

Appendix S

**AGRICULTURE, FOOD AND NATURAL RESOURCES (AFNR)
YOUTH APPRENTICESHIP**

**ENVIRONMENTAL SYSTEMS PATHWAY
ADVANCED WATER RESOURCES UNIT
UNIT 11**

Advanced Water Resources Unit

Competency (Work Tasks)	Performance Standards What employer checks for while doing task. Train YA Student on; YA student will ...	Learning Objectives What to know/learn to do this task. Content Suggested for Class/Reading/On-the-Job Training:
Regulatory		
1. Assist with reporting	<ul style="list-style-type: none"> • Obtain required reporting forms/reports as required by schedule • Obtain data and information as required for report • Complete forms with worksite professional • Obtain authorizations as indicated • Submit reports as required in time required 	<ul style="list-style-type: none"> • List common reports required by federal, state, and local regulations for water treatment facilities • Discuss common regulatory reporting and required schedules (annual, monthly, special) for water treatment • Define Excursion Reports • Discuss how reporting is handled for permit violation and errors at your facility
2. Assist to evaluate security & public health operations	<ul style="list-style-type: none"> • Review security and health regulatory requirements and applicable documents such as <ul style="list-style-type: none"> ○ Environmental Protection Agency (EPA) Water Security requirements ○ Homeland Security requirements ○ Safe Drinking Water Act • Assist worksite professional to develop/prepare/review audit tool including items such as <ul style="list-style-type: none"> ○ Asset identification, countermeasures, threat identification, etc. • Assist worksite professional to perform periodic security and public health audit activities • Document the results of audit • Follow protocols for federal and/or public notice procedures if indicated • Participate in the creation of an improvement plan • Improvement plan clearly outlines change • Improvement plan is supported by data 	<ul style="list-style-type: none"> • Define and explain the purpose of risk assessment • Discuss who sets water policy locally, nationally and globally • Explain public notice procedures and when they are indicated • Describe cultural influences on water use and perception of water use • Explain the Dept. of Homeland Security's Chemical Facilities Anti-Terrorism (CFATS), Safe Drinking Water Act, Clean Water Act, Water quality standards regulation • Explain some major advances to protect drinking water and wastewater systems • Discuss the methods of practice from the Water Environment Federation
3. Assist with required inspections/audits	<ul style="list-style-type: none"> • Review safety, equipment, environmental permit information, and any other applicable documents such as 	<ul style="list-style-type: none"> • Discuss common regulatory requirements according to Wisconsin Department of Natural Resources (DNR) and the National Environmental Policy Act

	<ul style="list-style-type: none"> ○ Water quality standards required by Wisconsin Department of Natural Resources (DNR) and the National Environmental Policy Act (NEPA) ○ Wisconsin Pollutant Discharge Elimination System (WPDES) permits issued to the DNR ○ Discharge monitoring reports (DMRs) ○ Compliance Maintenance Annual Reports (CMAR) ○ Capacity Management Operations and Maintenance (CMOM) requirements and reports ○ Certifications for operation and lab registration ● Assist to analyze operational data for productivity/trends ● Assist worksite professional to develop/prepare/review audit tool ● Assist worksite professional to perform periodic internal quality audit activities ● Document the results of audit ● Follow protocols for federal and/or public notice procedures if indicated ● Participate in the creation of an improvement plan ● Improvement plan clearly outlines change ● Improvement plan is supported by data 	<p>(NEPA) for water treatment</p> <ul style="list-style-type: none"> ● Discuss considerations in overall water treatment design based on water treatment function and environmental impact ● Explain why facilities become involved with improvement processes ● Define continuous improvement ● Explain the purpose of quality management systems ● Describe the impact of Total Quality Management (TQM) principles ● Explain the purpose of a quality audit ● Describe the procedures of a quality audit ● Describe how audit results are reported
TREATMENT & OPERATIONS		
<p>4. Assist to prepare chemicals</p>	<ul style="list-style-type: none"> ● Review the appropriate protocol for safely preparing the chemical ● Perform calculations and conversions if needed <ul style="list-style-type: none"> ○ Determine the concentration and amount required ○ Calculate the amount of solute and solvent needed to prepare the desired amount ○ Verify calculations with worksite professional ● Mix the proper concentration of solutions from solids and/or liquids ● Test and adjust pH or concentration if required ● Return solute, solvent, and/or concentrates to proper storage area ● Label and store prepared item as required per 	<ul style="list-style-type: none"> ● Discuss proper handling, storage and disposal of chemicals in your facility ● Calculate dosage rates ● Explain how to confirm chemical strength ● Discuss the facility chemical hygiene plan for transport, mixing, and feed systems ● Describe the proper storage and handling of various chemicals: Inorganic, Organic, acids, chlorinated chemicals, flammable, corrosive ● Compare and contrast the properties of chemicals used in water resource management ● Describe hazards associated with the chemicals used in water resource management ● Define the pH scale

	<ul style="list-style-type: none"> protocol • Document chemical preparation as required • Clean up 	
5. Assist to add chemicals	<ul style="list-style-type: none"> • Assist to prepare chemicals • Review the appropriate protocol for safely adding chemicals • Confirm chemical required • Verify chemical is properly mixed and within expiration date • Transport chemical to system site for addition to system as required • Add chemical to system site with worksite professional using manual or automatic feed systems • Document chemical addition as required • Transport, store, and dispose of materials as indicated 	<ul style="list-style-type: none"> • Characterize basic aspects of water chemistry • Explain how common chemicals added adjust water chemistry • Discuss the importance of maintaining pH in a water treatment system • Explain chemical addition methods • Explain the indications and use of a chemical spill kit and chemical shower/eyeball washer
6. Perform start-up & shut-down of pumps & equipment	<ul style="list-style-type: none"> • Review procedure for start-up or shut-down including safety precautions • Verify control settings needed • Check equipment fluid, air, pressure levels as required • Set equipment settings as required • Monitor start-up as required to ensure correct operation • Make adjustments if needed • Document start-up procedure if applicable • Shut-down equipment safely • Verify all equipment is shut down as required • Document shut-down procedure if applicable • Identify any process or equipment maintenance concerns • Take corrective action to report and correct maintenance concerns 	<ul style="list-style-type: none"> • Discuss water resource back up power resources • Discuss start up and shut down procedures for each tool/equipment you will operate • List the situations which require you to obtain help to resolve problems with equipment • Identify the major components of equipment used in your production process and their functions • List the quality checks performed as part of the start-up and shut-down process • List the situations which require you to obtain help to resolve problems with equipment
7. Inspect operational equipment	<ul style="list-style-type: none"> • Read technical drawings • Review procedure for inspection including safety precautions • Obtain tools for inspection if required • Follow procedure to inspect equipment for function 	<ul style="list-style-type: none"> • Identify basic construction components related to pumps, piping, and water collection and treatment systems (jointing, bedding, backfill, etc.) • Discuss common indicators and inspections performed to ensure operational quality of water

	<ul style="list-style-type: none"> and damage • Assist to troubleshoot and repair equipment problems • Take corrective actions • Lock Out/Tag Out equipment that is inoperable • Document inspection 	treatment equipment
8. Assist to troubleshoot operations	<ul style="list-style-type: none"> • Regularly review quality control indicators for water treatment operations • Assist to analyze lab results • Assist to analyze operational data for productivity/trends • Take corrective actions for item out of compliance following required protocol • Adjust processes for water treatment as required (add chemicals, adjust equipment rates, etc.) • Document operational correction 	<ul style="list-style-type: none"> • Explain pathogen removal options and methods • Explain toxic substance removal options and methods • Explain elemental removal options (P, N) and methods • Explain chemical addition options and methods
LAB		
9. Prepare microscope slides	<ul style="list-style-type: none"> • Review protocol for preparing slides including safety precautions • Mount slides- <ul style="list-style-type: none"> ○ Place drop of sample on slide ○ Cover sample with cover slip by placing slip at liquid edge at an angle and lower over drop • Stain slides- <ul style="list-style-type: none"> ○ Stain samples according to protocol prior to slide mount or on slide as required ○ Place one drop of stain at edge of cover slip ○ Draw to stain other side • Operate microscope 	<ul style="list-style-type: none"> • Compare microscopic, stain, and plate methods for microbe identification
10. Operate a microscope	<ul style="list-style-type: none"> • Review protocol for the microscopy required including safety precautions • Power on the microscope • Set control and magnification settings to scan first • Adjust light aperture, power, stage, etc. according to protocol • Place slide/sample on stage • Find item in scan setting • Switch to low power and use course knob to refocus 	<ul style="list-style-type: none"> • Compare types of microscopes and how they function to magnify samples • List basic components of a microscope and their functions • Demonstrate proper use and care of a microscope

	<ul style="list-style-type: none"> • Switch to high power and use fine adjustment to refocus only if slide has cover slip or is thin enough • After slide scan/count, return all settings to lowest magnification • Power off microscope • Remove slide from stage • Wipe excess material as required • Wash and dry slides as required • Discard cover slips as required • Document testing as required • Cover and store microscope as required 	
11. Identify microbes	<ul style="list-style-type: none"> • Review protocol for quantification and/or identification of including safety precautions • Set up equipment and supplies needed • Prepare reagents, solutions, and/or buffers • Sample and transfer the sample in question <p>QUANTIFICATION</p> <ul style="list-style-type: none"> • Dilute sample as required • Create serial dilutions if required • Stain and/or label sample to be counted as required by protocol for microscopy, cytometry, spectrophotometry, etc. • Obtain readings and/or calculate number taking into account any dilution factor • Document counts and calculations as required <p>IDENTIFICATION</p> <ul style="list-style-type: none"> • Follow protocols to perform identification tests such as the following: <ul style="list-style-type: none"> ○ Visually inspect colony morphology ○ Obtain images using microscopy ○ Stain the sample (Gram stain, Acid Fast, fluorescence, etc.) ○ Test agglutination to a specific antibody • Document quantification and identification procedure as required • Clean up and shut down equipment 	<ul style="list-style-type: none"> • Discuss differences in identification techniques for the different types of microbes • Explain how to quantify and identify microbes • Compare microscopic, stain, plate, and DNA methods for microbe identification • List resources used for microbe identification • Discuss the implications for water treatment in the presences of common microbes
12. Assist to analyze lab results	<ul style="list-style-type: none"> • Collect data and results from testing • Select and use statistical tools to analyze and synthesize data 	<ul style="list-style-type: none"> • Express numbers in scientific notation • Manipulate numbers expressed in scientific notation back to simple numbers

	<ul style="list-style-type: none"> • Create tables and graphs to organize data • Query and extract information from data • Interpret graphs and the trends in data • Use IT tools to manipulate data creating models, reports, plans, processes, or projects from data provided • Document analysis process and tools used • Draw conclusions based on analysis with worksite professional • Assist to troubleshoot operations and adjust processes based on lab results 	<ul style="list-style-type: none"> • Describe standard statistical calculations performed on sets of data (mean, median, mode, standard deviation) • Discuss how error is calculated • Discuss methods for organizing and representing data
EQUIPMENT & QUALITY		
13. Maintain schedules, communication, & documentation	<ul style="list-style-type: none"> • Identify frequency of maintenance tasks, i.e., daily, every other day, weekly, monthly, yearly, etc. • Update schedules as maintenance is completed • Schedule preventive and repair maintenance with all internal and external parties with limited disruption to operations • Communicate maintenance and repair needs clearly • Use the correct reporting formats for documentation and communication • Document maintenance and repair activities accurately • Maintenance is documented clearly and completely • Maintenance communication is timely and accurate • Maintenance communication is documented 	<ul style="list-style-type: none"> • Discuss how to schedule repair and maintenance functions with respect to operations requirements • Explain how communication for repair and maintenance issues demonstrates a knowledge of customer and business needs • List the parties that need to be involved in repair and maintenance issues • Describe the importance of documenting communications • Describe the process of reporting and documenting preventive and corrective actions • Discuss why preventive/corrective records must be retained
14. Perform preventive maintenance (PM)	<ul style="list-style-type: none"> • Complete scheduled preventive maintenance (PM) tasks in a timely manner • Communicate PM to production and other applicable parties • Assure that alternative/back up equipment is available if needed by production • Consult worksite professionals, technical drawings, maintenance manuals, and equipment history for PM • Determine type of lubrication requirements • Gather equipment and supplies needed to perform PM • Ensure that equipment is properly labeled and pulled 	<ul style="list-style-type: none"> • Compare corrective, preventive and predictive maintenance types • Explain the importance of Preventive Maintenance (PM) • List common critical PM activities at your facility

	<p>from production use</p> <ul style="list-style-type: none"> • Follow appropriate Lock Out/Tag Out procedures prior to performing PM • Follow all safety requirements and wear appropriate Personal Protective Equipment (PPE) as required • Document preventative actions completed • Evaluate PM through follow up 	
15. Calibrate equipment	<ul style="list-style-type: none"> • Check calibration certification regularly by reviewing documentation • Follow schedule to calibrate tools and instruments • Perform safety checks • Clean and adjust instruments before calibrating • Calibrate tools and instruments accurately and correctly • Promptly re-calibrate tools out of calibration • Re-qualify tools and instruments sent out for recalibration or repairs • Label tools and equipment that have been calibrated • Document all calibration activities 	<ul style="list-style-type: none"> • Define calibration and how it is performed for common water treatment tools such as hand held meters such as pH, Dissolved Oxygen (DO), Conductivity meters • Explain how calibration precision and schedules are determined • Explain how to determine and control potential sources of measurement error • Discuss how to calibrate tools and instruments in your facility • Compare precision vs. accuracy
16. Assist to troubleshoot & repair equipment	<ul style="list-style-type: none"> • Ensure that equipment is properly labeled and pulled from production use (Lock Out/Tag Out) • Read technical drawings for the equipment and process that is under investigation • Locate the equipment reference materials and manuals • Review previous preventive maintenance and repair history records on the equipment under investigation • Ensure that appropriate safety devices and personal protective equipment are in place prior to diagnosis • Follow all safety requirements and wears appropriate Personal Protective Equipment (PPE) as required • Assist worksite professional to identify the components to be checked for proper operation • Assist the worksite professional to take appropriate readings using meters and testing equipment • Assist the worksite professional in locating and determining the cause of the problems reported • Assist worksite professional to match suggested remedies with problems for the inoperative systems 	<ul style="list-style-type: none"> • Identify basic approaches to maintenance • Explain how to read and review repair history records • Describe how diagrams, schematics, equipment manuals, and equipment specifications are used to determine repair • Describe the most common causes of water treatment tool/equipment failure • Explain the meaning of common alarms on equipment • Describe the purpose, function, and components of common diagnostic testing equipment • Compare types of repair situations which would or would not require requalification • Distinguish between initial operational qualification of equipment and routine performance qualification • Describe the impact of Total Quality Management (TQM) principles and ISO9000 certification on equipment qualification

	<ul style="list-style-type: none"> • Assist with basic repair • Assist to re-qualify equipment • Place equipment back into service • Notify operations • Document testing, evaluation, repair and requalification • Update maintenance schedules 	
17. Assist to analyze operational data for productivity/trends	<ul style="list-style-type: none"> • Obtain questionable or out of compliance data and reports • Define question/problem to be evaluated • Determine data analysis tool • Collect additional data if needed • Organize data using quality tools <ul style="list-style-type: none"> ○ Check Sheet ○ Pareto Chart ○ Scatter Diagram ○ Histogram ○ Cause/Effect Diagram ○ Flowchart ○ Control Chart • Assist to analyze lab results • Analyze other operational data collected • Assist to troubleshoot operations and adjust processes based on analysis 	<ul style="list-style-type: none"> • Explain the purpose of quality tools • Identify the roles of management and workers regarding quality • Determine how quality monitoring processes are built in to operations • Compare common quality tools for purpose and best time to use • Explain the purpose of data collection and analysis to quality • Identify statistical tools used in process improvement such as mean, median, mode, standard deviation • Define and explain how to use Statistical Process Control charts • Discuss the importance of common lab tests such as pH, Settleability, Mixed Liquor Suspended Solids (MLSS), and Microbe Analysis in water treatment process control
18. Assist to record, summarize & evaluate budget/usage/billing information	<ul style="list-style-type: none"> • Assist worksite professional to process financial information such as accounts receivable and accounts payable records and usage • Calculate and summarize costs <ul style="list-style-type: none"> ○ Estimate required resources including staff time, staff training, equipment time, equipment maintenance and repair costs, support services and staff required, facility modifications ○ Estimate raw materials quantities needed including costs associated with energy use, handling, and processing of water ○ Estimate time requirements with times for approvals, delays, and repairs • Build an estimated budget for the operations process • Assist worksite professional to prepare financial 	<ul style="list-style-type: none"> • Compare investor-owned, municipal, and cooperative business models of water resources • Compare tangible versus intangible costs and benefits in operations • Define accounts receivable and accounts payable • Compare the objectives of lean operations to cost containment and customer satisfaction • Describe how to calculate costs associated with staff, equipment, facilities, and materials • Explain how operations timetables are developed from planning for usage, materials, equipment, numbers of workers needed, and cost projections • Discuss how annual budgets are used to plan and budget for revenue amounts and sources, expenditures, classifications for operations, and

<p>19. Participate in a system project</p>	<p>reports as requested</p> <ul style="list-style-type: none"> • Review the scope and phases of the system project • Review the evaluation of the problem and the decision evidence for the system project • Participate in the following system project team activities as able <ul style="list-style-type: none"> ○ Identify the cross-functional/departmental team required for the project ○ Take part in technical training or orientation for the system project ○ Develop task list ○ Evaluate project requirements such as staff, training, materials, SOPs, etc. ○ Identify required resources and budget ○ Estimate time requirements ○ Develop initial project management flowchart ○ Identify interdependencies ○ Identify critical milestones ○ Evaluate risks ○ Prepare contingency plan ○ Track critical milestones ○ Participate in project phase review ○ Report project status ○ Evaluate implementation • Periodically review system project activities completed during the course of the project and their results 	<p>capital improvement</p> <ul style="list-style-type: none"> • Explain the importance of team building and preparation for system projects • Describe how to identify stakeholders and resources needed for system projects • List some common long range goals, facility upgrades, and special projects for water treatment facilities • Define Continuous Quality Improvement (CQI) • Determine how business activities interface with data processing functions • Explain how increases in productivity are realized by CQI • Summarize the importance of cross-functional teams in achieving company goals • Describe strategies for maximizing productivity in a high tech environment • Classify costs (e.g., direct and indirect, fixed and variable, methods and standards) • Define the purpose of common quality tools used during system projects
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