










# Sustainable Mining Occupations

## Labor Market Analysis: San Diego County

July 2023

### Summary

NEW PROGRAM RECOMMENDATION?	EVIDENCE OF A SUPPLY GAP?	AT OR ABOVE THE LIVING WAGE?	EXPECTED EDUCATION FOR MAJORITY OF OCCUPATIONS ANALYZED
 <p><b>Proceed with New Program</b></p>	 	 	<input type="checkbox"/> Doctorate Degree <input type="checkbox"/> Master's Degree <input type="checkbox"/> Bachelor's Degree <input type="checkbox"/> Associate Degree <input type="checkbox"/> Some College or Certificate <input checked="" type="checkbox"/> HS Diploma or Equivalent <input type="checkbox"/> Less than a HS Diploma <input type="checkbox"/> Apprenticeship
SUPPORT FOR PROGRAM MODIFICATION?	NUMBER OF INSTITUTIONS THAT PROVIDE TRAINING	NUMBER OF ANNUAL JOB OPENINGS	
 	<p><b>MEDIUM</b></p> 	<p><b>HIGH</b></p> 	

This brief provides labor market information about *Sustainable Mining Occupations* to assist the San Diego and Imperial Counties Community Colleges with program development and strategic planning. *Sustainable Mining Occupations* include “Excavating and Loading Machine and Dragline Operators, Surface Mining,” “First-Line Supervisors of Construction Trades and Extraction Workers,” “Industrial Engineering Technologists and Technicians”, and “Surveying and Mapping Technicians.” According to available labor market information, *Sustainable Mining Occupations* in San Diego County have a labor market demand of 1,036 annual job openings (while average demand for a single occupation in San Diego County is 289 annual job openings), and five institutions supply 64 awards for these occupations, suggesting that there is a supply gap in the labor market. On average, entry-level wages are above the living wage. This brief recommends proceeding with developing a new program or modifying an existing program because 1) entry-level wages pay at or above the living wage and 2) a supply gap exists for these occupations.

## Introduction

This report provides labor market information in San Diego County for the following occupational codes in the Standard Occupational Classification (SOC)<sup>1</sup> system:

- **First-Line Supervisors of Construction Trades and Extraction Workers (SOC 47-1011):** Directly supervise and coordinate activities of construction or extraction workers.
- **Industrial Engineering Technologists and Technicians (SOC 17-3026):** Apply engineering theory and principles to problems of industrial layout or manufacturing production, usually under the direction of engineering staff. May perform time and motion studies on worker operations in a variety of industries for purposes such as establishing standard production rates or improving efficiency.
- **Surveying and Mapping Technicians (SOC 17-3031):** Perform surveying and mapping duties, usually under the direction of an engineer, surveyor, cartographer, or photogrammetrist, to obtain data used for construction, mapmaking, boundary location, mining, or other purposes. May calculate mapmaking information and create maps from source data, such as surveying notes, aerial photography, satellite data, or other maps to show topographical features, political boundaries, and other features. May verify accuracy and completeness of maps.
- **Excavating and Loading Machine and Dragline Operators, Surface Mining (SOC 47-5022):** Operate or tend machinery at surface mining site, equipped with scoops, shovels, or buckets to excavate and load loose materials.

For the purpose of this report, these occupations are referred to as *Sustainable Mining Occupations*.

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<sup>1</sup> The Standard Occupational Classification (SOC) system is used by federal statistical agencies to classify workers into occupational categories for the purpose of collecting, calculating, or disseminating data. [bls.gov/soc](https://www.bls.gov/soc).

## Projected Occupational Demand

Between 2022 and 2027, *Sustainable Mining Occupations* are projected to increase by 588 net jobs or six percent (Exhibit 1a). Employers in San Diego County will need to hire 1,036 workers annually to fill new jobs and backfill jobs due to attrition caused by turnover and retirement, for example.

**Exhibit 1a: Number of Jobs for Sustainable Mining Occupations (2012-2027)<sup>2</sup>**

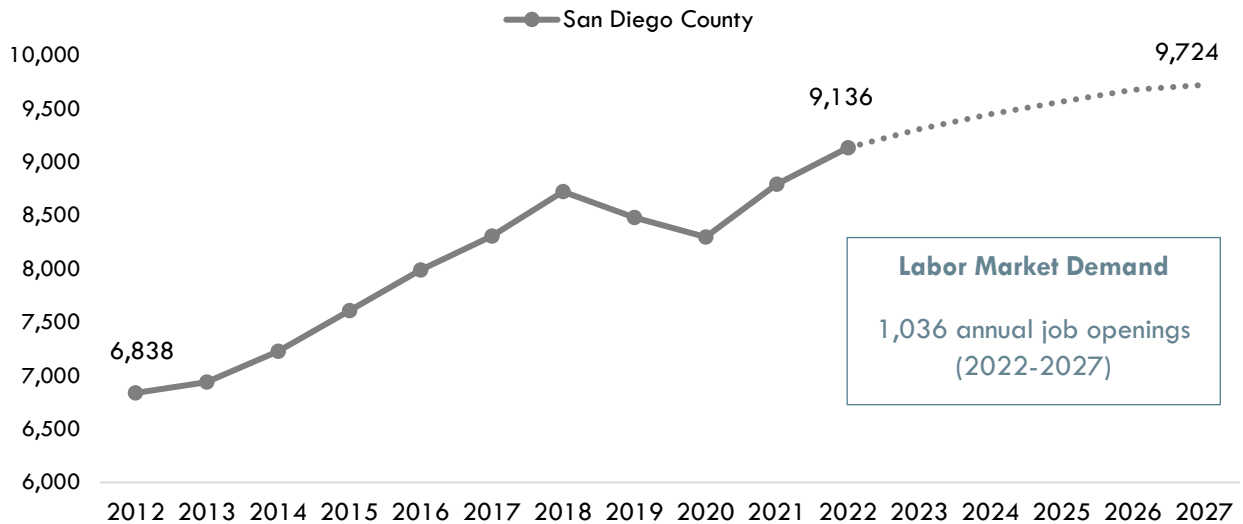


Exhibit 1b disaggregates the projected number of jobs change by occupation. “First-Line Supervisors of Construction Trades and Extraction Workers” are projected to have the most labor market demand between 2022 and 2027, with 873 annual job openings.

**Exhibit 1b: Number of Jobs for Sustainable Mining Occupations in San Diego County (2022-2027)<sup>3</sup>**

Occupational Title	2022 Jobs	2027 Jobs	2022 - 2027 Net Jobs Change	2022-2027 % Net Jobs Change	Annual Job Openings (Demand)
First-Line Supervisors of Construction Trades and Extraction Workers	7,906	8,388	482	6%	873
Surveying and Mapping Technicians	535	584	49	9%	79
Industrial Engineering Technologists and Technicians	476	523	47	10%	58
Excavating and Loading Machine and Dragline Operators, Surface Mining	219	229	10	5%	26
<b>Total</b>	<b>9,136</b>	<b>9,724</b>	<b>588</b>	<b>6%</b>	<b>1,036</b>

<sup>2</sup> Lightcast 2023.02; QCEW, Non-QCEW, Self-Employed.

<sup>3</sup> Lightcast 2023.02; QCEW, Non-QCEW, Self-Employed.

## Earnings

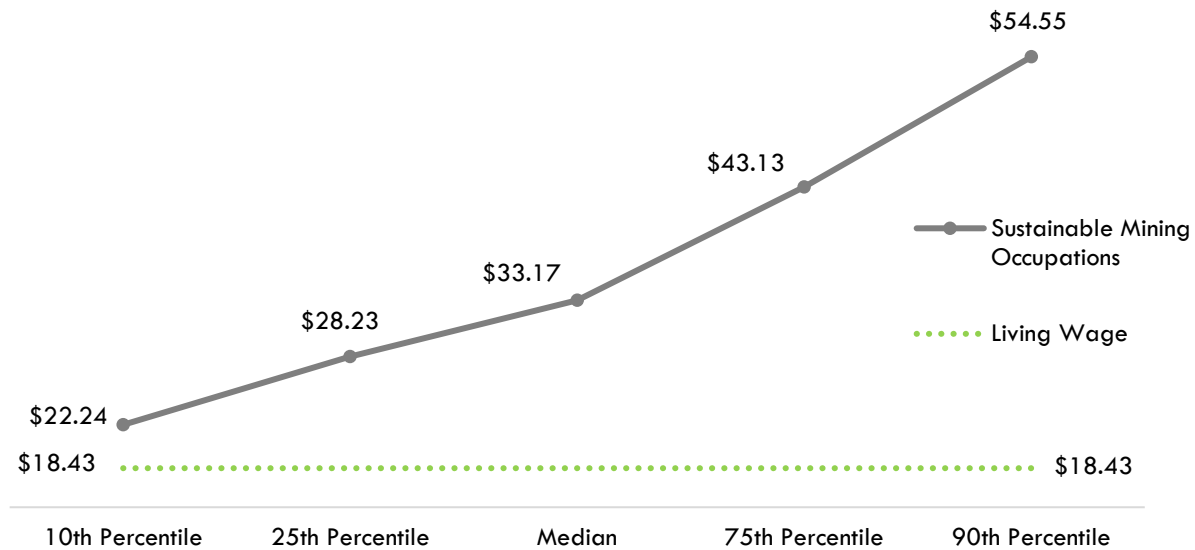
Exhibit 2a disaggregates hourly earnings by occupation. The entry-level hourly earnings for *Sustainable Mining Occupations* range from \$23.88 to \$28.31.

**Exhibit 2a: Hourly Earnings for Sustainable Mining Occupations in San Diego County<sup>4</sup>**

Occupational Title	Entry-Level Hourly Earnings (25 <sup>th</sup> Percentile)	Median Hourly Earnings	Experienced Hourly Earnings (75 <sup>th</sup> Percentile)
Surveying and Mapping Technicians	\$28.31	\$29.24	\$37.86
First-Line Supervisors of Construction Trades and Extraction Workers	\$28.16	\$37.11	\$48.40
Excavating and Loading Machine and Dragline Operators, Surface Mining	\$24.68	\$27.46	\$36.15
Industrial Engineering Technologists and Technicians	\$23.88	\$29.62	\$37.63

On average, the entry-level hourly earnings for *Sustainable Mining Occupations* are \$28.23; this is more than the living wage for a single adult in San Diego County, which is \$18.43 per hour (Exhibit 2b).<sup>5</sup>

**Exhibit 2b: Average Hourly Earnings<sup>6</sup> for Sustainable Mining Occupations in San Diego County<sup>7</sup>**



<sup>4</sup> Lightcast 2023.02; QCEW, Non-QCEW, Self-Employed.

<sup>5</sup> "Family Needs Calculator (formerly the California Family Needs Calculator)," Insight: Center for Community Economic Development, last updated 2021. [insightccd.org/family-needs-calculator/](https://insightccd.org/family-needs-calculator/).

<sup>6</sup> 10th and 25th percentiles could be considered entry-level wages, and 75th and 90th percentiles could be considered experienced wages for individuals who may have been in the occupation longer, received more training than others, etc.

<sup>7</sup> Lightcast 2023.02; QCEW, Non-QCEW, Self-Employed.

## Educational Supply

Educational supply for an occupation can be estimated by analyzing the number of awards in related Taxonomy of Programs (TOP) or Classification of Instructional Programs (CIP) codes.<sup>8</sup> There are **eight** TOP codes and **10** CIP codes related to *Sustainable Mining Occupations* (Exhibit 3).

**Exhibit 3: Related TOP and CIP Codes for Sustainable Mining Occupations<sup>9</sup>**

TOP or CIP Code	TOP or CIP Program Title
TOP 0934.20	Industrial Electronics
TOP 0947.30	Heavy Equipment Operation
TOP 0956.00	Manufacturing and Industrial Technology
TOP 0956.70	Industrial and Occupational Safety and Health
TOP 0957.00	Civil and Construction Management Technology
TOP 0957.30	Surveying
TOP 0999.00	Other Engineering and Related Industrial Technologies
TOP 2206.10	Geographic Information Systems
CIP 15.0612	Industrial Technology/Technician
CIP 15.0613	Manufacturing Engineering Technology/Technician
CIP 15.0699	Industrial Production Technologies/Technicians, Other
CIP 15.0703	Industrial Safety Technology/Technician
CIP 15.1102	Surveying Technology/Surveying
CIP 45.0702	Geographic Information Science and Cartography
CIP 46.0412	Building/Construction Site Management/Manager
CIP 46.0504	Well Drilling/Driller
CIP 46.0505	Blasting/Blaster
CIP 49.0202	Construction/Heavy Equipment/Earthmoving Equipment Operation

<sup>8</sup> TOP data comes from the California Community Colleges Chancellor's Office MIS Data Mart ([datamart.cccco.edu](http://datamart.cccco.edu)) and CIP data comes from the Integrated Postsecondary Education Data System ([nces.ed.gov/ipeds/use-the-data](http://nces.ed.gov/ipeds/use-the-data)).

<sup>9</sup> This brief uses a conservative estimate of program supply and only calculates awards from the TOP codes in Exhibit 3.

According to TOP data, five community colleges supply San Diego County with awards for these occupations: Cuyamaca College, Palomar College, San Diego City College, San Diego Mesa College and Southwestern College. According to CIP data, no non-community-college institution supplies the region with awards. (Exhibit 4).

**Exhibit 4: Number of Awards (Certificates and Degrees) Conferred by Postsecondary Institutions  
(Program Year 2019-20 through Program Year 2020-21 Average)**

TOP6 or CIP Code	TOP6 or CIP Program Title	3-Yr Annual Average CC Awards (PY19-20 to PY21-22)	Other Educational Institutions 2-Yr Annual Average Awards (PY19-20 to PY20-21)	Total Average Supply (PY19-20 to PY21-22)
0956.00	Manufacturing and Industrial Technology	<b>1</b>	<b>0</b>	<b>1</b>
	• Palomar	0	0	
	• San Diego City	1	0	
0956.70	Industrial and Occupational Safety and Health	<b>15</b>	<b>0</b>	<b>15</b>
	• Cuyamaca	9	0	
	• Southwestern	6	0	
0957.00	Civil and Construction Management Technology	<b>8</b>	<b>0</b>	<b>8</b>
	• San Diego Mesa	6	0	
	• Southwestern	2	0	
0957.30	Surveying	<b>4</b>	<b>0</b>	<b>4</b>
	• Cuyamaca	4	0	
0999.00	Other Engineering and Related Industrial Technologies	<b>3</b>	<b>0</b>	<b>3</b>
	• San Diego City	3	0	
2206.10	Geographic Information Systems	<b>33</b>	<b>0</b>	<b>33</b>
	• Palomar	19	0	
	• San Diego Mesa	11	0	
	• Southwestern	3	0	
			<b>Total</b>	<b>64</b>

## Demand vs. Supply

Comparing labor demand (annual openings) with labor supply<sup>10</sup> suggests that there is a **supply gap** for these occupations in San Diego County, with **1,036** annual openings and **64** awards. Comparatively, there are **10,398** annual openings in California and **1,541** awards, suggesting that there is also a **supply gap** across the state<sup>11</sup> (Exhibit 5).

**Exhibit 5: Labor Demand (Annual Openings) Compared with Labor Supply (Average Annual Awards)**

	<b>Demand</b> (Annual Openings)	<b>Supply<sup>12</sup></b> (Total Annual Average Supply)	<b>Supply Gap or Oversupply</b>
San Diego	1,036	64	<b>972</b>
California	10,398	1,541	<b>8,857</b>

**Please note:** This is a basic analysis of supply and demand of labor. The data does not include workers currently in the labor force who could fill these positions or workers who are not captured by publicly available data. This data should be used to discuss the potential gaps or oversupply of workers; however, it should not be the only basis for determining whether or not a program should be developed.

<sup>10</sup> Labor supply can be found from two different sources: Lightcast or the California Community Colleges Chancellor's Office MIS Data Mart. Lightcast uses CIP codes while MIS uses TOP codes. Different coding systems result in differences in the supply numbers.

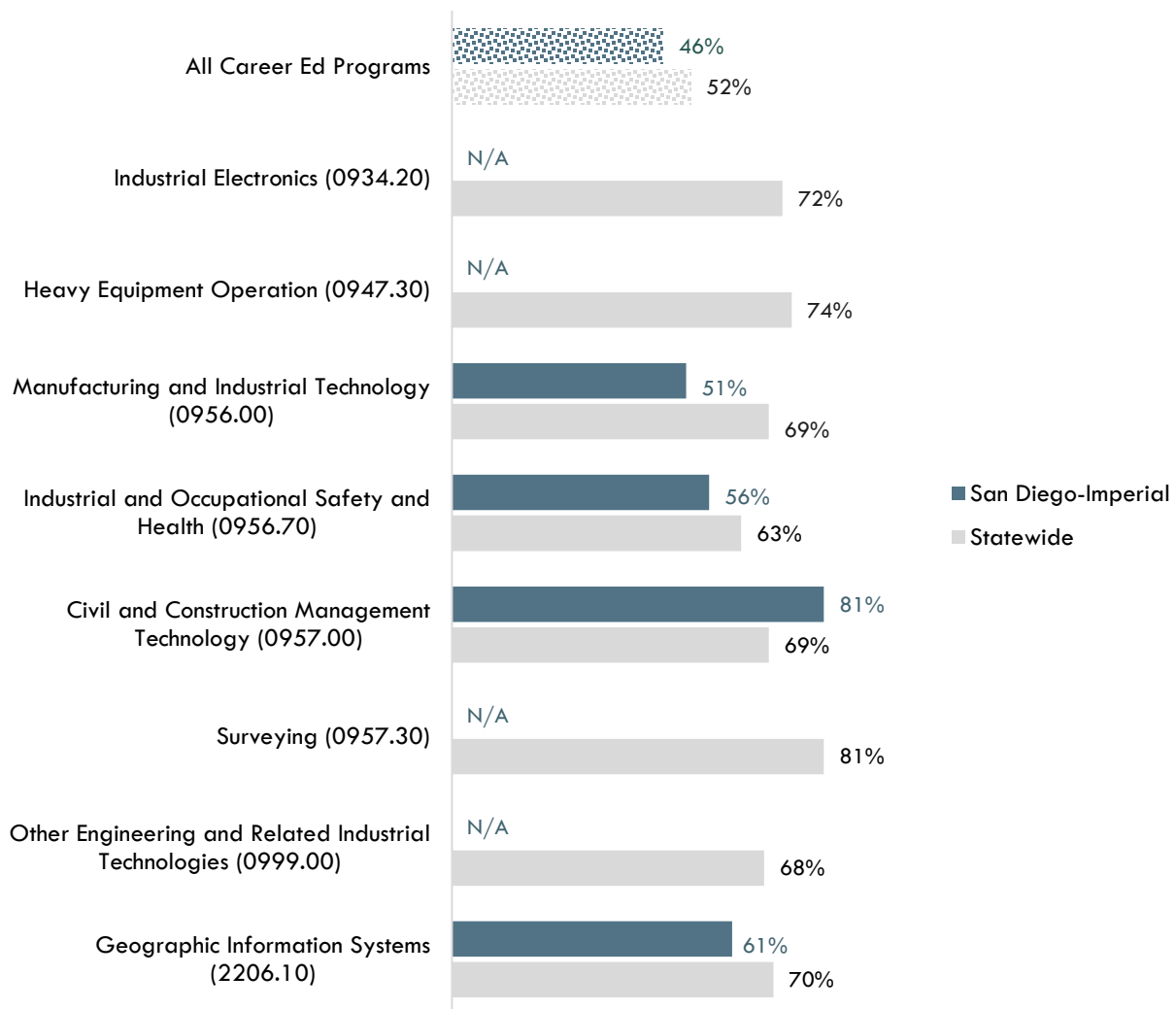
<sup>11</sup> "Supply and Demand," Centers of Excellence Student Outcomes, <https://coecc.net/our-resources/>.

<sup>12</sup> Awards included: associate degree; award <1 year; award 1<2 years; and postsecondary awards.

## Student Outcomes and Regional Comparisons

According to the California Community Colleges LaunchBoard, 51 to 81 percent of students in the San Diego-Imperial region earned a living wage after completing a program related to *Sustainable Mining Occupations*, compared 63 to 81 percent statewide and 52 percent of students in Career Education programs in general across the state (Exhibit 6a).<sup>13</sup>

**Exhibit 6a: Percentage of Students Who Earned a Living Wage by Program, PY2019-20<sup>14</sup>**



"N/A" indicates insufficient data

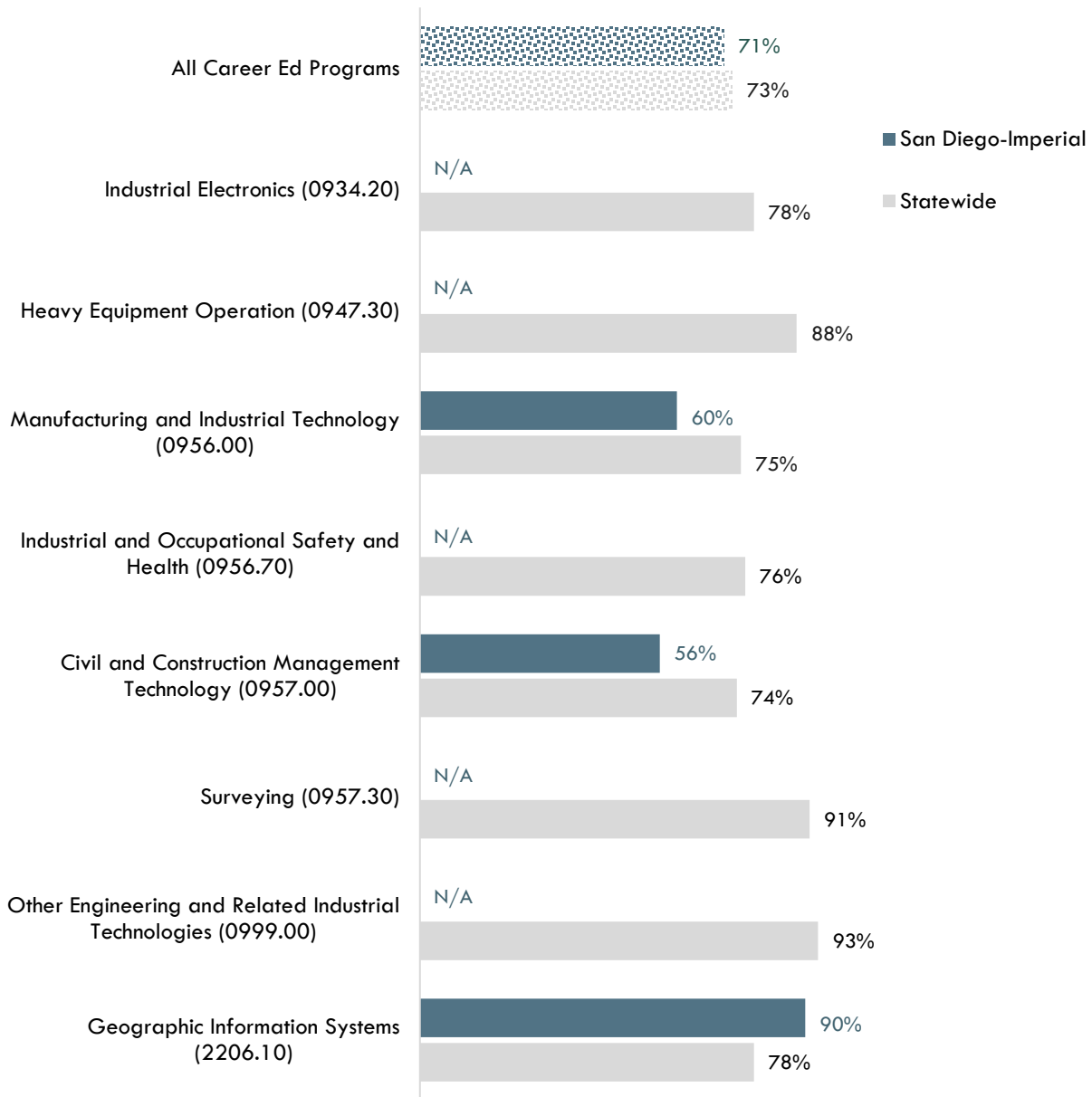
<sup>13</sup> "California Community Colleges Strong Workforce Program," California Community Colleges, [calpassplus.org/LaunchBoard/SWP.aspx](http://calpassplus.org/LaunchBoard/SWP.aspx).

<sup>14</sup> Most recent year with available data is Program Year 2019-20. Among completers and skills builders who exited, the percentage of students who attained a living wage.



According to the California Community Colleges LaunchBoard, 56 to 90 percent of students in the San Diego-Imperial region obtained a job closely related to their field of study after completing a program related to *Sustainable Mining Occupations*, compared to 74 to 93 percent statewide and 73 percent of students in Career Education programs in general across the state (Exhibit 6b).<sup>15</sup>

**Exhibit 6b: Percentage of Students in a Job Closely Related to Field of Study by Program, PY2018-19<sup>16</sup>**



"N/A" indicates insufficient data

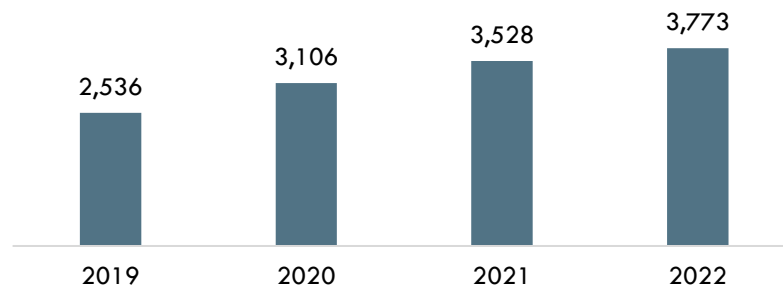
<sup>15</sup> "California Community Colleges Strong Workforce Program," California Community Colleges, [calpassplus.org/LaunchBoard/SWP.aspx](http://calpassplus.org/LaunchBoard/SWP.aspx).

<sup>16</sup> Most recent year with available data is Program Year 2018-19. Percentage of Students in a Job Closely Related to Field of Study: Among students who responded to the CTEOS, the percentage reporting employment in the same or similar field as their program of study.

## Online Job Postings

This report analyzes not only historical and projected (traditional LMI) data, but also recent data from online job postings (real-time LMI). Online job postings may provide additional insight about recent changes in the labor market that are not captured by historical data. Between 2019 and 2022, there was an average of 3,236 online job postings per year for *Sustainable Mining Occupations* in San Diego County (Exhibit 7). Please note that online job postings do **not** equal labor market demand; demand is represented by annual job openings (see Exhibit 1 b). While this brief includes online jobs postings data to help with curriculum development, the community colleges should note that this type of data is impacted by several variables: employers may post a position multiple times to increase the pool of applicants; a job posting can remain posted after a business decides not to fill a position; or an employer may use one posting to fill multiple positions, for example.

**Exhibit 7: Number of Online Job Postings for Sustainable Mining Occupations in San Diego County (2019-2022)<sup>17</sup>**



<sup>17</sup> Lightcast; "Job Posting Analytics." 2018-2022.

## Top Employers

Between January 1, 2020 and December 31, 2022, the top five employers in San Diego County for *Sustainable Mining Occupations* were [Aerotek](#), [Northrop Grumman](#), [Danaher](#), [Adecco](#), and [MilliporeSigma](#) based on online job postings (Exhibit 8).

### Exhibit 8: Top Employers for Sustainable Mining Occupations in San Diego County<sup>18</sup>

Top Employers	
<ul style="list-style-type: none"><li>• Aerotek</li><li>• Northrop Grumman</li><li>• Danaher</li><li>• Adecco</li><li>• MilliporeSigma</li></ul>	<ul style="list-style-type: none"><li>• Kelly Services</li><li>• AT&amp;T</li><li>• Volt</li><li>• Bridgestone Corporation</li><li>• Clark County Beverage Management</li></ul>

## Education, Skills, and Certifications

*Sustainable Mining Occupations* have a national educational attainment ranging from a [high school diploma or equivalent](#) to an [associate degree](#) (Exhibit 9a).

### Exhibit 9a: National Educational Attainment for Sustainable Mining Occupations<sup>19</sup>

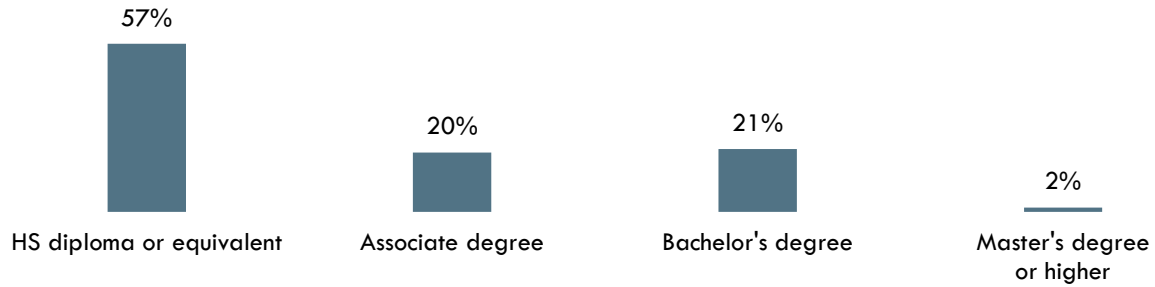
Occupational Title	Typical Entry-Level Education
Industrial Engineering Technologists and Technicians	Associate degree
Excavating and Loading Machine and Dragline Operators, Surface Mining	High school diploma or equivalent
First-Line Supervisors of Construction Trades and Extraction Workers	High school diploma or equivalent
Surveying and Mapping Technicians	High school diploma or equivalent

<sup>18</sup> Lightcast, "Job Posting Analytics." 2020-2022.

<sup>19</sup> Lightcast 2023.02; QCEW, Non-QCEW, Self-Employed.

Based on online job postings between January 1, 2020 and December 31, 2022 in San Diego County, employers posted a **high school diploma or equivalent** as the most requested educational requirement for *Sustainable Mining Occupations* (Exhibit 9b).<sup>20</sup>

**Exhibit 9b: Educational Requirements for Sustainable Mining Occupations in San Diego County<sup>21</sup>**



\*May not total 100 percent due to rounding

Exhibit 10 lists the top specialized, soft, and software skills that appeared in online job postings between January 1, 2020 and December 31, 2022.

**Exhibit 10: Top Skills for Sustainable Mining Occupations in San Diego County<sup>22</sup>**

Specialized Skills	Soft Skills	Software Skills
<ul style="list-style-type: none"> <li>• Good Manufacturing Practices</li> <li>• Construction</li> <li>• Machinery</li> <li>• Hand Tools</li> <li>• Standard Operating Procedure</li> </ul>	<ul style="list-style-type: none"> <li>• Communications</li> <li>• Troubleshooting</li> <li>• Operations</li> <li>• Detail Oriented</li> <li>• Management</li> <li>• Lifting Ability</li> <li>• Packaging And Labeling</li> <li>• Computer Literacy</li> <li>• Microsoft Excel</li> <li>• Customer Service</li> <li>• Problem Solving</li> <li>• Leadership</li> </ul>	<ul style="list-style-type: none"> <li>• Microsoft Excel</li> </ul>

<sup>20</sup> Lightcast; "Job Posting Analytics." 2020-2022.

<sup>21</sup> "Educational Attainment for Workers 25 Years and Older by Detailed Occupation," Bureau of Labor Statistics, last modified April 9, 2021. [bls.gov/emp/tables/educational-attainment.htm](https://bls.gov/emp/tables/educational-attainment.htm).

<sup>22</sup> Lightcast; "Job Posting Analytics." 2020-2022.

Exhibit 11 lists the top certification that appeared in online job postings between January 1, 2020 and December 31, 2022.

**Exhibit 11: Top Certification for Sustainable Mining Occupations in San Diego County<sup>23</sup>**

Top Certification in Online Job Postings

1. N/A
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<sup>23</sup> Lightcast; "Job Posting Analytics." 2020-2022.

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### **Important Disclaimers**

All representations included in this report have been produced from primary research and/or secondary review of publicly and/or privately available data and/or research reports. This study examines the most recent data available at the time of the analysis; however, data sets are updated regularly and may not be consistent with previous reports. Efforts have been made to qualify and validate the accuracy of the data and the report findings; however, neither the Centers of Excellence for Labor Market Research (COE), COE host district, nor California Community Colleges Chancellor's Office are responsible for the applications or decisions made by individuals and/or organizations based on this study or its recommendations.