Regional Occupational Program

# GIS for the Water Industry: Mapping Our Resources A-G 2025-2026

## COURSE DESCRIPTION

*Geographic Information Systems (GIS) for the Water Industry: Mapping Our Resources* provides students with foundational knowledge on the basics of GIS and introduces them to the core principles of how that knowledge may be applied to several occupations including water professionals, GIS technicians and analysts, foresters, biologists, and conservationists. In the water industry it is used to solve real world problems including infrastructure placement and maintenance, the difficulties associated with sourcing water, moving water, and treating water as well as the impacts of these activities on the natural world. The course utilizes ArcGIS, software developed by ESRI, a Redlands California based company. ESRI offers this software for free, and all activities are completely online. Instruction includes ArcGIS basics, the effects of population and agriculture on human systems, natural disaster preparation and an examination of water supply and demand. Career preparation standards, which include basic academic, communication, and problem-solving skills are integrated throughout the course.

### Course Information:

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| Course Length: | 1 Year |
| Prerequisite: | Pre-Algebra |
| Course Level: | Capstone |
| UC: | Yes G - Elective |
| Articulated: | No |
| Industry Cert.: | No |
| Industry Sector: | Energy, Environment, and Utilities |
| Pathway: | Environmental Resources |
| CALPADS: | 7612 |

### O*Net SOC Codes:

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|---|---|
| 17-3031 | Surveying and Mapping Technicians |
| 19-4043 | Geological Technicians, Except Hydrologic Technicians |
| 15-1299.02 | Geographic Information Systems Technologists and Technicians |

### Legend:

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| CTE - PS | CTE Pathway Standards |
| CRP | Career Ready Practices |
| CTE - AS | CTE Anchor Standards |
| CCSS | Common Core State Standards |
| ISTE | International Society for Technology in Education |

# GIS for the Water Industry: Mapping Our Resources

## Course Orientation

a. Discuss objectives for this course, including competencies, teacher expectations, classroom policies, and procedures.
b. Identify and discuss the acquisition of transferable skills (communication, collaboration, creativity, and critical thinking) and their importance to being college and career ready and for future personal and professional success.
c. Review objectives, competencies, and course syllabus.
d. Discuss student and teacher expectations, including behavior, class rules, appropriate dress, pre-course knowledge, and grading policies, including enrollment and attendance requirements and procedures, and classroom/school safety and disaster procedures.
e. Discuss next steps in course sequence related to the career pathway, the need for reinforcement of basic skills, transferrable skills, and postsecondary and career options.
f. Discuss the Big Six: Career Ready Essentials and the Standards for Career Ready Practice as they relate to this course, all aspects of the industry sector, and being college and career ready.

## Big Six: Career Ready Essentials

| 1. Effective Communication | CTE - PS | CRP | CTE - AS | CCSS | ISTE |
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| **a. Demonstrate effective verbal communication and conflict resolution skills.**<br>**b. Use the writing process to develop written communication with the appropriate tone, organization, and format for the identified audience.**<br>c. Explain the effect of interpersonal skills on one's ability to communicate effectively and develop relationships.<br>d. Describe the impact of ineffective communication on business relationships.<br>e. Analyze the impact of vocabulary, body language, and tone on verbal communication.<br>f. Demonstrate active listening skills.<br>g. Accurately interpret industry-specific written communication.<br>h. Model responsible and effective use of various communication technologies.<br>i. Identify valid and reliable digital reference and resource materials.<br>j. Gather information from multiple digital sources to compare and contrast, synthesize, and summarize.<br>k. Identify and use appropriate communication and collaboration technologies.<br>l. Utilize technology to problem solve, accomplish tasks, and to produce or publish products. | | 1<br>2<br>11 | 2<br>3<br>4<br>5<br>7<br>8<br>9<br>10<br>11 | **LS**<br>9-10<br>11-12.6<br><br>**SLS**<br>11-12.2<br>9-10<br>11-12.1<br>11-12.1d<br><br>**WS**<br>11-12.7<br>11-12.6 | 1b,c<br>2c<br>3b,c<br>5c<br>6b,c,d |

| 2. Collaboration, Creativity, and Critical Thinking | CTE - PS | CRP | CTE - AS | CCSS | ISTE |
|---|---|---|---|---|---|
| **a. Demonstrate critical thinking skills for a variety of purposes and in different settings.**<br>**b. Collaborate to reach consensus on an identical objective through the sharing of knowledge, tasks, and learning.**<br>c. Discuss the importance of the critical thinking process to real-world applications. | | 2<br>4<br>5<br>7 | 2<br>3<br>4<br>5 | **LS**<br>9-10<br>11- 12.6 | 1c<br>3c,d<br>4a-d<br>5c,d |

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| d. Evaluate the impact of creative thinking on problem solving and innovation in real-world applications.<br>e. Compile work that demonstrates the process used to (elaborate, refine, analyze) evaluate original ideas and maximize creative efforts.<br>f. Apply divergent and convergent thinking to the development of an original idea or solution.<br>g. Examine real-world limits to adopting ideas.<br>h. Demonstrate creative thinking (preparation, insight, evaluation, elaboration, and communication) to create a new idea or concept.<br>i. Assume shared responsibility for collaborative work, and value the individual contributions made by each team member.<br>j. Evaluate evidence, arguments, claims, and beliefs to identify connections.<br>k. Identify bias, prejudice, propaganda, self-deception, distortion, and misinformation.<br>l. Produce intellectual, informational, or material products that serve an authentic purpose.<br>m. Work effectively and respectfully with those from diverse backgrounds or cultures.<br>n. Demonstrate respect, trust, commitment, and the ability to compromise in collaborative projects. | | 9<br>10<br>11 | 7<br>8<br>9<br>11 | **SLS**<br>9-10<br>11-12.1<br>11-12.1d<br>11-12.2<br><br>**WS**<br>11-12.7<br>11-12.6 | 6c<br>7b,c,d |
| **3. Leaders and Teams: Roles and Responsibilities** | **CTE – PS** | **CRP** | **CTE - AS** | **CCSS** | **ISTE** |
| **a. Determine the individual and team members' roles and responsibilities.**<br>**b. Demonstrate leadership skills and qualities (i.e., reliability, negotiation skills, initiative, positive reinforcement, recognition of others' efforts, problem-solving skills, conflict resolution, and delegation).**<br>c. Compare and contrast leadership styles and their effectiveness in various situations.<br>d. Organize and delegate responsibilities in a team setting to encourage ideas, perspectives, and contributions from all team members.<br>e. Develop a strong sense of team identity by brainstorming solutions, volunteering, assisting others, practicing respect and courtesy, and taking initiative.<br>f. Examine situations in which a follower becomes the leader.<br>g. Describe twenty-first-century skills required across all occupations.<br>h. Identify and discuss the characteristics of a successful team (i.e., leadership, cooperation, and effective decision-making).<br>i. Leverage social and cultural differences to increase innovation and quality of work. | | 7<br>8<br>9 | 3<br>7<br>8<br>9<br>11 | **SLS**<br>11-12.2<br>9-10<br>11-12.1<br>11-12.1d<br><br>**WS**<br>11-12.6 | 7a,c |
| **4. Legal, Ethical, and Environmental Considerations** | **CTE - PS** | **CRP** | **CTE - AS** | **CCSS** | **ISTE** |
| **a. Demonstrate industry specific ethical and legal practices.**<br>**b. Identify eco-friendly industry specific practices and resources.**<br>c. Identify local, state, and federal regulatory agencies, entities, laws, and regulations.<br>d. Identify discrimination based on race, nationality, religion, gender, age, disability, or sexual orientation. | | 5<br>7<br>8<br>12 | 3<br>5<br>7<br>8<br>9 | **WS**<br>11-12.6<br>11-12.7<br><br>**SLS** | 2a,b<br>3a,b<br>5c<br>6c |

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| e. Summarize the ethical and legal implications of workplace discrimination and harassment.<br>f. Explain the concept of corporate citizenship.<br>g. Examine an employer's role in protecting the health and welfare of employees, the community, and the environment.<br>h. Analyze current environmental laws and regulations and their impact on industry.<br>i. Compare and contrast both society's and industry's impact on the environment. | | | 11 | 9-10<br>11-12.1<br>11-12.1d<br>11-12.2 | |
| **5. Personal Growth and Career Planning** | **CTE - PS** | **CRP** | **CTE - AS** | **CCSS** | **ISTE** |
| **a. Demonstrate continued personal development and growth.**<br>**b. Develop and manage a personal growth and career plan.**<br>c. Explain the relationship between sound financial habits and financial security.<br>d. Create and manage a personal financial plan.<br>e. Demonstrate initiative in achieving personal and professional goals.<br>f. Apply time management strategies to meet deadlines.<br>g. Demonstrate a growth mindset through flexibility and a positive attitude.<br>h. Select and demonstrate appropriate job-search and retention techniques.<br>i. Demonstrate strategies to prepare for employment.<br>j. Demonstrate interpersonal skills appropriate for the workplace.<br>k. Elaborate on the importance of perseverance to personal and professional success.<br>l. Discover personal career interests, aptitudes, and skills. | | 1<br>2<br>3<br>4<br>6 | 2<br>3<br>4<br>7<br>8<br>11 | **LS**<br>9-10<br>11-12.6<br><br>**SLS**<br>9-10<br>11-12.1<br>11-12.1d<br>11-12.2<br><br>**WS**<br>11-12.6 | 1a<br>3a,c<br>4d<br>6a,d<br>7b |
| **6. Workplace Safety and Personal Wellness** | **CTE - PS** | **CRP** | **CTE - AS** | **CCSS** | **ISTE** |
| **a. Demonstrate proper industry specific safe work practices to prevent injury or illness.**<br>**b. Assess the potential impact of goal setting on personal and professional success.**<br>c. Describe the role of security and emergency procedures in workplace safety.<br>d. Describe the effect of preventative measures on emergencies in the workplace.<br>e. Identify and describe the causes, prevention, and treatment of common accidents.<br>f. Identify local, state, and federal agencies that regulate workplace safety.<br>g. Explain the role of the California Occupational Safety and Health Administration (Cal-OSHA) and the Environmental Protection Agency (EPA).<br>h. Discuss the basics of system operations.<br>i. Demonstrate the proper use of personal protective equipment (PPE).<br>j. Explain the purpose of and accurately interpret a Safety Data Sheet (SDS).<br>k. Identify hazardous materials and chemicals.<br>l. Demonstrate proper procedures to respond to work-related accidents and injuries.<br>m. Describe how ergonomics, housekeeping, and maintenance are related to accidents and injuries.<br>n. Demonstrate cyber ethics, cyber safety, and cybersecurity. | | 2<br>5<br>6<br>8<br>12 | 2<br>5<br>6<br>7<br>8<br>10<br>11 | **LS**<br>9-10<br>11-12.6<br><br>**WS**<br>11-12.7<br>11-12.6<br><br>**SLS**<br>9-10<br>11-12.1<br>11-12.1d | 1a,d<br>2a,d<br>5b |

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| o. Assess the potential impact of preventative physical and mental health measures on workplace safety. | | | | | |

## Get in the Water: Careers with a Future Units of Instruction

| 7. Introduction to the World of Water | CTE-PS | CRP | CTE- AS | CCSS | ISTE |
|---|---|---|---|---|---|
| **a. Demonstrate understanding of water supply limits and the amount of water that is used in daily life.**<br>**b. Demonstrate understanding of California's geography and the role it plays in water supply.**<br>c. Discover the amount of water that is available for human consumption.<br>d. Describe the local geography and the effect this has on water supply.<br>e. Discuss competition for water resources and the role different stakeholders have in water allocation. | A9.0<br>A10.0 | 1<br>2<br>5<br>6<br>11<br>12 | 1<br>2<br>5<br>6<br>11 | **LS**<br>9-10<br>11-12.6<br><br>**WS**<br>11-12.7<br><br>**RSTS**<br>9-10<br>11-12.4 | |

| 8. Introduction to ArcGIS | CTE - PS | CRP | CTE - AS | CCSS | ISTE |
|---|---|---|---|---|---|
| **a. Demonstrate understanding of ArcGIS and the importance technology has in water supply to meet a variety of needs including human and environmental uses.**<br>**b. Demonstrate understanding of analyzing and manipulating data utilizing the ArcGIS software to create maps.**<br>c. Identify and explain how a local watershed is contained within a larger watershed that connects to the ocean.<br>d. Observe rainfall patterns and analyze the effects of geography on population.<br>e. Discover the effects of temperature and precipitation on bioregions.<br>f. Identify the effects of the Dust Bowl on population in California.<br>g. Explore the characteristics of different climate zones on population centers around the world.<br>h. Identify historical and emerging trends in population, water and land use, and agriculture.<br>i. Discover and manipulate meaningful data to create maps that convey information.<br>j. Identify and quantify implications and consequences of decisions. | A2.3 | 1<br>2<br>4<br>5<br>11<br>12 | 1<br>2<br>4<br>5<br>11 | **LS**<br>9-10<br>11-12.6<br><br>**WS**<br>11-12.6<br>11-12.7 | |

| 9. Population Pressure | CTE - PS | CRP | CTE - AS | CCSS | ISTE |
|---|---|---|---|---|---|
| **a. Demonstrate understanding of the effects of population on water supply.**<br>**b. Demonstrate understanding of potential solutions of population growth on water supply.**<br>c. Explore the impacts that population shifts, and growth have on water supply and civilization.<br>d. Discover the impact of water on economic development by identifying and measuring standard of living indicators. | A2.3<br>A9.1 A9.2<br>A9.4 | 1<br>5<br>8<br>11<br>12 | 1<br>5<br>8<br>11 | **WS**<br>11-12.7<br><br>**SLS**<br>11-12.1d | |

| 10. Agriculture | CTE - PS | CRP | CTE - AS | CCSS | ISTE |
|---|---|---|---|---|---|
| **a. Demonstrate understanding of the effects of agriculture on water supply.** | A6.0 A9.4 | 1 | 1 | **LS** | |

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| **b. Demonstrate understanding of the environmental changes that occur as land is moved into agriculture.**<br>c. Identify and analyze food crops that are not native to the United States and the effects that "exchanges" had on land development and water.<br>d. Investigate and explain the environmental issues associated with tropical deforestation including contributing factors.<br>e. Explain how it is possible for California to remain the world's leading food producer during reoccurring droughts.<br>f. Explore and discuss the different water systems in California: surface, ground, and the distribution of water through the State Water Project.<br>g. Discuss the impacts humans have on the environment. | A10.0 | 2<br>5<br>6<br>11<br>12 | 2<br>5<br>6<br>11<br>12 | 9-10<br>11-12.6<br><br>**WS**<br>11-12.7<br><br>**RSTS**<br>9-10<br>11-12.4 | |
| **11. Water is Powerful** | **CTE - PS** | **CRP** | **CTE - AS** | **CCSS** | **ISTE** |
| **a. Demonstrate understanding that water can be a destructive force.**<br>**b. Demonstrate understanding of the necessity for careful and thoughtful water management planning.**<br>c. Discuss the political impacts of global warming.<br>d. Explore and identify the interconnectivity of watersheds to the ocean.<br>e. Investigate the effects of natural and manmade problems including global warming, pollution, and hurricanes.<br>f. Explain the human problems associated with global warming, pollution, and hurricanes. Describe the wastewater plant operations, and identify critical components of preliminary, primary, secondary, and tertiary treatment of solids.<br>g. Map the design, operation, and maintenance of a wastewater treatment process. | A2.4<br>A2.5 A2.6<br>A5.1<br>A10.6 | 1<br>2<br>5<br>8<br>9<br>11<br>12 | 1<br>2<br>5<br>8<br>9<br>11 | **LS**<br>9-10<br>11-12.6<br><br>**WS**<br>11-12.7<br><br>**SLS**<br>11-12.1d | |

| A-G Approved Key Assignments | |
|---|---|
| 1. | Explore the United States Geological Survey (USGS) website and Environmental Protection Agency (EPA) website to learn how where they live impact the water cycle. Students will prepare a lab report with their findings including visual representation (model) of the water cycle in their geographical area. *Unit(s) 7* |
| 2. | Use topographical maps to explore California's hydrologic regions and investigate population centers and their proximity to water. Students will complete the booklet, the Geography of Water, which is provided free of charge from the Metropolitan Water District of Southern California. *Unit(s) 7*<br>Teacher guide can be downloaded at: http://www1.mwdh2o.com/DocSvcsPubs/Education_Site/publications/The_Geography_of_Water.pdf<br>Order materials at: https://www.surveymonkey.com/r/?sm=5nsUhcVO%2b5t%2bOUZHBk7O2w%3d%3d |
| 3. | Research and map the locations and availability of water throughout California using ArcGIS. Students will then identify a variety of ways that water is used and the key stakeholder groups and their views. Using their research students will participate in a class discussion to determine which stakeholder groups views are the most important. *Unit(s) 7* |
| 4. | Use basic GIS concepts, features, and tasks to demonstrate the use of scientific inquiry and data analysis to make a decision and formulate a policy. Students will be assigned a topic in which they calculate people to resource ratios and develop a policy to address any identified inequalities. Students will be assessed on the map, analysis of data, and the developed policy. *Unit(s) 8* |
| 5. | Calculate the amount of water needed for both a traditional grass lawn and a native landscape to survive during various times of the year in different regions of the state. This data will be used to create a chart that visually represents the findings. *Unit(s) 8* |
| 6. | Use ArcGIS software to observe and analyze patterns of monsoon rainfall of South Asia in relationship to seasonal changes and the region's geographical features. In addition, students will research the agricultural practices and population distribution to create an emergency preparedness plan or evacuation route for an assigned region. Students will demonstrate further understanding of the data by writing four letters about life in India and the impact of seasonal changes on human life. *Unit(s) 8* |
| 7. | Use ArcGIS software to evaluate the impact of latitude, elevation, and proximity to the ocean on the need for water. Students will explore characteristics of the earth's tropical, temperate, and polar zones by analyzing monthly and annual temperature patterns in cities around the world in relationship to latitude, elevation, and proximity to the ocean. *Unit(s) 8* |
| 8. | Students will use ArcGIS to investigate and explore ancient cities, changes in population densities, and hypothesize about the reason these changes occurred. *Unit(s) 9* |
| 9. | Research and analyze differences in the standards-of-living and how physical location, cultural norms, and the economy contributes to a population's change and economic development over time. Using ArcGIS students will compare and contrast the population growth of the world's fastest and slowest growing regions to identify social and economic implications of rapid population growth. In addition, a student will identify access barriers to water and how those barriers may impact the standards-of-living. Students will write a report detailing their findings and proposing solutions. *Unit(s) 9* |
| 10. | Explore the history of food crop exchanges using ArcGIS software. Students will identify one crop that was introduced to California and write a report detailing how, where, and when these exchanges took place and their impact on the local culture, economy, ecosystems, and health of the population. *Unit(s) 10* |
| 11. | Complete a map activity using ArcGIS software to investigate tropical deforestation, wetland decline, and loss of indigenous species around the world and analyze the contributing factors. Students will then work in groups to prepare a presentation on these issues as they pertain to California and possible solutions for wetland rehabilitation and changes in farming practices. *Unit(s) 10*<br>Student resources: |

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| | Map of California as it existed pre-European contact (Spanish - 1769).<br>http://www.davidrumsey.com/luna/servlet/detail/RUMSEY~8~1~200040~3000024:Chapter-3--The-Advent-of-Human-Sett<br>More current map of agriculture in California<br>http://agric.ucdavis.edu/Agronomic_Crops_in_California/ |
| 12. | Using resources below students will answer the following questions.<br>1. How has California remained the leading food producer and exporter of food crops in times of drought?<br>2. What are the intentions and outcomes of State Water Projects?<br>3. What are the environmental and economic impacts of moving water from where it originates to where it is needed?<br>Students will then participate in a class discussion. *Unit(s) 10*<br>Student resources:<br>https://water.ca.gov/Programs/State-Water-Project<br>http://geology.com/lakes-rivers-water/california.shtml<br>https://sgma.water.ca.gov/webgis/?appid=SGMADataViewer#gwlevels |
| 13. | Complete a watershed mapping activity using ArcGIS. The map will detail how the watershed is interconnected with the smallest streams to the eventual flow into the ocean, including all activities that take place on or near the water source. These activities can create aquatic dead zones in the ocean. Students will use this activity to identify activities that cause these dead zones and possible solutions. Students will present findings to the class including a multimedia presentation. *Unit(s) 11* |
| 14. | Investigate the effects of Hurricane Mitch by using the ArcGIS software to collect data from before and after the Hurricane. Data points that will be analyzed include the effects on population centers, railroads, airports, the precipitation rates, the size of the hurricane and how quickly it escalated to hurricane status. After completing the mapping portion of the assignment, students will assume the role of an exchange student living in the Central American region and create a journal describing their experiences. *Unit(s) 11* |
| 15. | Final project: Working in groups students must prepare a map utilizing their mapping skills that includes the Colorado River and the closest cities. Each group, acting as Colorado River stewards will make a presentation to their fellow students who will be acting as policy makers for the Colorado River. Using their map as a visual guide, the presenting group must explain the solution to one of the problems they have discovered. *Unit(s) 12* |

## Standards Alignment

The curricula have been aligned with the CTE Model Curriculum Standards released in 2013. Each industry sector was updated to meet the increased rigor and relevancy requirements of the Common Core State Standards. The curriculum also includes the new Standards for Career Ready Practices.

### Standards for Career Ready Practice

1. *Apply appropriate technical skills and academic knowledge.*
2. *Communicate clearly, effectively, and with reason.*
3. *Develop an education and career plan aligned with personal goals.*
4. *Apply technology to enhance productivity.*
5. *Utilize critical thinking to make sense of problems and persevere in solving them.*
6. *Practice personal health and understand financial literacy.*
7. *Act as a responsible citizen in the workplace and the community.*
8. *Model integrity, ethical leadership, and effective management.*
9. *Work productively in teams while integrating cultural and global competence.*
10. *Demonstrate creativity and innovation.*
11. *Employ valid and reliable research strategies.*
12. *Understand the environmental, social, and economic impacts of decisions.*

## CTE Anchor Standards—Common Core English Language Arts Alignment

### *Anchor Standard 1: Academics*

Analyze and apply appropriate academic standards required for successful industry sector pathway completion leading to postsecondary education and employment. Refer to the industry sector alignment matrix for identification of standards. Note: alignment listed within each sector.

### *Anchor Standard 2: Communications*

Language Standard: Acquire and accurately use general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the (career and college) readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression. LS 9-10, 11-12.6

### *Anchor Standard 3: Career Planning and Management*

Speaking and Listening Standard: Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. SLS 11-12.2

### *Anchor Standard 4: Technology*

Writing Standard: Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments and information.

### *Anchor Standard 5: Problem Solving and Critical Thinking*

Writing Standard: Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem, narrow, or broaden the inquiry when appropriate, and synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. WS 11-12.7

### *Anchor Standard 6: Health and Safety*

Reading Standards for Science and Technical Subjects: Determine the meaning of symbols, keywords, and other domain-specific words and phrases as they are used in a specific scientific or technical context. RSTS 9-10, 11-12.4

### *Anchor Standard 7: Responsibility and Flexibility*

Speaking and Listening Standard: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners, building on others' ideas and expressing their own clearly and persuasively. SLS 9-10, 11-12.1

### *Anchor Standard 8: Ethics and Legal Responsibilities*

Speaking and Listening Standard: Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the work. SLS 11-2.1d

### *Anchor Standard 9: Leadership and Teamwork*

Speaking and Listening Standard: Work with peers to promote civil, democratic discussions and decision making; set clear goals and deadlines; and establish individual roles as needed. SLS 11-12.1b

### *Anchor Standard 10: Technical Knowledge and Skills*

Writing Standard: Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. WS 11-12.6

### *Anchor Standard 11: Demonstration and Application*

Demonstrate and apply the knowledge and skills contained in the industry-sector anchor standards, pathway standards, and performance indicators in the classroom, laboratory, and workplace settings, and the career technical student organization. Note: no alignment evident for this standard. WS 11-12.6

## CTE Model Curriculum Standards—Industry Sectors and Pathways

***Energy, Environment, and Utilities***

***A. Environmental Resources Pathway***

*A2.3 Analyze the impact of climate upon human activities and needs.*
*A2.4 Identify the greenhouse effect and climate change.*
*A2.5 Explain how greenhouse gases are generated.*
*A2.6 Assess impacts of greenhouse gases on the environment.*
*A5.1 Understand the role of waste and storm water management systems, their operation, and their impact on the environment.*
*A6.0 Understand the field of land use management and its potential for environmental impact.*
*A9.0 Research drinking-water sources, systems, treatment, and conservation.*
*A9.1 Understand water reuse: issues, strategies, technologies, and applications.*
*A9.2 Analyze strategies for improving energy efficiencies in water collection and distribution.*
*A9.4 Understand the functions and operations of water storage, reservoirs, aqueducts, and dams.*
*A10.0 Evaluate the impact and flow management of storm water, rivers, and groundwater.*
*A10.6 Describe the concerns and strategies for catastrophic storm water events and management.*

## ISTE Standards for Students

*1. Empowered Learner- Students leverage technology to take an active role in choosing, achieving, and demonstrating competency in their learning goals, informed by the learning sciences.*

*a) Students articulate and set personal learning goals, develop strategies leveraging technology to achieve them, and reflect on the learning process itself to improve learning outcomes.*

*b) Students build networks and customize their learning environments in ways that support the learning process.*

*c) Students use technology to seek feedback that informs and improves their practice and to demonstrate their learning in a variety of ways*

*d) Students understand the fundamental concepts of technology operations, demonstrate the ability to choose, use and troubleshoot current technologies and are able to transfer their knowledge to explore emerging technologies.*

*2. Digital Citizen- Students recognize the rights, responsibilities, and opportunities of living, learning, and working in an interconnected digital world, and they act and model in ways that are safe, legal, and ethical.*

*a) Students cultivate and manage their digital identity and reputation and are aware of the permanence of their actions in the digital world.*

*b) Students engage in positive, safe, legal, and ethical behavior when using technology, including social interactions online or when using networked devices.*

*c) Students demonstrate an understanding of and respect for the rights and obligations of using and sharing intellectual property.*

d) Students manage their personal data to maintain digital privacy and security and are aware of data-collection technology used to track their navigation online.

*3.Knowledge Constructor- Students critically curate a variety of resources using digital tools to construct knowledge, produce creative artifacts, and make meaningful learning experiences for themselves and others.*

*a) Students plan and employ effective research strategies to locate information and other resources for their intellectual or creative pursuits.*

*b) Students evaluate the accuracy, perspective, credibility, and relevance of information, media, data, or other resources.*

*c) Students curate information from digital resources using a variety of tools and methods to create collections of artifacts that demonstrate meaningful connections or conclusions.*

*d Students build knowledge by actively exploring real-world issues and problems, developing ideas and theories, and pursuing answers and solutions.*

*4. Innovative Designer- Students use a variety of technologies within a design process to identify and solve problems creating new, useful, or imaginative solutions.*

*a) Students know and use a deliberate design process for generating ideas, testing theories, creating innovative artifacts, or solving authentic problems.*

*b) Students select and use digital tools to plan and manage a design process that considers design constraints and calculated risks.*

*c) Students develop, test, and refine prototypes as part of a cyclical design process.*

*d) Students exhibit a tolerance for ambiguity, perseverance, and the capacity to work with open-ended problems.*

*5. Computational Thinker- Students develop and employ strategies for understanding and solving problems in ways that leverage the power of technological methods to develop and test solutions.*

*a) Students formulate problem definitions suited for technology-assisted methods such as data analysis, abstract models, and algorithmic thinking in exploring and finding solutions.*

*b) Students collect data or identify relevant data sets, use digital tools to analyze them, and represent data in various ways to facilitate problem-solving and decision-making.*

*c) Students break problems into component parts, extract key information, and develop descriptive models to understand complex systems or facilitate problem-solving.*

*d) Students understand how automation works and use algorithmic thinking to develop a sequence of steps to create and test automated solutions.*

*6. Creative Communicator- Students communicate clearly and express themselves creatively for a variety of purposes using platforms, tools, styles, formats, and digital media appropriate for their goals.*

*a) Students choose the appropriate platforms and tools for meeting the desired objectives of their creation or communication.*

*b) Students create original works or responsibly repurpose or remix digital resources into new creations.*

*c) Students communicate complex ideas clearly and effectively by creating or using a variety of digital objects such as visualizations, models, or simulations.*

*d) Students publish or present content that customizes the message and medium for their intended audiences.*

*7. Global Collaborator- Students use digital tools to broaden their perspectives and enrich their learning by collaborating with others and working effectively in teams locally and globally.*

*a) Students use digital tools to connect with learners from a variety of backgrounds and cultures, engaging with them in ways that broaden mutual understanding and learning.*

*b) Students use collaborative technologies to work with others, including peers, experts, or community members, to examine issues and problems from multiple viewpoints.*

*c) Students contribute constructively to project teams, assuming various roles and responsibilities to work effectively toward a common goal.*

*d) Students explore local and global issues and use collaborative technologies to work with others to investigate solutions.*