes	1
Total	98

GREEN KNOWLEDGE AND CUSTOMER EDUCATION ISSUES	COUNT
Not knowing what the green jobs are in the future	6
Awareness of the implications	4
Client awareness	4
Education of building owners need to catch up with energy efficient practices	4
Client knowledge about cost and benefit of "green"	3
Knowledge	3
Lack of knowledge	3
Clients	2
Currently none but, there will be the need for more technical knowledge as the industry matures and expands	2
Education	2
*PA has gotten a reputation of being the "bad guy" polluting because of the Marcellus Shale activity. It's hard for anyone involved in environmental issues to combat the negativity and convince the public of the benefits of "greening the economy" - whether it's reclaiming water or ending the nation's reliance on fossil fuels.	1
Accessibility of information	1
Changing thought process in regards to green burials	1
Client Buy-in	1
Client interest	1
Client interest in green is slowly coming around, but has been a barrier in the past	1
Client need is not great	1
Client reluctance to balance additional cost to long-term benefit	1
Clients request	1
Consumers lack of interest in buying green-grown products.	1
Customer concerns that cost is more important than the environmental benefits.	1
Customer Demands	1
Customer education	1
Customer education & financing	1
Customer education about green benefits that outweigh the cost	1
Customer education, cost is a major factor, material availability	1

Customer education; financing	1
Customer education; return on investment	1
Customer knowledge & green practices making economic sense	1
Development of cleaner and greener solutions	1
Economic and Cultural barriers. Lack of knowledge about new developments and services.	1
Education is the biggest she faced.	1
Education of clients	1
Education of clients of green building	1
Education of clients on Sustainability and the cost advantage over time	1
Education of clients to green buildings	1
Education of people (customers)	1
General outside knowledge of "green", cost	1
Green skills are included in the education	1
Initial investments and convincing customers to purchase green services	1
It seems to be generational, the folks that have been here 20 to 25 years seem to be reluctant movers unless they can see cost drivers/savings. I can see though that we will be greatly affected by the demands of our customers; as their demands for sustainability grow, our focus will shift.	1
Lack of community support/lack of information on what's already occurring to protect our environment	1
Lack of customer knowledge	1
Lack of general Green knowledge.	1
Lack of knowledge demand for green power sources	1
Lack of knowledge on consumer end and the costs of materials.	1
Lack of understanding and lack of clients who are receptive to green products	1
Level of consumer awareness/budgets	1
Never have too much awareness	1
Not enough green information and education	1
Not knowing what green jobs are	1
Older generation, afraid of change/hi-tech	1
Plant knowledge of green practices. People don't know much yet.	1
Public information/education	1

Appendix N

Publics lack of knowledge about geothermal energy.	1
Technology issues due to product development that would stall green initiatives	1
The only green is the grass outside	1
There is as much information available as there is a lack of	1
Total	81

ECONOMY AND SUPPLY/DEMAND ISSUES	COUNT
The economy	28
Competition	7
Economy	4
Economics	2
Lack of work	2
Opportunities	2
Economy waste taxpayers money i.e. blue bins have to be purchased in some areas privately	1
Chinese competition	1
Competition	1
Competition, Costs (that are associated with running a business)	1
Decline in public income	1
Economic Climate	1
Economic crisis, bad science programs developed by government for the government	1
Economics, government regulations	1
Economy and housing market dropping.	1
Economy and prices of solar panels.	1
Economy and The Government Regulations	1
Economy, Credits	1
Economy, government should back it more, cost	1
Having enough consumers	1
Housing market is very low. That is hurting builders.	1
It depends on economy and cost. Currently looking into the new electronics recycling bill do not know how that will effect pick up and delivery may need different types of trucks	1
Just keeping customers	1
Lack of business, money	1

Lack of clients and workload	1
Lack of Customer Demand	1
Lack of Customers, Expenses	1
Limited market opportunities in the rural area.	1
Market for it.	1
Not enough end users	1
Other contractors	1
Population base and ability capitalize.	1
Slow economy for builders and clients	1
Total	72

STAFFING AND TRAINING ISSUES	COUNT
Training	7
Lack of trained/certified staff	6
Shortage of teachers and students in the upper levels	5
Although there are always cost and funding barriers (We recently completed 2 LEED Certified buildings), many of the other challenges we've had have been met through the "Center of Environmental Research & Education" and its degree programs. All of the persons you've asked about either received a BS then got their jobs here or got their jobs and received an MS from the program.	4
Experienced workers that want to work	4
Insurance companies make it very difficult for Truck Drivers right out of school to get a job because the insurance companies require 2 years experience and these new drivers have no where to get the experience.	3
Process to get everybody certified	2
50% of workers in this field will be retiring in the next few years. The 1972 EPA clean water act means that all the employees currently in these positions are retiring now. This field needs more workers.	1
Bio-solids Management Engineers and Waste Water Treatment Engineers are in need because most in these jobs are 55 years + and are ready to retire.	1
Civil environmental engineer	1
Considering having their maintenance people trained in HVAC	1
Employees do not know enough about methane gas.	1

Employees need to have 5 years experience. No specific green skills other than HVAC	1
Employees who don't want to change	1
Expense in some cases, staffing	1
Funds for continuing education	1
Knowledge and Training (of different systems)	1
Lack of job opportunities.	1
Lack of trained/certified staff	3
Large shortage of skilled welders at this time.	1
LEED certification courses not easily available (extensive travel)	1
Need for more pacific training in this field	1
No certified people currently employed in company.	1
PA requires 100+ college credits in engineering and geology to be able to take the ASBOG exam. Once you have the certificate you can write reports and you have to continue to update your certificate every two years and take classes. Most kids in school are majoring in Environmental Engineering and that doesn't give you enough credits to take the ASBOG exam.	1
Plumbers can become resistant to new schooling but no others	1
Practices need to be better known by workers	1
Product type controlled by manufacture	1
She would like the state to start conducting training & pick up the cost of OSHA 10 License and CPR training so that employees already have the training prior to be being hired.	1
She would like to see High Schools and Voc Tech schools offer more classes relating to the environment and the six core areas.	1
State Certifications	1
Teachers have to have degree knowledge already to teach	1
This company said that there is currently no certifications required in his city.	1
Time requirements for Certifications and Licensing are very expensive and hold up jobs.	1
We don't have enough staff. We cannot send people to training or workshops because if we are short staff, then the day get s chaotic.	1

We've already been fortunate and able to take advantage of EPA, DOP and Worker Retraining programs.	1
Workers need to be 21 years old to be able to blast. The minimum age to be a laborer is 18 years old.	1
Total	62



CENTER FOR WORKFORCE INFORMATION & ANALYSIS

COMMONWEALTH OF PENNSYLVANIA GREEN SKILLS SURVEY

ABOUT THE SURVEY

The U.S. Department of Labor is taking a multi-state approach in refining its industry and occupational descriptions to keep up with the rapidly evolving green economy. As one of the states selected for a federal award in this national effort, Pennsylvania is partnering with the Washington State Employment Security Department to conduct a green employer skills survey. This is a follow-up survey to those employers who participated in Pennsylvania's green jobs survey. The goal of this partnership is to develop a green workforce, and we need our employers' help. The purpose of this survey is to help us learn about the associated skills sets and training needs for workers employed in green industries and occupations in Pennsylvania. The data collected will be targeted to workforce development practitioners and educators to help them prepare businesses and job seekers for opportunities within the green economy. It is vital that our state aligns our public policy investments with your business activities so that we benefit from this dynamic change in Pennsylvania's economy. Pennsylvania defines green jobs as jobs that employ workers in producing or offering products or services that:

1. Promote energy efficiency;
2. Contribute to the sustainable use of resources or renewable energy;
3. Prevent pollution;
4. Clean up the environment;
5. Promote the reduction of harmful emissions; and
6. Provide green education/training, awareness, or compliance.

COMPLETING THE SURVEY

- Please direct this survey to your Operations Manager or Human Resources Department.
- Include information about the location shown on the address label above.
- Fax both sides to 360-407-4510, or
- Contact us at 800-837-3074 to report by telephone or receive answers to your questions.
- Please respond before April 22, 2011.
- All information will be treated confidentially.

ID NUMBER: _____

COMPANY NAME: _____

CONTACT PERSON:

Name: _____

Title: _____

Telephone Number: () _____

Fax Number: () _____

Mailing Address _____

Date: _____

THANK YOU FOR PARTICIPATING BY APRIL 22, 2011

COMMONWEALTH OF PENNSYLVANIA GREEN SKILLS SURVEY

*Please enter information for the past three month's business activities only.

Job Title and Brief Description		New Positions	Total Number	Estimated Number	Minimum Education Requirement	Special Requirements	Specific Green Technical Skills Required	Wage Range	Promotion
List the job title and briefly describe any major job duties related to green activities. Only list jobs where work in green categories was essential to the job in 2010. (Exclude consultants, outside contractors, vendors, and others not considered employees.) Please Print.		Number of New Positions Within the Last Year?	Current Employees in Position	Employees in Position in Two Years	Enter one of the Following Codes: A = No requirement B = HS Diploma/GED C = Some College, no Degree D = Assoc. or Voc. Degree E = Bachelor's Degree F = Graduate Degree G = Other (Please Specify)	List any Required Special Licenses, Certifications, or Other Training.	(If yes, please list the skills.)	Hourly Range or Annual Salary Range of Employee(s)	Position(s) at the Next Level (Title)
Example: Wind Turbine Technician	Installs and Repairs Wind Turbines	1	2	4	D	Renewable Energy Technician Certification	Repairing Wind Turbines	\$30,000 to \$50,000	Wind Turbine Engineer
Title	Description								

If more space is needed, please contact us for another copy or make a copy of this page.

What green-related skills or areas of knowledge do you find most often lacking in job candidates? _____

During the next two years, do you expect your firm's green practices to: Increase ☐ Decrease ☐ Remain the Same ☐ (Check One)

In the next two years, what percent of your employees do you expect will require green skills or knowledge? 1-10% ☐ 11-20% ☐ 21-30% ☐ 31-40% ☐ 41-50% ☐ Don't Know ☐ None ☐ (Check One)

What green training sources do you currently utilize? _____

What types of training would you like to see school programs include to better prepare job candidates for your company? _____

What green training resources outside your company would you consider? Public Workforce System ☐ Career & Tech. Educ. ☐ Voc. Tech. Schools ☐ Comm. Colls. ☐ Universities ☐ Private Vendors ☐ Other ☐ (Check One) If Other, please explain: _____

Would you like to be contacted for these services?: Yes ☐ No ☐ (Check One) If yes, by Mail ☐ E-mail ☐ Phone ☐ Fax ☐ (Check One)

Please identify any occupations/jobs declining due to implementation of green practices: _____

Which existing positions do you envision will change the most as a result of green practices? _____

Do you have barriers that stand in your way of implementation of green practices? _____

Appendix P

List of Job Titles Reported by Employers

JOB TITLES	
HVAC Specialist	136
Electrician	115
Civil Engineer	112
Architect	104
Carpenter	101
Project Manager	94
Plumber	81
Mechanical Engineer	78
Sales Representative	76
Electrical Engineer	65
Environmental Engineer	59
Truck Driver	55
Construction Laborer	50
Refuse and Recyclable Material Collectors	48
Office Clerk	36
Operations Manager	36
Estimator	32
Environmental Scientist	28
Office Manager	26
General Manager	25
Heating and Air Conditioning Mechanics and Installers	25
Solar Thermal Technician	25
Farm Worker	24
Production Worker	24
Roofer	21
Architectural Drafter	20
Laborer	20
General Contractor	19
Environmental Consultant	18
Heavy Equipment Operator	18
Structural Engineer	18
Administrative Assistant	17
Construction Manager	17
Geologist	17
Mechanic	17

Nursery Worker	17
Accounting	16
CAD Designer	16
Forester	16
General and Operations Manager	16
Maintenance Worker	16
Service Technician	16
Construction Carpenter	15
Environmental Technician	15
Foreman	15
Equipment Operator	14
Landscape Architect	14
Recyclable Material Collector	14
Science Teacher	14
Secretary	14
Construction Worker	13
Environmental Science Teacher	13
Teacher	12
Energy Engineer	12
Interior Designer	12
Occupational Health and Safety Technicians	12
Chemical Engineer	11
Energy Auditor	11
Occupational Health and Safety Specialist	11
Plant Manager	11
President	11
Recycling Coordinator	11
Surveyor	11
Green Marketer	10
Maintenance Technician	10
Plant Operator	10
Superintendent	10
Chemist	9
Cost Estimator	9
Customer Service Representative	9
Drafter	9
Environmental Specialist	9

Installation Technician	9
Manager	9
Office Support Worker	9
Transportation Specialist	9
Agriculture Consultant	8
Business Developer	8
Construction Foreman	8
Forest and Conservation Technician	8
Hazardous Materials Removal Worker	8
Hazmat Technician	8
Insulation Installer	8
Laboratory Technician	8
Machine Operator	8
Maintenance Supervisor	8
Recycling Worker	8
Sustainability Specialist	8
Water Resource Specialist	8
Watershed Program Manager	8
Building Inspector	7
Energy Consultant	7
Energy Manager	7
Maintenance Mechanic	7
Plumbing and Heating Mechanic	7
Recycle Driver	7
Sanitation Laborer	7
Warehouse Worker	7
Automotive Mechanic	6
Carpenter Helper	6
Chief Executive	6
Design Engineer	6
District Manager	6
Electrical Technician	6
Environmental Manager	6
Fabricator	6
Facilities Manager	6
Geothermal Technician	6
Industrial Engineer	6
Installer	6
Landscaper	6
Mechanical Drafter	6
Project Engineer	6
Purchasing Manager	6

Roll off Truck Driver	6
Science Teacher; Secondary	6
Soil and Water Conservationist	6
Welder	6
Administrative Support Worker	5
Architectural Project Manager	5
Billing Clerk	5
Biological Science Teacher postsecondary	5
Driller	5
Electronic Technician	5
Engineer	5
Engineering Technician	5
Environmental Coordinator	5
Environmental Science Professor	5
Environmental Science Teacher; Secondary	5
Executive Director	5
Farmer	5
Field Service Technician	5
Hydro geologist	5
Inspector	5
Instructor	5
Journeyman Electrician	5
Land Surveyor	5
Logger	5
Maintenance and Repair Workers	5
Painter	5
Power Plant Operator	5
Principal	5
Production Manager	5
Program Technician	5
Receptionist	5
Reclamation Worker	5
Recycling and Reclamation Worker	5
Resource Conservation Specialist	5
Sanitary Engineer	5
Scientist	5
Solid Waste Collector	5
Trainer	5
Waste Water Treatment Operator	5
Window Installer	5
Teacher	4
Administrator	4

Appendix P

Architectural Engineer	4
Automotive Technician	4
Chemistry Teacher postsecondary	4
Computer Programmer	4
Crushing; Grinding; and Polishing Machine Setters; Operators; and Tenders	4
Electrical Designer	4
Electrical Drafter	4
Environmental Health and Safety Specialist	4
Environmental Scientist and Specialist	4
Excavator Operator	4
Explosive Workers	4
Farm Manager	4
Flooring Installer	4
Garbage Collector	4
Geotechnical Engineer	4
Groundskeeper	4
Human Resources Manager	4
Journeyman Plumber	4
Lab Technician	4
Laborer; general	4
Landscape Designer	4
Librarian	4
Manufacturing Production Technician	4
Nutrient Management Specialist	4
Refrigeration Technician	4
Sewer and Drain Technician	4
Waste Water Operator	4
Water and Liquid Waste Treatment Plant System Operator	4
Watershed Specialist	4
Weatherization Technician	4
Well Driller	4
Administrative Service Managers	3
Aquatic Biologist	3
Assembler	3
biologist	3
Bus Driver	3
Chemical Technician	3
Chief Executive Officer	3
Concrete Finisher	3
Conservationist	3
Construction and Building Inspector	3

Construction Inspector	3
Contractor	3
Controller	3
Director of Engineering	3
Draftsman	3
Education Coordinator	3
Environmental Compliance Inspector	3
Environmental Science Teacher (HS)	3
Field Operations Supervisor	3
First line Supervisors/Managers of production and operating Workers	3
Front Loader Residential Driver	3
Funeral Director	3
Geography Teacher postsecondary	3
Geoscientist	3
Health and Safety Manager	3
High School Environmental Science Teacher	3
Horticulturist	3
Housekeeper	3
Industrial Hygienist	3
Journeyman Plumber	3
Landscaping and Grounds keeping Worker	3
Leed Carpenter	3
Machinist	3
Manager of Production	3
Manufacturing Engineer	3
Market Research Consultant	3
Marketing Coordinator	3
Material Handler	3
Middle School Science Teacher	3
Mining Engineer	3
Operation Manager	3
Operator	3
Outside Sales Representative	3
Paving; Surfacing; and Tamping Equipment Operators	3
Pest Control Worker	3
Pipe Fitter	3
Planner	3
Principal Architect	3
Purchasing Agent	3
Retail Salesperson	3
Safety Director	3

Safety Manager	3
Safety Specialist	3
Septic Cleaner	3
Service Manager	3
Sheet Metal Worker	3
Software Engineer	3
Stone cutters and Carvers; manufacturing	3
Technical Writer	3
Training and Development Specialist	3
Urban and Regional Planner	3
Wastewater Treatment Plant Operator	3
Administrative Officer	2
Air Control Specialist	2
Application Engineer	2
Apprentice Electrician	2
Architectural Designers	2
Asbestos Abatement Worker	2
Assembly Worker	2
Assistant Vice President of Facilities Service	2
Automotive Technician	2
Auxiliary Operator	2
Chief Engineer	2
Civil Engineering Technician	2
Commercial and Industrial Designers	2
Community Development Planner	2
Compliance Investigator	2
Conservation Technician	2
Construction and Building inspectors	2
Construction Project Manager	2
Control Operator	2
Custodian	2
Data Entry Clerk	2
Designer	2
Development Engineer	2
Director	2
Director of Operations	2
Dispatcher	2
Drill Helper	2
Drill Operator	2
Driver	2
Dry Wall Installer	2
Economy Teacher postsecondary	2

Electrical Equipment Assembler	2
Electronic Engineer	2
Emission Inspection Technician	2
Enforcement Officer	2
Engineering Manager	2
Environmental Engineer	2
Environmental Geologist	2
Environmental Health & Safety Specialist	2
Environmental Project Manager	2
Erosion Control Specialist	2
Executive Secretaries and Administrative Assistants	2
Farm Laborer	2
Farm Management Specialist	2
Field Supervisor	2
Field Technician	2
First-Line Supervisors/Managers of Mechanics; Installers; and Repairers	2
Floor Mechanic	2
Fuel Cell Technician	2
Glazier	2
Glaziers	2
Graphic Designer	2
High School Science Teacher	2
High School Teacher	2
Home Remodeler	2
Human Resources Consultant	2
Industrial Machinery Mechanic	2
Inside Sales Representative	2
Inspectors; Testers; Sorters; Samplers; and Weighers	2
Instructional Designer	2
Insulator	2
Interior Design	2
IT Manager	2
Janitor	2
Laboratory Supervisor	2
Logging Worker	2
Maintenance and Repair Worker	2
Maintenance Electrician	2
Manufacturing Technician	2
Materials Engineer	2

Appendix P

Methane Landfill Gas Generation System Technician	2
Mine Cutting Operator	2
Mining and Geological Engineers; including Mining Safety Engineers	2
Mining Machine Operator	2
Museum Educator	2
Nursery Manager	2
Office Clerks; General	2
Operating Engineer	2
Philosophy Teacher postsecondary	2
Plumbing Engineer	2
Production Supervisor	2
Project Designer	2
Public Relations Specialist	2
Quality Control Analyst	2
Quality Control Manager	2
Quality Control Systems Manager	2
Recreational Manager	2
Refinery Operator	2
Resource Technician	2
Septic Tank Servicers	2
Sewer and Drain Cleaner	2
Site Manager	2
Stock Clerks- Stockroom; Warehouse; or Storage Yard	2
Supervisor of Production	2
Technical Director	2
Technical Service Manager	2
Treatment Plant Operator	2
Truck Driver; Heavy Equipment	2
Utility Operator	2
Utility Service Worker	2
Warehouse Manager	2
Waste Water Technician	2
Waste Water Treatment Plant Operator	2
Wastewater Operator	2
Water Operator	2
Water Plant Operator	2
Weatherization Installer	2
AAS Technician	1
Account Representative	1
Activity Aide	1

Administrative Assistant Clerk	1
Administrative Specialist	1
Aerospace Engineer	1
Analyst	1
Analytical Chemist	1
Electrical Technician	1
Anthropology Professor	1
Applications Specialist	1
Applicator	1
Arbitrator	1
Arborist	1
Architect	1
Architectural Illustrator	1
Architectural Teacher	1
Asbestos Abatement	1
Assemblers and Fabricators	1
Assistant Director Current Planning	1
Assistant Director Transportation	1
Assistant District Manager	1
Assistant Executive Director	1
Assistant Manager	1
Assistant Treatment Operator	1
Associate Director of Support Service	1
Attorney	1
Auto Technician Instructor	1
Automotive Specialty Technician	1
Automotive Technology Instructor	1
Bailer - Puts together paper and cardboard	1
Billing Supervisor	1
Biodiesel Manager	1
Biofuels Processing Technician	1
Biofuels Production Manager	1
Biological Technician	1
Biology Professor	1
Biomass Collector	1
Biomedical Technician	1
Boiler Operator	1
Bookkeeper	1
Bookkeeping; Accounting; and Auditing Clerks (utility rates)	1
Brick mason	1
Brick masons and Block masons	1

Bricklayer	1
Bridge and Lock Tenders	1
Broadcast Technician	1
Brownfield Redevelopment Specialists	1
Building and Grounds Supervisor	1
Building Code Administrator	1
Building Contractor	1
Building Designer	1
Building Foreman	1
Building Mechanical Engineer	1
Building Mechanical Engineer	1
Building Performance Consultant	1
Building Rehab Administrator	1
Building Superintendent	1
Buildings and Grounds Supervisor	1
Business Analyst	1
Business Solutions Advisor	1
Business Teacher postsecondary	1
Buyer	1
Cabinet Designer	1
Campground Cleaner	1
Car Sales Representative	1
Car Washer	1
Carpet Installer	1
Cement Finisher	1
Cement Masons	1
Cement Masons and Concrete Finishers	1
Cemetery Caretaker	1
CEO/CFO	1
Certified Pesticide Applicator	1
Chauffeur	1
Chemical Equipment Operator	1
Chemical Hygiene Officer	1
Chemical Operator	1
Chemical Plant and System Operator	1
Chemical Technicians	1
Chemists	1
Chicken Farmer	1
Chief Executive; owner	1
Chief Executive; President	1
Chief Financial Officer	1
Chief Operating Officer	1

Chief Operations Officer	1
Chief Operator oversee treatment plant	1
Chief Sustainability Officer	1
Civil Engineering Designer	1
Client Services	1
Clinical Laboratory Manager	1
Cold Storage Designer	1
Collection Superintendent	1
Collection System Operator	1
Commercial and Industrial Designer	1
Commercial Loop Installer	1
Community & Social Service Specialist	1
Compliance Officer	1
Computer and Information Scientists	1
Computer Hardware Engineer	1
Computer Software Engineers Applications	1
Computer Support Specialist	1
Computer Technician	1
Computer Training Specialist	1
Concrete Mason	1
Conservation District Manager	1
Conservation Engineer	1
Conservation Teacher postsecondary	1
Construction Administrator	1
Construction Analyst	1
Construction Carpenters	1
Construction Equipment Mechanic	1
Construction Equipment Operators	1
Construction Journeyman	1
Construction Laborers	1
Construction Superintendent	1
Consultant Engineer	1
content experts	1
Continuous Improvement Specialist	1
Continuous Mining Machine Operators	1
Contracting Services Manager	1
Control Room Operator	1
corrosion specialist	1
Cost Estimator Manager	1
Counter Clerk	1
Craft Artist	1
Crane and Tower Operators	1

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Credit Manager	1
Crew Foreman	1
Crew Supervisor	1
Curator	1
Curator of Education	1
Curriculum Coordinator	1
Curriculum Director	1
Curriculum Director of Secondary Education	1
Custom Shop Worker	1
Customer Relations Director	1
Customer Service Specialist	1
Cutting Operator	1
Dairy Consultant	1
Dairy Farmer	1
Data Processing Manager	1
Database Analyst	1
deconstruction laborer	1
Decorating Consultant	1
Delivery Driver	1
Delivery Drivers	1
Designer Engineer	1
Development Manager	1
Development Specialist	1
Diesel Emission Fluid Technician	1
Diesel Mechanic	1
Director of Business Performance & Technology Services	1
Director of Energy Programs	1
Director of Environmental Compliance	1
Director of Environmental Education	1
Director of Land Conservation and Planning	1
Director of Maintenance	1
Director of Marketing	1
Director of Member Services	1
Director of Natural Gas Technician	1
Director of Programs	1
Director of Rivers Program	1
Director of Solar	1
Director of Training	1
Director of Wastewater Utility	1
District Technician	1
Division Chief	1

Door and Window Manufacture	1
Draftsperson	1
Drill Foreman	1
Drill Rigg Operator	1
Drill Technician	1
Dump Truck Driver	1
Earth Science Teacher	1
Economics Professor	1
Editor	1
Education Administrator	1
Education Administrator; Director of Green Center	1
Education Specialist	1
Education Teacher postsecondary	1
educator	1
Electrical and Electronic Equipment Assemblers	1
Electrical and Instrument Technician	1
Electrical Apprentice	1
Electrical Assembler	1
Electrical Contractor	1
Electrical Design Engineer	1
Electrical Design Technician	1
Electrical Inspector	1
Electrical Manager	1
Electrical/Mechanical Engineer	1
Electronic Assembler	1
Electronic Equipment Assembler	1
Employment Service Specialist	1
Employment Specialist	1
Energy Analyst	1
Energy and HVAC Manager	1
Energy Auditors	1
Energy Broker	1
Energy Educator	1
Energy Engineers	1
Energy Inspector	1
Energy Management Engineer	1
Energy Program Manager	1
Energy Project Manager	1
Energy Specialist	1
Engineer Coordinator	1
Engineer Technician	1
Engineering Assistant	1

Engineering Associate	1
Engineering Teacher Postsecondary	1
Engineering Teachers	1
Engineering Teachers; Postsecondary	1
English Language Teacher postsecondary	1
Entomologist	1
Environmental and Science Technician	1
Environmental Biologist	1
Environmental Compliance Inspector (ROW Agent)	1
Environmental Compliance Inspector Officer	1
Environmental Compliance Manager	1
Environmental Compliance Technician	1
Environmental Conservationist	1
Environmental Director	1
Environmental Enforcement Officer	1
Environmental Engineering Technician	1
Environmental Engineering Technicians	1
Environmental Engineering Technicians	1
Environmental Engineers	1
Environmental Field Services Technician	1
Environmental Health & Safety Coordinator	1
Environmental Health & Safety Director	1
Environmental Health & Safety Engineer	1
Environmental Health and Safety Manager	1
Environmental Health and Safety Representative	1
Environmental Health Technician	1
Environmental Inspector	1
Environmental Lab Technician	1
Environmental Management Specialist	1
Environmental Planner	1
Environmental Remed Construction Manager	1
Environmental Remed Project Manager	1
Environmental Resource Manager	1
Environmental Science and Protection Technicians	1
Environmental Science Teacher postsecondary	1
Environmental Science Technician	1
Environmental Scientist and Specialist including Health	1
Environmental Staff Consultant	1
Epidemiologist	1
Equipment Engineer	1

Equipment Intern	1
Equipment Manager	1
Equipment Operators	1
Erosion and Sediment Technician	1
Excavating Operator	1
Excavator	1
Executive Assistant	1
Executive Director (Administrator)	1
Executive Manager	1
Executive Secretary	1
Extrusion Technician	1
Facilities Associate	1
Facilities Engineer (HVAC)	1
Facility Service Manager	1
Faller	1
Farm and Home Management Advisors	1
Farm Equipment Operator	1
Farm General Manager	1
Farm Workers	1
Fence Installer	1
Field Inspector	1
Field Superintendent	1
Finance Administrator Manager	1
Financial Managers Branch or Department	1
Financial Specialist	1
Fire Prevention and Protection Technician	1
Fire Prevention Specialist	1
Fire Protection Engineer	1
Fire Restoration	1
Fire Suppression Agent	1
First-Line Supervisors/Managers of Construction Trades and Extraction Workers	1
First-Line Supervisors/Managers of Office and Administrative Support Workers	1
Fisheries Scientist	1
Food Processors	1
Food Science Technician	1
Forman	1
Framer	1
Front Counter Sales Representative	1
Fuel Technicians	1
Funeral Attendant	1
Garbage Collector	1

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Gas Mechanic	1
Gas System Technician	1
General Construction	1
General laborer	1
Geographer	1
Geographic Information Systems Technician	1
Geography Professor	1
Geography Teachers postsecondary	1
Geological Engineer	1
Geologists	1
Geology Professor	1
Geology Teacher postsecondary	1
Geophysicist	1
Geospatial Technician	1
GeoTech Engineer (Soil Scientist)	1
Geotechnical Consultant	1
Geothermal Installer	1
Geothermal Service Technician	1
Geothermal Technicians	1
Graphic Artist	1
Green Marketer; Manager	1
Greenhouse Laborer	1
Greenhouse Manager	1
Greenhouse Worker	1
Greens keeper	1
Grinder	1
Ground Core Driller	1
Grounds Supervisor	1
Grounds Worker	1
Grounds/Maintenance Specialist	1
Groundwater Consultant	1
Grouting Technician	1
Guidance Counselor	1
H.R. Director	1
Hay Farmer	1
Hazard materials removal worker	1
Hazardous Materials Technician	1
Hazmat Material Removal Worker	1
Health & Safety Coordinator	1
Health Physicist	1
Health Specialties Teacher postsecondary	1
Heavy Equipment Manager	1

Heavy Truck Driver	1
Historic Preservation Specialist	1
Historic Preservationist Specialist	1
History Professor	1
Hoe Worker	1
Home Appliance Installer	1
Home Appliance Repairer	1
Housing Manager	1
Human Resource	1
Human Resource Representative	1
Human Resources Administrative Assistant	1
Hydroelectric Pant Technicians	1
I & C Engineer	1
Illustrator	1
Industrial Hygiene and Safety Consultant	1
Industrial Hygienist Technician	1
Industrial Production Manager	1
Industrial Safety and Health Engineer	1
Industrial Safety and Health Engineers	1
Industrial Truck and Tractor Operators	1
Information Technology Manager	1
Inspectors; Testers; sorters; samplers;	1
Installation Manager	1
Instructural Designers and Technologists	1
Instrument and Controls Technician	1
Instrument and Electrical Technician	1
Instrumentation Technician	1
Insulation Technician	1
Insulation Worker	1
Interior Design Coordinator	1
Interior Design Director	1
Intern Architect	1
Iron Worker	1
ISO Coordinator (Quality Assurance)	1
Job Foreman	1
Job Superintendent	1
Job Training Specialist	1
Journeyman	1
Journeyman Wireman	1
Lab Analyst	1
Lab Inspector	1
Lab Technician Supervisor	1

Laboratory Analyst	1
Laboratory Manager	1
Laboratory Technician	1
Laborer	1
Laborer; Secretary	1
Laborers and Freight; and stock and Material Movers	1
Laborers and freight; stock; and Material Movers; Hand	1
Land Acquisition Coordinator	1
Land Development Specialist	1
Land Manager	1
Land Reclamation Specialist	1
Landfill Worker	1
Landscaped Designer	1
Landscaping Worker	1
Lawn Care	1
Lawyer	1
Lead Carpenter	1
Lead Electrical/Mechanical Engineer	1
LEED Program Director	1
Library Clerk	1
Library Director	1
Lighting Engineer	1
Lineman	1
Loader	1
Loader Operator	1
Loan Officer	1
Local Industry Manager	1
Logging Equipment Operator	1
Logistics Engineer	1
Logistics Manager	1
Machine Adjuster	1
Maids and Housekeeping Cleaner	1
Maids and Housekeeping Cleaners	1
maintenance	1
Maintenance Engineer	1
Maintenance Equipment Operator	1
Maintenance Foreman	1
Maintenance Plan Scheduler	1
Maintenance Yard	1
Management	1
Management Aide	1

Management Analysts	1
Manager (Farm)	1
Manager of Installers	1
Manufacturing Consultant	1
Manufacturing Engineer Consultant	1
Manufacturing Laborer	1
Manufacturing Manager	1
Manufacturing Supervisor	1
Marine Captain	1
Marine Engineer	1
Market Research Analyst	1
Market Research Manager	1
Marketing	1
Marketing Manager	1
Mason	1
Master Automotive Technician	1
Master Plumber	1
Mechanical Contractor	1
Mechanical Designer	1
Mechanical Drafters	1
Mechanical Project Engineer	1
Mechanical Service Technician	1
Media and Communication Workers; All Other	1
Member Services Manager	1
Member Services Representative	1
Merchant marine	1
Metal Roofing Mechanic	1
Metal Stud Framers	1
Meter Reader	1
Methane/Landfill Gas Collection System Operators	1
Methane/Landfill Gas Generation System Technician	1
Mill Operator	1
Mine Cutting and Channeling Machine Operators	1
MIPP Administrator	1
Mobile Heavy Equipment Mechanic	1
Module Assembler	1
Museum Educator	1
Natural Resources Technician	1
Natural Resources Technician Assistant	1
Natural Sciences Managers	1

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Natural Scientist Managers	1
Network Engineers	1
Non-Destructive Testing Specialist	1
Nuclear Engineer	1
Nuclear Monitoring Technicians	1
Oceanographer	1
Office Administrator	1
Office and Administrative Support Workers	1
Office and Administrative Support Workers; All Other	1
Office Assistant	1
Office Clerks	1
Office Project Manager	1
Office Worker	1
Oil Reclamation Operator	1
Operating Manager	1
Organic Farmer	1
Outdoor Laboratory Director	1
Outreach Specialist	1
Over the Road Driver	1
Paint Consultant	1
Painter Helper	1
Painters; Construction and Maintenance	1
Park Activities Coordinator	1
Park Director	1
Paver Operator	1
Paving Stone Installer	1
Payroll Accountant	1
Payroll Clerk	1
Petroleum Engineer	1
Petroleum Inspector	1
Philosophy Professor	1
Pipe Layer	1
Planning Director	1
Plant Engineer	1
Plant Maintenance	1
Plant Manager Assistant	1
Plant Superintendent	1
Plant Supervisor	1
Political Science Professor	1
Political Science Teacher postsecondary	1
Political Scientist Teacher postsecondary	1

Pool Supervisor	1
Pool Technician	1
Power Plant Operators	1
Precast Fabricators	1
Precision Agriculture Technician	1
Precision Instrument and Equipment Repairer	1
Principal Engineer	1
Principle; Environmentalist	1
Process Controls Programmer	1
Process Engineer	1
Process Engineer Supervisor	1
Process Operator	1
Processing Engineer	1
Procurement Clerks	1
Procurement Forester	1
Product Designer	1
Product Engineer	1
Product Manager	1
Production	1
Production Associate	1
Production Control Coordinator	1
Production Controller	1
PRODUCTION ENGINEER	1
Production Technician	1
Production Worker; All others	1
Production workers	1
Professional Engineer	1
Professor of Biological Science	1
Professor of Chemistry	1
Professor of Economic	1
Professor of History	1
Professor of Political Science	1
Program Administrator	1
Program Assistant	1
Program Coordinator	1
Program Director	1
Program Manager	1
Program Specialist	1
Project Coordinator	1
Project Development Engineer	1
Project Development Manager	1
Project Engineering Manager	1

Project Foreman	1
Project Manager2	1
Project Manger (Enviro. Div)	1
Project Structural Engineer	1
Project Superintendent	1
Project Superintendent	1
Project Supervisor	1
Psychology Professor	1
Public Relations Director	1
Public Relations Manager	1
Public Relations Specialist	1
Purchasing Agents; except wholesale; retail and farm products	1
Purchasing Managers	1
Quality Assurance	1
Quality Assurance Analyst	1
Quality Assurance Inspector	1
Quality Assurance Specialist	1
Quality Assurance Tester	1
Quality Control	1
Quality Control Chemist	1
Quality Control Inspector	1
Quality Inspector	1
Quantitative Ecologist	1
Quarry Worker	1
Ranch Hand	1
real Estate Agent	1
Real Estate Broker	1
Reclamation Specialist	1
Reclamation Workers	1
Recreation Specialist	1
Recyclable Waste Collector	1
Recycle Brokers	1
Recycling Driver	1
Recycling Processor Operator	1
Recycling Supervisor	1
Reference Librarian	1
Refurbish Tires Technician	1
Regional Engineer	1
Regional Manager	1
Regional Operator	1
Regional Planner	1
Regulatory Affairs Manager	1

Reinforcing Iron and Rebar Worker	1
Rental Agent	1
Research and Development Staff	1
Research and Development Technician	1
Research Specialist	1
Residential Geothermal Installer	1
Residential Remodeler	1
Retail Sales Associate	1
Rig Operator	1
Riggers	1
Roll Back Driver	1
Roofers	1
Roofing Laborer	1
Roofing Manager	1
Roofing Mechanic	1
Roofing Technician	1
Rotary Drill Operators; Gas and oil	1
Safety Compliance Officer	1
Safety Engineer	1
Safety Instructor	1
Safety Professional	1
Safety Supervisor	1
Salvage master	1
Sampler	1
SCADA Operator	1
School Bus Driver	1
Seamstress	1
Secondary School Teachers; Except Special and Vocational Education	1
Security and Fire Alarm System Installers	1
Semi Truck Driver	1
Senior Lean Implementation Specialist	1
Senior Project Manager	1
Septic Pump Truck Driver	1
Septic Technician	1
Sewage Enforcement Officer	1
Sewer	1
Sewer Treatment Operator	1
Shift Supervisor	1
Shipping and Receiving Traffic Clerks	1
Shipping/Receiving Clerk	1
Shipping; receiving; and Traffic Clerks	1
Shop Foreman	1

Appendix P

Shop Helpers	1
SHOP MANAGER	1
Showroom Salesperson	1
Silt Sock Installer	1
Site EES Operator/Laborers	1
Site Project Manager	1
Site Remediation Specialist	1
Site Superintendent	1
Site Supervisor	1
Sociology Professor	1
Software Technician	1
Soil and Water Conservationist; Manager	1
Soil and Water Conservationists	1
Solid Waste Enforcement Officer	1
Solid Waste Engineer	1
Solid Waste Recycle Specialist	1
Special Projects Manager	1
Spray Technician	1
Staff Naturalist	1
Staff Writer	1
Stationary Engineers and Boiler Operator	1
Steamfitter	1
Steel Erectors	1
Steel Worker	1
Stone Mason	1
Store Manager	1
Storm water Manager	1
Structural Iron and Steel Workers	1
Structural Metal Fabricators and Fitters	1
Supervisor	1
Supervisor of Field Operations	1
Supply Chain Engineer	1
Survey Researcher	1
Surveyor/Land Planner	1
Sustainability Coordinator	1
Sustainable Forestry Initiative Manager	1
System Integrator	1
System Operator	1
Systems Engineer	1
Team Assembler	1
Technical Development	1
Technical Director and Managers	1

Technical Directors and Mangers	1
Technical Manager	1
Technical Sales	1
Technical Services Representative	1
Technician	1
Technician Helper	1
Telecommunications Technician	1
Test and Balance Engineer	1
Test Engineer	1
Tester	1
Tipping Floor Operator	1
Tool and Die Maker	1
Tool Pusher Manager	1
Tour Guide and Escort	1
Trades Helper	1
Traffic Signal Technician	1
Training Manager	1
Training Specialist	1
TransAir Customer Service Representative	1
Transmission Mechanic	1
Treasurer	1
Tree Planter	1
Tree Trimmers and Pruners	1
Truck Driver; Heavy and Tractor Trailer	1
Truck Drivers; Light or Delivery Services	1
Truck Mechanic	1
Truck Technician	1
Urban Planner	1
Utility Analyst	1
Utility Operator oversee mechanical maintenance	1
Vice President International Sale	1
Vice President of Building Information Modeling Technology	1
Vice President of Sales	1
Vinyl Deck Installer	1
Vinyl Fench Fabricator	1
Waste Collector	1
Waste Handling Technician	1
Waste Treatment Operator	1
Waste Water Engineer	1
Waste Water Plant Operator	1
Waste Water Treatment Plant Operator	1

Wastewater Engineer	1
Water and Liquid Waste Treatment Plant and System Operators	1
Water and Waste Water Engineer	1
Water Conservationist	1
Water park Maintenance	1
Water Quality Lab Technician	1
water resources engineer	1
Water Treatment Operator	1
Water Treatment Plant Operator	1
Water Well Driller	1
Water/Wastewater Engineer	1
Water/Wastewater Engineer	1
Water/Wastewater Engineers	1
Water/Wastewater Engineers	1
Watershed Program Manager	1
Weaver	1
Web Designer	1
Web Developer	1
Welder-Fitter	1
Welding; Soldering; and Brazing Machine Setters; Operators; and Tenders	1
Well Drill Operator	1
Well Tender	1
Wellhead Pumpers	1
Wildlife Biologist	1
Wildlife Biology Technician	1
Wind Energy Engineers	1
Wind Turbine Service Technician	1
Window Manufacturers	1
Window Technician	1
Woodworkers	1
Woodworking Machine Operator	1
Zone Service Manager	1
Zone Tillage Operator	1



The Pennsylvania **Green** Job Skills Survey Report

May 2011

Commonwealth of Pennsylvania

Edward G. Rendell, Governor

Sandi Vito, Secretary,
Department of Labor & Industry

Dr. Robert Garraty,
Deputy Secretary for Workforce Development,
Department of Labor & Industry

Sue Mukherjee, Director,
Center for Workforce Information & Analysis

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