



CENTERS OF EXCELLENCE  
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ENVIRONMENTAL SCAN

# WATER & WASTEWATER OCCUPATIONS

In Southern California

NOVEMBER 2011



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**Mission:** The Centers of Excellence, in partnership with business and industry, deliver regional workforce research customized for community college decision making and resource development.

**Vision:** We aspire to be the premier source of regional economic and workforce information and insight for community colleges.

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**In Southern California, water and wastewater industries are projected to account for as many as 4,400 job opportunities for water and wastewater operators, mechanics, electricians and maintenance technicians over the next three years.**

— 2011 Center of Excellence Employer Survey

## Executive Summary

Water is one of the most valuable resources for any region in California, but it is especially vital for the Southern part of the state. As population in Southern California continues to expand, maintaining an adequate supply of water and increasing efficiency of its use is a high priority. In order to implement these priorities, water and wastewater agencies need qualified professionals to perform various distribution and treatment functions and to maintain water systems and equipment. However, due to a number of factors, including anticipated retirements of incumbent workers and a growing need for services, these professions are projected to experience labor shortages in the near future.

This report summarizes the findings of a workforce study conducted by the Inland Empire/San Diego-Imperial and Los Angeles-Orange Centers of Excellence. The study focused on gathering data on industry and occupational employment trends, workforce challenges and needs, as well as community college courses and programs. Surveys of employers and community colleges were conducted to surface any potential mismatches between industry workforce needs and education and training. The information contained in this report is for the Southern California region, which includes the counties of Imperial, Los Angeles, Orange, Riverside, San Bernardino, San Diego and Ventura.



The findings of the study suggest that employment opportunities for new graduates in water and wastewater industries will be plentiful in the next three years. Among the seven mission-critical occupations studied, water distribution operator is the largest occupation (4,000 workers currently in the workforce; 950 job openings by 2014), followed closely by wastewater treatment operators (3,400 current jobs; 663 job openings). Electronic Maintenance Technician/Instrument Technician is projected to experience the fastest job growth (8%). This position is also the most difficult to employ, with over two-thirds of firms reporting difficulty hiring for this classification.

Largely because of upcoming retirements, employers anticipate having 3,400 replacement job openings available for the seven occupations, which constitutes as much as 18% of their current workforce. As retirees begin to exit the workforce, they will take the knowledge they have acquired during their careers with them creating a need for qualified entry-level applicants. With such a large proportion of the workforce retiring, it is unlikely that new workers will receive the mentoring they need to quickly acquire the skill and expertise of retired workers.

The challenges that water and wastewater employers and community colleges face in the current economic environment demonstrate a need for creative workforce preparation solutions developed in partnership between the industry and educators. Appropriate training and education options are needed in order to (1)

increase the number of qualified applicants entering the workforce and (2) ensure that incumbent workers are proficient and up-to-date in water and wastewater competencies, skills, and technologies.

Community colleges are already well positioned to address these employer needs. Twelve colleges in the region have developed core competencies in providing water and wastewater education and training. However, the number of slots available for students is limited due to budget constraints; very few not-for-credit (fee-based) training options are available in the region; and only a few colleges offer training and education for support occupations with a water/wastewater specialty, such as electronic maintenance technician.

Recommendations for colleges include: 1) exploring not-for-credit mechanisms to offer training at colleges that already have facilities and curricula developed; 2) building partnerships between Water Technology programs and Electrical, Mechanical and Industrial Technology departments to develop pathways for support occupations in water industries, such as mechanics, industrial maintenance technicians, electrical technicians, machinist, etc.; 3) adding new courses and/or creating certificate options in water conservation and water quality analysis; 4) strengthening employer-college partnerships for job placement and internship opportunities; and 5) working more closely with K-12 and 4-year educational systems to create the pipeline for the water/wastewater careers.

## Introduction

Water is indeed one of our most valued resources. It is vital to our most basic activities and we depend on it for our survival. According to the American Water Works Association (AWWA), an estimated 339 billion gallons of water per day are consumed across the nation.<sup>1</sup> In order to maintain public health and economic growth, reliable water supplies must be adequate and accessible. Industries from agriculture to healthcare are impacted by the distribution and maintenance of clean water.

A shortage of water is one of the challenges that Southern California residents, municipalities and businesses face. This shortage is attributed to a combination of factors: population growth, semi-arid weather conditions, droughts, and environmental constraints.<sup>2</sup> Helix Water District projects that by 2020 Southern California's residential population will increase by three million people.<sup>3</sup> The expanding population will require more water supply, treatment and reclamation services. These services are performed by a variety of water and wastewater agencies or utilities. It is becoming common knowledge that these firms are going to experience a shortage of qualified and trained workforce in the near future due to anticipated retirements and increasing demand for services. Adequate and up-to-date labor market data are needed to confirm and quantify these expectations.

The California Community Colleges System has charged the Centers of Excellence (COE), part of the Economic & Workforce Development (EWD) Program to identify industries and occupations with unmet employee development needs and introduce partnering potential for colleges<sup>4</sup>. The Inland Empire/San Diego Imperial and Los Angeles-Orange Centers of Excellence partnered on this study of water and wastewater utilities and agencies across seven Southern California counties.<sup>5</sup>

The research focused on gathering both quantitative and qualitative employment data through a survey of water and wastewater employers in order to better understand workforce challenges and employment trends in the industry. The study also included an examination of community college offerings that directly prepare students for entering water and wastewater professions. A survey of community colleges with such

<sup>1</sup> AWWA, online at <http://www.awwa.org/careercenter/resources/docs/industrytrends.cfm>

<sup>2</sup> <http://www.emwd.org/news/WaterShortage.htm>

<sup>3</sup> "Protecting Water Supplies in Southern California with Water Recycling", Helix Water District, online at <http://www.elmontevalley.com/waterreuse.pdf>

<sup>4</sup> The Centers of Excellence (COE) are one of several initiatives within the EWD network. Appendix A contains further information on the initiative and how to use this report.

<sup>5</sup> The counties included in the study are Imperial, Los Angeles, Orange, Riverside, San Bernardino, and Ventura.

offerings was conducted which enabled the research team to assess training gaps, identify challenges, and explore best practices.

The purpose of this report is to summarize the findings of the study and provide specific recommendations to community colleges related to course and program development. More specifically, the report aims to provide information on:

- number and size of water and wastewater firms in the region
- current employment and future job growth for the seven occupations studied, as well as a need to replace workers in these occupations
- level of difficulty in hiring for each of the positions
- industry preferences for education and training programs
- number, type and capacity of community college offerings designed to prepare for water and wastewater occupations
- challenges and successes experienced by colleges
- estimated number of community college program completers and current training gap
- recommendations for action

In addition to the overall assessment of the water and wastewater workforce in Southern California as a whole, the report provides employment and workforce data specific to three EWD administrative regions: Los Angeles/Orange, the Inland Empire, and San Diego/Imperial, which together includes 49 community colleges.

## Methodology

The findings presented in this report are based on the available secondary information and the data collected from both employers and community colleges for the purposes of this study.

On the employer side, the COE conducted an extensive literature review, followed by a survey of water and wastewater firms in May-June 2011. With the assistance of the California-Nevada section of the American Water Works Association (AWWA), the COE identified 349 water and wastewater employers across Southern California. These firms were contacted and asked to complete a 21-question survey.

Building on a previous COE assessment of water and wastewater utilities in the San Francisco Bay Area completed in 2009 ([Water and Wastewater Occupations](#)), the Southern California survey focused on seven “mission critical” occupations that face workforce challenges in the near future. The survey included questions pertaining to current employment, 3-year growth or decline, and incumbent worker retirement expectations for these occupations; factors affecting the industry; training offered to employees; interest in training/education programs, etc. Of the 349 employers identified, 71 firms (20%) responded to the survey. Appendix B supplies more detailed information on the employer survey methodology.

On the college response side, the research team has utilized public data sources to inventory programs directly related to water and wastewater operations as well as those that prepare individuals for support occupations, such as mechanic, electrician and electronic maintenance technician. Community colleges that offer such programs were asked to respond to a survey. All 12 colleges (100%) with a water technology program responded to the survey. Completion data were obtained using the California Community Colleges Data Mart System.

## Industry Overview

Water and wastewater industries primarily involve the collection, distribution, treatment, and conservation of water. While water systems are responsible for providing and distributing clean water to businesses and homes, wastewater systems are responsible for collecting and treating sewage and runoff water that can be cleaned and possibly reused.<sup>6</sup>

Relevant legislation such as the Safe Drinking Water Act (SDWA) and the Clean Water Act (CWA) have been developed to ensure that the standards for clean drinking water are met. The SDWA was specifically created to protect the public drinking water supply and its sources<sup>7</sup>, while the CWA aims to limit the amount of pollutants discharged into waters within the United States. The SDWA sets the standards within the water distribution industry, while the CWA primarily sets the standards for wastewater agencies.<sup>8</sup>

### Industry Designation

Across Southern California, approximately 350 firms employ water and wastewater workers. Water and wastewater firms were identified based upon their 2007 North American Industry Classification System (NAICS) codes and through a supplementary literature review. Most firms identified belong to one of two industry designations: 1) water supply and irrigation systems (NAICS 221310), and 2) sewage treatment facilities (NAICS 221320). A small number of agencies and utilities identified themselves with a number of other industries, including government (NAICS codes starting with 92) and professional services (NAICS codes starting with 54). Table 1 displays the industry designation of firms included in the study.

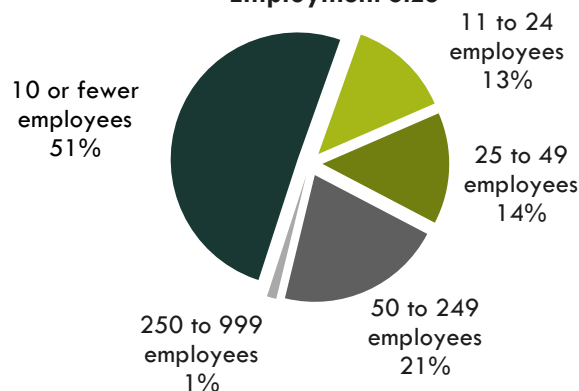
**Table 1 - Water Industry NAICS Codes<sup>9</sup>**

NAICS	Description
<b>Primary</b>	
221310	Water Supply and Irrigation Systems
221320	Sewage Treatment Facilities
<b>Secondary</b>	
541690	Other Scientific & Technical Consulting Services
541711	Research and Development in Biotechnology
624190	Other Individual and Family Services
921120	Legislative bodies
924110	Administration of Air and Water Resource and Solid Waste Management Programs
926130	Regulation and Administration of Communications, Electric, Gas, & Other Utilities

### Size of Firms

Of the 349 water and wastewater firms identified, the majority of them are small – 51% employ fewer than 11 employees (see Figure 1).

**Figure 1 – Water & Wastewater Agency Employment Size**



<sup>6</sup> “Water and Wastewater Industry Occupational Outlook”, January 2010, San Diego Workforce Partnership,

<sup>7</sup> Summary of the Safe Drinking Water Act, online at <http://water.epa.gov/lawsregs/rulesregs/sdwa/>

<sup>8</sup> Summary of the Clean Water Act, online at <http://www.epa.gov/lawsregs/laws/cwa.html>

<sup>9</sup> The majority of the firms were represented by the first NAICS code (221310). The remaining NAICS codes are those that relate to the water industry, but may not directly impact and encompass water and wastewater occupations.



## Occupational Overview

### Occupations studied

Seven water and wastewater occupations were studied. These occupations included Water Treatment Operator, Water Distribution Operator, Wastewater Treatment Operator, Wastewater Collections Operator, Mechanic/Machinist/Plant Technician, Electrician/Electrician Technician, and Electronic Maintenance Technician/Instrument Technician. Descriptions of the occupations are presented below

**Table 2 - Water and Wastewater Occupations<sup>10</sup>**

Occupation	Description
<b>Water Treatment Operator</b>	Performs water treatment function. T-2 certification from Department of Health Services is generally where the journey level starts
<b>Water Distribution Operator</b>	Operates water transmission and distribution systems (e.g. pumps and valves), often using a SCADA control system. Generally does not perform construction, maintenance, or plumbing work. D-2 certification from Department of Health Services is generally where the journey-level begins.
<b>Wastewater Treatment Operator</b>	Performs wastewater treatment function. Usually requires Grade 2 certification by Regional Water Quality Control Board.
<b>Wastewater Collections Operator</b>	Performs wastewater collections function. Sometimes requires Grade 2 certification by California Water Environment Association
<b>Mechanic/Machinist</b>	Maintains mechanical equipment associated with water and wastewater transmission, distribution, storage, and treatment
<b>Electrician/Electrician Technician</b>	Maintains, repairs, tests, installs, modifies, calibrates, and trouble-shoots electrical equipment used in the facilities and systems of water and wastewater utilities
<b>Electronic Maintenance Technician/Instrument Technician</b>	Maintains, repairs, tests, installs, modifies, calibrates, and trouble-shoots electronic, pneumatic, and control equipment associated with the facilities and systems of water and wastewater utilities

These occupations typically follow a career pathway from apprentice to journeyman to manager/supervisor. To move up a career ladder, these workers would normally need to show certain work experience and/or obtain additional higher level certification in their specialty. For an example of a career pathway, see Appendix E of the Bay Region COE Environmental Scan on water and wastewater occupations.<sup>11</sup>

### Projected Employment

Employers were asked to provide their current employment, the estimate of a 3-year occupational growth (new positions) or decline, and 3-year retirement eligibility of incumbent workers (replacement jobs) for the seven water and wastewater occupations. The occupational data in Table 3 are estimates based on the survey data, extrapolated from the sample to the universe of Southern California water and wastewater utilities.

The extrapolated occupational data yielded the following findings:

- The 349 Southern California water and wastewater utilities are projected to currently employ as many as 18,360 workers. Over the next three years, there may be as many as 4,370 new and replacement jobs within these seven water and wastewater occupations.

<sup>10</sup> Occupational descriptions were developed using the definitions from the report published by the San Francisco Bay Area Center of Excellence in partnership with BAYWORK (see "Environmental Scan: Water and Wastewater Occupations in the Bay Region," Centers of Excellence, 2009). These definitions were validated and modified for this Southern California report by the water industry professionals.

<sup>11</sup> "Environmental Scan: Water and Wastewater Occupations in the Bay Region", Centers of Excellence, 2009

- Water Distribution Operator is the largest occupation with an estimated 4,059 workers. This occupation is also projected to create the most jobs: an estimated 958 new and replacement jobs within the 3-year period.
- Wastewater Treatment Operator is the second largest occupation in Southern California with an estimated 3,399 workers. It is projected to have a replacement rate of 16.8% over the next three years and could account for as many as 663 new and replacement jobs.
- The total growth rate for replacement jobs within the seven occupations is almost four times the growth rate for new jobs
- Of the seven occupations, Electronic Maintenance Technician/Instrument Technician is the occupation with the fastest new job growth and highest replacement job rate.

**Table 3 - Extrapolated 2011 Employment, 3-year Growth, and Replacement Jobs**

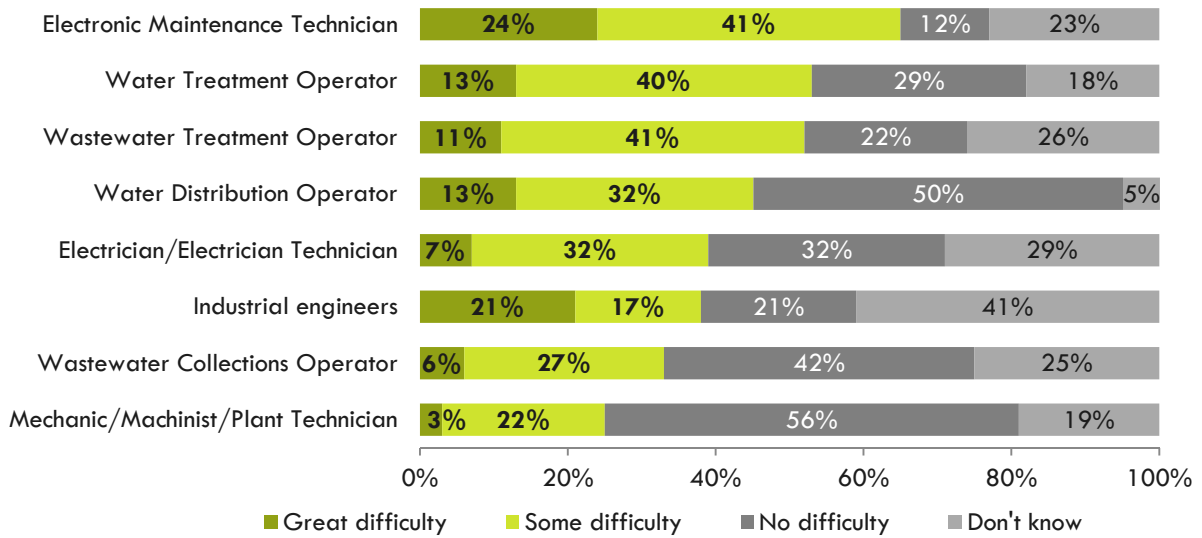
Water/Wastewater Occupations	2011 employment	3-year employment (new jobs)	3-year growth rate	Eligible to retire in 3 years (replacement jobs)	Replacement job rate	New and replacement jobs
Water Treatment Operator	2,635	87	3.3%	419	15.9%	506
Water Distribution Operator	4,059	256	6.3%	702	17.3%	958
Wastewater Treatment Operator	3,399	92	2.7%	571	16.8%	663
Wastewater Collections Operator	2,551	161	6.3%	296	11.6%	457
Mechanic/Machinist	3,116	181	5.8%	710	22.8%	891
Electrician/Electrician Technician	1,344	78	5.8%	426	31.7%	504
Electronic Maintenance Technician/Instrument Technician	1,256	98	7.8%	293	23.3%	391
<b>TOTAL</b>	<b>18,360</b>	<b>953</b>	<b>5.2%</b>	<b>3,417</b>	<b>18.6%</b>	<b>4,370</b>

### Difficulty in Hiring

Respondents were also asked to rate the difficulty filling positions for the seven water and wastewater occupations. Figure 3 depicts these responses. Respondents reported at least some difficulty in hiring each of the seven occupations.

- Water and wastewater employers reported the most difficulty in hiring Electronic Maintenance Technicians/Instrument Technicians (65% combined difficulty)
- A majority of the employers reported that they experienced difficulty in hiring Water and Wastewater Treatment Operators
- Over half of the employers reported having no difficulty in hiring Water Distribution Operators and Mechanics/Machinists/Plant Technicians

**Figure 3 - Difficulty Hiring for Water and Wastewater Positions**



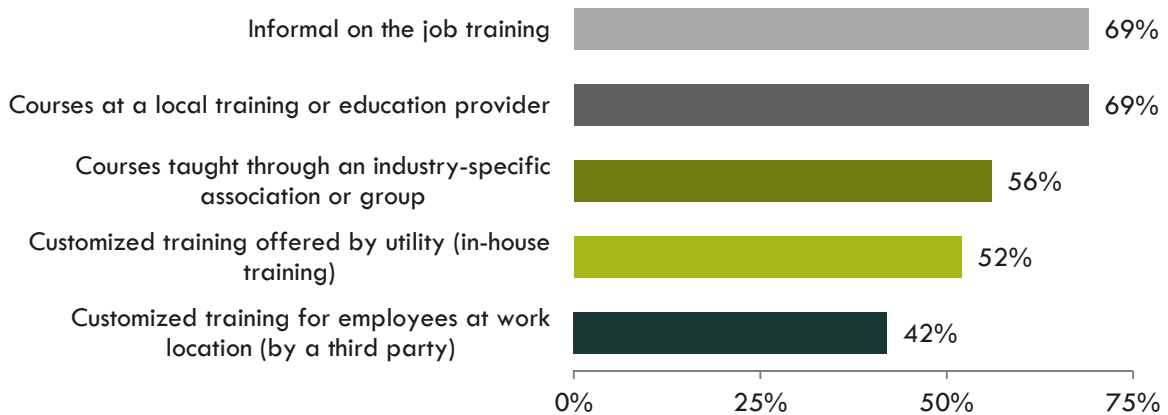
**Emerging Occupations**

**Water Quality Analyst** and **Water Conservations Specialist** were identified as two emerging occupations in water and wastewater industries. These occupations are not part of the Standard Occupational Classification (SOC) system and do not have occupational codes. Their definitions vary by employer. To better assess the current employment in these occupations across Southern California, firms were asked to report whether or not they employed these two occupations. Thirty-seven percent (37%) of firms reported that they employed Water Quality Analysts and about 55% of firms stated that they employed Water Conservations Specialists. These responses demonstrate two emerging occupations in the water and wastewater industries that could create more job opportunities for qualified workers and new college graduates seeking employment. However, more research is needed to understand the educational and experience requirements for these positions and their relevance for community colleges.

**Training and Education Offered by Firms**

In an effort to assess the current training and education offered to water and wastewater workers, firms were also asked to provide insight into the type of trainings and education they offered. Figure 4 illustrates their responses (multiple responses were allowed).

**Figure 4 – Current Training & Education Practices Among Water & Wastewater Firms**



The survey results demonstrate the following:

- About 7 out of 10 firms reported that they provide informal on the job training
- Close to 70% of firms stated that they allow water and wastewater workers to take courses at a local training or education provider
- Fifty-six percent (56%) offer courses taught through an industry-specific association or group to their water and wastewater workers
- None of the employers provided training through a union apprenticeship program

### Industry Certifications

There are numerous industry certifications for water and wastewater occupations. Many employers require certifications to perform certain work. There are also other certifications that are not “must have,” but would make a candidate more desirable on the job market. In California, industry certifications are available in the following areas:

**Water distribution:** There are five levels of certifications from D1 to D5 offered by the California Department of Public Health.<sup>12</sup>

**Water treatment:** There are five levels of certifications from T1 to T5 offered by the California Department of Public Health.<sup>13</sup>

**Wastewater collection:** There are four levels of certification in collection system maintenance offered by California Water Environment Association (CWEA).<sup>14</sup>

**Wastewater treatment:** There are five levels of certifications offered by State Water Resources Control Board.<sup>15</sup>

**Backflow prevention and cross connection control:** There is one certification level but it is offered by many agencies. Riverside, San Bernardino, Orange and Los Angeles counties offer certification which is valid to practice in a respective county.

**Water conservation or water use efficiency:** There are two levels offered by the American Water Works Association (AWWA).<sup>16</sup>

**Other:** In addition to the wastewater collection certification, CWEA provides certification in areas such as laboratory analysis, plant maintenance, mechanical technologist, and electrical/instrumentation.

AWWA also offers certifications in other fields – backflow, water distribution, treatment, laboratory analyst, etc.<sup>17</sup> It is an alternative to the state certification options.

<sup>12</sup> California Department of Public Health, <http://www.cdph.ca.gov/certlic/occupations/pages/dwopcert.aspx>

<sup>13</sup> Ibid.

<sup>14</sup> California Water Environment Association, [http://www.cwea.org/crj\\_new\\_howstart\\_becomeoper.shtml](http://www.cwea.org/crj_new_howstart_becomeoper.shtml)

<sup>15</sup> California Environmental Protection Agency, State Water Resources Control Board, <http://www.waterboards.ca.gov/>

<sup>16</sup> American Water Works Association,

[http://ca-nv-awwa.org/iMISpublic/AM/Template.cfm?Section=Water\\_Conservation\\_Practitioner](http://ca-nv-awwa.org/iMISpublic/AM/Template.cfm?Section=Water_Conservation_Practitioner)

<sup>17</sup> AWWA, <http://ca-nv-awwa.org/iMISpublic/AM/Template.cfm?Section=Certification#listing>

## Employer Needs and Challenges

A review of existing literature combined with the survey findings demonstrate that there is a shortage of workers in the water and wastewater industries. According to a 2010 Water Research Foundation study, there are three main factors impacting the water industry workforce: baby boomer retirements, increased complexity of work, and a shrinking pool of available workers.<sup>18</sup>

**One of the major workforce challenges faced by water and wastewater firms is finding an adequate pool of applicants and retaining qualified workers.** According to a report by the West Coast Water Utility, an inadequate applicant pool was one of the most critical factors affecting water and wastewater utilities across the west coast.<sup>19</sup> The competitiveness of the labor market has plagued the water industry over the last several years. Although plentiful, jobs in water and wastewater may be perceived as less prestigious than other occupations and therefore, less appealing to younger workers and recent graduates from college and trade programs. According to the AWWA Research Foundation, this shortage has pushed water and wastewater workers beyond their capacity and, as a result, job satisfaction has suffered.<sup>20</sup> With the trend toward conservation and recycling of water, resulting in the increased demand for wastewater services, these worker shortages are especially difficult for wastewater firms.

**Retirements have disrupted employment within water and wastewater industries.** According to AWWA, more than 30% of all water and wastewater operators nationwide are eligible to retire in the next five years. The COE employer survey confirms this statistic for Southern California, projecting that the number of operators eligible to retire in the next three years constitutes somewhere between 12% and 17% of the current operator workforce. As these operators begin to exit the workforce, they will take the knowledge they have acquired during their careers with them — creating an ever-growing need for qualified applicants to fill these positions. Even if employers are able to replace these positions, knowledge retention will remain an issue in the water and wastewater industries. Retirees will likely be replaced with less experienced workers who will lack the knowledge of their retired counterparts. Additionally, with a large proportion of the workforce retiring, it is unlikely that new workers will receive the mentoring they need to quickly acquire the skill and expertise of retired workers.

**Changes in technology have made the work more complex.** The newer generation of water and wastewater workers brings knowledge of and comfort with technology to the workplace, which is often a challenge for an older generation. To successfully address the needs of industry, water and wastewater workers need to possess both experiential knowledge of the water and wastewater industries and comfort with technology.

Much like the industry as a whole, several factors impact the day-to-day work of water and wastewater workers within Southern California. To better understand the factors impacting water and wastewater systems, the COE asked employers to evaluate how various factors (baby boomer retirements, water quality and environment regulations, technological advances, and skill upgrades) are changing the ways in which water and wastewater employees perform their day-to-day work. Figure 5 depicts responses.

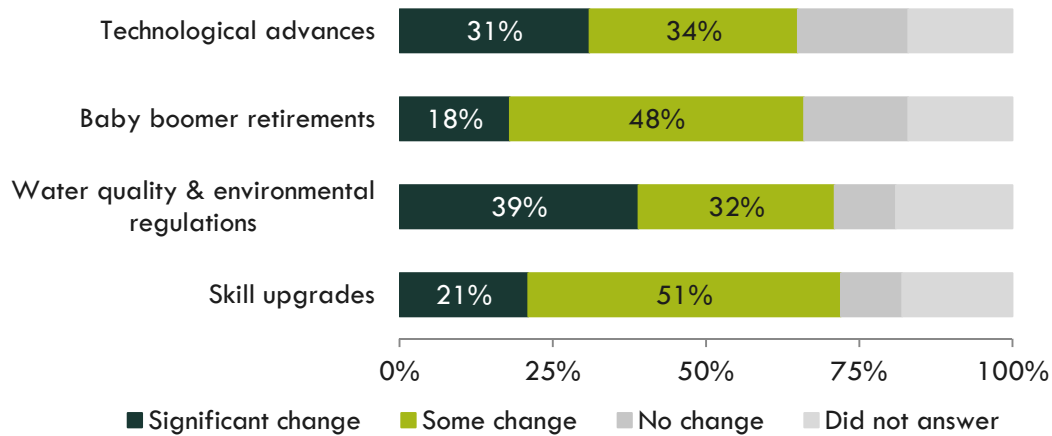
- More than 70% of employers reported that skill upgrades and water quality/environment regulations largely affect the day-to-day work of water and wastewater workers.
- Over one-third of firms report that water quality/environment regulations and technological advances will have a **significant** effect on the day-to-day work of water and wastewater workers.

<sup>18</sup> “Water Sector Sustainability Initiative”, Water Research Foundation, 2010

<sup>19</sup> Final Report on West Coast Water Utility Workshop on Workforce Development, May 2008, Santa Clara Valley Water District

<sup>20</sup> Workforce Planning for Water Utilities - Successful Recruiting, Training and Retaining Operators and Engineers to Meet Future Challenges, AWWA Research Foundation, 2008.

**Figure 5 – Factors Impacting Water and Wastewater Workforce**



The challenges within the water and wastewater industries demonstrate the need for trainings, programs, and certificates that will provide training and education to current and prospective water and wastewater workers. Appropriate training and education would meet the needs of water and wastewater firms in two ways. First, it would increase the number of qualified applicants entering the workforce in the water and wastewater industries. Second, it would provide the training needed to ensure that workers are proficient in water and wastewater competencies and skills, and up-to-date with water and wastewater technologies.

**Interest in Education and Training Programs**

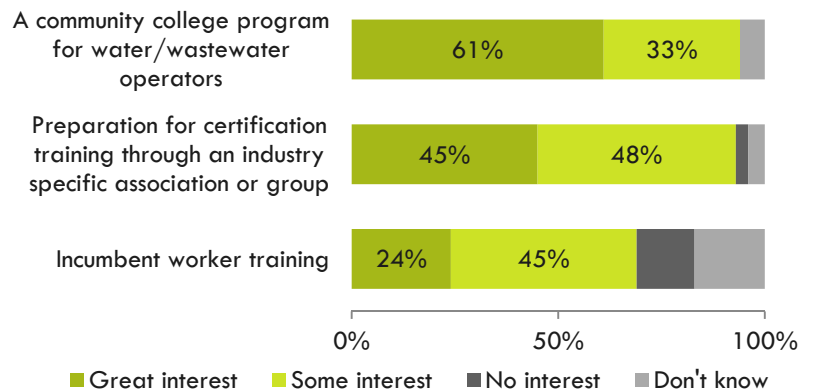
After assessing the current training offered by water and wastewater firms, the study examined employers’ level of interest in expanding the types of training and education they offer employees. These potential offerings included a community college program for each of the seven occupations, preparation for certification training through an industry-specific association or group, an established relationship with a formal apprenticeship program for relevant occupations, and incumbent worker training. The results are organized by each of the seven occupations<sup>21</sup>:

**Water Treatment Operators**

The following was reported by firms employing Water Treatment Operators:

- Over 90% of these firms reported interest in a community college program for water and wastewater operators
- More than 90% of these firms also reported interest in preparation for certification training through an industry specific association or group
- 7 out of 10 employers reported interest in incumbent worker training

**Figure 6 – Training and education preferences for Water Treatment Operators (N = 38)**



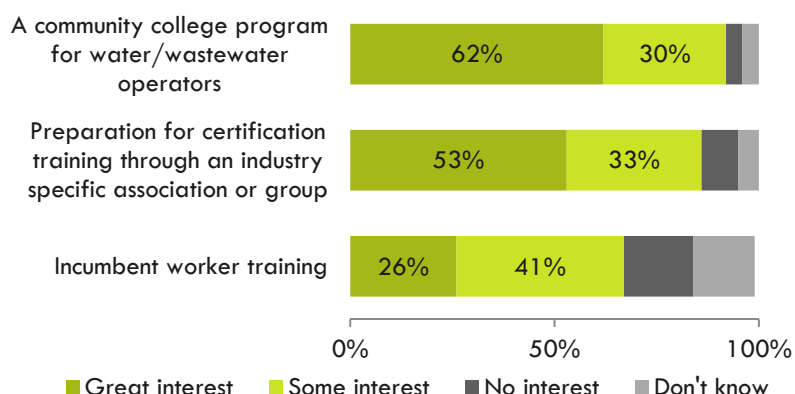
<sup>21</sup> Multiple responses were allowed.

### Water Distribution Operators

The following was reported by firms employing Water Distribution Operators:

- Over 90% of these firms reported interest in a community college program for water and wastewater operators
- About 85% of these firms expressed interest in preparation for certification training through an industry specific association or group
- Two-thirds of the employers reported interest in incumbent worker training

**Figure 7 – Training and education preferences for Water Distribution Operators (N = 57)**

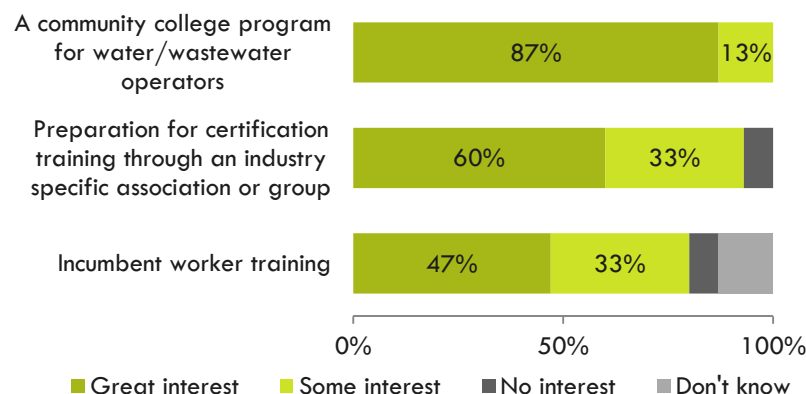


### Wastewater Treatment Operators

The following was reported by firms employing Wastewater Treatment Operators:

- 100% of firms reported interest in a community college program for water and wastewater operators
- Over 90% of these firms expressed interest in preparation for certification training through an industry specific association or group
- About 4 out of 5 employers reported interest in incumbent worker training

**Figure 8 – Training and education preferences for Wastewater Treatment Operators (N = 16)**

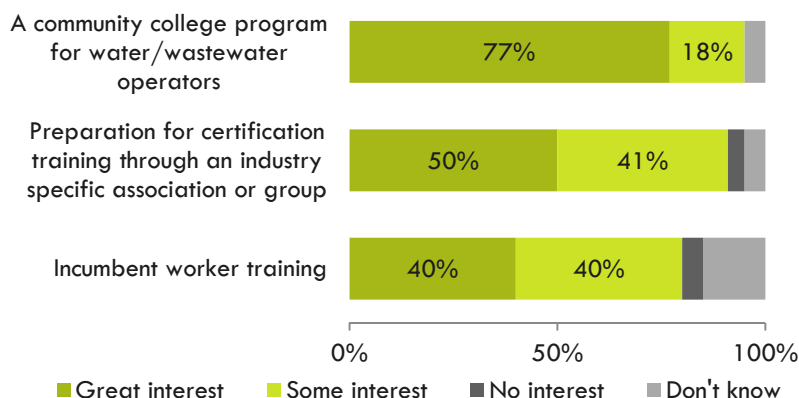


### Wastewater Collections Operators

The following was reported by firms employing Wastewater Collections Operators:

- 95% of the firms employing Wastewater Collections Operators reported interest in a community college program
- Over 90% of these firms expressed interest in preparation for certification training through an industry specific association or group
- Four out of 5 employers reported interest in incumbent worker training

**Figure 9 – Training and education preferences for Wastewater Collections Operators (N = 23)**

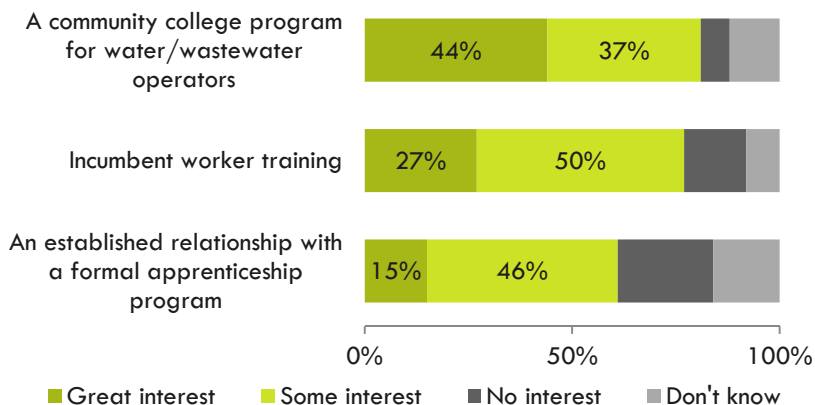


**Mechanics/Machinists/Plant Technicians**

The following was reported by firms employing Mechanics/Machinists/Plant Technicians:

- About 80% of the firms reported interest in a community college program
- 77% of these firms reported interest in incumbent worker training
- About 6 out of 10 firms expressed interest to establish a relationship with a formal apprenticeship program

**Figure 10 – Training and education preferences for Mechanics/Machinists/Plant Technicians (N = 28)**

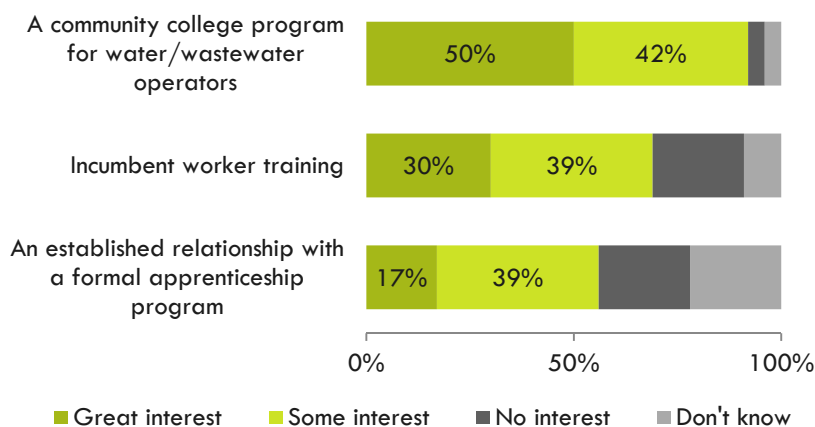


**Electricians/Electrician Technicians**

The following was reported by firms employing Electricians/Electrician Technicians:

- Over 90% of the firms employing Electricians/Electrician Technicians reported interest in a community college program
- About 7 out of 10 firms reported interest in incumbent worker training
- 56% of the firms expressed interest in an established relationship with a formal apprenticeship program

**Figure 11 – Training and education preferences for Electricians/Electrician Technicians (N = 35)**

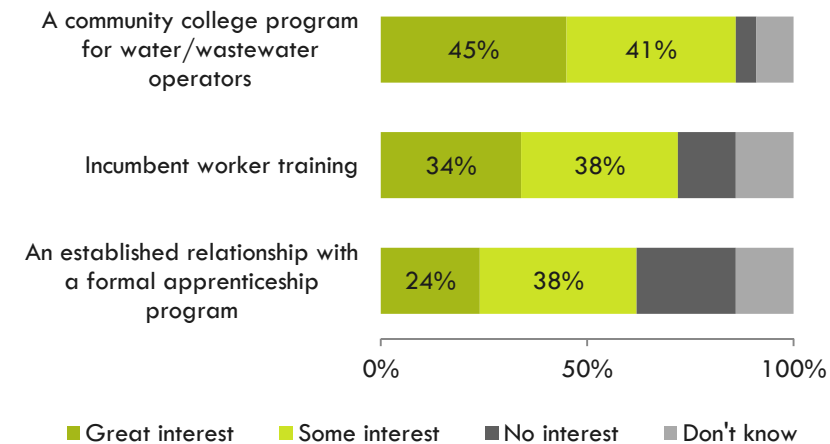


**Electronic Maintenance Technician/Instrument Technician**

The following was reported by firms employing Electronic Maintenance Technician/Instrument Technician:

- 86% of the firms employing Electronic Maintenance Technicians reported interest in a community college program
- 72% of these firms reported interest in incumbent worker training
- About 6 out of 10 firms expressed interest in an apprenticeship program.

**Figure 12 – Training and education preferences for Electronic Maintenance Technician/Instrument Technician (N = 29)**





## College Response and Issues

In order to assess how community colleges are addressing employer demand for trained water and wastewater workforce, the COE identified and surveyed administrators/faculty of Water and Wastewater Technology programs (TOP Code 0958.00) in Southern California. In addition, we inventoried and surveyed those colleges that prepare individuals for support occupations in water/wastewater such as mechanic/plant technicians, electrician, and electronic maintenance technician.

According to the California Community Colleges Data Mart System, 12 community colleges currently offer water and wastewater technology programs. Table 4 illustrates these programs and the number of degrees and certificates awarded in the 2009-2010 academic year.

**Table 4: Community College Water & Wastewater Technology Programs (2009-10)<sup>22</sup>**

Region/ College Name	Program Name	Degrees Completed	Certificates Completed
<b>Los Angeles &amp; Orange County</b>			
Citrus College	Water Technology	3	12
Los Angeles Trade Technical	Supply Water Systems Technology Wastewater Systems Technology Supply Water Technology	1	6
Mt San Antonio College	Water Technology	0	5
Santiago Canyon College	Water Distribution Water Treatment Wastewater/Environmental Sanitation	23	55
<b>Desert/Inland Empire</b>			
Mt San Jacinto College	Water Technology	12	26
San Bernardino Valley College	Water Supply Engineering	6	33
Victor Valley Community College	<u>Courses:</u> Water Science; Water Resource Management; Water and Soil Conservation; Water-Efficient Landscaping; Basics of Water Efficient Landscape Design	N/A	N/A
<b>San Diego &amp; Imperial Counties</b>			
Cuyamaca College	Wastewater Collection Systems Water Distribution Systems Water and Wastewater Technology Water Treatment Plant Operator Wastewater Treatment Operator Cross Connection Control Systems	0	21
Imperial Valley College	Water Treatment Technology	4	0
Palomar College	Wastewater Technology Education Water Technology Education	10	28
<b>South Central Region (Ventura and parts of LA county)</b>			
College of the Canyons	Water Systems Technology	3	3
Ventura College	Water Science: Water, Water Science: Wastewater	7	1
<b>TOTAL</b>		<b>69</b>	<b>190</b>

<sup>22</sup> California Community Colleges Data Mart System provides completion data for all college credit certificate and degree programs. California Community Colleges Chancellor's Office, Data Mart, <http://www.cccco.edu/CommunityColleges/DataMart/tabid/848/Default.aspx>, accessed May 2011.

Together, community colleges awarded 69 degrees and 190 certificates in water and wastewater programs in the 2009-2010 academic year. Of these 259 degrees and certificates, 78 (30%) were awarded to Santiago Canyon College graduates in Orange county.

Based on the COE employer survey data and available labor market statistics, the annual projections for new and replacement jobs range from 515 (EMSI data) to 860 (extrapolated annualized survey data)<sup>23</sup>. The colleges' output of water and wastewater operators is significantly short of the estimated demand, even relying on the most conservative outlook.

### Survey Results: Water Technology Programs

Program administrators of all 12 community colleges were asked to complete an online 24-question survey about their water/wastewater technology program. The survey inquired about credentials and certifications offered, capacity of courses, successful partnerships, challenges that the programs face, and other. Eleven colleges completed the survey in full. The following represents the main findings:

#### Program Types and Characteristics

Most water technology programs in Southern California are well established. The majority (10 out of 11) of them have been in existence for over five years. However, the colleges keep current with the new technologies and other changes in the industry: all but two colleges have updated their curricula and/or obtained new equipment in the last five years.

In terms of credentials offered to students upon completion, most colleges are set up to offer Associate of Science degrees and other state-approved educational certificates. A small number of colleges also offer departmental certificates (Cuyamaca and Victor Valley) and not-for-credit credentials (Mt. San Antonio and San Bernardino Valley). There is a variety of educational certificates that can be obtained. For example, Cuyamaca College offers six different certificate options: from generic *Water and wastewater technology* to more specialized *Water treatment plant operator* and *Cross connection control systems*. On average, water technology certificate programs in Southern California community colleges require 22.3 units to receive a credential (unit requirements range from 18 to 30).

Most programs are designed to prepare students for numerous industry certifications (at least 55% of responsible administrators reported availability of industry certification), but almost none of the colleges administer exams for industry certification in-house. Palomar College is the only college in the region that administers industry certification exam for backflow prevention.

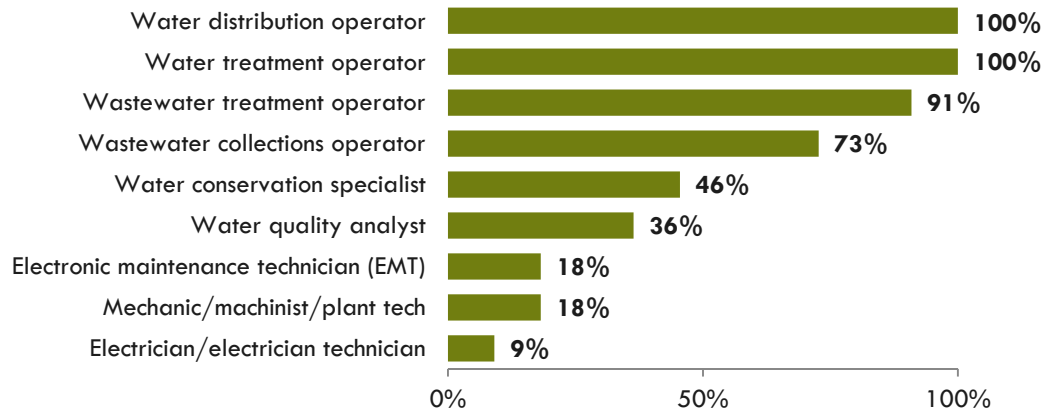
All water and wastewater programs are funded through colleges' general funds, although some colleges have utilized other funds to supplement their budgets, such as grants and partnerships with Workforce Investment Boards.

#### Occupational Focus

When asked about the occupations that their programs are training for, the overwhelming majority of program administrators/faculty reported that they are preparing students for all four operator occupations: water distribution, water treatment, wastewater treatment, and wastewater collection. Less than half of all programs also provide training for students to become water conservation specialists, and one-third of colleges prepare for water quality analyst jobs. Only a few water and wastewater programs provide any training in support water/wastewater occupations, such as mechanics, electricians, maintenance technicians, etc. Figure 13 demonstrates the distribution of all responses.

<sup>23</sup> Low-end estimates reflect the number of annual job openings for Water and liquid waste treatment plant and system operators (SOC 51-8031) in the next three years, provided by Economic Modeling Specialists, Inc. (EMSI, Complete Employment – 2011.3). High-end projection is an annual estimate derived from extrapolated 3-year growth & replacement projections for four occupations: water treatment operator, water distribution operator, wastewater treatment operator, and wastewater collections operator based on the employer survey data.

**Figure 13 – Occupations Water Technology Programs Train for (Multiple choices were allowed)**



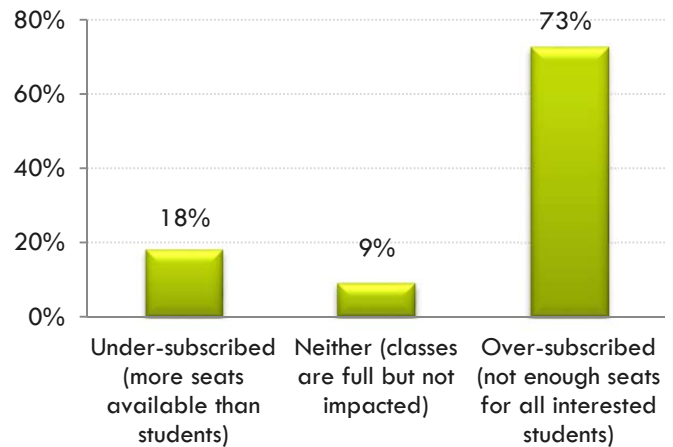
Within the 12 colleges, many provide training for a variety of system specializations relevant to water and wastewater industries. The three most popular system specialization topics are Water treatment, Water system operations, and Wastewater operations, followed by Water purification, Water delivery design, and Water system design. Some other topics that colleges have recently added to their training programs include the following:

- Collection
- Water Conservation technology
- Control systems
- Environmental Laws and Regulations
- Pumps and Motors

**Capacity**

Colleges were asked to assess the capacity of their water and wastewater technology programs to accept all interested students. Based on responses from 11 colleges, the majority of their classes are impacted, as there are more students interested in the program than seats available for them (see Figure 14). Colleges have to turn down students or put them on a waiting list. Many programs are experiencing these challenges due to the recent budget cuts that undermined colleges’ ability to provide education to all interested students. Securing additional funding either through grants or partnerships with employers is critical for these programs. The other option is to offer fee-based or contract education courses.

**Figure 14 – In terms of the number of slots available and student interest in your programs, is your program under- or over-subscribed?**



**Partnerships**

Employers have been key partners in all community college water and wastewater technology programs surveyed. According to the survey results, they support programs in a variety of ways, including:

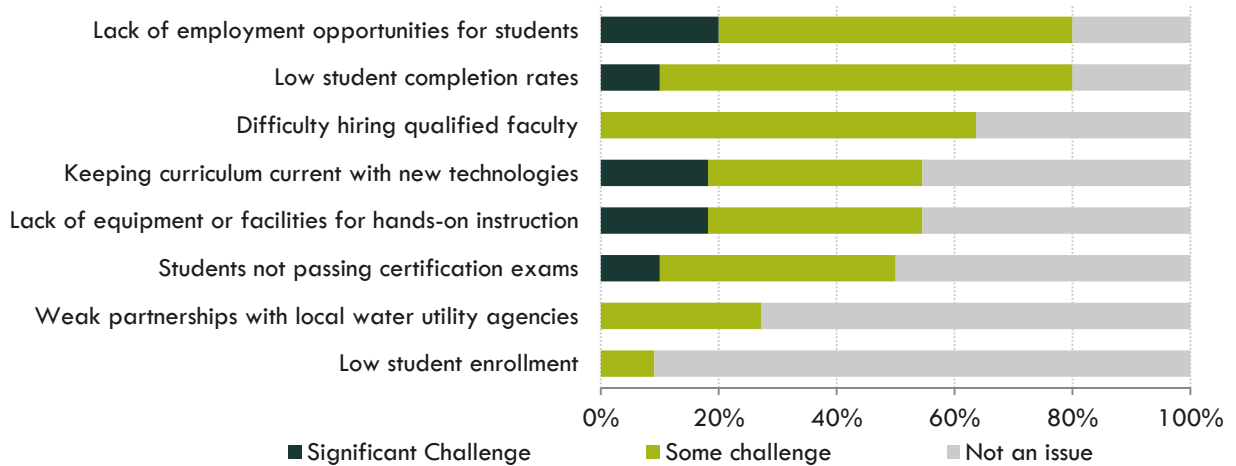
- Serving as advisory board members (100%; 11 colleges reporting this employer involvement)
- Serving as adjunct instructors (91%; 10 colleges)
- Offering internships for students (73%; 8 colleges)
- Donating supplies/ equipment (46%; 5 colleges)
- Offering externships for faculty(18%; 2 colleges)
- Other: providing tours and guest speakers, and working on recruitment events with faculty

Unlike partnerships with employers, colleges have had very weak partnerships with the K-12 system and 4-year universities in regards to their water and wastewater programs. Only one out of 11 colleges (Santiago Canyon College) reported having articulation agreements in place from high school to college and from community college to university.

**Challenges**

The most common challenges colleges cited were lack of employment opportunities and low student completion rates (Figure 15). Lack of employment opportunities is surprising as over half of employers surveyed reported that they experienced difficulty hiring water and wastewater treatment operators. This surfaces an opportunity for Southern California colleges and employers to work together in order to create a better alignment between employer recruitment and students close to graduation.

**Figure 15 – Program Challenges**



Other challenges that more than half of water/wastewater college programs reported include difficulty hiring qualified faculty, keeping curriculum current with new technologies, and providing equipment and facilities for hands-on instruction. Expanded and stronger employer-college partnerships might help solve these challenges.

The majority of colleges did not feel that low student enrollment or weak partnerships with local utilities was an issue.

**Programs for Support Occupations in Water Industries**

Out of the seven mission critical occupations identified for this research, three can be considered support jobs that are not unique for water and wastewater industries. Their skills and knowledge areas span beyond water and wastewater systems. Specifically, these three occupations are Electronic Maintenance Technician/Instrument Technician, Electrician or Electrician Technician, and Mechanic or Machinist.

The community college programs in Southern California that train for these occupations are numerous. There are 50 associate degree and 62 state-approved certificate options available in the region. Many colleges also offer departmental certificates that require less than 12 units to obtain. Table 5 lists the programs identified as those that prepare for each of the support occupations as well as the number of degree and certificate options available.

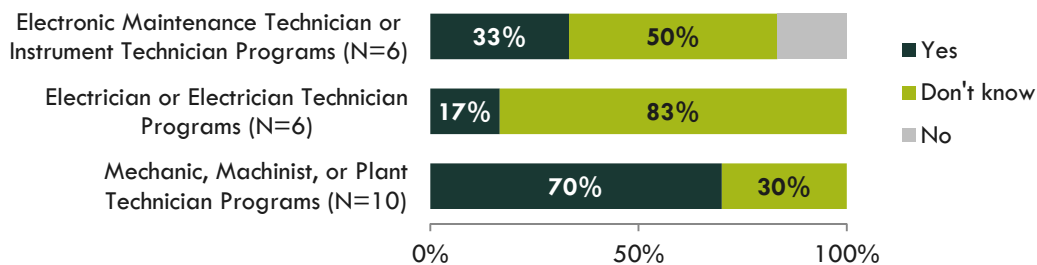
**Table 5: Community College Programs for Support Occupations in Water/Wastewater\***

TOP Code & Name	Colleges	Certificates Offered	Degrees Offered
<b>Electronic Maintenance Technician/Instrument Technician</b>			
9340 Electronics and Electronic Technology	Allan Hancock, Imperial Valley, Long Beach City, Palomar, Pasadena City, Saddleback, San Bernardino, Santa Ana, Southwestern, Victor Valley	10	6
9342 Industrial Electronics	Cerritos, El Camino, Imperial Valley, Mt. San Antonio	7	5
9473 Heavy Equipment Operation (Operating Engineers)	Rio Hondo	1	0
9990 Other: Industrial Technology	Orange Coast	0	1
<b>Electrician/Electrician Technician</b>			
9522 Electrical	Allan Hancock, Antelope Valley, Cerritos, Cuesta, L.A. Trade-Tech, Palomar, San Diego City, Santiago Canyon	10	7
<b>Mechanic/Machinist</b>			
9563 Machining and Machine Tools	Allan Hancock, Cerritos, Cerro Coso, El Camino, Fullerton, Glendale, L.A. Pierce, L.A. Trade-Tech, Long Beach City, Orange Coast, Pasadena City, San Bernardino, San Diego City, Santa Ana, Ventura	36	31
<b>TOTAL</b>		<b>62</b>	<b>50</b>

\*Note: Not all programs within a given TOP code were included, but only those that were deemed relevant to this study.

Administrators and faculty of the programs listed in Table 5 were requested to fill out a short survey. Eleven surveys were completed covering 22 programs with a focus on support occupations. Based on this sample, only those programs that train for Mechanics/Machinists have a connection to the water/wastewater industry as an employment venue for the graduates (70% of Machining and Machine Tools respondents noted that their students find jobs in water utility industry). The administrators/faculty of the other programs were mostly unsure whether or not they prepare their students to enter careers in this sector (Figure 16).

**Figure 16 - Do students who complete this program find employment in the water utilities industry?**



Generally, there are very few programs in the region that incorporate specific coursework to prepare the graduates of Electrical/Machine Technology/Electronics programs for careers in the water and wastewater industry in Southern California. The following colleges and programs listed specific preparation for such careers:

- Santiago Canyon College
- Glendale Community College
- Los Angeles Trade-Technical College
- Antelope Valley College

## Conclusion and Recommendations

Although water and wastewater industries are not expected to create significantly more new jobs by 2014, workforce opportunities for new graduates will still be plentiful. Upcoming retirements will be driving the increase in job openings in the next three years. According to the employer survey, there will be about 3,400 replacement jobs available, which constitutes as much as 18% of the current workforce. As retirees begin to exit the workforce, they will take the knowledge they have acquired during their careers with them creating an ever-growing need for qualified applicants to fill these positions. With such a large proportion of the workforce retiring, it is unlikely that new workers will receive the mentoring they need to quickly acquire the skill and expertise of retired workers.

- Among the seven mission-critical occupations studied, water distribution operator is the largest occupation with over 4,000 workers currently in the workforce in Southern California. It is also projected to have the most job openings over the next 3 years: an estimated 950 new and replacement jobs.
- Opportunities exist for wastewater treatment operators that account for nearly 3,400 current jobs and a replacement job rate of 16.8% over the next 3 years (663 new and replacement jobs).
- The study also found that Electronic Maintenance Technician/Instrument Technician is the occupation with the highest new job growth rate (8%) and the most difficult to employ – over two-thirds of employers reported difficulty hiring for these positions.
- In addition, water quality analysts and water conservation specialists are becoming more common positions in the industry and could create more job opportunities for qualified workers and new college graduates seeking employment in these industries.

The challenges within the water and wastewater industries demonstrate a need for programs that will provide training and education to current and prospective workers in these industries. Appropriate training and education would meet the needs of water and wastewater firms in two ways. First, it would increase the number of qualified applicants entering the workforce. Secondly, it would provide the training needed to ensure that workers are proficient and up-to-date in water and wastewater competencies, skills, and technologies.

Community colleges are already well positioned to address these employer needs. Twelve colleges in the seven-county Southern California region have developed core competencies in providing water and wastewater education and training. However, budget constraints and a limited number of partnerships with water and wastewater employers create challenges. The overwhelming majority of courses are impacted as there are more students interested in these programs than slots available. At the same time, colleges report lack of employment opportunities for their graduates.

There are also very few opportunities available for training and education in support occupations with a water/wastewater specialty, such as electronic maintenance technician. In addition, only a couple of colleges offer not-for-credit programs, limiting community college training options for the incumbent workforce in the region.

### Recommendations to Community Colleges:

The findings of this study point to a need for creative solutions between college and industry partners to meet budget challenges and employer demand for qualified workforce. Here are some of the possible approaches that community colleges in Southern California may take:

- ***Exploring not-for-credit mechanisms of offering water and wastewater training at colleges that already have facilities and curricula developed.*** This would allow more students to take classes in the environment of budget cuts and provide opportunities for partnerships with employers to address their needs for incumbent worker training in a timely manner.

- **Building partnerships between Water Technology programs and Electrical, Mechanical and Industrial Technology departments to develop pathways for support occupations in water industries**, such as mechanics, industrial maintenance technicians, electrical technicians, machinist, etc. Such partnerships within different departments of a college would help address a need for electronic maintenance technicians and other trades with necessary skills and knowledge to work in water and/or wastewater agencies.
- **Expanding existing programs with new courses and/or creating certificate options in water conservation and water quality analysis**. As more employers are expected to add jobs for water conservation specialists and water quality analysts, skills and knowledge in these areas could give graduates of water technology programs a competitive edge on the job market and an opportunity to move up on a career ladder.
- **Strengthening and increasing the number of employer-college partnerships for job placement and internship opportunities**. Employer and college interests align. As employers are looking to prepare qualified workforce to replace retired workers, colleges could be their key partners in training new generations of water and wastewater professionals. However, new graduates of water programs often face obstacles to employment. Internship is one of the vehicles in facilitating the entrance into the workforce. Community colleges should proactively pursue partnerships with many employers within their service areas with the purpose of creating internship opportunities for their students. The partnerships that Cuyamaca College has formed with employers for internships could be considered best practice and may be replicated by other colleges. Also, the COE can provide a list of water/wastewater employers in a college service area within Southern California that expressed an interest to be contacted by a community college.
- **Working more closely with K-12 and 4-year educational systems to create articulated agreements and facilitate the movement along the water/wastewater career pathway**. Aligning community college offerings with those of secondary and university institutions would provide an opportunity for students to enter water and wastewater careers earlier and also advance to higher paying positions. Partnerships with K-12 system could help raise awareness of the high school students about water and wastewater career options, which seems to be a challenge (according to various studies). Partnerships with 4-year universities and employers could yield a chance for more experienced workers to obtain higher level degrees and move up along the career ladder, while leaving a space community college graduates to enter the labor force in this industry.

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## Appendix A: How to Utilize this Report

This report is designed to provide current industry data to:

- Define potential strategic opportunities relative to an industry's emerging trends and workforce needs;
- Influence and inform local college program planning and resource development;
- Promote a future-oriented and market responsive way of thinking among stakeholders; and,
- Assist faculty, Economic Development and CTE administrators, and Community and Contract Education programs in connecting with industry partners.

The information in this report has been validated by employers and also includes a listing of what programs are already being offered by colleges to address those workforce needs. In some instances, the labor market information and industry validation will suggest that colleges might not want to begin or add programs, thereby avoiding needless replication and low enrollments.

### About the Centers of Excellence

The Centers of Excellence (COE), in partnership with business and industry, deliver regional workforce research customized for community college decision making and resource development. This information has proven valuable to colleges in beginning, revising, or updating economic development and Career Technical Education (CTE) programs, strengthening grant applications, assisting in the accreditation process, and in supporting strategic planning efforts.

The Centers of Excellence Initiative is funded in part by the Chancellor's Office, California Community Colleges, Economic and Workforce Development Program. The total grant amount (grants ## 10-305-027 and 10-305-024 for \$205,000 each) represents funding for multiple projects and written reports through the Center of Excellence. The Centers aspire to be the premier source of regional economic and workforce information and insight for California's community colleges.

More information about the Centers of Excellence is available at [www.coeccc.net](http://www.coeccc.net).

### Important Disclaimer

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. Efforts have been made to qualify and validate the accuracy of the data and the reported findings; however, neither the Centers of Excellence, COE host District, nor California Community Colleges Chancellor's Office are responsible for applications or decisions made by recipient community colleges or their representatives based upon components or recommendations contained in this study.

## Appendix B: Survey Methodology and Sample Data

### About the Survey

In June and July 2011 the Centers of Excellence, with assistance from AWWA, collected workforce information regarding occupations in water and wastewater via an in-depth employer survey. All survey responses were collected online.

Technique	Online survey of water/wastewater employers
Population	350 water/wastewater employers
Sample	71 employer respondents
Field dates	June-July 2011

### About the Respondents

Seventy-one employers, representing a combined workforce of 4,487 California employees, responded to the survey. The size of the firm and regional location were recorded where possible. Caution should be used in generalizing results to the entire population of employers to the degree that the sample may differ from the universe. Respondents were located in the following counties: Los Angeles County, Orange County, Riverside County, San Bernardino County, San Diego County, and Ventura County. The employers were carefully selected based on their relation to the water and wastewater industries. This relation involved the distribution, collection, conservation, and/or treatment of water; or some combination of the four. All firms had some association with the water industry - whether it was direct or indirect. The following NAICS (North American Industry Classification System) codes were used:

#### Water Industry (2007 NAICS)

- 221310 Water Supply and Irrigation Systems
- 221320 Sewage Treatment Facilities
- 541690 Other Scientific and Technical Consulting Services
- 541711 Research and Development in Biotechnology
- 624190 Other Individual and Family Services
- 921120 Legislative bodies
- 924110 Administration of Air and Water Resource and Solid Waste Management Programs
- 926130 Regulation and Administration of Communications, Electric, Gas, and Other Utilities

### Universe of Firms

The number of water and wastewater firms in California was estimated by gathering public employer information and using InfoUSA. California-Nevada Sections of AWWA also assisted the COE in identifying water and wastewater firms. Through the research conducted on the water and wastewater industries, 349 firms were identified. The following is the distribution of the employer population in each EWD region:

Los Angeles/Orange County	134
Inland Empire	129
San Diego/Imperial	61
South Central (parts of L.A. & Ventura)	25

## Occupational Employment

Seven occupations related to the water and wastewater industries were identified as high growth and aligned with community college education programs. The combined employment in Southern California for the seven occupations totals at least 1,475 jobs and could be as high as 18,360, as determined by survey respondents. The latter figure is an extrapolated estimate of employment, based on survey responses and an estimate of the total number of water and wastewater firms in Southern California.

To arrive at the estimates of occupational employment currently and in 3-years, survey data for the sample was extrapolated to approximate the employment for the universe of firms.

- First, respondents were asked to report the number of workers they employed in each of the seven occupations. Specifically, employers were asked to report full-time, permanent positions. Based upon these responses, the COE calculated the distribution of employment, mean employment, and total employment.
- Respondents then reported the number of workers that would be employed in the seven water and wastewater occupations in the next 3 years. These responses resulted in occupational growth rates for the 3-year period.
- Respondents were also asked to report the number of workers eligible to retire in the next 3 years. These responses resulted in the replacement jobs for the 3-year period.
- The employment data was then used to extrapolate to the universe of water and wastewater firms.

The following table details the current employment and growth expectation from the survey sample of employers.

**Table B-1 - Sample Data for 2011 Employment and Projected 3-year Occupational Growth**

Water and Wastewater Occupations	2011 Employment	3-year employment (new jobs)	3-year growth rate	Eligible to retire in 3 years (replacement jobs)	Replacement job rate	New and replacement jobs
Water Treatment Operator	302	10	3.3%	48	15.9%	58
Water Distribution Operator	663	42	6.3%	115	17.3%	157
Wastewater Treatment Operator	185	5	2.7%	31	16.8%	36
Wastewater Collections Operator	190	12	6.3%	22	11.6%	34
Mechanic/Machinist	241	14	5.8%	55	22.8%	68
Electrician/Electrician Technician	104	6	5.8%	33	31.7%	39
Electronic Maintenance Technician/Instrument Technician	90	7	7.8%	21	23.3%	28
<b>Total</b>	<b>1,475</b>	<b>86</b>	<b>5.8%</b>	<b>325</b>	<b>22.0%</b>	<b>420</b>

Extrapolations were based upon conservative employment numbers obtained by eliminating outliers that were three standard deviations beyond the mean. These outliers were replaced with the largest numbers that fell within three standard deviations of the mean. Unless a firm's employment data revealed outliers on all variables, it was not deleted. The average employment data for the sample and the number of firms in the universe were used to extrapolate the number of employees in each of the seven water and wastewater occupations. A similar method was used to extrapolate 3-year growth. Percentage growth within the sample was applied to the extrapolated employment numbers, yielding the 3-year projected growth and retirement in the water and wastewater industries.

For additional information on data methodology or to request a copy of the survey questions, please contact the Center of Excellence at [www.coeccc.net](http://www.coeccc.net)

## Appendix C: Regional Data

### Los Angeles/Orange County Region

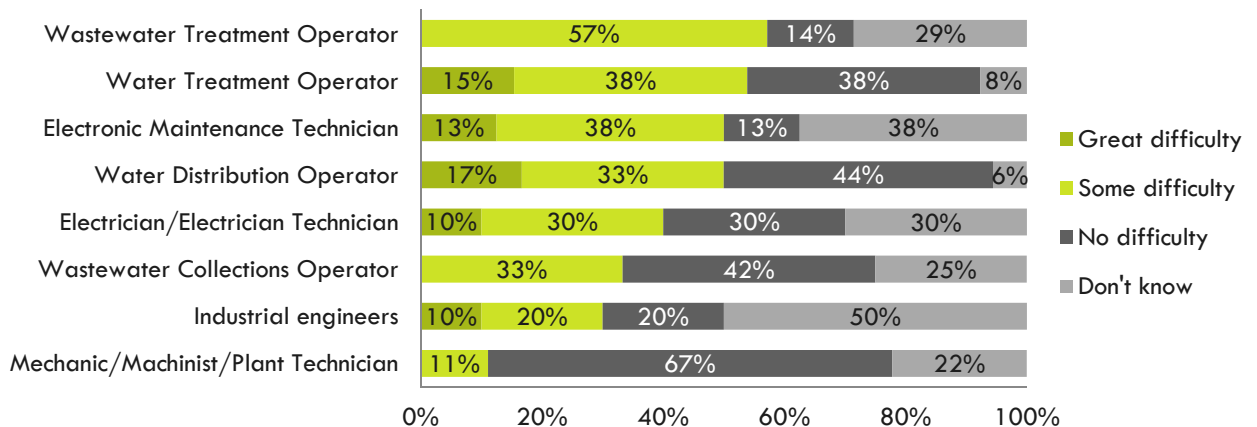
- According to the respondents, the Los Angeles and Orange County firms employ 508 water and wastewater workers in the seven occupations studied. In the next 3 years, there may be as many as 76 new and replacement jobs within these seven occupations.
- Water Distribution Operator is the largest occupation with an estimated 262 workers. This occupation is also projected to create 40 new and replacement jobs over the next 3 years.
- Water Treatment Operator is the second largest occupation in Los Angeles and Orange County with an estimated 109 workers. It is projected to have a replacement job rate of 12.8% over the next 3 years and could create as many as 17 new and replacement jobs.

**Table C-1: Sample Employment and 12-month Growth in Water and Wastewater occupations in Los Angeles/Orange County**

Occupation	2011 Employment	3-year employment (new jobs)	3-year growth rate	Eligible to retire in 3 years (replacement jobs)	Replacement job rate	New and replacement jobs
Water Treatment Operator	109	3	2.8%	14	12.8%	17
Water Distribution Operator	262	6	2.3%	34	13%	40
Wastewater Treatment Operator	12	0	0%	0	0%	0
Wastewater Collections Operator	80	4	5%	9	11.3%	13
Mechanic/Machinist/Plant Technician	33	1	3%	3	9%	4
Electrician/Electrician Technician	8	0	0%	2	25%	2
Electronic Maintenance Technician/Instrument Technician	4	0	0%	0	0%	0
<b>Total</b>	<b>508</b>	<b>14</b>	<b>2.8%</b>	<b>62</b>	<b>12.2%</b>	<b>76</b>

- Over 50% of the respondents reported having at least some difficulty hiring Water and Wastewater Treatment Operators
- Employers within Los Angeles/Orange County are having the least difficulty hiring Mechanics/Machinists/Plant Technicians

**Figure C-1 - Employers' Difficulty in Hiring Water and Wastewater Occupations**



**Inland Empire/Desert Region**

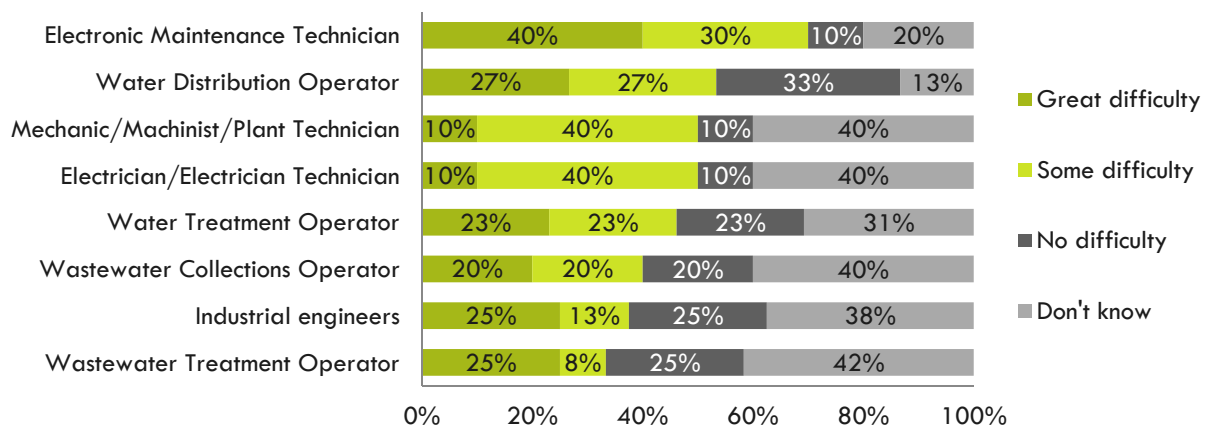
- The Inland Empire respondents employ 348 water and wastewater workers in the seven occupations studied. In the next 3 years, there may be as many as 240 new and replacement jobs within these seven occupations.
- Water Distribution Operator is the largest occupation with 96 workers. It is projected that this occupation could create as many as 20 new and replacement jobs.
- Wastewater Treatment Operator is the second largest occupation in the Inland Empire with 73 workers. It is projected to have a replacement job rate of 20.5% over the next 3 years and could create as many as 18 new and replacement jobs.

**Table C-2: Extrapolated Employment and 12-month Growth in Water and Wastewater occupations in the Inland Empire**

Occupation	2011 Employment	3-year employment (new jobs)	3-year growth rate	Eligible to retire in 3 years (replacement jobs)	Replacement job rate	New and replacement jobs
Water Treatment Operator	60	1	1.7%	14	23.3%	170
Water Distribution Operator	96	6	6.3%	14	14.6%	20
Wastewater Treatment Operator	73	3	4.1%	15	20.5%	18
Wastewater Collections Operator	32	0	0%	3	9.4%	3
Mechanic/Machinist	54	6	11%	16	29.6%	22
Electrician/Electrician Technician	12	3	25%	2	16.7%	5
Electronic Maintenance Technician/Instrument Technician	21	2	10%	3	14.3%	2
<b>Total</b>	<b>348</b>	<b>21</b>	<b>6%</b>	<b>67</b>	<b>19.3%</b>	<b>240</b>

- 7 out of 10 employers reported that they experienced at least some difficulty in hiring Electronic Maintenance Technicians
- At least 50% of employers experienced difficulty in hiring the three occupations: Water Distribution Operator, Mechanic/Machinist/Plant Technician, and Electrician/Electrician Technician.

**Figure C-2 - Employers' Difficulty in Hiring Water and Wastewater Occupations in the Inland Empire**



### San Diego/Imperial County Region

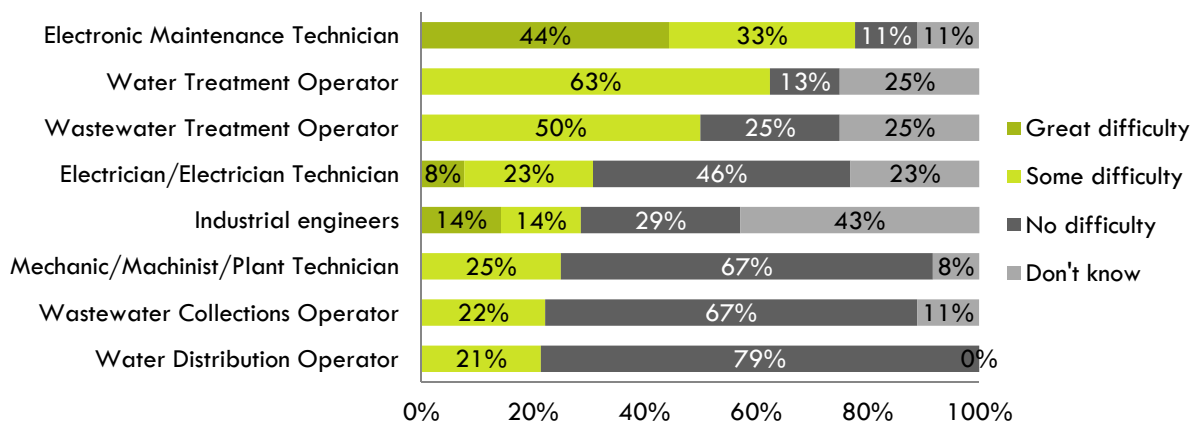
- The San Diego/Imperial County employers that responded to the survey employ 613 water and wastewater workers in the seven occupations. In the next 3 years, there may be as many as 190 new and replacement jobs within these seven occupations.
- Water Distribution Operator is the largest occupation with 174 workers. It is projected to have a replacement job rate of 25.9% over the next 3 years and could create as many as 58 new and replacement jobs.
- Mechanic/Machinist/Plant Technician is the second largest occupation in San Diego County with 134 workers. It is projected to have a replacement job rate of 21.6% over the next 3 years and could create as many as 36 new and replacement jobs.

**Table C-3 - Extrapolated Employment and 12-month Growth in water and wastewater occupations in San Diego/Imperial County**

Occupation	2011 Employment	3-year employment (new jobs)	3-year growth rate	Eligible to retire in 3 years (replacement jobs)	Replacement job rate	New and replacement jobs
Water Treatment Operator	52	0	0%	12	23%	12
Water Distribution Operator	174	13	7.4%	45	25.9%	58
Wastewater Treatment Operator	70	2	2.9%	14	20%	16
Wastewater Collections Operator	71	13	18.3%	9	12.7%	22
Mechanic/Machinist/Plant Technician	134	7	5.2%	29	21.6%	36
Electrician/Electrician Technician	52	10	19.2%	16	11.5%	26
Electronic Maintenance Technician/Instrument Technician	60	5	8.3%	15	25%	20
<b>Total</b>	<b>613</b>	<b>50</b>	<b>8.2%</b>	<b>140</b>	<b>22.8%</b>	<b>190</b>

- About 8 out of 10 employers reported that they experienced at least some difficulty in hiring Electronic Maintenance Technicians
- About 6 out of 10 firms reported that they experience at least some difficulty in hiring Water Treatment Operators
- Half of the firms reported difficulty in hiring Wastewater Treatment Operators

**Figure C-3 - Employers' Difficulty in Hiring Water and Wastewater Occupations in San Diego/Imperial County**



**Appendix D: Community College Programs That Train for Related Occupations**

COLLEGE	PROGRAM TITLE	CERT	A.S.	DC
<b>9340 - Electronics and Electronic Technology</b>		<b>10</b>	<b>6</b>	<b>1</b>
Allan Hancock	Basic Electronic Training	x		
	Digital Systems Technician	x		
Imperial Valley	Electrical Technology	x	x	
Long Beach City	Electrical Technology	x	x	
Palomar	Advanced Electronic Technician	x	x	
Pasadena City	Electrical Technology	x	x	
Saddleback	General Electronic Technology	x	x	
San Bernardino	General Electrician Certification Training	x		
Santa Ana	Completion of Maintenance & Repair Workers Certificate			x
Southwestern	Electrical & Electronics Test Technician	x	x	
Victor Valley	Digital Electronics	x		
<b>9342 - Industrial Electronics</b>		<b>7</b>	<b>5</b>	<b>1</b>
Cerritos	Industrial Electronics	x	x	
El Camino	Electronics & Comp. Hard. Tech/Industrial Comp Control Tech	x		
Imperial Valley	Apprenticeship: Electrician	x	x	
	Apprenticeship: Generation Mechanic	x	x	
	Apprenticeship: Meter Technician	x	x	
	Electrical Trades	x	x	
Mt. San Antonio	Industrial Electronics	x		x
<b>9473 - Heavy Equipment Operation</b>		<b>1</b>	<b>0</b>	<b>0</b>
Rio Hondo	Operating Engineers Apprenticeship	x		
<b>9522 - Electrical</b>		<b>10</b>	<b>7</b>	<b>0</b>
Allan Hancock	Electrical Apprenticeship	x		
Antelope Valley	Electrical Technology	x	x	
Cerritos	Apprenticeship: Electrical Trades	x		
Cuesta	Electrical Technology	x	x	
L.A. Trade-Tech	Electrical Construction and Maintenance	x	x	
Palomar	Apprentice Electrician	x	x	
	Electrician Trainee	x		
San Diego City	Apprenticeship: Construction Trades - Electrical Trade	x	x	
	Construction Trades: Electrical	x	x	
Santiago Canyon	Apprenticeship: Industrial Electrical	x	x	
<b>9563 - Machining and Machine Tools</b>		<b>36</b>	<b>31</b>	<b>0</b>
Allan Hancock	Machine Technology: General Machining	x	x	
	Machine Technology: Maintenance Machining	x	x	
Cerritos	Apprenticeship: Machine Tool Technology		x	
	Machine Tool Technology	x	x	
	Machine Tool Technology-Machinist Option		x	
	Machine Tool Technology-Numerical Control Tool Programmer Option		x	
	Machinist	x		
	Numerical Control Machine Operator	x	x	
	Numerical Control Tool Programmer	x		
Cerro Coso	Machine Tool Technology	x	x	

COLLEGE	PROGRAM TITLE	CERT	A.S.	DC	
El Camino	Machine Tool Technology: CNC Machine Operator	x			
	Machine Tool Technology: Machinist Option	x	x		
	Machine Tool Technology: Numerical Control Programmer Option	x	x		
Fullerton	Computer Numerical Control	x			
	Machine Technology Level II	x			
Glendale	Computer Numerical Control Technician	x	x		
	Machinist	x	x		
L.A. Pierce	Numerical Control Programming	x	x		
L.A. Trade-Tech	Machine Shop: CNC	x	x		
	Machine Shop: CNC-Adjunct	x			
L.A. Valley	Manufacturing Technology: Metal Machining	x	x		
	Manufacturing Technology: Numerical Control	x	x		
Long Beach City	Machine Tool Technology	x	x		
Orange Coast	Manufacturing Technology: CNC Machine Operator	x	x		
	Manufacturing Technology: CNC Machine Programmer	x	x		
	Manufacturing Technology: Machinist	x	x		
	Manufacturing Technology: Tooling	x	x		
Pasadena City	Machine Shop Technology	x	x		
San Bernardino	Machine Technology	x			
	Machinist Standard	x	x		
San Diego City	Apprenticeship: Honeywell Tool & Die	x	x		
	CNC Technology	x			
	Machine Technology: Computerized Numerical Control	x	x		
Santa Ana	Manufacturing Technology: CNC Lathe Set Up & Operation	x	x		
	Manufacturing Technology: CNC Machine Set Up & Operation	x	x		
	Manufacturing Technology: CNC Milling Machine Set Up & Operati	x	x		
	Manufacturing Technology: CNC Programmer	x	x		
	Manufacturing Technology: Conventional Machining	x	x		
Ventura	Machine Technology	x	x		
<b>9990 - Other</b>		<b>0</b>	<b>1</b>	<b>0</b>	
Orange Coast	Industrial Technology		x		
		<b>TOTAL</b>	<b>62</b>	<b>50</b>	<b>2</b>