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ECONOMIC & WORKFORCE DEVELOPMENT through the CALIFORNIA COMMUNITY COLLEGES

C·O·E CENTERS OF EXCELLENCE

Inform Connect Advance

Water Operators

Los Angeles County

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There are 2,350 Water Operators in Los Angeles County, and many of them are Baby Boomers who will soon leave the industry. Forecasts indicate a need for 578 new Water Operators in the next five years. *Source: EMSI*[1]

Executive Summary

Water distribution, water treatment, and wastewater treatment are essential industries that are generally run by public utilities and taken for granted by most citizens. Heightened security concerns since 9/11, new technologies, and continually increasing demand for water are some of the trends that are putting pressure on the industry to expand and evolve.

Employees who work in water treatment are categorized as "Water and Liquid Waste Treatment Plant and System Operator" (SOC 51-8031), and are referred to as "Water Operators" in this report. The large majority of Water Operators work in the public sector. Their median hourly wage in Los Angeles County was $25.43 in 2006[2]. Water Operators control equipment and processes that remove or destroy harmful materials, chemicals, and microorganisms from water or wastewater. All Water Operators must earn a State certification (grade I to V).

Projections of demand for Water Operators are fueled by a high level of expected retirements among experienced workers and the continued increase in demand for water by both residential and commercial customers. EMSI projects that the industry will need to hire 578 additional Water Operators in the next five years in Los Angeles County, to replace incumbent workers retiring, and fill new positions (490 replacements and 88 new jobs). New entrants to the industry need education and training to obtain State certification and incumbent workers need additional credits when they seek a higher level of State certification.

Three community colleges in Los Angeles County offer programs in Water Technology. While the community colleges are a preferred training provider, students can also take classes at universities (classroom or on-line) or obtain training through industry associations. The need for Water Operators does not justify the creation of additional programs; however, it is recommended that colleges which already have programs do the following:

- Create a pipeline of workers by partnering with high-schools, ROPs, the LA Infrastructure Academy and WorkSource Centers to educate potential entrants on the opportunities in the industry and to recruit students.
- Promote careers in water technology, by emphasizing existing career opportunities, high-wages, job stability and other factors that can be appealing to the youth, job seekers, and workers wanting to transition to another industry.
- Develop materials presenting educational requirements for the different grades of certification, and highlight the career opportunities that exist for those who have earned an Associates Degree or a Bachelors Degree, to encourage students to continue their education.

[1] Economic Modeling Specialists, Inc. www.economicmodeling.com
[2] Economic Modeling Specialists, Inc. www.economicmodeling.com

- Increase flexibility in course offerings (i.e. short-term courses, evening courses and online courses) to allow workers to take classes at convenient times, and complete the training more quickly.
- Explore the possibility of delivering worksite training to incumbent workers via contract education.

Introduction

In the year 2000, scientists predicted that by 2025 one-third of the world's population would suffer from a shortage of fresh water. This prediction, however, came true in 2006![3] Worldwide, the consumption of water increased six-fold during the last century. Americans alone use 339 billion gallons of water a day.[4]

Water and wastewater treatment is an essential and well-established industry with an aging infrastructure and workforce. Replacement of critical infrastructure components, like 100-year-old pipes and pumps, while maintaining service to customers, is one of the greatest challenges in the industry today. In addition, the high-level of retirements, new technologies, and increased demand for safe drinking water also contribute to the pressure on the industry to adapt.[2]

Workers in the water and wastewater treatment industry process water from a variety of sources and make it safe for drinking and/or to be returned to the environment. Water treatment facilities process water from wells, rivers, streams, and reservoirs while wastewater treatment plants process wastewater from customers' sewer pipes. Operators in both types of plants use similar procedures, materials, instruments, computer programs, and hand and power tools to control equipment and processes.[5]

The water treatment industry is growing in complexity and these changes are putting new, higher demands on industry workers:

- **Security –** The post-9/11 atmosphere has heightened the importance of security throughout the industry. The *Public Health Security and Bioterrorism Preparedness and Response Act of 2002* placed new reporting, training, and hiring requirements on industry operators.[6]

- **Increased Demand/Inadequate Supply –** Southern California is an area of chronic water shortages and drought conditions. As the population increases, the demand

[3] Deloitte/Technology, Media, and Communications, Technology Predictions, TMT Trends 2008, http://www.deloitte.com/dtt/cda/doc/content/cz%28en%29_tmt_tech_trends_140208.pdf
[4] American Water Works Association Career Center Resources http://www.awwa.org/careercenter/resources/docs/WaterIndustryTrends.cfm
[5] Bureau of Labor Statistics, U.S. Department of Labor, *Occupational Outlook Handbook, 2008-09 Edition,* Water and Liquid Waste Treatment Plan and System Operators, http://www.bls.gov/oco/ocos229.htm
[6] Nuzzo, Jennifer; "The Biological Threat to U.S. Water Supplies; Toward a National Water Security Policy," Biosecurity and Bioterrorism: Biodefense Strategy, Practice, and Science; Volume 4, Number 2, 2006. pp 147-159 http://www.liebertonline.com/doi/pdfplus/10.1089/bsp.2006.4.147

for water grows. Life-style choices and manufacturing demands also affect the adequacy of the supply.

- **Conservation –** As customers are encouraged and/or required to practice conservation techniques, the pricing schemes, public relations, and education functions of the industry are evolving.

- **Technology –** Improved technologies reduce leakage, support conservation, and increase the security of the water supply. Technology has also improved testing and increased standards for treating water. These technologies have converted occupations that used to be based on manual labor to higher levels of skill and knowledge.[7]

- **Regulations –** The industry is becoming highly and stringently regulated. New regulations govern disinfection byproduct (DBP) control, microbial removal, the treatment of inorganic contaminants, security concerns, and improved analytical methods that detect potentially harmful contaminants at part-per-trillion levels. These regulations create additional demands on operators of water plants.[8]

- **Public Involvement –** Public awareness of the quality of everything that is ingested, including water, is keen. The public expects a utility to be aware of its concerns and responsive to them. New customer service demands include community outreach, educational programs, and innovative rate structures.[9]

- **New Processes –** The industry is constantly exploring ways to meet the expanding demand. New water processes focused on desalination and reverse osmosis are being actively explored by the Los Angeles Department of Water and Power. The drive to expand supply through these alternative methods offers the possibility of new plants, systems, and jobs (with new skills and knowledge requirements) within the industry.[10]

[7] Orange County Business Council, Education and Training Needs in the OC Water Treatment and Distribution Industry, Prepared for Water Utility Science Program, Career Education Division, Santiago Canyon College, 2004-2005 http://www.sccollege.edu/apps/page.asp?Q=Water%20Report&menutab=3&pro=68
[8] Brandhuber, Philip J, "Trends in Drinking Water Treatment." Water and Wastes Digest, http://www.wwdmag.com/%20Trends-in-Drinking-Water-Treatment-article6437
[9] American Water Works Association Career Center Resources http://www.awwa.org/careercenter/resources/docs/WaterIndustryTrends.cfm
[10] Los Angeles Department of Water and Power, Scattergood Seawater Desalination Pilot Project http://www.ladwp.com/ladwp/cms/ladwp001350.jsp and Current Recycling Projects at http://www.ladwp.com/ladwp/cms/ladwp004170.jsp

Labor Market

Employers

The water and waste water treatment industries are categorized as "Water, Sewage, and other Systems" (NAICS code 2213), and "Water Treatment and Disposal" (NAICS code 5622). However, most employers (e.g. municipalities) are in the public sector, and categorized as "Local Government" (NAICS code 9300). Therefore, they are not represented in the data specific to the industry. The Bureau of Labor Statistics estimated that 80% of all water distribution and treatment employees work in the public sector.[11] For this reason, this report focuses on the most relevant occupation, "Water and Liquid Waste Treatment Plant and System Operator" (SOC 51-8031) rather the industry, to include employees working in both the public and private sectors. For the purpose of this report, "Water and Liquid Waste Treatment Plant and System Operators" are referred to as "Water Operators."

Table 1: Number of Water Operators (SOC 51-8031) by Industry and 5-year Projections:

NAICS Code	Name	2007 Jobs	2012 Jobs (projection)	Change	% Change
93000	Local government	1,909	1,981	72	4%
22130	Water, sewage and other systems	260	272	12	5%
56220	Waste treatment and disposal	44	49	5	11%
92000	State government	14	14	0	0%
22110	Electric power generation, transmission and distribution	13	13	0	0%
54160	Management, scientific, and technical consulting services	13	17	4	30%
33280	Coating, engraving, heat treating, and allied activities	10	10	0	0%
	Other/unknown	87	82		
	Total	**2,350**	**2,438**	**88**	**4%**

Source: EMSI Complete Employment - September 2007

Economic Modeling Specialists, Inc (EMSI)[12] estimates that over 80% of jobs considered in this report are in the public sector. The three largest employers in Los Angeles County are the Los Angeles Department of Water and Power, the Los Angeles Sanitation District and the Metropolitan Water District of Southern California, which is a collaborative of 26 smaller water districts. The largest private employer is the Golden State Water Company, part of the American States Water Company, which is publicly traded on the New York Stock Exchange.[13]

Because of the budget constraints on public agencies, pressure on the industry to increase supply is expected to result in an increased role of private sector employers in the industry. Increased regulation has also resulted in some public utilities outsourcing their activities to

[11] Bureau of Labor Statistics, U.S. Department of Labor, *Occupational Outlook Handbook, 2008-09 Edition,* Water and Liquid Waste Treatment Plan and System Operators, http://www.bls.gov/oco/ocos229.htm
[12] Economic Modeling Specialists, Inc. http://www.economicmodeling.com/
[13] The American States Water Company, http://www.aswater.com/ Region II, http://www.aswater.com/Organization/Company_Links/Regions/Region_2/region_2.html

private companies. As private utilities expand, there will be more pressure on the publicly-owned facilities to improve their efficiencies and promote themselves to the consumers.[14]

Job Growth and Wages

According to the data presented in table 1, only 88 new jobs are expected to be created for water operators in Los Angeles County in the next 5 years; however, employers will also need to replace retirees. Many water operators are baby-boomers and will be leaving the industry in the next few years. For example, half of the Los Angeles Department of Water and Power's employees will be eligible to retire in the next five years.[15] Table 2 shows employment projections including both job creations and replacements (i.e. retirements).

Table 2: Employment Projections for Water Operators and Wages

		Growth Only				Growth + Replacements			
SOC Code	**Description**	**2007 Jobs**	**2012 Jobs**	**Change**	**% Change**	**New & Rep. Jobs**	**% New & Rep.**	**Median Hourly Earnings**	**Average Hourly Earnings**
51-8031	Water and liquid waste treatment plant and system operators	2,350	2,438	88	4%	578	25%	$25.43	$25.94

Source: EMSI Complete Employment - September 2007

By taking into consideration replacement needs, it is projected that employers will need to hire approximately 578 new water operators by 2012. The median hourly wage ($25.43) is close to the average hourly wage ($25.94) and both are relatively high for occupations that do not require a degree.

Occupations

As mentioned previously, the report focuses on "Water and Liquid Waste Treatment Plant and System Operators" (SOC 51-8031), which are referred to as "Water Operators" in this report. Water Operators, in water distribution, and water and wastewater treatment plants, control equipment and processes that remove or destroy harmful materials, chemicals, and microorganisms from the water. Operators also control pumps, valves, and other equipment that move the water or wastewater through the various treatment processes, after which they dispose of the removed waste materials.

In smaller plants or facilities, operators may be responsible for the entire treatment and distribution process in addition to handling administrative duties. In larger plants, there may be several levels and/or types of specialty operators who are each responsible for only one step in the process. In these larger plants, operators report to a Plant Supervisor or

[14] American Water Works Association Career Center Resources
http://www.awwa.org/careercenter/resources/docs/WaterIndustryTrends.cfm
[15] Los Angeles Infrastructure Academy: Overview, September 20, 2007 http://renewcalifornia.org/

Superintendent who generally has a degree in civil engineering or science, and work along side specialized chemists, laboratory technicians, and mechanics. As plants of all sizes are modernized and new plants are constructed, the level of technical and computer skills required of operators is steadily rising.[16]

Employers report having different career ladders (presented in Appendix B). Most commonly, employees start as technicians, then move to water operators (grades I to V), and with more training and education may continue as plant or system supervisors.

Training Requirements

A minimum of a high school diploma is usually required for water operators. Completion of a certificate program in water technology strongly increases an applicant's chances for employment and promotion, because of certification requirements and the increasing complexity of plants, systems, and procedures. In some cases, a degree or certificate program can be substituted for experience, allowing a worker to obtain a higher level of certification more quickly. [17]

Certification

All water operators (treatment, distribution, or wastewater) are required to have a State certification. The standards for certification are defined on a national level, and enforced by the Environmental Protection Agency. Water operators must hold specific certifications for the operations that they are monitoring. In California, there are four types of certifications with five levels in each type that are based on a water operator's experience, education, and type of facility where the water operator works.

- The California Department of Public Health (CDPH) certifies Water Treatment and Water Distribution Operators (these are separate certifications, but an individual can be cross-certified in both treatment and distribution). Requirements for certification by grade level for Water Treatment and Water Distribution Operators are available online at: http://www.cdph.ca.gov/certlic/occupations/Documents/Opcert/OperatorCertificationRegulations.pdf
- The Water Resources Control Board (WRCB) certifies Wastewater Operators. Requirements for certification by grade level for Wastewater Operators are available online at: http://www.swrcb.ca.gov/cwphome/opcert/docs/requirements.pdf
- Finally, there is a certification for the water treatment or wastewater facility itself that depends upon the size and capabilities of the plant.[18]

[16] Bureau of Labor Statistics, U.S. Department of Labor, *Occupational Outlook Handbook, 2008-09 Edition,* Water and Liquid Waste Treatment Plan and System Operators http://www.bls.gov/oco/ocos229.htm
[17] Bureau of Labor Statistics, U.S. Department of Labor, *Occupational Outlook Handbook, 2008-09 Edition,* Water and Liquid Waste Treatment Plan and System Operators, http://www.bls.gov/oco/ocos229.htm
[18] California Department of Public Health, Drinking Water Treatment and Distribution System Operators http://www.cdph.ca.gov/certlic/occupations/Pages/DWopcert.aspx (Last Update, March 5, 2008)

Water treatment and/or water distribution operators must renew their certification every 3 years, and wastewater operators every 2 years. Certification and recertification are based on a combination of educational level, experience, and continuing education units. Operators who hold an Associates Degree (or who have earned 60 units of college semester units) generally need two years less experience, in order to qualify for certification, than those with high school diplomas or equivalent. [19] Wastewater operators with no experience can apply for an Operator-in-Training certification for up to four years. They can hold any plant job during this time as long as they have the required supervision. During this time they can work on meeting both the education and experience requirements for regular certification.[20]

Industry Validation

A survey of public employers was conducted in 2007 for the Los Angeles/Orange County Regional Consortium by BW Research Partnership.[21] Water operators were among the ten occupations selected for the study, based on employment growth and/or workforce development needs. This occupation was the one with the highest replacement needs due to retirements. In addition, over 96% of employers surveyed reported difficulty finding qualified employees. This was significantly higher than any of the other occupations covered in the study. According to BW Research's findings, water operators are the types of workers expected to be the most undersupplied in the future, because of the high-level of retirements, the moderate growth, and the lack of qualified job applicants.

To obtain more specific information, the Center of Excellence interviewed 10 organizations representing water treatment, distribution, and wastewater, in March and April 2008. All employers were in the public sector, most of them being water districts or cities' department of water and power. Collectively, these organizations employ over 600 water operators in Los Angeles County. Businesses stated that employees often start as technicians, or work in maintenance or even as meter readers, to "get their foot in the door" and move up to positions with higher levels of responsibility and compensation. However, since 1998 all water operators are required to have a State certification. When asked how difficult it is to recruit qualified water operators, 6 respondents stated "very difficult", 2 "somewhat difficult" and 2 "not difficult". The 2 employers stating having no difficulty are small organizations hiring fewer than 10 water operators each year.

8 respondents explained that the job requirement that applicants most often do not meet is the State certification. Many applicants have certifications at grade I or II but few have higher levels of certification. Operators with certification at grade IV and V are difficult to find. To help their employees obtain higher levels of certification, half of respondents (the largest employers) offer training in-house and/or hire trainers to come to their sites. The Metropolitan Water District of Southern California needs to hire dozens of water operators each year and

[19] State Water Control Resources Board, Operator Certification Program, Requirements by Grade http://www.swrcb.ca.gov/cwphome/opcert/docs/requirements.pdf
[20] California Environmental Protection Agency, State Water Control Resources Board, Water Quality, Operator Certification Program http://www.waterboards.ca.gov/water_issues/programs/operator_certification/
[21] BW Research Partnership, Public Sector Workforce Challenges and Opportunities, July, 2007 http://www.laocrc.com/projects/6/BW_Research_LAOC_Report_08_06_07.pdf

has had difficulty recruiting qualified applicants. For this reason, a decision was recently made to expand their apprenticeship program to water operators, to adequately prepare individuals to replace retirees. Employees working for smaller organizations usually take classes at community colleges or universities (CSU or UC Extensions). CSU Sacramento was often cited because it offers online courses. Private organizations and associations such as the American Water Works Association are also often used for training.

When asked what role the community colleges can play in the preparation of water operators, half of employers suggested the expansion or creation of new water technology programs. Indeed, the East-end of the County has two community college programs (Citrus College and Mt. San Antonio College), but the rest of the County is only served by LA Trade Tech College. Employers confirmed that job applicants with certificates in water technology from community colleges were most desirable for the positions. Associate degrees are a benefit for those who seek more education, higher grades of certification, and advancement into supervisory positions.

The other half of respondents suggested that the colleges should focus on teaching chemistry, physics, hands-on mechanical skills, technical skills, regulations, communication (written and interpersonal), applied math, customer service for trade jobs (as opposed to sales for example) and English as a Second Language, and offer flexible options (as opposed to 16-week semesters and day time courses). They did not suggest that the colleges offer courses on the latest changes affecting the industry, because industry associations are already offering day-long sessions that cover what they need to learn to remain up-to-date.

9 out of 10 employers agreed that more needs to be done to promote the industry and create a pipeline of workers to replace incumbent workers as they retire. Although small in terms of number of jobs, the water industry offers great career opportunities, well-paying jobs, and job stability as the jobs have to remain local, and the need for water keeps increasing.

Existing Programs

Community College Programs in Los Angeles County

Training and education from the community colleges in Los Angeles County range from individual courses to certificate programs and degree programs as presented below:

Mt. San Antonio College

Water Technology Certificate: 18 Units Required

- Introduction to Water Systems
- Water Treatment
- Water Distribution
- Cross Connection Control – Certified Tester
- Cross Connection Control – Certified Specialist
- Water Hydraulics and Instrumentation

Citrus College

Associate in Science Degree in Water Technology: 60 Units Required

Water Technology Certificate: 18-20 Units Required; 6 classes, including:

- Introduction to Water Systems
- Water Resources and Distribution
- Water Treatment I
- Water Resources and Distribution II (or) Water Treatment II
- Business Mathematics (or) any Higher Level Mathematics
- One elective from a specific list of classes.

Additional classes offered:

- Cross connection control
- Water Distribution Exam Preparation class
- Water Systems Operations and Technology Update for industry incumbents required to renew their certification.

Los Angeles Trade Tech

Water Systems Technology – Associate in Science Degree (2 options available – Supply Water or Wastewater) 60 Units Required

Supply Water Option: Required Courses

- Modern Water Works I and II
- Water Systems Controls
- Water Purification I and II
- Backflow Prevention Devices
- Plumbing Layout & Estimating I
- Advanced Water Systems Controls
- Three elective courses and 30 units in general education.

Wastewater Option: Required Courses

- Wastewater Operations I – VI (includes Basic Laboratory Analyses, Mechanics, Fluids, Electricity, Public Health, Environment and Management)
- Water and Wastewater Mathematics
- Three elective courses and 30 units in general education.

A certificate for each of the 2 options can be obtained after completion of the 7 core courses, for a total of 21 or 22 units.

Colleges have varying levels of enrollment and involvement with businesses, but all three reported that about half of their students were already employed in the industry.

- Citrus college is expanding its programs and number of students served, although the college has encountered difficulty finding qualified instructors. Citrus College works very closely with public employers, and through an incumbent worker training grant for public works and water technology, offers on-site training for employees.
- LA Trade Tech College is maintaining its program and is participating in the LA infrastructure academy (see next page for more details).
- Mt. San Antonio College reported excellent enrollment in the program, but no ability to grow at this time. Moreover, Mt. San Antonio College is located only a few miles away from Citrus, and the two colleges work collaboratively to avoid destructive competition.

Los Angeles Infrastructure Academy[22]

In 2007, the Los Angeles Infrastructure Academy was formed to channel Los Angeles high school students into careers in the public sector and local utilities. The program starts during the summer before the students' junior year in high school and provides real-world experience along with special classes and career guidance throughout the remainder of the high school experience. Upon graduation, students will be transitioned into entry-level jobs and/or guided to community college programs that can provide appropriate certificates, AA or AS degrees or a foundation for transfer to University programs (see Appendix D for more information).

Los Angeles Trade Tech College is participating in the six-month pilot program to inaugurate the Academy in the Summer 2008. When fully operational, the academy's goal is to serve 1,700 students. In two years when Academy graduates start entering the workforce or transitioning to college programs, an effective pipeline will be in place for bringing fresh talent into these critical public sector jobs.

Other Education and Training Opportunities

Details of other regional community college programs and other training providers are available in Appendix D and Appendix E.

Implications and Recommendations for Community Colleges

The size of the opportunity (578 jobs in the next 5 years in Los Angeles County) does not justify a regional response from the colleges, because 3 colleges already have programs and individuals can obtain training from other providers (e.g.; universities and industry associations). However, to address the workforce development needs presented above, it is recommended that community colleges which already have courses in water technology do the following:

1. Create a pipeline of workers by partnering with high-schools, ROPs and WorkSource Centers to educate potential entrants on the opportunities in the industry and to recruit students.
2. Connect with the LA Infrastructure Academy, as it will soon expand beyond the city of Los Angeles, and counts many strategic partners (see Appendix F for more information).
3. Promote careers in water technology, by emphasizing existing career opportunities, high-wages, job stability and other factors that can be appealing to the youth, job seekers, and workers wanting to transition to another industry.
4. Develop materials presenting educational requirements for the different grades of certification, and highlight the career opportunities that exist for those who have earned an Associates Degree or a Bachelors Degree, to encourage students to continue their education.

[22] Los Angeles Infrastructure Academy: Overview, September 20, 2007 http://renewcalifornia.org/

5. Increase flexibility in course offerings (i.e. short-term courses, evening courses and online courses) to allow workers to take classes at convenient times, and complete the training more quickly.
6. Explore the possibility of delivering worksite training to incumbent workers via contract education.
7. LA Trade Tech might consider expanding their programs, since their participation in the LA Infrastructure Academy is likely to increase student demand for their programs, and because there is no other community college program in this area.

Conclusion

The water industry is facing numerous challenges due to the shortage of water supply, safety issues, new technologies, a growing demand for water, a high level of retirements and a need for workforce development. Three community colleges in Los Angeles County already have programs in water technology and are well-positioned to meet the industry's training needs. Through an incumbent worker training grant, Citrus College offered training at four employers' sites, and has expanded its programs and ability to serve the industry. LA Trade Tech may consider working more closely with employers as well, to develop training solutions for organizations that do not offer in-house training. The colleges can also play an important role by partnering with high-schools, ROPs, WorkSource Centers, and the LA Infrastructure Academy to promote careers in water technology, market their programs, and create a pipeline of workers to replace retirees.

Data Limitations

The labor market data for this report has considerable limitations. The water operator occupation is the best fit for the jobs studied in this report, but does not include all of the related jobs such as water technicians. There are no other occupational categories to capture the other jobs related directly to water treatment and distribution. The data available from the California Employment Development Department seems to under-represent the number of jobs (based on employers' feedback). For this reason, data provided by EMSI was used, as it seemed more representative of the actual labor market.

Santiago Canyon College identified a list of job titles that their graduates and certificate holders have, which include environmental laboratory technician, ultra-pure water technician, industrial pre-treatment coordinator, engineering consultant and technician, surface water manager, and state and federal regulator. Another related emerging occupation identified in the LA/OC Public Sector Employer Survey is energy or water conservation specialist or planner. Unfortunately, these jobs are not captured in the data because they do not have their own occupational codes, and cannot be isolated for study. Therefore, the number of jobs estimated in this report is most likely lower than the actual number of jobs that students would qualify for.

References and Resources

American Water Works Association Career Center Resources
http://www.awwa.org/careercenter/resources/docs/WaterIndustryTrends.cfm

Brandhuber, Philip J, "Trends in Drinking Water Treatment." Water and Wastes Digest,
http://www.wwdmag.com/%20Trends-in-Drinking-Water-Treatment-article6437

Bureau of Labor Statistics, U.S. Department of Labor, *Occupational Outlook Handbook, 2008-09 Edition,* Water and Liquid Waste Treatment Plan and System Operators, on the Internet at http://www.bls.gov/oco/ocos229.htm

BW Research Partnership, Public Sector Workforce Challenges and Opportunities Report Conducted for the Los Angeles/Orange County Regional Consortium, July, 2007
http://www.laocrc.com/projects/6/BW_Research_LAOC_Report_08_06_07.pdf

California Department of Public Health, Drinking Water Treatment and Distribution System Operators
http://www.cdph.ca.gov/certlic/occupations/Pages/DWopcert.aspx (Last Update, March 5, 2008)

California Environmental Protection Agency, State Water Control Resources Board, Water Quality, Operator Certification Program http://www.waterboards.ca.gov/water_issues/programs/operator_certification/

California Occupational Guide No. 443 (2005) Drinking Water Treatment and Distribution Operators/Wastewater Treatment Plant Operators p. 5 http://www.calmis.ca.gov/file/occguide/WATEROP.PDF

Deloitte/Technology, Media, and Communications, Technology Predictions, TMT Trends 2008,
http://www.deloitte.com/dtt/cda/doc/content/cz%28en%29_tmt_tech_trends_140208.pdf

Economic Modeling Specialists, Inc. (EMSI) http://www.economicmodeling.com/

Los Angeles City Personnel Department, Career Ladders, Water Treatment Operator
http://www.lacity.org/per/eeo/career/Water%20Treatment%20Operator.pdf

Los Angeles Department of Water and Power, Scattergood Seawater Desalination Pilot Project
http://www.ladwp.com/ladwp/cms/ladwp001350.jsp and Current Recycling Projects at
http://www.ladwp.com/ladwp/cms/ladwp004170.jsp

Los Angeles Infrastructure Academy: Overview, September 20, 2007 http://renewcalifornia.org/

Nuzzo, Jennifer; "The Biological Threat to U.S. Water Supplies; Toward a National Water Security Policy," Biosecurity and Bioterrorism: Biodefense Strategy, Practice, and Science; Volume 4, Number 2, 2006. pp 147-159 http://www.liebertonline.com/doi/pdfplus/10.1089/bsp.2006.4.147

Orange County Business Council, Education and Training Needs in the OC Water Treatment and Distribution Industry, Prepared for Water Utility Science Program, Career Education Division, Santiago Canyon College, 2004-2005 http://www.sccollege.edu/apps/page.asp?Q=Water%20Report&menutab=3&pro=68

State Water Control Resources Board, Operator Certification Program, Requirements by Grade
http://www.swrcb.ca.gov/cwphome/opcert/docs/requirements.pdf

The American States Water Company, http://www.aswater.com/ Region II information is found at
http://www.aswater.com/Organization/Company_Links/Regions/Region_2/region_2.html

Appendices

Appendix A: How to Utilize this Report

About Us - Description of BWPI

The Business and Workforce Performance Improvement (BWPI) initiative is focused on building the capacity of the colleges in the area of economic and workforce development to enhance their ability to deliver education and training services to businesses and workers in high growth industries, new technologies, and other clusters of opportunities.

The Centers of Excellence (COE) within BWPI provide information regarding workforce trends, increasing awareness and visibility about the colleges' economic and workforce development programs and services, and building partnerships with business and industry.

The goal is to position the colleges as the workforce partners of choice to business and industry and ensure that college programs are current and responsive. This will contribute to the overall economic vitality of the communities in which they serve.

How to Use This Report

The Centers of Excellence within the Business and Workforce Performance Improvement Initiative of the California Community College Economic and Workforce Development Program have undertaken Environmental Scanning to provide targeted and valuable information to community colleges on high growth industries and occupations.

This report is intended to assist the decision-making process of California community college administrators and planners in addressing local and regional workforce needs and emerging job opportunities in the workplace as they relate to college programs. The information contained in this report can be used to guide program offerings, strengthen grant applications, and support other economic and workforce development efforts. This report is designed to provide current industry data that will:

- Define potential strategic opportunities relative to an industry's emerging trends and workforce needs.
- Inform local college program planning and resource development.
- Promote a future-oriented and market responsive way of thinking among stakeholders.

Important Disclaimer

All representations included in this industry scan report have been produced from a 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. The purpose of the Environmental Scan is to assist the California Community Colleges to respond to emerging market needs for workforce performance improvement. However, neither the Business and Workforce Performance Improvement Centers of Excellence, COE host college nor California Community Colleges Chancellor's Office are responsible for applications or decisions made by recipient community colleges or their representatives based upon this study including components or recommendations.

Additional Information

The Business and Workforce Performance Improvement Initiative is funded in part by the Chancellor's Office, California Community Colleges, Economic and Workforce Development Program. The total grant amount (grant number 07-305-016 for $205,000) represents funding for multiple projects and written reports through the Center of Excellence.

Our mission is to strengthen California's workforce and advance economic growth through education, training and job development.

Appendix B: Career Ladders

1. Los Angeles Department of Water and Power's career ladder:[23]

<table>
<tr><td colspan="3">Water Utility Superintendent</td></tr>
<tr><td rowspan="2">Water Treatment Supervisor</td><td rowspan="2"></td><td>Waterworks Supervisor</td></tr>
<tr><td>Waterworks Mechanic I and II</td></tr>
<tr><td colspan="3">Water Treatment Operator</td></tr>
</table>

2. Career ladder identified by California Water Environment Agency (CWEA)[24]

Operations Manager or Superintendent
Chief Plant Operator Operations Supervisor Senior or Lead Plant Operator
Water and Liquid Water Treatment Operator

3. Career ladder presented in the 2007 Public Sector Employer Report by BW Research[25]

Plant or Systems Supervisor
Water or Wastewater Operator or Senior Technician
Water/Wastewater Technician or Junior Operator
Community College Student

[23] Los Angeles City Personnel Department/Career Ladders/Water Treatment Operator http://www.lacity.org/per/eeo/career/Water%20Treatment%20Operator.pdf

[24] California Occupational Guide No. 443 (2005) Drinking Water Treatment and Distribution Operators/Wastewater Treatment Plant Operators p. 5 http://www.calmis.ca.gov/file/occguide/WATEROP.PDF

[25] Orange County Business Council, Education and Training Needs in the OC Water Treatment and Distribution Industry, Prepared for Water Utility Science Program, Career Education Division, Santiago Canyon College, 2004-2005 http://www.sccollege.edu/apps/page.asp?Q=Water%20Report&menutab=3&pro=68

Appendix C: Wastewater Operators Certification Requirements by Grade

REQUIREMENTS BY GRADE

Please refer to Sections 3670.1, 3671 and 3683, Title 23, of the California Code of Regulations for more information. Please contact the Office of Operator Certification at (916) 341-5672 or scfong@waterboards.ca.gov if you have questions on qualifying duties and education.

GRADE I			
Path 1	6 educational points	and	1 year performing the duties of an operator while holding a certificate
GRADE II			
Path 1	High School or equivalent and 6 educational points	and	2 years performing the duties of an operator while holding a certificate
Path 2			1 ½ years performing the duties of an operator while holding a Grade 1 certificate
GRADE III			
Path 1	Associate degree or 60 college semester units, either of which includes 15 semester units of basic science courses	and	2 years performing the duties of an operator while holding a certificate
Path 2	High School or equivalent and 16 educational points	and	4 years performing the duties of an operator while holding a certificate
Path 3			3 years performing the duties of an operator while holding a Grade II certificate
GRADE IV			
Path 1	Bachelor's degree with a major related to wastewater treatment including 30 semester units of basic science courses	and	2 years performing the duties of an operator while holding a certificate
Path 2	Associate degree or 60 college semester units, either of which includes 15 semester units of basic science courses	and	4 years performing the duties of an operator while holding a certificate
Path 3	High School or equivalent and 32 educational points	and	6 years performing the duties of an operator while holding a certificate
Path 4			4 years performing the duties of an operator while holding a Grade III certificate
GRADE V			
Path 1	Valid license as a civil or chemical engineer issued by the California Board of Registration for Professional Engineers and Land Surveyors	and	4 years performing the duties of an operator while holding a certificate
Path 2	Bachelor's degree with a major related to wastewater treatment including 30 semester units of basic science courses	and	5 years performing the duties of an operator while holding a certificate
Path 3	Associate degree or 60 college semester units, either of which includes 15 semester units of basic science courses	and	6 years performing the duties of an operator while holding a certificate
Path 4	High School or equivalent and 48 educational points	and	10 years performing the duties of an operator while holding a certificate
Path 5			6 years performing the duties of an operator while holding a Grade IV certificate

Source: Water Resources Control Board http://www.swrcb.ca.gov/cwphome/opcert/docs/requirements.pdf

Appendix D: Other Local Community College Programs

Santiago Canyon College (Orange County, Rancho Santiago District)

Water Science Program (http://www.sccollege.edu/apps/comm.asp?Q=68)

Santiago Canyon offers Certificates of Completion and Associate of Science Degrees in Water Distribution, Water Treatment and Wastewater/Environmental Sanitation.

Water Distribution 24 units required	**Water Treatment** 24 units required	**Wastewater/ Environmental Sanitation** 24 Units Required
• Water Mathematics and Hydraulics • Electrical Wiring and Circuits • Telemetering and Instrumentation Principles • California Water Resources • Water Distribution Systems • Water Reclamation and Reuse Pumps and Pumping • Advanced Water Distribution	• Water Mathematics and Hydraulics • Water Treatment Fundamentals • Advanced Water Treatment • Water Chemistry and Bacteriology • California Water Resources • Water Distribution Systems • Water Reclamation and Reuse • Water Sources and Conservation: The Colorado River System	• Water Mathematics and Hydraulics • California Water Resources • Introduction to Operation of Wastewater Treatment Plants • Advanced Operation of Wastewater Treatment Plants • Sewer Facilities Maintenance • Water Reclamation and Reuse • Pumps and Pumping

In addition, Santiago Canyon College partners with the American Water Works Association and other organizations to host an annual, day-long Joint Instrumentation Workshop allowing management, field and laboratory personnel from the California-Nevada Region to gain continuing education contact hours.

Appendix E: Other Training Providers and Industry Associations

American Water Works Association (AWWA):
AWWA provides ongoing education through on-line classes, on-site seminars, teleconferences, webcasts, and discussion forums. AWWA course offerings include introductory, distribution, occupational health and safety, security, human resources, environmental compliance courses. AWWA holds two conferences per year through which operators can receive contact hours.

California Water Environment Association (CWEA):
CWEA hosts numerous events and conferences throughout the year for wastewater professionals. These events offer opportunities for technical training and contact hours.

360Water.com:
360Water.com offers a variety of water and wastewater continuing education courses through which water professionals can earn contact hours. In addition to the more traditional types of water courses, 360Water offers training in very specific water technologies.

CEU Plan:
CEU Plan offers state approved, on-line training course for contact hours. Courses include standard operator courses as well as courses in terrorism vulnerability, accounting, leadership and communication.

A more extensive list of training providers approved for California operators is available on the California Water Environment Association web site, at: http://www.cwea.org/pdf/tcp/TrainingList-CA.pdf.

Water Infrastructure Security Training is also available through EPA's Drinking Water Academy (see http://www.epa.gov/safewater/dwa.html) and the Association of State Drinking Water Administrators (see www.asdwa.org).

Appendix F: Los Angeles Infrastructure Academy

Renewing the California Dream: the Los Angeles Infrastructure Academy

Overview / September 20, 2007[26]

A Workforce Development Crisis in Civil Infrastructure

Los Angeles is in the midst of a massive building effort: LA Live!, Grand Avenue, the Expo and Gold subway lines, the LA River, LAUSD and the community colleges' building campaigns, LAX renovation, and so on. Over the next decade, $100 billion will be invested in public and private construction in LA County. The utilities will transition to cleaner sources of energy and better water conservation. Yet the workforce that builds and maintains our infrastructure is nearing retirement. Half of the Department of Water and Power's workforce will be eligible to retire in the next five years. The other utilities and skilled trades face similar workforce challenges.

At the same time, over half of LAUSD students fail to graduate on time. Too often, these young people join gangs, become pregnant, or enter dead-end jobs. Many students drop-out because they think school is irrelevant. A recent study found that 81% of drop-outs want to see a connection between school and work… they want to get a good job.

One Mission… Many Positive Outcomes

The mission of the LA Infrastructure Academy is to build a pipeline of diverse, well-qualified, young people to enter the civil infrastructure field and place them into careers. Utilizing an after-school/summer school/Saturday school model, the Academy will prepare high school students for careers with the employers who build and maintain our infrastructure. In addition, the Academy will address several other important priorities for the city of LA:

- *Education Reform* – Creating "multiple pathways" to success will increase student motivation and retention by providing students with the necessary skills, knowledge, and preparation to enter directly into a career or continue their education.
- *Gang Prevention* – The most dangerous hours for young people are after-school. Engaged young people are far less likely to participate in illegal behavior.
- *Economic Development* – Creating opportunities for young people to enter living wage careers will foster the development of middle class communities in LA.
- *Environment* – Young people will learn the rationale for "greening LA" as well as sustainable development techniques and technologies.

Critical Partnerships

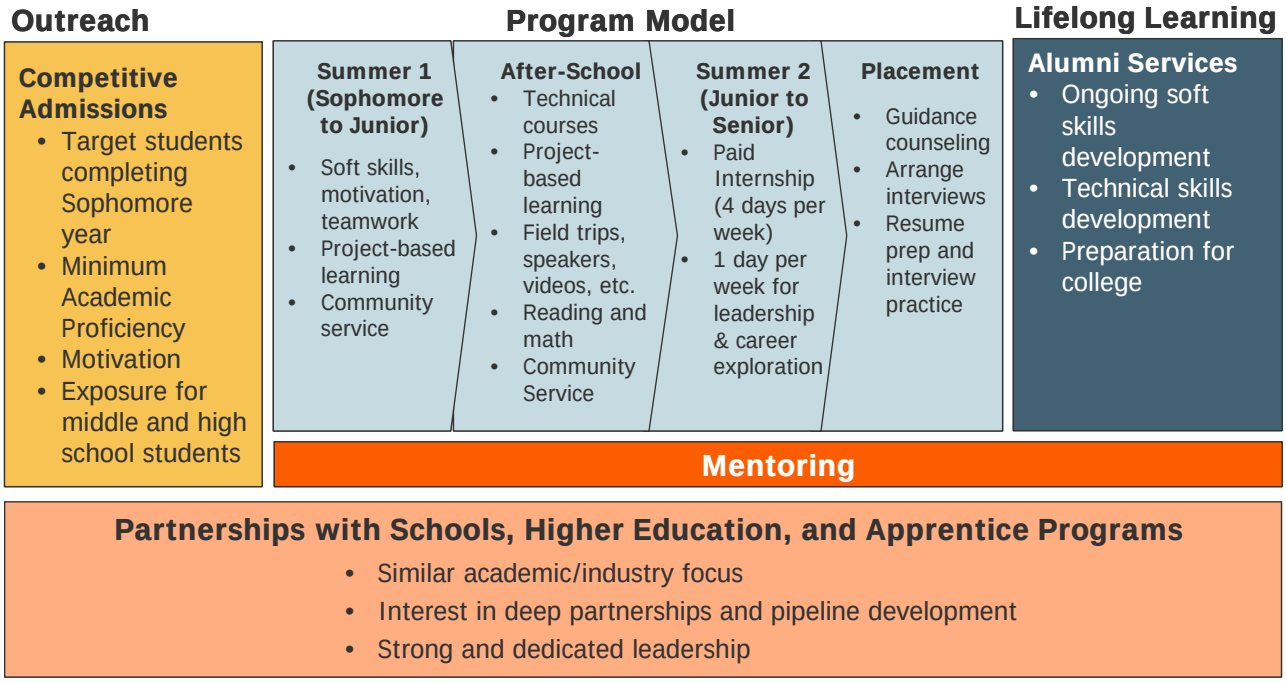
To bridge the gap between school and work, partnerships with each are essential. We will partner with the Los Angeles Department of Water and Power, the Metropolitan Water District, the Southern California Gas Company, the International Brotherhood of Electrical Workers Local 18, the Utility Workers Union of America, the College of Engineering at California State University at Los Angeles, Los Angeles Trade Tech College, and the Los Angeles Unified School District. Each of these partners will contribute money, people, knowledge, or other resources. Community based organizations such as the Youth Policy Institute, Community

[26] Source: Renewing the California Dream: the Los Angeles Infrastructure Academy, 2007, http://renewcalifornia.org/Infrastructure%20Academy%20Overview.doc

Coalition, and Inner City Struggle will help to spread the word about this program and these amazing career opportunities.

An Innovative Program Model

The LA Infrastructure Academy, which will be an independent non-profit organization, will serve high school juniors and seniors and place them into careers. The program and curriculum design will be based on research of what works in small schools and youth development programs. Partnerships with high schools, higher education, and union apprentice programs will be critical.



Start-Up and Expansion

The program will start in January 2008 with a 6-month pilot program at LA Trade-Technical College. The full program will begin in summer 2008 with four sites including LA Trade Tech and the College of Engineering at California State University, Los Angeles. Specific sites and school partners are currently under consideration. Further expansion will occur geographically (including beyond the City of Los Angeles) to address employer need and school demand. In the future, the Academy will expand to address other industries including telecommunications, civil construction, trade and logistics, and transit.

Funding and Sustainability

Initial funding will be provided by a diverse set of funders including employers, foundations, California Department of Education after-school funding, and 21st Century grants. The Academy will also pursue federal and state grants. In addition, partners will provide significant in-kind funding for facilities, instructors, subject matter experts, and mentors. The pro forma budget anticipates $1 million for 2007-08 and $4.3 million for 2008-09. Over time, the Academy will move to a "fee-for-hire" funding model where employers pay for each program graduate they hire.