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Water security for Texas: a post-secondary education pathway for water workforce readiness

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Abstract: Water and wastewater industry leaders in Texas and throughout the United States have expressed concern over high rates of retirement eligibility and difficulties finding and attracting workers ready to fill job openings, especially for work in smaller systems. In late January 2018, the U.S. Government Accountability Office released a report on water workforce readiness and a bill was introduced in the U.S. Senate to establish a water infrastructure workforce development program. Concern over existing education of workers in water and demographic information projecting future workforce readiness are commonly cited as signaling a coming crisis for the water industry. An alignment of post-secondary training and industry needs is recommended to meet coming workforce employment requirements for Texas and the nation. A model post-secondary education pathway for water science and technology is described to support water workforce readiness.

Keywords: water education, water industry, water workforce, water and wastewater degree, water security

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Terms used in paper

Acronyms	Descriptive name
AWWA	American Water Works Association
B.A.A.S.	Bachelor of Applied Arts and Sciences
B.S.	Bachelor of Science
GAO	U.S. Government Accountability Office
TAMU–SA	Texas A&M University–San Antonio
TCEQ	Texas Commission on Environmental Quality
TEEX	Texas A&M Engineering Extension Service

INTRODUCTION

In late January 2018, two events took place over the course of two days that may shape future education and training opportunities for work in water and wastewater (hereinafter termed "water" with equal weight to water and wastewater sectors) systems and treatment industries in the United States. The U.S. Government Accountability Office (GAO) released a report on water workforce readiness (USGAO 2018), and a bill was introduced in the U.S. Senate to establish a water infrastructure workforce development program (USS 2018). Both actions stem from long-standing alarms raised by the water industries about high rates of retirement eligibility and difficulties finding and attracting job-ready workers to fill job openings, especially for work in smaller water systems (Kemp-Rye 2005; Mann and Runge 2008; Grigg and Zenzen 2009; Brueck et al. 2010; SFPUC 2012; PCAST 2016; AWWA 2017).

The GAO report and Senate Bill 2346 (S. 2346) describe workforce demographic information commonly cited as evidence of a coming crisis for the water industry. Findings in S. 2346 state that the median age of water sector workers is 48 years old, which is six years older than the national median age of workers. In turn, there will be unprecedented workforce replacement needs over the next 10 years because 37% of water and 31% of wastewater workers will retire during that period. The GAO report also describes industrywide concern about filling future job openings. The report and proposed legislation demonstrate the need for a well-trained and knowledgeable workforce for proper management of water utilities to prevent water pollution and to ensure safe drinking water and long-term sustainability of public water systems. In particular, both described the vital role of the water workforce in ensuring compliance with the Safe Drinking Water Act (42 U.S.C. §§ 300f et seq.) and Clean Water Act (33 U.S.C §§ 1251-1387 et seq.).

WATER INDUSTRY EXPERTS IN TEXAS AND THROUGHOUT THE UNITED STATES EXPRESS ALARM ABOUT WORKFORCE READINESS

While assessments of the status of the water workforce have varied, multiple industry studies support the findings of the GAO and S. 2346 sponsors. For more than a decade the American Water Works Association's (AWWA) annual *State of the Water Industry* report, which surveys member opinion nationally, has been drawing attention to water workforce shortages (Mann and Runge 2008; Brueck et al. 2010; AWWA 2017). In 2017 the AWWA reported that only 1% of water industry survey respondents indicated that the industry was fully prepared to address workforce attraction and retention in the next

five years (AWWA 2017), the same percentage reported each year since 2014 (AWWA 2014, 2015, 2016). The AWWA also ranked major issues facing the industry during these years, with the aging workforce and talent attraction and retention ranked as the fifth overall most important issue facing the industry in 2013 (AWWA 2013). One comprehensive study supported by the AWWA indicated retirement eligibility may be as high as 50% of the entire workforce within 10 years, with an additional potential 45% increase in recruitment of water workers needed due to new regulations, infrastructure growth, security challenges, and customer demand (Brueck et al. 2010). There are about 478,700 workers in the combined water and wastewater utilities sector, with about 55% estimated to be facility operators, according to references used by the GAO. The AWWA concluded in its 2015 report that the water industry is continuously facing difficulty recruiting, training, and retaining these skilled employees, especially for small systems (AWWA 2015).

Texas water experts similarly identified a coming crisis in the Texas water workforce at a series of industrywide planning forums exploring key future water security issues in 2015 and 2016 (Mohtar and Rosen 2015; Rosen 2017; Rosen et al. 2017). Participants expressed expert opinions and recalled past conversations and discussions from earlier industry meetings. They reiterated concerns about a coming wave of retirements and attrition, accompanied by inadequate recruitment to the water workforce and identified another major issue: the general failure of post-secondary educational institutions to supply workforce-ready graduates for Texas' evolving urban and rural water sectors. Participants at the forums submitted a series of proposals as solutions, focusing largely on reversing the failure of existing post-secondary educational institutions to meet water industry demand for graduates with job-ready training.

WATER WORKFORCE EDUCATION

Industry reports, planning documents, and conference discussions confirm that there is concern about education and recruitment of the future water workforce in many states (SFPUC 2012; PCAST 2016) and even in Canada (Yessie 2012). Impacts on water security due to failure of our educational institutions to respond to industry workforce needs will be felt nationwide and beyond, not just in Texas.

In general, the most prominent recommendations in industry publications for enhancing recruitment of water workers include mentoring, internships, and increased access to industry training programs. It has been industry-driven training, focused on regulatory licensing and certification requirements, which has been the traditional mainstay for educating the water workforce. Occupational licensing and education requirements for workers in the water industries in Texas are the responsibility of the Texas Commission on Environmental Quality (TCEQ). Current requirements for licensing include various combinations of high school and secondary education credits, work experience, completion of licensing-related training, and passing a licensing exam. Licensing is required for water operators at public utilities. Licensing for wastewater treatment plant and collection system operators varies according to workers' levels of knowledge, experience, and education (Table 1). Options for licensing water system operators start with a minimum base of education, work experience, and training requirements for a Class D license, increasing levels of competency in water distribution, groundwater, and surface water for Classes B and C operators, and a combination of all for Class A water operators (Table 2).

Few efforts described by the water industry focus on creating pathways to training by higher education institutions that are equipped to prepare the future workforce with job-relevant workforce-ready training, plus a degree that will enable long-term professional growth into managerial positions. Industry-level training delivers licenses required for employment in many water jobs and provides an excellent and highly applied complement to degree granting programs, but it does not equip the future workforce for today's emerging requirements for a bachelor's degree for basic employment as a manager. Nor does industry training alone provide a means for employment in a company where a university degree is basic entry-level criteria for any significant position or help attract people to a water career who are interested in obtaining a future competitive edge by having broader training, including in subject areas such as computer science, policy, engineering, business, or other studies that may help expand future job opportunities.

Public faith in water management institutions fell in the aftermath of publicity surrounding impacts to public health from harmful drinking water supplied to residents of Flint, Michigan (Heard-Garris et al. 2017). Among results has been a heightened recognition of a need for education and workforce development in water treatment (FWATF 2016). Post-secondary education degrees for water workers may become essential for utilities and water providers worried about liability for proper water and wastewater treatment and where there are significant water security concerns.

The GAO report and S. 2346 suggest possible pathways. For example, to fund the need for enhanced water workforce planning and training, S. 2346 would authorize a competitive grants program for infrastructure workforce development. The grants program would be managed by the Administrator of the U.S. Environmental Protection Agency and the Secretary of the Army. Should S. 2346 pass and appropriations be provided by the U.S. Congress, many education initiatives would be started or enhanced. Fortunately, nearly all of the recommendations in the proposed bill are being used to some degree in various locations already. Such initiatives include internships, apprenticeships, post-secondary bridge programs, and collabo-

Table 1. Occupational licensing education, work experience, and training requirements for wastewater treatment plant and collection system operators. From Texas Commission on Environmental Quality occupational licensing requirements webpage accessed October 16, 2018: https://www.tceq.texas.gov/licensing/licenses/wwlic/#require1

Education and Work Experience – Wastewater Treatment Licensing			
Class A	**Class B**	**Class C**	**Class D**
Master's Degree: • Education: degree major must be in chemistry, biology, engineering, microbiology, bacteriology, or another similar discipline as approved by the TCEQ Executive Director. • Work Experience: four years of "hands-on" experience. At least one half of the work experience must be obtained in the specific field for the license that is requested. **Bachelor's Degree:** • Education: degree major must be in chemistry, biology, engineering, microbiology, bacteriology, or another similar discipline as approved by the TCEQ Executive Director. • Work Experience: five years of "hands-on" experience. At least one half of the work experience must be obtained in the specific field for the license that is requested. **High School diploma or General Equivalence Diploma (GED):** • Education: High School diploma or GED. • Work Experience: eight years of work experience, six of which must be "hands-on". At least one half of the work experience must be obtained in the specific field for the license that is requested. **Acceptable Work Experience Substitute:** Applicants with a High School diploma or GED may substitute up to two years of experience with college hours or additional TCEQ approved wastewater operator training. • 32 semester hours of college or 40 additional hours of approved training for one year of work experience • 16 semester hours of college or 20 additional hours of approved training for six months of work experience.	**Bachelor's Degree:** • Education: degree major must be in chemistry, biology, engineering, microbiology, bacteriology, or another similar discipline as approved by the TCEQ Executive Director. • Work Experience: 2.5 years of "hands-on" experience. At least one half of the work experience must be obtained in the specific field for the license that is requested. **High School diploma or General Equivalence Diploma (GED):** • Education: High School diploma or GED. • Work Experience: five years of work experience, three of which must be "hands-on". At least one half of the work experience must be obtained in the specific field for the license that is requested. **Acceptable Work Experience Substitute:** Applicants with a High School diploma or GED may substitute up to two years of experience with college hours or additional TCEQ approved wastewater operator training. • 32 semester hours of college or 40 additional hours of approved training for one year of work experience. • 16 semester hours of college or 20 additional hours of approved training for six months of work experience.	**High School or General Equivalency Diploma:** • Education: High School diploma or General Equivalency Diploma. • Work Experience: two years of work experience. At least one half of the work experience must be obtained in the specific field for the license that is requested. **Acceptable Work Experience Substitute:** Applicants with a High School diploma or GED may substitute up to one year of experience with college hours or additional TCEQ approved wastewater operator training. • 32 semester hours of college or 40 additional hours of approved training for one year of work experience. • 16 semester hours of college or 20 additional hours of approved training for six months of work experience.	**High School or General Equivalency Diploma:** • Education: High School diploma or General Equivalency Diploma. • Work Experience: none.
Training Courses – Wastewater Treatment Licensing			
Class A	**Class B**	**Class C**	**Class D**
Core Courses: Activated Sludge or Wastewater Treatment, Wastewater Collection, Wastewater Laboratory, Water Utility Management, Water Utility Safety, plus one elective course. **Elective Courses:** Intermediate Wastewater Laboratory, Water Utility Calculations, Wastewater Technology, or Advanced Management.	**Core Courses:** Activated Sludge or Wastewater Treatment, Wastewater Collection, Wastewater Laboratory, Water Utility Safety, plus one elective course. **Elective Courses:** Intermediate Wastewater Laboratory, Water Utility Calculations, or Wastewater Utility Management.	**Core Courses:** Basic Wastewater Operation, Activated Sludge or Wastewater Treatment, plus one elective course. **Elective Courses:** Wastewater Collection, Wastewater Laboratory, Water Utility Calculations, or Water Utility Safety.	**Core Courses:** Basic Wastewater Operation

Table 2. Occupational licensing education, work experience, and training requirements for water system operators. From Texas Commission on Environmental Quality occupational licensing requirements webpage accessed October 16, 2018: https://www.tceq.texas.gov/licensing/licenses/waterlic

Education and Work Experience – Water System Operator Licensing

Class A	Class B	Class C	Class D
Master's Degree: • Education: degree major must be in chemistry, biology, engineering, microbiology, bacteriology, or another similar discipline as approved by the TCEQ Executive Director. • Work Experience: four years of "hands-on" experience in public water system operations. **Bachelor's Degree:** • Education: degree major must be in chemistry, biology, engineering, microbiology, bacteriology, or another similar discipline as approved by the TCEQ Executive Director. • Work Experience: five years of "hands-on" experience in public water system operations. **High School or General Equivalency Diploma:** • Education: High School diploma or GED. • Work Experience: eight years' experience in public water system operations, six of which must be "hands-on". **Acceptable Work Experience Substitute:** Applicants with a High School diploma or GED may substitute up to two years of experience with college hours or additional TCEQ approved water operator training. • 64 semester hours of college or 80 additional hours of approved training for two years of work experience. • 32 semester hours of college or 40 additional hours of approved training for one year of work experience.	**Bachelor's Degree:** • Education: degree major must be in chemistry, biology, engineering, microbiology, bacteriology, or another similar discipline as approved by the TCEQ Executive Director. • Work Experience: 2.5 years of "hands-on" experience. At least one half of the work experience must be obtained in the specific field for the license that is requested. **High School or General Equivalency Diploma:** • Education: High School diploma or GED. • Work Experience: five years of work experience, three of which must be "hands-on". At least one half of the work experience must be obtained in the specific field for the license that is requested. **Acceptable Work Experience Substitute:** Applicants with a High School diploma or GED may substitute up to two years of experience with college hours or additional TCEQ approved water operator training. • 64 semester hours of college or 80 additional hours of approved training for two years of work experience. • 32 semester hours of college or 40 additional hours of approved training for one year of work experience.	**High School or General Equivalency Diploma:** • Education: High School diploma or GED. • Work Experience: two years of experience, one of which must be "hands-on". At least one half of the work experience must be obtained in the specific field for the license that is requested. **Acceptable Work Experience Substitute:** Applicants may substitute up to one year of experience with college hours or additional TCEQ approved water operator training. • 32 semester hours of college or 40 additional hours of approved training for one year of work experience • 16 semester hours of college or 20 additional hours of approved training for six months of work experience	**High School or General Equivalency Diploma:** • Education: High School diploma or GED. • Work Experience: no work experience requirements.

Training Courses – Water System Operator Licensing

Class A	Class B	Class C	Class D
Core Courses: Basic Waterworks Operation, Surface Water Production I, Surface Water Production II, Groundwater Production, Water Distribution, Water Laboratory, Water Utility Management, and Water Utility Safety. **Elective Courses:** Plus an additional 20 hours of training to meet the 184 hour requirement.	**Class B Surface Water** **Core:** Basic Waterworks Operations, Surface Water Production I, Surface Water Production II, Water Distribution, Water Utility Safety, Water Laboratory, Water Utility Management. **Elective Courses:** None. **Class B Groundwater** **Core:** Basic Waterworks Operations, Groundwater Production, Water Distribution, Water Utility Safety, Water Laboratory, Plus one elective course. **Elective Courses:** Water Utility Management, Water Utility Calculations, Chlorinator Maintenance, Pump and Motor Maintenance, Valve and Hydrant Maintenance. **Class B Distribution** **Core:** Basic Waterworks Operations, Water Distribution, Water Utility Safety, Pump and Motor Maintenance, Valve and Hydrant Maintenance, Plus one elective course. **Elective Courses:** Water Utility Management, Water Utility Calculations, Chlorinator Maintenance, Water Laboratory.	**Class C Surface Water** **Core:** Basic Waterworks Operations, Surface Water Production I, Surface Water Production II. **Elective Courses:** None. **Class C Groundwater** **Core:** Basic Waterworks Operations, Groundwater Production, Plus one elective course. **Elective Courses:** Water Distribution, Water Laboratory, Water Utility Safety, Water Utility Calculations, Chlorinator Maintenance, Pump and Motor Maintenance, Valve and Hydrant Maintenance. **Class C Distribution** **Core:** Basic Waterworks Operations, Water Distribution, Plus one elective course. **Elective Courses:** Water Laboratory, Water Utility Safety, Water Utility Calculations, Chlorinator Maintenance, Pump and Motor Maintenance, Valve and Hydrant Maintenance.	**Core Courses:** Basic Wastewater Operation

rations with trade organizations, community colleges, universities, federal programs, and other training initiatives. Others include kindergarten through 12th grade and young adult education about the role of water and wastewater systems in communities, development of appropriate water curricula, and learning laboratories. Finally, S. 2346 would fund leadership development, education, and mentoring to prepare water utility workers for higher level professional, supervisory, and managerial positions.

It is this last category of recommendation in S. 2346 that creates a means for water workers to obtain a bachelor's degree. This offers the greatest departure from traditional approaches to water worker training and recruitment. It also promotes education that helps prepare the future workforce to use new technologies, meet basic standards of education for professional advancement, and reduce potential adverse public exposure and liability should public health or environmental pollution problems occur.

And finally, as treatment technologies advance, greater levels of education through industry training plus a university degree will become more often a requirement for job applicants, especially at large utilities. The GAO found considerable variation in the results of past efforts at workforce planning and development at large versus small water utilities when implementing past recruitment and retention initiatives. In response, the GAO describes recommendations to enhance security of the U.S. water supplies by providing new oversight on workforce matters, including recommendations for enhanced workforce planning and training, during inspections of water systems for compliance monitoring of drinking water and wastewater facilities. In particular, the GAO was concerned about violations of pollution discharge and drinking water rules, and impacts to the environment and public health.

POST-SECONDARY TRAINING AND INDUSTRY NEED MUST ALIGN

Participants at the Texas water forums stated that future education of students seeking employment in water and wastewater management should be different than that generally available through a typical civil or environmental engineering degree program. They believed that water workforce training and education need to be responsive to industry requirements for workers. Industry need is driven by regulatory requirement changes, advancing technologies, and rapid incorporation of new technologies into facility design, operation, and renovation. However, participants saw little or no rapid alignment of university curricula, TCEQ licensing requirements, industry training opportunities, changing technologies, and regulation changes. They noted this lack of alignment with changing technologies and regulations exists despite there is little likelihood that yesterday's curricula, designed for an earlier time, will provide the best training for the jobs of today and tomorrow. Further, as a person moves forward in their career, while they may start on the operational side of the business, many workers eventually end up on the planning and management side of the business.

Participants at the Texas water forums and industry workforce studies (Kemp-Rye 2005; Brueck et al. 2010) also pointed out a need to recognize that and account for differently sized communities have different kinds and scales of water facilities, different needs for water workers, and different training requirements for the water workforce. There will be greater demand for additional skills in a larger versus smaller community as water workers advance in their careers. Participants at the Texas forums also advised that the water workforce should be reflective of the society being served. Educational models should support educating people for jobs in local water systems (Grigg and Zenzen 2009; USGAO 2018; USS 2018). Water forum participants advised this will help ensure the water workforce meets the technical needs of stakeholders for services, as well as the social, economic, and political realities of the communities served. Regional universities, in collaboration with community colleges and extension programs, can be effective in delivering such education, especially if students are presented an attractive education pathway to obtain a degree and training required to enter the workforce.

CHANGING POST-SECONDARY EDUCATION MODELS

University educational models are not ones that bend easily to disruptive change. The current trend in higher education is for universities to become as much alike as possible. Thus, higher education has created an environment that cannot adapt their models quickly enough to respond to new innovative technologies and resulting changes in workforce needs. At present, few universities strive to develop graduates with practical operational training versus theoretical training. Training for work in water is among the casualties. The challenge of change is magnified by a growing separation between what industry needs as technology advances and what is being taught to students. This is greater in higher education than at technical training institutes.

Current incentives that are forcing universities to focus on theoretical training and become as much alike as possible must be reversed. Incentives should be made available to universities that choose to equip graduates with practical operational training that truly makes them ready for today's jobs. Administrative, leadership, and funding models need to change to enable such disruption of current practice. The very definition of career path through higher education may need to evolve to

make it possible to address future workforce needs in a way that will meet new technology and related workforce requirements.

Because university curricula are tied to accreditation agencies, these agencies will also need to adapt to enable universities to meet new technology-driven workforce demands in a timely fashion. It remains questionable, however, if higher education can adapt quickly enough. If not, universities will become even less effective at meeting the educational needs of the real-life water workforce and become still farther removed from practical use of the technology it is in the process of helping create.

We offer a post-secondary education initiative in Texas based on three pillars: first, the advice of experts at the Texas water sector planning forums (Mohtar and Rosen 2015; Rosen 2017; Rosen et al. 2017); second, a post-secondary education pathway for water science and technology students recently approved by Texas A&M University–San Antonio (TAMU–SA); and third, our own experiences seeking or developing improved educational curricula and degree programs relevant to educating students at various levels of education and the public about water and creating the future water workforce in Texas (e.g., Rosen 2014 for middle and high school students).

A MODEL POST-SECONDARY EDUCATION PATHWAY FOR WATER SCIENCE AND TECHNOLOGY

We propose a model for an education pathway leading to a Bachelor of Science (B.S.) or Bachelor of Applied Arts and Sciences (B.A.A.S.) degree for students seeking education and related certifications for entry into employment in Texas water industries. The education pathway must be available through a combination of distance education options, extension education, mobile laboratories, competency-based education credits, community colleges, and regional universities, which will ensure local access to water science and technology degrees for students throughout Texas. This learning model addresses the direction of S. 2346 by providing educational opportunities for a future labor force to help ensure a secure water future for Texas that can adapt to changing and emerging needs in the water industries at the rural (small systems) and urban (large systems) levels. The learning model will also help address industry liability issues and regulatory requirements and meet basic educational degree requirements for licensing and long-term employment of graduates.

Traditionally, entry- to technical-level positions in the water treatment industries was available to job seekers having only a high school degree and specialized technical training leading to attainment of certificates of training and licenses issued by regulatory authorities. Today, integration of new technologies in water treatment processes, evolving regulatory requirements, liability issues, and general hiring standards in utilities are driving educational requirements upward. This nationwide trend is expected to continue and possibly accelerate in the near term. In addition, significant job advancement for existing members of the water industry workforce will require college-level degrees due to increases in minimum requirements to hold positions in the water industry. As this trend matures, universities need to better position degree programs in Texas to support water industry professionals who will increasingly be required to obtain advanced-level training or a university degree if they wish to progress within their organizations.

The new educational model must use existing training programs at all levels and new distance learning options, to create an educational pathway for high school graduates and practicing water industry professionals to obtain a job-relevant B.S. or B.A.A.S. degree.

This model must also be generic for use by any community college and regional university in combination with industry, university extension, and government training programs. This model is based on discussion and recommendations from water experts documented in two Texas water forums (Mohtar and Rosen 2015; Rosen 2017; Rosen et al. 2017) and our specific experience designing an education pathway for students to obtain a B.A.A.S. degree in water resources science and technology at TAMU–SA. Northwest Vista College, a community college in the Alamo Community College District, and the Texas A&M Engineering Extension Service (TEEX) cooperated with TAMU–SA in development of the B.A.A.S. degree program.

Figure 1 displays a flow diagram of a model education pathway providing multiple ways a high school graduate or practicing professional can combine progress to completion of a B.S. or B.A.A.S. degree in water science and technology. This model includes an option for a 2+2 degree, with the first two years of academic work completed at a community college and the last two years at a four-year degree granting regional university. Industry professionals who have completed certifications and training through industry, government, or university extension programs, such as those available through TEEX, will be able to earn competency-based credit toward a degree at a participating community college or university. Internships or work-study arrangements in water-related industries will be compulsory for completion of degree requirements for all students. An advisory board consisting of relevant water industry professionals drawn from local sources should guide the overall thrust of the degree curriculum at each participating community college and university, as well as support student internship opportunities. Features of the education pathway for beginning students and practicing professionals follow:

- Beginning students who have completed a high school degree have several options. They can complete the general Texas state education core curriculum at an insti-

Figure 1. Multiple pathway options to obtain a Bachelor of Science or Bachelor of Applied Arts and Sciences in water resources for high school graduates with no previous training and practicing professionals who have completed water industry or TEEX training, certification courses, and regulatory licensing requirements. (Presentation adapted from Porter's Five Forces Diagram by Michael Porter, licensed under CC BY 2.0.)

tution such as the Virtual College of Texas through online courses, or at any community college in the state, complete an associate's degree in water science and technology at any of the participating community colleges, and then finish with a B.S. or B.A.A.S. degree in water science and technology at participating universities. We envision a community college or group of community colleges collaborating with a specific regional university for any given region in Texas. Beginning students can also start and finish their degree program at any participating university.

- Water industry professionals who have finished high school, have completed industry training courses, and have various certifications can similarly obtain a B.S. or B.A.A.S. degree by a combination of steps: complete the Virtual College of Texas core curriculum online, take distance education water science and technology courses, obtain competency-based credit toward a degree for training and certifications already completed, obtain an associate's degree from a community college, and complete coursework toward a B.S. or B.A.A.S. degree from a participating regional university.

To provide access to this program statewide and to meet the needs of working students and practicing professionals, all courses that are not laboratory-based or experiential learning-based would be available online in a three-year time-frame, jointly administered by the participating community college and regional university. Laboratory experiences would be supported by mobile water laboratories maintained by TEEX or other training providers that would be made available to participating colleges and universities. This will reduce the need for participating schools to buy or build expensive specialized laboratory equipment and facilities that may only receive use once or twice a year. Laboratory experiences would be offered as intensive short courses at participating community colleges or the regional university as needed. Short courses and licensing preparatory courses available through TEEX and industry sources would also be made available to students as needed. While students may or may not receive university credit toward their degree for such courses pending the nature of the course,

making these courses available to students will allow them to qualify for necessary certificates and licenses for job readiness.

This model relies on application of rigorous science and practical applied industry readiness training. It should be attractive to students seeking a clear path for a position in the water industry and provide long-term professional growth potential. It should also be attractive to practicing water professionals seeking a relevant university degree to enhance their own professional advancement opportunities.

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