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ENVIRONMENTAL SCAN

WATER EFFICIENCY TECHNOLOGY IN THE PLUMBING SECTOR

GREATER SACRAMENTO REGION

OCTOBER 2008



CENTER OF EXCELLENCE,
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**CALIFORNIANS CONSUME AN AVERAGE OF 180 GALLONS OF WATER PER CAPITA EVERY DAY,
BUT THE INSTALLATION OF EXISTING WATER EFFICIENT TECHNOLOGY COMBINED WITH A
TRAINED WORKFORCE COULD REDUCE THIS RATE BY ONE THIRD.**

SOURCE: GREENPLUMBERS USA AND WASTE NOT, WANT NOT: THE POTENTIAL FOR URBAN WATER CONSERVATION IN CALIFORNIA

Executive Summary

Water efficiency technology has become an important issue to Californians due to the depleting reserves caused by an inefficient use of water and a drought that is expected to continue through 2009. New technology in the plumbing sector can significantly decrease the average daily consumption rate, but requires an increase in installation as well as a trained workforce. Several trends are increasing demand for green and sustainable products, including economic and environmental benefits, public policy and regulatory support, and cost efficient technology. Of these, public policy is having the largest impact on the industry.



In July 2008, California became the first state in the nation to approve building code standards with specific water conservation criteria. The new code calls for a 20 percent reduction of general water usage and a 50 percent reduction of landscaping water usage with all new building construction. Although the new code is currently voluntary, it is expected to be mandatory by late 2010 or early 2011. The lag from voluntary to mandatory provides plumbing organizations time to prepare and train their workforce, and architects and landscape designers time to incorporate the new standards into building and grounds planning.

To assess the training and workforce needs of the plumbing sector, the Northern California Center of Excellence, in partnership with BW Research, launched and completed a survey of 50 of the approximately 500 plumbing businesses in the Greater Sacramento Region. The primary objectives included:

- Explore the changes in the plumbing sector due to new green technologies and state and local policies;
- Develop employment projections, assess skills and educational requirements;
- Create a gap analyses for current and future skill sets; and,
- Identify job development strategies for green plumbing occupations.

The survey findings revealed that nearly half (48%) of plumbing businesses in the region will add new employees while more than one third (38%) expect to stay the same size in the next 12 months. Given that the construction industry has seen a sharp decline of sales over the last few

years, these findings indicate a positive economic shift and a growing need for a trained workforce.

Four out of five employers indicated that certificates or specific training in plumbing is somewhat or very important for new applicants. Employers expressed less specific need for training in green and sustainable technologies; only 30 percent of respondents worked on a green project in the last year. However, 46 percent expect demand for green projects to increase in the next 12 months.

Lastly, more than half of the employers surveyed reported difficulty in hiring entry level employees with the appropriate education and training. Since there are no community college programs in the Sacramento area that provide plumber training, this represents an opportunity for community colleges to develop a certificate or program to meet the industry's current and projected workforce needs. As the demand for water efficiency technology grows, there will also be a demand for training on the new building code standards and installation of green and sustainable products.

Introduction

The California Community Colleges Economic and Workforce Development Program (EWD) has charged the Centers of Excellence with identifying industries and occupations that have unmet employee development needs at a regional level. In September 2008, the Center of Excellence, in partnership with BW Research, surveyed 50 plumbing businesses in the Greater Sacramento Region to examine the impact of water efficiency technology on the plumbing sector's employment needs, skill and education requirements, and job development requirements.

The research findings, which are being released fully for the first time in this report, provide colleges with timely and credible information for the development of green plumbing training and education programs. The Greater Sacramento Region includes the following six counties: Sacramento, Placer, El Dorado, Yolo, Yuba, and Sutter.

Industry Overview

Californians consume an average of 180 gallons of water per capita every day,¹ but the installation of water efficient plumbing technology combined with appropriate public policy could significantly reduce this rate. This section summarizes the key elements that are increasing demand for water efficiency technology in the residential and commercial plumbing sector including: 1) California's water crisis; 2) the economic and environmental impact of water consumption; 3) public policy and legislative changes; and, 4) cost efficient plumbing technology.

California's Water Crisis

Drought, climate change, and population growth are depleting California's water supply, creating an unreliable system and increasing the need for water efficiency technology. In June 2008, Governor Arnold Schwarzenegger issued an executive order declaring a statewide drought and a State of Emergency Proclamation for 9 counties in the Central Valley including Sacramento County. The order required state agencies and departments to "take immediate action to address the serious drought conditions and water delivery limitations that currently exist in California." Since then, water restrictions have been placed on the Sacramento-San Joaquin Delta, one of the largest delivery systems in the state, and a water bank has been set up to purchase water supplies from willing sellers to help eliminate the risk of water shortages.²

California has a history of prolonged drought periods with the last multi-year drought recorded in 1987-92.² Even though there are relatively long periods between severe droughts, climate change may reduce the time intervals and/or increase the severity of drought conditions. Recent research by the California Department of Water Resources shows that California minimum air temperatures have risen, creating fewer extremely cold days, reducing mountain snow-pack, and increasing spring-season runoff.³ If these conditions persist, the availability of freshwater will continue to diminish.

Further, the state's population growth has reduced the amount of available freshwater per capita. From the onset of this century, the available water has declined while the population has grown. Between 2000 and 2007, California's population grew by nearly 8 percent; it is expected to

¹ *Waste Not, Want Not: The Potential for Urban Water Conservation in California*, Nov. 2003, Estimate for California's urban water use in 2000.

² California Department of Water Resources, *Drought Conditions*, 2008.

³ "Progress on Incorporating Climate Change into Management of California's Water Resources," *Climatic Change*, Springer, Netherlands, Volume 89, Supplement 1, March 2008, pg 91-108.

continue to grow at a similar rate in the future.⁴ Between 2000 and 2030, California's population is projected to grow by 44 percent from about 34.1 million to 49.2 million, while the freshwater supply, at best, will remain at the same level.⁵ It is clear that today's water crisis is not going to disappear on its own, but rather must be addressed at the state and local level.

Economic and Environmental Benefits

The most important benefit of water conservation is it will help to ensure that future generations have access to freshwater. It will also help to boost economic activity, provide cost-savings to consumers and businesses, and reduce energy consumption. Below are four key examples of the economic and environmental benefits of water conservation:

- According to the Pacific Institute's study, *Waste Not, Want Not*, "one-third of California's current urban water use – more than 2.3 million acre-feet (AF) – can be saved with existing technology." The study goes on to state that at least 85 percent of the 2.3 million AF would provide a cost-savings to consumers over a relatively short period of time.
- GreenPlumbersUSA estimates that an investment of water efficiency technology in a large commercial structure, like a hotel, would show an evident ROI within a few years. For example, an investment of \$47,000 dollars in water efficiency fixtures and products at a hotel would result in approximately \$192,000 in water savings and \$48,000 in energy savings over a ten-year period.
- In the agricultural and construction sectors, water rationing has a significant impact on profits, which results in project delays or reduction of crops. According to the California Department of Water Resources, the total economic losses caused by the drought in the first 7 months of 2008 were \$245.8 million. Reducing water consumption in other uses would support economic activity in these industry sectors, creating thousands of jobs and adding millions of dollars to the state's annual GDP.
- California's water treatment and delivery system is one of the largest consumers of energy, accounting for seven percent of all electricity consumed in the state each year. At the end user level, water cooling, heating, and circulation systems also consume a large amount of energy.⁶ Thus, water conservation efforts would lower consumer water and energy bills while lowering carbon dioxide emissions.

Public Policy and Regulatory Support

Federal, state, and local policies play an important role in driving demand for water efficiency products and systems. The most notable policy change is within the California Building Standards Code. California is the first state in the nation to approve building standards with specific water conservation criteria. The new code calls for a 20 percent reduction of general water usage and a 50 percent reduction of landscaping water usage with all new building construction. Although the new code is currently voluntary, it is expected to be mandatory by late 2010 or early 2011. Appendix B reviews the changes to the California Building Codes Standards related to water

⁴ U.S. Census Bureau, Population Estimates Program.

⁵ California Department of Finance, Population Projections, Released July 2007.

⁶ Pacific Institute, "Energy Down the Drain: The Hidden Costs of California's Water Supply," August 2004

efficiency technology. Below is a summary of existing and pending policies that are impacting the demand for water efficiency technology in the plumbing sector.

Table 1: Water Efficiency Policies Influencing the Plumbing Sector

Legislative Policy	Description / Requirements	Status
State Assembly Bill 2572	This bill requires that all cities and counties install and use water meters by 2025. Water meters ensure that consumers are charged for the amount of water they use. The City of Sacramento is implementing this measure in stages. 'Those who have meters installed prior to January 1, 2009 will be switched to metered billing January 1, 2010. Those who have meters installed after January 1, 2009 will receive one calendar year of comparative billing before being switched to a metered rate.'	Approved
State Assembly Bill 715	This bill requires that all water closets sold or installed in California use no more than an average of 1.6 gallons per flush. On and after January 1, 2014, all water closets, other than institutional water closets, must be high-efficiency water closets in which the effective flush volume does not exceed 1.28 gallons. The law is set to a progressive timetable requiring that the total number of high efficiency models offered for sale in the state be: (A) Fifty percent in 2010. (B) Sixty-seven percent in 2011. (C) Seventy-five percent in 2012. (D) Eighty-five percent in 2013. (E) One hundred percent in 2014 and thereafter.	Approved
U.S. House of Representatives 3957	'Water Use Efficiency and Conservation Research Act - Requires the Environmental Protection Agency's (EPA) Assistant Administrator for Research and Development to establish a research and development program to promote water use efficiency and conservation, including: (1) technologies and processes that enable the collection, treatment, and reuse of rainwater and graywater; (2) water storage and distribution systems; and (3) behavioral, social, and economic barriers to achieving greater water use efficiency. Requires the Administrator to: (1) facilitate the adoption of technology and processes to increase water use, water efficiency, and conservation; and (2) collect and disseminate information on technologies and processes to increase water use and conservation, including information on incentives and impediments to development and commercialization, best practices, and anticipated increases in water use efficiency resulting from the implementation of specific technologies and processes.'	Pending
California Building Standards Code	The new code calls for a 20 percent reduction of general water usage and a 50 percent reduction of landscaping water usage with all new building construction – residential, commercial and public. While the code will be voluntary in 2009, it is expected to be mandatory by late 2010 or early 2011.	Currently voluntary; Pending approval by state appointed authorities
Leadership in Energy and Environmental Design (LEED) 2009	The US Green Building Council, the founding entity of LEED, has requested a greater representation of water efficiency in the 2009 LEED rating system. The LEED 2009 draft includes a 20 percent reduction of water usage from the calculated baseline. This is a significant improvement from the previous version of the LEED rating system.	Pending / Available for public comment
Sacramento County Water Agency Rebate	Offers several rebate programs to replace outdated washing machines and toilets with high efficiency and low flow products.	Ongoing

Program		
Federal Incentives for Renewable Energy	The Energy Policy Act of 2005 (H.R. 6, Section 1335) established a 30% tax credit up to \$2,000 for the purchase and installation of residential solar water heating systems.	Expires 12/31/08
Sacramento Municipal Utility District	'The Sacramento Municipal Utility District's (SMUD) Solar Domestic Hot Water Program provides rebates and/or loan financing to customers who install solar water heating systems. Rebates of \$1500 per solar water heating system are available for SMUD residential customers who replace their electric water heating system. In addition, SMUD offers 100% loan financing to cover the remaining costs with a ten-year repayment period.'	Ongoing

Plumbing Technology

As the demand for water efficiency technology increases, plumbers are beginning to be asked to conduct residential and commercial inspections. These inspections provide consumers with a review of their current water consumption and ways to conserve through fixtures, fittings, appliances and systems.

The top three technologies for conserving water include:

- (1) Water saving fixtures and fittings;
- (2) Water efficient appliances; and,
- (3) Harvesting rainwater and recycling graywater for indoor and outdoor use.

Replacing conventional plumbing fixtures with water saving fixtures is one of the easiest conservation strategies to implement. Efficient fixtures use less water while maintaining the same or similar performance compared to conventional models. Low flow showerheads, faucets, and toilets typically reduce the amount of water usage by 25 to 50 percent. Water efficient irrigation systems reduce evaporation, reducing the amount of water used by as much as 75 percent.

Water efficient appliances can also save a significant amount of water. ENERGY STAR certified dishwashers and front load clothes washers reduce the total water and energy needed for operation. Not only do these products reduce the water usage, they also use about 40 percent less energy than older models.

Recycling graywater is the process of reusing wastewater, except toilet water and water containing food waste. Similarly, harvesting water captures rainwater for everyday use. These systems can offset freshwater usage by 60 to 95 percent, depending on the precipitation in the area.

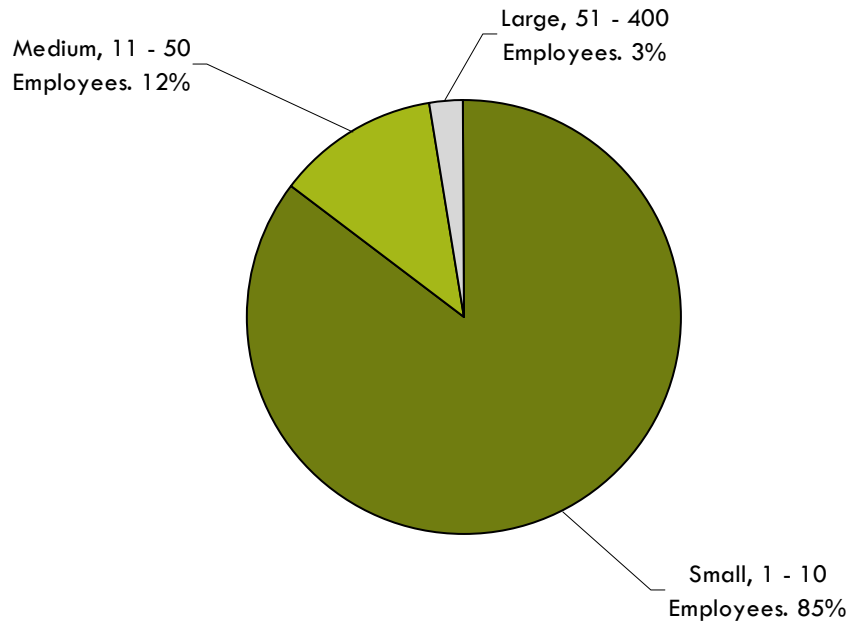
Another method of reducing consumption is through the use of alternative hot water heating systems, such as tankless hot water heating systems. These alternative heating systems are an important element of water technology that can significantly decrease the amount of water and electricity consumed on a daily basis.

Occupational Overview

Size and Distribution

In the Sacramento Region, there are approximately 500 plumbing businesses, with the largest concentration within Sacramento County. As shown below, the majority of plumbing firms employ 10 or less employees and only a small handful employ more than 50 employees, suggesting that the plumbing industry offers excellent entrepreneurial opportunities. The Sacramento region also has a higher concentration of plumbing and HVAC workers than the industry's overall employment at the statewide level. Some of the larger plumbing businesses in the Sacramento Region are profiled in Table 2.

Figure 1: Size of Plumbing Businesses in the Greater Sacramento Region⁷



⁷ InfoUSA Data, 2007.

Table 2: Major Plumbing Businesses in the Greater Sacramento Region⁸

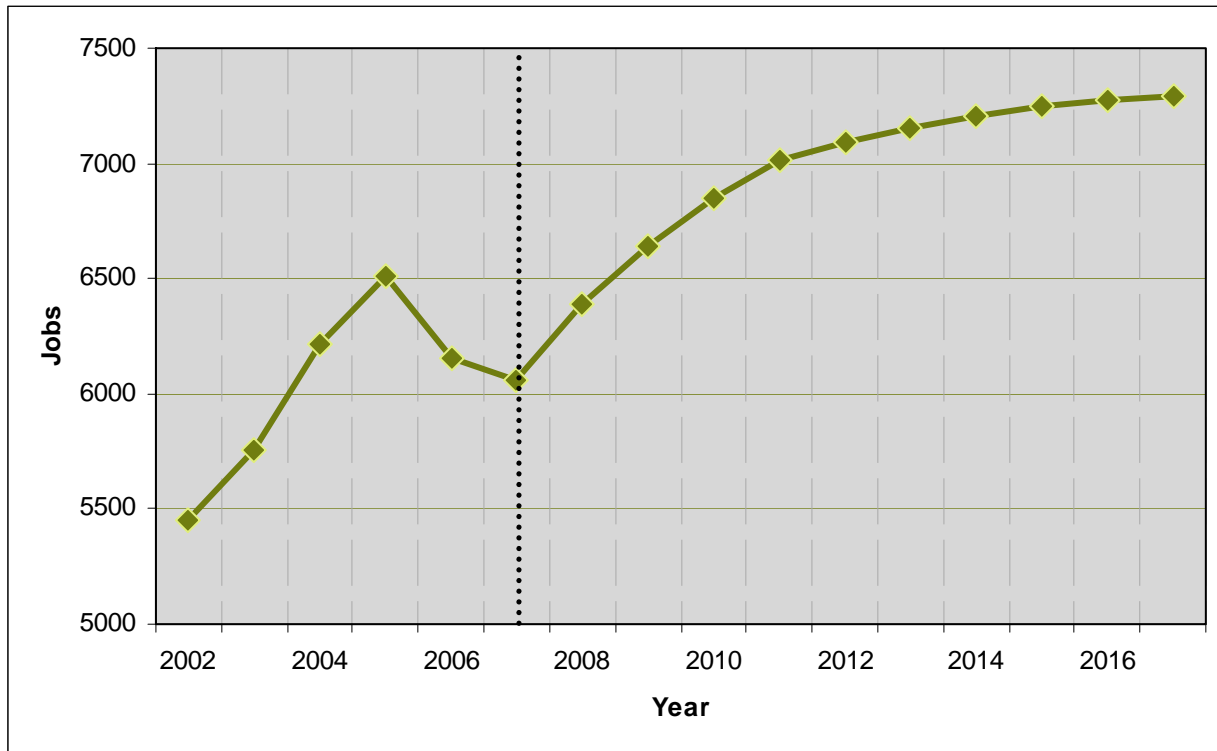
Company	City	Products/Services	Employees
J R Pierce Plumbing Co. Inc.	Rocklin	Project engineering, plumbing design, and commercial and residential plumbing services.	250
Bianchi Plumbing Co. Inc.	Roseville	Residential and commercial, design, installation, service and repair. All plumbing types, includes heating & air.	175
Northstar Plumbing	Sacramento	Employee owned, residential & commercial with emphasis on environmental awareness, safety & training programs.	160
B Z Plumbing Co. Inc.	Lincoln	New homes, residential & commercial. Services include plumbing, video camera pipe inspection, sewer & drain cleaning, and fire protection. Use of green products.	100
Risse Mechanical	Rio Linda	Commercial and residential, plumbing and mechanical piping, heating and AC, repairs, service design, and installation.	80
Ace Plumbing	Sacramento	Full service residential and commercial plumbing. New, remodels, and repairs and service.	30
Bonney Plumbing	Sacramento	Commercial and residential plumbing services. Full service installation and repairs. Sewer & waterline repairs.	23

⁸ InfoUSA, executive interviews and company web sites.

Growth and Earnings

Similar to other construction trade industry sectors, the plumbing sector experienced a sharp decline of sales as the booming housing market deteriorated. As shown in Figure 2, several employers downsized their workforce to offset the decline in sales in 2006 and 2007. Though the market has not fully rebounded, employment projections show a return to growth in the near term. Locally, a survey of 50 plumbing employers revealed that nearly half (48%) anticipate that their businesses will grow in the next 12 months and over one third (38%) estimate they will stay the same size. Only 2 businesses (4%) responded that they will employ less people in the next 12 months.

Figure 2: Job Growth in Plumbing Occupations, 2002-2017⁹



Note: The line break in the above chart differentiates between historic data and projection data.

⁹ EMSI Data, August, 2008. Data compiled by grouping plumbing occupations.

As shown in Table 3, the plumbing sector in the Greater Sacramento Region is projected to grow by 20 percent from about 6,050 jobs in 2007 to 7,300 jobs in 2017. This mirrors the average growth rate for the region during the same time period. The plumbing sector is also expected to replace about 950 plumbers, pipefitters and steamfitters and about 230 helpers during this time period due to separations caused by retirements, career changes, and turnover.¹⁰

Table 3: Job Growth in Plumbing Occupations, 2007-2017¹⁰

Occupation Title	New Jobs		2007 – 2017 Change	
	2007	2017	Absolute	Percent
Plumbers, pipefitters, and steamfitters	5,109	6,150	1,041	20%
Helpers: pipelayers, plumbers, pipefitters, and steamfitters	954	1,143	189	20%
Total	6,063	7,293	1,230	20%

Table 4 provides the 2007 hourly earnings by percentile. Plumbers earn good wages with median earnings slightly above the region’s median average for all occupations. Ten percent of the plumbers, pipefitters, and steamfitters are earning \$75,650 annually / \$36.37 per hour and 90 percent are earning at least \$26,603 annually / \$12.79 per hour.

Table 4: Percentile Annual Salary and Hourly Earnings of Plumbing Occupations, 2007¹⁰

Occupation Title	Percentile (Pct) Annual Salary and Hourly Earnings				
	Pct 10	Pct 25	Median (Pct 50)	Pct 75	Pct 90
Plumbers, pipefitters, and steamfitters	\$26,603	\$55,505	\$49,712	\$62,608	\$75,650
	\$12.79	\$17.07	\$23.90	\$30.10	\$36.37
Helpers: pipelayers, plumbers, pipefitters, and steamfitters	\$20,529	\$22,963	\$26,624	\$31,366	\$37,273
	\$9.87	\$11.04	\$12.80	\$15.08	\$17.92

¹⁰ EMSI Data, August, 2008.

Employer Needs and Challenges

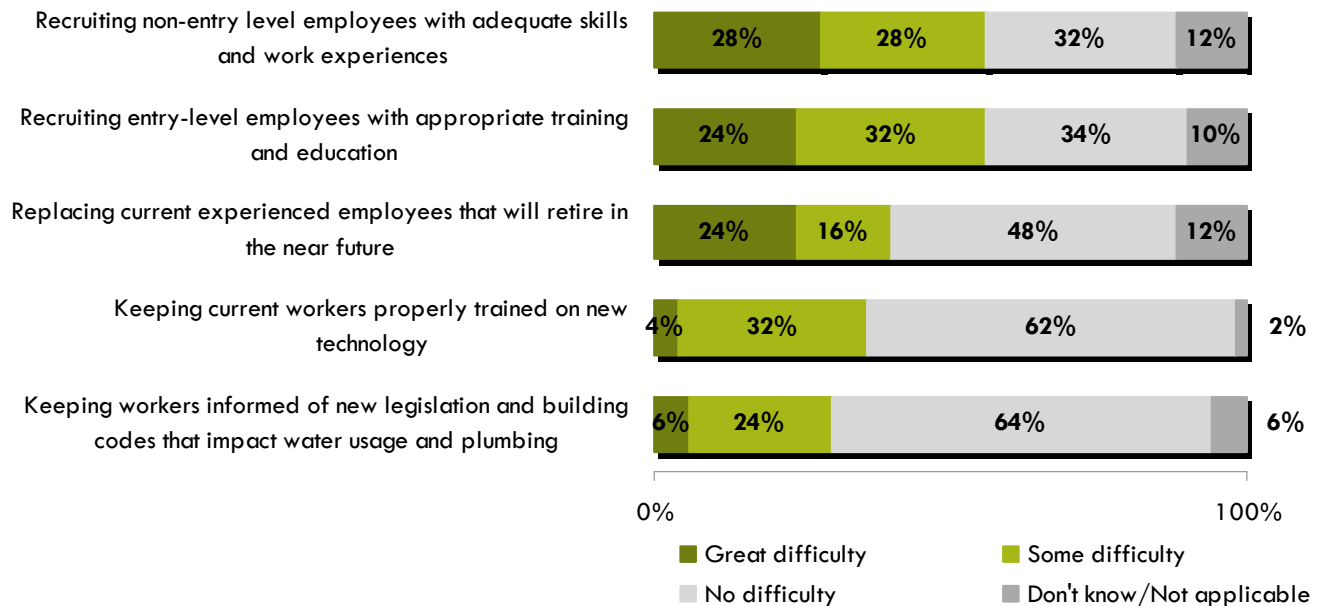
This section reviews the findings from the executive interviews and surveys. Of the 50 employers surveyed, 90 percent focus all or almost all of their work on plumbing and the remaining 10 percent focus on plumbing as well as HVAC and/or other activities. The type of contracts these firms work on is mixed between residential and commercial with 28 percent primarily working in residential, 24 percent working in commercial, and 48 percent working in both areas.

Workforce Issues and Challenges

Figure 3 reveals the difficulty employers are experiencing with workforce issues. The two most prevalent issues include recruiting non-entry level and entry level employees with the appropriate skills, experience, and training. More than half of the survey respondents reported difficulty recruiting qualified employees. About 40 percent indicated that they are having difficulty replacing experienced employees that will retire in the near future, which was reiterated in the executive interviews.

Given that the plumbing sector recently experienced a downturn, employers are not aggressively participating in recruitment practices to solicit applications. Only 18 percent of the survey respondents advertise with job-finder websites like monster.com and even fewer (10%) participate in local job fairs. The two most common methods used to recruit new applicants are through apprenticeship programs (34%) and temporary to permanent work opportunities (34%).

Figure 3: Workforce Issues and Challenges for Greater Sacramento Plumbing Employers



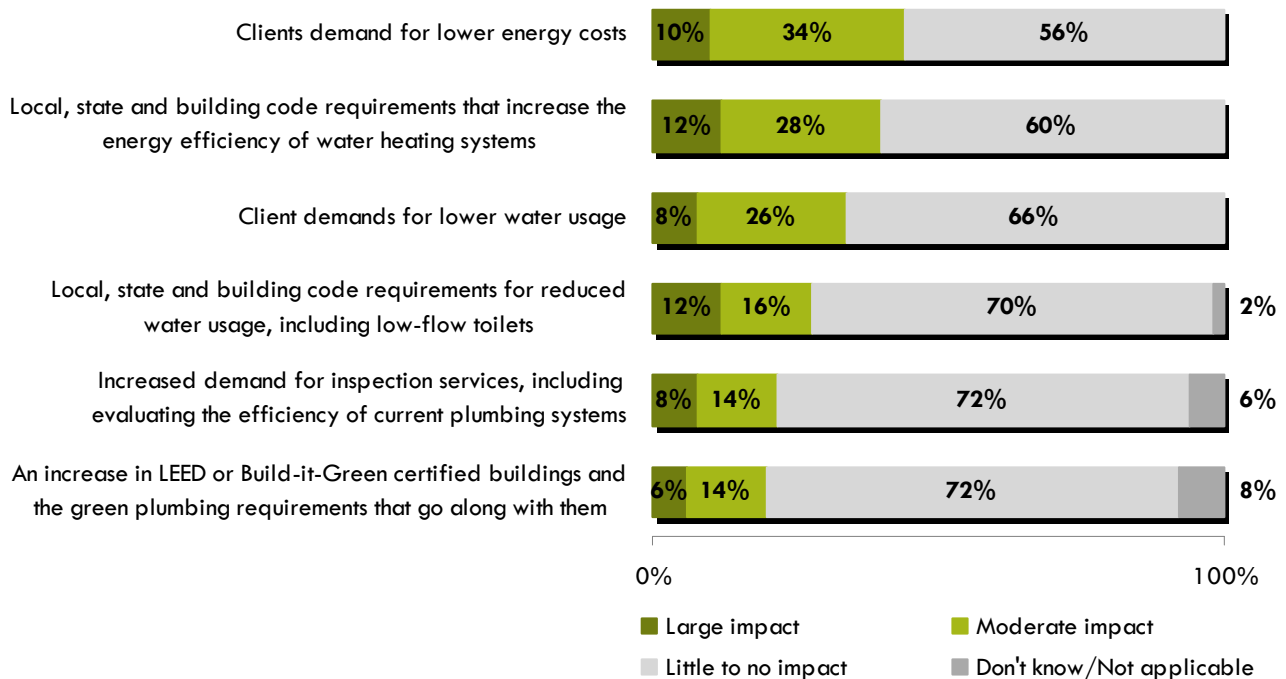
Business Trends

Figure 4 shows the different green issues and trends that are impacting plumbing employers in the Sacramento region. As shown, 44 percent of the respondents stated that clients are beginning to ask for services that will lower their energy costs and 34 percent are beginning to ask for services that will lower water usage. These services are typically requested by public sector customers rather than residential or private sector customers. Overall, the results show heightening consumer awareness, which is a positive trend for the region.

The survey also revealed that local, state and building code requirements that require an increase in energy efficiency for water heating systems are impacting 40 percent of the survey respondents. The state building codes will likely have a larger impact on the sector when the voluntary water efficiency standards become mandatory.

In addition, almost one out of three businesses (30 percent) has worked on a green or sustainable plumbing project in the last 12 months. Of those, an average of 20 percent of their work was focused on green or sustainable plumbing projects. Overall, 46 percent of the respondents expect that their green projects will increase either somewhat or substantially over the next twelve months.

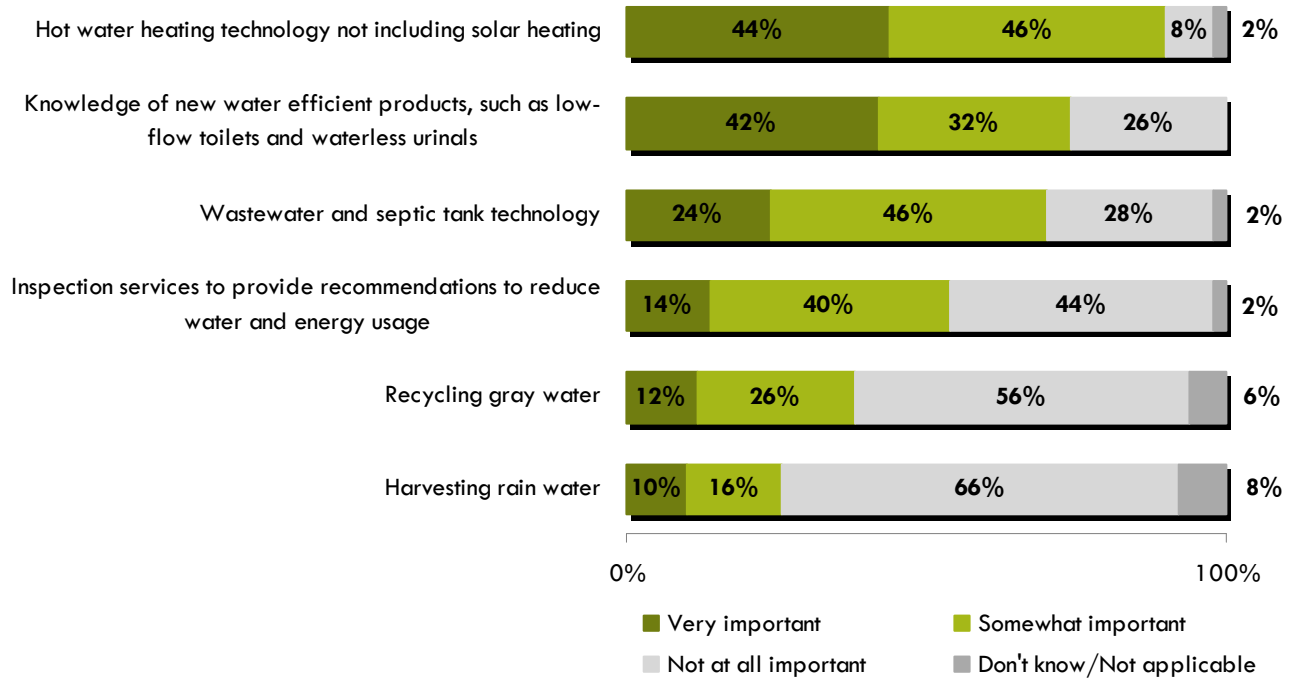
Figure 4: Industry Trends Impacting Greater Sacramento Plumbing Employers



Occupational Skill Requirements

When asked to reflect on the skills and expertise that are important for training programs for new plumbers, Sacramento region employers considered hot water heating technology (not including solar heating) as important with 44 percent rating this skill as very important and 46 percent rating it as somewhat important. Knowledge of new water efficiency products, such as low-flow toilets and waterless urinals, received the second-highest level of importance with 42 percent rating this skill as very important and 32 percent rating it as somewhat important.

Figure 5: Desired Skills and Expertise for Greater Sacramento Employees



When asked to identify other skills and areas of knowledge that they would like to see in a training program, Greater Sacramento Region employers stated the following as important:

General Requirements

- Drivers' license and clean DMV record
- Good work ethic, drug free, and appropriate work attire

Basic Skills

- Basic math skills: measuring, estimating, and identifying grade levels
- Ability to complete a standardized form

- A high degree of verbal communication skills for communication with homeowners / i.e. customer service skills
- Reading and interpreting written instructions

Trade Specific Skills

- Basic knowledge of the industry
- Reading plans and interpreting the building code standards
- Diagnosing and repairing plumbing problems
- Inspecting and testing plumbing systems
- Knowledge of water and energy efficient systems
- Knowledge of hydraulic heating systems and gas pipelines

Educational Preferences

When asked how important it is for new applicants to have a certificate or specific training in plumbing before they are hired, four out of five said it was either very or somewhat important. Only 34 percent said it was important for new applicants to have some training or experience in green or sustainable plumbing techniques. However, as shown in figure 6, 42 percent of the survey respondents expect that green plumbing certificates will become more important in the future.

Figure 6: Importance of Green Certificates When Considering Future Applicants

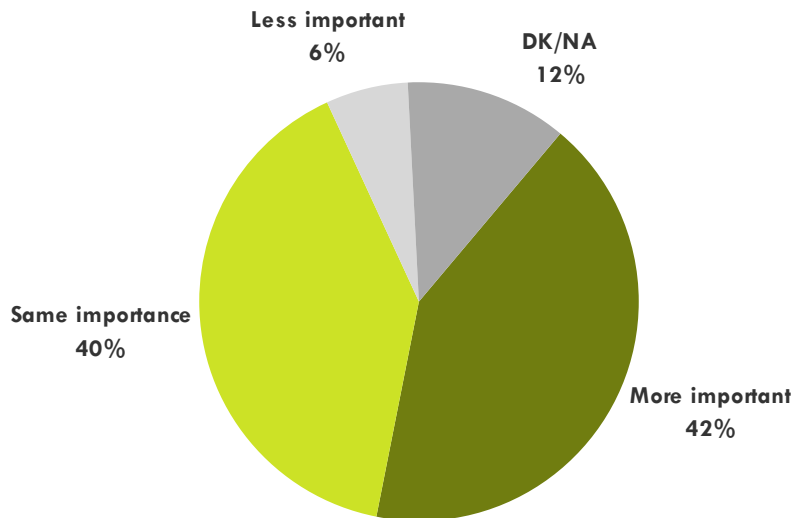
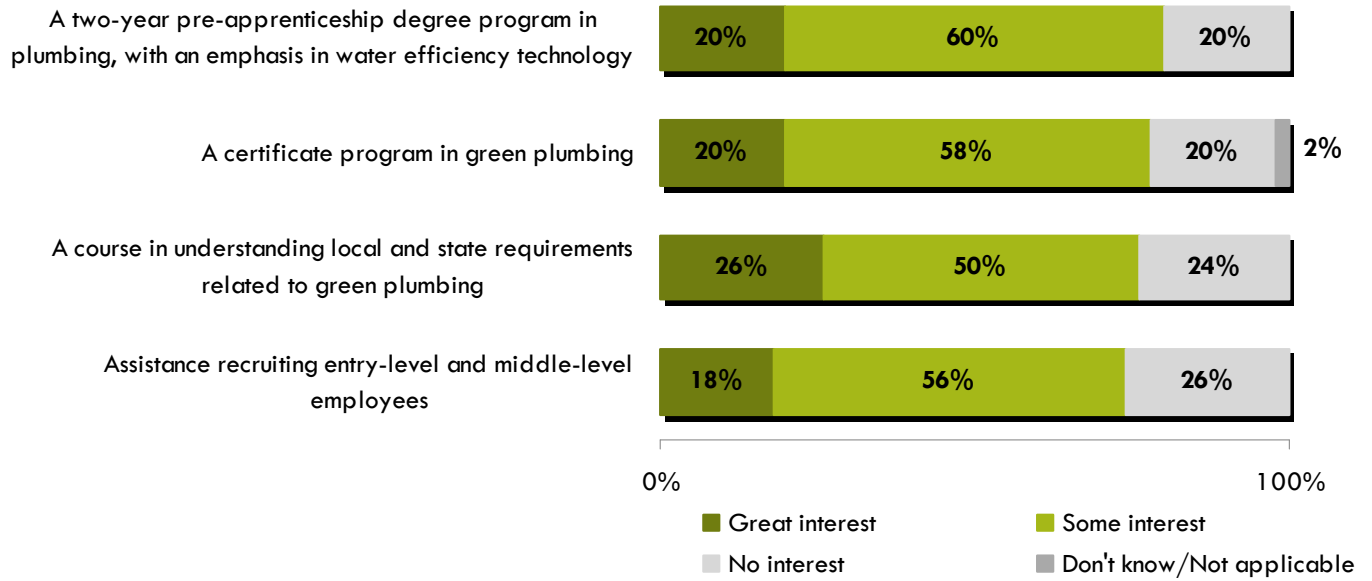


Figure 7 shows the organization’s level of interests in training and educational programs that could be developed by community colleges for the plumbing sector. An average of 77 percent of the survey respondents expressed “great” or “some” interest in all of the options presented.

Figure 7: Preferences for Specific Training Programs



College Programs and Response

According to the California Community Colleges Chancellor's Office Inventory of Approved and Projected Programs, there are no plumbing programs in the Sacramento area. Outside of the region, seven colleges offer Certificate, Associate in Arts (AA), and/or Associate in Science (AS) degree programs related to plumbing technology. Below is a summary of the existing programs. While most of these programs offer a course on California Building Code Standards, none offer an emphasis in water efficiency technology.

College Name	Program Title	Degree Type / Number of Units
Allan Hancock College	Plumbing Apprenticeship	Certificate / 30 Units
Bakersfield College	Plumbers & Steamfitters Apprenticeship	Certificate / 30 Units AA /30 Units
Chabot College	Plant Engineering Apprenticeship – Plumbing & Pipefitting	Certificate / 32 Units

College of San Mateo	Plumbing and Pipefitting	Certificate / 35 Units AS Degree /35 Units
Foothill College	Plumbing/Pipefitting/Pipe Trades Apprenticeship	Certificate / 42 Units
Los Angeles Trade Technical College	1) Plumbing 2) Plumbing Construction Tech	1) Certificate / 48 Units AS /48 Units 2) Certificate / 22 Units AA /45 Units
San Diego City College (SDCC)	Plumbing Trades	Certificate / 24 Units AS Degree / 24 Units

Of the above programs, San Diego City College (SDCC) has developed a noteworthy partnership with its local trade union. SDCC offers a Plumbing Trades AS degree program in partnership with the San Diego and Imperial Counties Pipe Trades Union. This five-year program balances on-the-job-training with technical classroom instruction. Students work during the day, earning wages that start at \$16 an hour, and attend classes in the evening. This allows students to earn a livable wage while developing the expertise necessary for a career in the plumbing trades.

In the Sacramento area, there are two plumbing state-approved apprenticeship programs: Plumbing-Heating-Cooling Contractors Association (PHCC) and Plumbers and Pipe Fitters Union. Both offer a multi-year program that combines hands-on training with work experience. By articulating with these programs, community colleges could offer students pre-apprenticeship training that leads to advance journeyman level training. This type of articulation would increase the pipeline of trained plumbers entering the industry.

Community Support and Resources

There are several community resources that could be utilized to support the development of training programs. The chart below summarizes the existing and potential organizations that could be leveraged for a variety of support functions.

Organization	Description
GreenPlumbersUSA	GreenPlumbers is a national training and accreditation program that assists plumbers in understanding their role in the environment and public health. The organization's goal is to train and promote the benefits of water conservation and the reduction of GHG emissions. The focus is on changing consumer and plumbing behavior through the use of energy efficiency and water saving technologies. http://www.greenplumbersusa.com/

<p>Alliance For Water Efficiency</p>	<p>The Alliance for Water Efficiency is a stakeholder-based 501(c)3 non-profit organization dedicated to the efficient and sustainable use of water. Located in Chicago, the Alliance serves as a North American advocate for water efficient products and programs, and provides information and assistance on water conservation efforts. http://www.allianceforwaterefficiency.org</p>
<p>BuildingGreen.com</p>	<p>BuildingGreen.com is an independent publishing company that provides accurate, unbiased, and timely green design information. For an annual fee, they provide articles and research through a variety of publications, including Environmental Building News, the GreenSpec directory of green products, and the BuildingGreen Suite of online tools. http://www.buildinggreen.com/</p>
<p>Leadership in Energy and Environmental Design (LEED)</p>	<p>LEED is a third-party certification program and the nationally accepted benchmark for the design, construction and operation of high performance green buildings. LEED promotes a whole-building approach to sustainability by recognizing performance in five key areas of human and environmental health: sustainable site development, water savings, energy efficiency, materials selection and indoor environmental quality. http://www.usgbc.org/leed/</p>
<p>U.S. Environmental Protection Agency, WaterSense Program</p>	<p>WaterSense, a partnership program sponsored by EPA, seeks to protect the future of our nation's water supply by promoting water efficiency and enhancing the market for water-efficient products, programs, and practices. WaterSense will help consumers identify water-efficient products and programs. The WaterSense label will indicate that these products and programs meet water efficiency and performance criteria. WaterSense labeled products will perform well, help save money, and encourage innovation in manufacturing. http://www.epa.gov/watersense/</p>
<p>National Association of Home Builders (NAHB)</p>	<p>NAHB has partnered with Delmar Cengage Learning to produce plumbing curriculum for the residential construction industry. Their products provide a comprehensive step-by-step guide of the skills, abilities and knowledge needed to work in the plumbing sector. http://www.residentialacademy.delmar.cengage.com/products/plumbing/</p>
<p>Plumbing-Heating-Cooling Contractors Association (PHCC)</p>	<p>One of the key roles of the PHCC is to provide education and training to its members. The association offers home study courses, a four-year apprenticeship training programs, as well as instructor workshops and textbooks. http://www.phccweb.org/ http://www.phccsacvalley.org/</p>
<p>Plumbers and Pipe Fitters Union</p>	<p>The Plumbers and Pipe Fitters Union provides a five year apprenticeship training program and ongoing courses for journeymen level plumbers. http://www.ua.org/</p>

Conclusion and Recommendations

The plumbing sector is beginning to rebound from the housing downturn. Almost 90 percent of the employers surveyed in this study said they plan to add workers or stay the same size in the next twelve months. Additionally, the demand for water efficiency technology is expected to increase within the next few years, especially when the new voluntary water efficiency building code standards become mandatory. These changes represent an opportunity for community colleges to develop training programs that respond to the regional workforce needs. The following recommendations can help colleges address the plumbing sector's workforce and training needs outlined in this report.

1) Develop training pathways

- Develop a two-year plumbing Associate degree program that aligns and articulates with local apprenticeship programs and incorporates current water efficiency technology
- Partner with GreenPlumbersUSA to develop water efficiency technology courses that meet their certification standards
- Develop a contract education course in understanding the California Building Code Standards in water efficiency technology to be launched prior to the mandatory building codes change
- Identify and apply for grants to support the development of a learning laboratory
- Identify employer equipment, facilities and resources and coordinate their use for training

2) Support the development of a pipeline of skilled workers

- Develop articulation agreements with local high school construction programs to promote entry into the community college program
- Develop faculty and student internship programs
- Partner with the local WIB to help recruit students
- Create an industry advisory board to support the development of a plumbing program and connect students with regional employers

References

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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
- Influence and 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 Environmental Scan product/study 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 08-305-017 for \$205,000) represents compensation for multiple documents or 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: California Building Standards Code (Code of Regulations, Title 24)

LEGEND FOR EXPRESS TERMS

1. Black text adopted by all agencies in Chapter 1; by CBSC, HCD, and OSHPD only in other chapters.
2. Green text adopted by CBSC and OSHPD
3. Dark yellow text adopted by CBSC and HCD
4. Violet text adopted by OSHPD
5. Blue text adopted by CBSC
6. Orange text adopted by HCD
7. Brown text adopted by DSA

EXPRESS TERMS

PREFACE

This document is Part 11 of the official compilation and publication of the adoptions, amendments and repeal of regulations to California Code of Regulations, Title 24, also referred to as the California Building Standards Code.

This Part is known as the California Green Building Standards Code.

The California Legislature delegated authority to various State agencies, boards, commissions and departments to create building regulations to implement the state's statutes. These building regulations have the same force of law and take effect 180 days after their publication unless otherwise stipulated. The California Building Standards Code applies to all occupancies in the State of California as annotated. A city, county or city and county may make necessary changes to the provisions contained in this code which are reasonably necessary because of local climatic, geological, or topographical conditions. Findings of the local condition(s) and the adopted local building standard(s) must be filed with the California Building Standards Commission to become effective and may not be effective sooner than the effective date of this edition of the California Building Standards Code. Building standards that were adopted by local ordinance and applicable to previous editions of the California Building Standards Code do not apply to this edition without appropriate adoption and the required filing.

EFFECTIVE USE OF THIS CODE

This format of this code is common to other parts of the California Building Standards Code and contains building standards applicable to occupancies which fall under the authority of different state agencies. Occupancies and applications under the authority of a specific state agency are identified in Chapter 1, Sections 103 through 106.

Sections of this code which are applicable and adopted by each state agency are identified in the Application Checklist for each state agency contained in Chapter 11. The following outline may be helpful as a guide to establish which provisions are applicable to a specific occupancy.

1. Establish the type of occupancy.
2. Verify which state agency has authority for the established occupancy by reviewing the authorities list in Sections 103 through 106.
3. Once the appropriate agency has been identified, find the application checklist for that agency in Chapter 11.
4. The application checklist will list the green building measures adopted, provide the effective date and other information regarding each green building measure applicable to the established occupancy.
5. Each green building measure listed in the application checklist has a section number which correlates with a section number in Chapters 4 through 8.
6. More information is available for each green building measure listed in the application checklist in the correlated sections contained in Chapters 4 through 8.

Combined Express Terms: 19 OF 60 7/8/08
Adopt the 2007 CGBC

CHAPTER 6

WATER EFFICIENCY AND CONSERVATION

SECTION 601 GENERAL

601.1 Scope. The provisions of this chapter shall establish the means of conserving water used indoors, outdoors, and in wastewater conveyance.

SECTION 602 DEFINITIONS

602.1 Definitions. The following words and terms shall, for the purposes of this chapter and as used elsewhere in this code, have the meanings shown herein.

DENSITY FACTOR [Kd]{dimensionless}. The Coefficient used to modify Ks to reflect the water needs of a particular plant or group of plants with reference to the density of the plant material. Kd ranges from 0.5 for a sparse planting to 1.3 for very dense plantings and averages 1.0. (Landscape, 2000).

EVAPOTRANSPIRATION [ET]. The combination of water transpired from plant tissues and evaporated from the soil and plant surfaces measured in inches per unit of time.

GRAYWATER. Untreated household waste which has not come into contact with toilet waste. Graywater includes used water from bathtubs, showers, bathroom wash basins, and water from clothes washing machines and laundry tubs. It shall not include waste water from kitchen sinks, dishwashers, or laundry water from soiled diapers.

HISTORICAL EVAPOTRANSPIRATION [Historical ETo]. A multiple-year average of recorded historical reference ETo data from a weather station or evaporative pan in a given geographic location. This value is typically a monthly average of the specific month in a given multi-year time frame. This value, when corrected for plant species characteristics, can be used as a baseline to evaluate the expected water needs of a landscape planting in that geographic area.(FAO 1998; ASCE, 1990)

LANDSCAPE (PLANT) COEFFICIENT [KI]. The product of the species factor multiplied by the density factor and the microclimate factor. $\{KI=Ks \times Kd \times Kmc\}$ The landscape coefficient is used in the landscape water budget calculation. (UCCE, 2000)

MICROCLIMATE FACTOR [Kmc]. The coefficient used to modify Ks to reflect water needs of a particular plant or group of plants with reference to the microclimate of the planting area. Microclimate factors include sun exposure, proximity to reflective surfaces, and windy locations. Kmc ranges from 0.5 for low microclimate factors to 1.4 for high microclimate factors. (UCCE, 2000)

MODEL WATER EFFICIENT LANDSCAPE ORDINANCE. The California ordinance regulating landscape design, installation and maintenance practices that will ensure commercial, multifamily and other developer installed landscapes greater than 2500 square feet meet an irrigation water budget developed based on landscaped area, and climatological parameters.

PLANT SPECIES FACTOR, [Ks]{dimensionless}. A factor or coefficient used to adjust reference evapotranspiration to reflect water use by a particular plant species. Ks ranges from <0.1 for very low water using plants, 0.1-0.3 for low water using, 0.4-0.6 moderate water using to 0.7-0.9 for high water using plants. The Ks for cool season turfgrass is 0.8 and warm season turfgrass is 0.6.

POTABLE WATER. Water that is drinkable and meets the U. S. Environmental Protection Agency (EPA) Drinking Water Standards. See definition in the California Plumbing Code, Part 5.

RECYCLED WATER. Water which, as a result of treatment of waste, is suitable for a direct beneficial use or a controlled use that would not otherwise occur (Water Code Section 13050 (n)). Simply put, recycled water is water treated to remove waste matter attaining a quality that is suitable to use the water again.

REFERENCE EVAPOTRANSPIRATION {ETo}. The estimated rate of evapotranspiration from a standardized surface of well watered, actively growing cool season turfgrass clipped to 12 cm with sufficient density to fully shade the soil. The water needs of a landscape planting can be calculated by multiplying the Landscape Coefficient [KI] and Reference Evapotranspiration {ETo}

SUBMETER. A meter installed subordinate to a site meter. Usually used to measure water intended for one purpose, such as landscape irrigation, also known as a Dedicated Meter.

**SECTION 603
INDOOR WATER USE**

603.1 Meters. Separate meters or submeters shall be installed for indoor and outdoor potable water use.

603.2 20% Savings. A schedule of plumbing fixtures and fixture fittings that will reduce the overall use of potable water within the building by 20% shall be provided. The reduction shall be based on the maximum allowable water use per plumbing fixture and fittings as required by the California Building Standards Code. The 20% reduction in potable water use shall be demonstrated by one of the following methods.

1. Each plumbing fixture and fitting shall meet the 20% reduced flow rate specified in Table 603.2, or
2. A calculation demonstrating a 20% reduction in the building “water use baseline” as established in Table 603.1 shall be provided. For low-rise residential occupancies, the calculation shall be limited to the following plumbing fixture and fitting types: water closets, urinals, lavatory faucets, showerheads and kitchen faucets.

603.2.1 Multiple showerheads serving one shower. When single shower fixtures are served by more than one showerhead, the combined flow rate of all the showerheads shall not exceed the maximum flow rates specified in the 20% reduction column contained in Table 603.2 or the shower shall be designed to only allow one showerhead to be in operation at a time.

**TABLE 603.1
WATER USE BASELINES**

Fixture Type	Flow-rate ²	Duration	Daily uses	Occupants ^{3, 4}
Showerheads	2.5 gpm @ 80 psi	8 min.	1	X
Showerheads Residential	2.5 gpm @ 80 psi	8 min.	1	X
Lavatory Faucets Residential	2.2 gpm @ 60 psi	.25 min.	3	X
Kitchen Faucets	2.2 gpm @ 60 psi	4 min.	1	X
Replacement Aerators	2.2 gpm @ 60 psi			X
Wash Fountains	2.2 [rim space (in.) / 20 gpm @ 60 psi]			X
Metering Faucets	0.25 gallons/cycle	.25 min.	3	X
Metering Faucets for Wash Fountains	.25 [rim space (in.) / 20 gpm @ 60 psi]	.25 min.		X
Gravity tank type Water Closets	1.6 gallons/flush	1 flush	1 male ¹ 3 female	X
Flushometer Tank Water Closets	1.6 gallons/flush	1 flush	1 male ¹ 3 female	X
Flushometer Valve Water Closets	1.6 gallons/flush	1 flush	1 male ¹ 3 female	X
Electromechanical Hydraulic Water Closets	1.6 gallons/flush	1 flush	1 male ¹ 3 female	X
Urinals	1.0 gallons/flush	1 flush	2 male	X

Fixture “Water Use” = Flow rate x Duration x Occupants x Daily uses

¹ Except for low-rise residential occupancies the daily use number shall be increased to three if urinals are not installed in the room.

² The Flow-rate is from the CEC Appliance Efficiency Standards, Title 20 California Code of Regulations; where a conflict occurs, the CEC standards shall apply.

³ For low rise residential occupancies, the number of occupants shall be based on two persons for the first bedroom, plus one additional person for each additional bedroom.

⁴ For non-residential occupancies, refer to Table A, Chapter 4, 2007 California Plumbing Code, for occupant load factors.

⁵ Use Worksheet WS-1 to calculate base line water use.

**TABLE 603.2
FIXTURE FLOW RATES**

Fixture Type	Flow-rate	Maximum flow rate at 20% Reduction
Showerheads	2.5 gpm @ 80 psi	2 gpm @ 80 psi
Lavatory Faucets Residential	2.2 gpm @ 60 psi	1.8 gpm @ 60 psi
Kitchen Faucets	2.2 gpm @ 60 psi	1.8 gpm @ 60 psi
Wash Fountains	2.2 [rim space (in.) / 20 gpm @ 60 psi]	1.8 [rim space (in.) / 20 gpm @ 60 psi]

Metering Faucets	0.25 gallons/cycle	0.2 gallons/cycle
Metering Faucets for Wash Fountains	.25 [rim space (in.) / 20 gpm @ 60 psi]	.20 [rim space (in.) / 20 gpm @ 60 psi]
Gravity tank type	1.6 gallons/flush	1.28 gallons/flush ¹
Water Closets		
Flushometer Tank Water Closets	1.6 gallons/flush	1.28 gallons/flush ¹
Flushometer Valve Water Closets	1.6 gallons/flush	1.28 gallons/flush ¹
Electromechanical Hydraulic Water Closets	1.6 gallons/flush	1.28 gallons/flush ¹
Urinals	1.0 gallons/flush	.8 gallons/flush

¹ Includes water closets with an effective flush rate of 1.28 gallons or less when tested per ASME A112.19.2 and ASME A112.19.14.

603.3 Appliances.

1. Clothes washer shall have a maximum Water Factor (WF) that will reduce the use of water by 10% below the California Energy Commissions' WF standards for commercial clothes washers located in Title 20 of the California Code of Regulations.
2. Dishwashers shall meet the following water use standards:
 - a. Residential—5.8 gallons per cycle
 - b. Commercial—refer to Table 603.3

**TABLE 603.3
COMMERCIAL DISHWASHER WATER USE**

Type	High-Temperature— maximum gallons per rack	Chemical—maximum gallons per rack
Conveyer	0.70	0.62
Door	0.95	1.16
Undercounter	0.90	0.98

3. Ice makers shall be air cooled.
4. Food steamers shall be connection-less or boiler-less.
5. The use and installation of water softeners that discharge to the community sewer system shall be limited or prohibited by local agencies if certain conditions are met.

603.4 Wastewater reduction. Each building shall reduce the generation of wastewater by one of the following methods:

1. The installation of water-conserving fixtures (water closets, urinals) meeting the criteria established in sections 603.2 or 603.3 or
2. Utilizing non-potable water systems (captured rainwater, graywater, and municipally treated wastewater (recycled water),

603.5 Dual plumbing. New buildings and facilities shall be dual plumbed for potable and recycled water systems for toilet flushing when recycled water is available as determined by the enforcement authority.

**SECTION 604
OUTDOOR WATER USE**

604.1 Water budget. A water budget shall be developed for landscape irrigation use that conforms to the local water efficient landscape ordinance or to the California Department of Water Resources Model Water Efficient Landscape Ordinance where no local ordinance is applicable.

604.2 Potable water reduction. Provide water efficient landscape irrigation design that reduces by 50% the use of potable water beyond the initial requirements for plant installation and establishment. Calculations for the reduction shall be based on the water budget developed pursuant to section 605.1.

Methods used to accomplish the requirements of this section must be designed to the requirements of the California Building Standards Code and shall include, but not be limited to, the following:

1. Plant coefficient.
2. Irrigation efficiency and Distribution Uniformity.
3. Use of captured rainwater.
4. Use of recycled water.
5. Water treated for irrigation purposes and conveyed by a water district or public entity.
6. Use of graywater.

604.3 Potable water elimination. Provide a water efficient landscape irrigation design that eliminates the use of potable water beyond the initial requirements for plant installation and establishment.. Methods used to accomplish the requirements of this section must be designed to the requirements of the California Building Standards Code and shall include, but not be limited to, the following:

1. Plant coefficient.
2. Irrigation efficiency and Distribution Uniformity.

3. Use of captured rainwater.
4. Use of recycled water.
5. Water treated for irrigation purposes and conveyed by a water district or public entity.
6. Use of graywater.

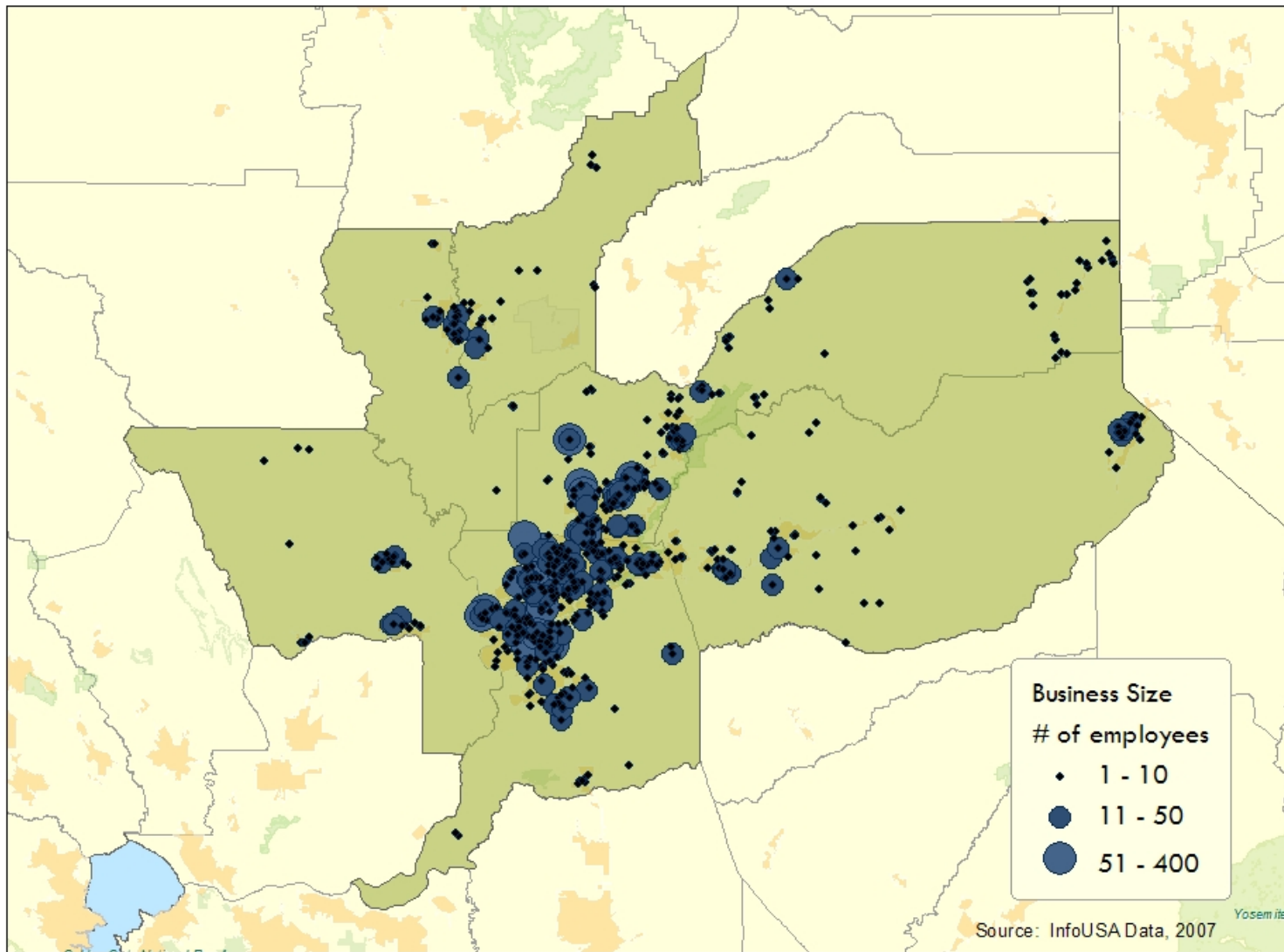
604.4 Graywater Irrigation System. Install a graywater collection system for onsite subsurface irrigation using graywater collected from bathtubs, showers, bathroom wash basins, and laundry water. See Appendix G, 2007 California Plumbing Code.

604.5 Rainwater or stormwater collection systems. Either as a site design feature (vegetated swales, etc.), or as a constructed system (rain cistern, etc.), rain cisterns and other constructed water collection devices may store water for landscape irrigation.

SECTION 605
RECYCLED (RECLAIMED) AND GRAYWATER SYSTEMS
(Reserved)

Appendix C: Employer Locations

Plumbing Contractors in the Six-County Greater Sacramento Region



Appendix D: O*NET Occupational Profile

Plumbers

Tasks

- Assemble pipe sections, tubing and fittings, using couplings, clamps, screws, bolts, cement, plastic solvent, caulking, or soldering, brazing and welding equipment.
- Fill pipes or plumbing fixtures with water or air and observe pressure gauges to detect and locate leaks.
- Review blueprints and building codes and specifications to determine work details and procedures.
- Prepare written work cost estimates and negotiate contracts.
- Study building plans and inspect structures to assess material and equipment needs, to establish the sequence of pipe installations, and to plan installation around obstructions such as electrical wiring.
- Keep records of assignments and produce detailed work reports.
- Perform complex calculations and planning for special or very large jobs.
- Locate and mark the position of pipe installations, connections, passage holes, and fixtures in structures, using measuring instruments such as rulers and levels.
- Measure, cut, thread, and bend pipe to required angle, using hand and power tools or machines such as pipe cutters, pipe-threading machines, and pipe-bending machines.
- Install pipe assemblies, fittings, valves, appliances such as dishwashers and water heaters, and fixtures such as sinks and toilets, using hand and power tools.

Tools & Technology

Tools used in this occupation:

- Drain or pipe cleaning equipment — Drain cleaning cables; Hand spinners; Sectional drain cleaning machines; Toilet augers
- Pipe or tube cutters — Pipe cutters; Power pipe cutters; Ratcheting polyvinyl chloride PVC cutters; Tubing cutters
- Pipe wrenches — End pipe wrenches; Offset pipe wrenches; Straight pipe wrenches
- Pressure indicators — Air pressure gauges; Heavy duty water pressure gauges; Maximum reading water pressure gauges; Water pressure gauges

- Specialty wrenches — Chain wrenches; Spud wrenches; Strainer wrenches; Water heater element removal wrenches

Technology used in this occupation:

- Accounting software — Intuit QuickBooks; Intuit Quicken software; Job costing software; KRS Enterprises Service First!
- Analytical or scientific software — Elite Software DPIPE; Elite Software FIRE; Klear Estimator; Quote Software QuoteExpress
- Computer aided design CAD software — Autodesk Building Systems; Drawing and drafting software; Elite Software Sprinkler CAD; Horizon Engineering Sigma Plumbing Calculator
- Project management software — Estimating software; FastEST FastPipe; FastEST software; Vision InfoSoft Plumbing Bid Manager
- Word processing software — Atlas Construction Business Forms; Contractor City Contractor Forms Pack; Microsoft Word; Wilhelm Publishing Threshold

Knowledge

- Customer and Personal Service — Knowledge of principles and processes for providing customer and personal services. This includes customer needs assessment, meeting quality standards for services, and evaluation of customer satisfaction.
- Mechanical — Knowledge of machines and tools, including their designs, uses, repair, and maintenance.
- English Language — Knowledge of the structure and content of the English language including the meaning and spelling of words, rules of composition, and grammar.
- Building and Construction — Knowledge of materials, methods, and the tools involved in the construction or repair of houses, buildings, or other structures such as highways and roads.
- Mathematics — Knowledge of arithmetic, algebra, geometry, calculus, statistics, and their applications.
- Public Safety and Security — Knowledge of relevant equipment, policies, procedures, and strategies to promote effective local, state, or national security operations for the protection of people, data, property, and institutions.
- Chemistry — Knowledge of the chemical composition, structure, and properties of substances and of the chemical processes and transformations that they undergo. This includes uses of chemicals and their interactions, danger signs, production techniques, and disposal methods.

- Design — Knowledge of design techniques, tools, and principles involved in production of precision technical plans, blueprints, drawings, and models.
- Sales and Marketing — Knowledge of principles and methods for showing, promoting, and selling products or services. This includes marketing strategy and tactics, product demonstration, sales techniques, and sales control systems.

Skills

- Active Listening — Giving full attention to what other people are saying, taking time to understand the points being made, asking questions as appropriate, and not interrupting at inappropriate times.
- Mathematics — Using mathematics to solve problems.
- Repairing — Repairing machines or systems using the needed tools.
- Troubleshooting — Determining causes of operating errors and deciding what to do about it.
- Complex Problem Solving — Identifying complex problems and reviewing related information to develop and evaluate options and implement solutions.
- Installation — Installing equipment, machines, wiring, or programs to meet specifications.
- Equipment Selection — Determining the kind of tools and equipment needed to do a job.
- Reading Comprehension — Understanding written sentences and paragraphs in work related documents.
- Time Management — Managing one's own time and the time of others.
- Management of Material Resources — Obtaining and seeing to the appropriate use of equipment, facilities, and materials needed to do certain work.

Abilities

- Arm-Hand Steadiness — The ability to keep your hand and arm steady while moving your arm or while holding your arm and hand in one position.
- Manual Dexterity — The ability to quickly move your hand, your hand together with your arm, or your two hands to grasp, manipulate, or assemble objects.
- Problem Sensitivity — The ability to tell when something is wrong or is likely to go wrong. It does not involve solving the problem, only recognizing there is a problem.
- Static Strength — The ability to exert maximum muscle force to lift, push, pull, or carry objects.

- **Deductive Reasoning** — The ability to apply general rules to specific problems to produce answers that make sense.
- **Extent Flexibility** — The ability to bend, stretch, twist, or reach with your body, arms, and/or legs.
- **Finger Dexterity** — The ability to make precisely coordinated movements of the fingers of one or both hands to grasp, manipulate, or assemble very small objects.
- **Information Ordering** — The ability to arrange things or actions in a certain order or pattern according to a specific rule or set of rules (e.g., patterns of numbers, letters, words, pictures, mathematical operations).
- **Near Vision** — The ability to see details at close range (within a few feet of the observer).
- **Oral Comprehension** — The ability to listen to and understand information and ideas presented through spoken words and sentences.

Work Activities

- **Performing General Physical Activities** — Performing physical activities that require considerable use of your arms and legs and moving your whole body, such as climbing, lifting, balancing, walking, stooping, and handling of materials.
- **Getting Information** — Observing, receiving, and otherwise obtaining information from all relevant sources.
- **Handling and Moving Objects** — Using hands and arms in handling, installing, positioning, and moving materials, and manipulating things.
- **Identifying Objects, Actions, and Events** — Identifying information by categorizing, estimating, recognizing differences or similarities, and detecting changes in circumstances or events.
- **Repairing and Maintaining Mechanical Equipment** — Servicing, repairing, adjusting, and testing machines, devices, moving parts, and equipment that operate primarily on the basis of mechanical (not electronic) principles.
- **Performing for or Working Directly with the Public** — Performing for people or dealing directly with the public. This includes serving customers in restaurants and stores, and receiving clients or guests.
- **Making Decisions and Solving Problems** — Analyzing information and evaluating results to choose the best solution and solve problems.
- **Controlling Machines and Processes** — Using either control mechanisms or direct physical activity to operate machines or processes (not including computers or vehicles).

- **Inspecting Equipment, Structures, or Material** — Inspecting equipment, structures, or materials to identify the cause of errors or other problems or defects.
- **Monitor Processes, Materials, or Surroundings** — Monitoring and reviewing information from materials, events, or the environment, to detect or assess problems.

Appendix G: Survey Methodology and Script

Methodology

The table below briefly outlines the methodology for this project. Two phases of primary research were conducted - qualitative executive interviews with human resource and training managers and directors within the plumbing sector and a quantitative internet/telephone survey of 50 plumbing employers across the six-county Greater Sacramento Region.

Internet/Telephone Survey Methodology

Technique	Telephone survey of plumbing sector employers
Universe	506 employers
Number of Respondents	50 employers, about 10 percent of the universe
Field Dates	September 24 through October 2, 2008

Questionnaire Design

Through an iterative process, BW Research Partnership worked closely with the Northern California Center of Excellence to develop the questionnaire for the study.

To avoid the problem of systematic position bias - where the order in which a series of questions is asked systematically influences the answers to some of the questions - several of the questions in this survey were randomized such that respondents were not consistently asked the questions in the same order.



Greater Sacramento, C.O.E.
Plumbing Employers (n=50)
FINAL: September 2008

Green Plumbing Employer Survey

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Introduction:

Hello, my name is _____? May I please speak to [name] or the person handling staffing at [company].

Hello, my name is _____ and I'm calling on behalf of the Greater Sacramento Community Colleges, who would value your participation in a brief survey that will help address your future business needs for trained and educated employees with plumbing skills and knowledge.

(If needed): The survey should take approximately ten minutes of your time. By answering this survey, you can help the California Community College system develop the appropriate type of training that will prepare the employees you will be looking for in the future.

(If needed): This survey has been commissioned by the Greater Sacramento Community Colleges, which are committed to developing the regional workforce. The survey is being conducted by BW Research, an independent research firm.

(If needed): Your individual responses will not be published, only aggregate information will be used in the reporting of the survey results.

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Firm - Related Questions

I'd like to begin by asking you a few general questions about your business,

- 1. Including all full-time and part-time employees, how many permanent employees work at your business location?

Record # of employees _____

- 2. If you currently have [TAKE Q1 #] permanent employees at your business location, how many more or less permanent employees to you expect to have at your business location 12 months from now?

1 More [record # _____]

- 2 Less [record # _____]
- 3 (DO NOT READ) Same number of permanent employees

[If amount differs by 10% or more in either direction, ask:]

Just to confirm, you currently have ____ permanent employees and you expect to have ____ (more/less) employees, for a total of ____ permanent employees 12 months from now.

Do you hire temporary employees, and if so how many have you hired in the last 12 months?

(NO=0) Record # of employees _____

Next, I would like to ask a few questions about the role your firm has in the plumbing industry.

3. What percentage of your firm’s work is focused on plumbing (IF NEEDED WATER AND WASTEWATER DISTRIBUTION) compared to related services in HVAC (IF NEEDED HEATING, VENTILATION, AIR CONDITIONING), refrigeration or appliance repairs?

- 1 All of our work is focused on plumbing (100%)
- 2 Almost all of our work is focused on plumbing (99% to 76%)
- 3 One half to three quarters of our work is focused on plumbing (75% to 50%)
- 4 Less than half of our work is focused on plumbing (49% to 1%)
- 5 (DO NOT READ) DK/NA

[IF Q4= 2 – 5 READ - For the remainder of the survey I want to focus on issues related to the plumbing side of your business]

4. What type of properties does your firm primarily work on in the plumbing industry: residential properties primarily, commercial properties primarily, or both residential and commercial properties?

- 1 Residential properties primarily
- 2 Commercial properties primarily
- 3 Both residential and commercial properties
- 4 (DO NOT READ) Other (please specify) _____
- 5 (DO NOT READ) DK/NA

WORKFORCE NEEDS

5. Now, I’m going to read a list of issues facing the region’s plumbing workforce in the coming years. Please tell me how much difficulty your firm faces in addressing the workforce needs associated with occupations in plumbing.

Here’s the (first/next) one _____ (READ ITEM): Please tell me whether your business has no difficulty, some difficulty, or great difficulty in dealing with this issue?

RANDOMIZE

	<u>No difficulty</u>	<u>Some difficulty</u>	<u>Great difficulty</u>	<u>(DON'T READ DK/NA)</u>
A. Keeping current workers properly trained on new technology.....	1	2	3	4
B. Keeping workers informed of new legislation and building Codes that impact water usage and plumbing.....	1	2	3	4

- C. Recruiting entry-level employees with appropriate training and education 1 2 3 4
- D. Recruiting non-entry level employees with adequate skills and work experience..... 1 2 3 4
- E. Replacing current experienced employees that will retire in the near future 1 2 3 4

6. Next, I'd like to ask you about how your firm recruits applicants for hiring. As I read each of the following recruitment practices, please indicate whether your firm uses each practice.

RANDOMIZE	<u>Yes</u>	<u>No</u>	<u>(DON'T READ DK/NA)</u>
A. Apprenticeship programs..... 1	1	2	3
B. Advertising on job-finder webistes like monster.com 1	1	2	3
C. Participating in local job fairs..... 1	1	2	3
D. Working with community colleges and high schools for recruiting..... 1	1	2	3
E. Working with local workforce agencies to find and train new recruits..... 1	1	2	3
F. Temporary to permanent work opportunities..... 1	1	2	3

INDUSTRY TRENDS

7. Next, I want to ask about different issues that may or may not be impacting your business and the plumbing industry.

Here's the (first/next) one _____ (READ ITEM): Please tell me if this is having a large impact, moderate impact, or little to no impact on your business as it relates to the plumbing industry?

RANDOMIZE	<u>Large Impact</u>	<u>Moderate Impact</u>	<u>Little to No Impact</u>	<u>(DON'T READ DK/NA)</u>
A. Local, state and building code requirements for reduced water usage including low-flow toilets 1	1	2	3	4
B. Local, state and building code requirements that increase the energy efficiency of water heating systems 1	1	2	3	4
C. Client demands for lower water usage..... 1	1	2	3	4
D. Increased demand for inspection services, including evaluating the efficiency of current plumbing systems..... 1	1	2	3	4
E. Clients demand for lower energy costs 1	1	2	3	4
F. An increase in LEED or Build-it-Green certified buildings and the green plumbing requirements that go along with them 1	1	2	3	4

GREEN PLUMBING HISTORY AND EXPECTATIONS

Now I have a few questions about green or sustainable plumbing. For this discussion green or sustainable plumbing is generally defined as an organized effort to use products and technology that reduce water and energy usage and can include renewable energy like solar power to heat water.

8. Has your company worked on any *green or sustainable plumbing* projects, and if so, have you worked on this type of project in the last 12 months?

- 1 Yes, and in the last 12 months [TYPE 1]
- 2 Yes, but not in the last 12 months [TYPE 2]
- 3 No [TYPE 3]
- 4 (Don't Read) DK/NA

[ONLY ASK Q10 IF Q9=1 OTHERWISE SKIP TO Q11]

9. What percentage of the projects that you worked on over the last 12 months would be defined as *green or sustainable plumbing* projects?

Record % _____

10. Do you expect the percentage of projects that your firm works on over the next 12 months that would be defined as *green or sustainable plumbing* projects to increase substantially, increase somewhat, stay about the same or decline?

- 1 Increase substantially
- 2 Increase somewhat
- 3 Stay about the same
- 4 Decline
- 5 (Don't Read) DK/NA

11. Which of the following three items are most important for your business as it they related to green plumbing?

RANDOMIZE PRESENTATION OF ITEMS 1 – 3

- 1 Meeting state and local requirements for water and energy usage
- 2 Meeting clients demands for reduced water and energy costs
- 3 Meeting clients demands for more environmental sustainability
- 4 (Don't Read) DK/NA

GREEN PLUMBING WORKFORCE & CERTIFICATIONS

Next, I want to ask about hiring new workers and the skills and abilities that you could look for in the future.

12. When considering new job applicants for plumbing occupations, how important is it for applicants to have a certification or other specific training in plumbing before they are hired?

- 1 Very important
- 2 Somewhat important
- 3 Not at all important
- 4 (DO NOT READ) DK/NA

13. Do you offer training programs for entry-level plumbing applicants that do not have experience or training in plumbing?

- 1 Yes, we have an internal training program
- 2 Yes, we partner with an agency that trains our entry-level plumbers
- 3 No, we do not hire plumbing applicants with no experience or training
- 4 (DO NOT READ) DK/NA

14. How important is it for new applicants in plumbing occupations to have some training or experience in green or sustainable plumbing techniques?

- 1 Very important
- 2 Somewhat important
- 3 Not at all important
- 4 (DO NOT READ) DK/NA

15. What specific certifications do you like to see new plumbing applicants have? [DO NOT READ, ACCEPT FIRST TWO RESPONSES]

- 1 None that they are aware of
- 2 No certificate in particular, but like to see some type of certificate
- 3 Green Plumbers certification (Code Q17 as 1 and Skip to Q18)
- 4 IAPMO (Intl. Association of Plumbing and Mechanical Officials) Inspection Cert.
- 5 Sacramento County Plumbing Certificate
- 6 Other (Please specify _____)
- 7 DK/NA

16. Have you heard of the Green Plumbers certificate?

- 1 Yes
- 2 No
- 3 (DO NOT READ) DK/NA

17. Do you expect certificates in green plumbing to become more important, less important or stay about the same importance when considering future applicants for your plumbing occupations?

- 1 More important
- 2 Less important
- 3 Same importance
- 4 (DO NOT READ) DK/NA

GREEN PLUMBING SKILLS

18. Now, I'd like to ask about some of the skills and areas of expertise that are being considered for training programs for new plumbers, please indicate how important each item is for your business.

Here's the (first/next) one _____ (READ ITEM): Please tell me if this is very important, somewhat important or not at all important for your business and the type of people you may look to hire for in the future?

RANDOMIZE

	<u>Very Important</u>	<u>Somewhat Important</u>	<u>Not at all Important</u>	(DON'T READ DK/NA)
A. Recycling gray water.....	1	2	3	4
B. Harvesting rain water	1	2	3	4
C. Wastewater and septic tank technology	1	2	3	4
D. Knowledge of new water efficient products, such as low-flow toilets and waterless urinals.....	1	2	3	4
E. Inspection services to provide recommendations to reduce water and energy usage	1	2	3	4
F. Hot water heating technology not including solar heating.....	1	2	3	4

19oe. What other skills or areas of knowledge would you like to see in a training program for entry-level or experienced plumbers?

20oe. What is the biggest challenge for your firm in finding and/or training employees in the plumbing industry?

21oe. What specific challenges do you face in finding and/or training employees in green or sustainable plumbing?

We are almost finished. I'd like to ask you a few more general questions and verify your contact information.

22. Please think about your firm's level of interest in the following training and education programs that could be developed at the local community colleges for the plumbing workforce. As I read each possible program, please

tell me whether your business would have no interest, some interest, or great interest in the following workforce development programs?

RANDOMIZE	<u>No Interest</u>	<u>Some Interest</u>	<u>Great Interest</u>	<u>(DON'T READ DK/NA)</u>
A. A two-year pre-apprenticeship degree program in plumbing with an emphasis in water efficiency technology	1	2	3	4
B. A certificate program in green plumbing.....	1	2	3	4
C. A course in understanding local and state requirements related to green plumbing.....	1	2	3	4
D. Assistance recruiting entry-level and middle-level employees.....	1	2	3	4

Please confirm for us your information.

- A. First and Last Name of respondent _____
- B. Position of respondent _____
- C. Phone of respondent _____
- D. Email of respondent _____

Thank you, very much for your time

- E. Name of Company _____
- F. Address of company _____
- G. Date of Interview _____
- H. Name of interviewer _____
- I. Time of Interview _____
- J. City of business location? _____
- K. Zip Code _____
- L. PRIMARY SIC/NAICS _____
- M. County _____