

Scenario Worksheet

Practice and Scenario Description:

Information Type	Data
Region	New England
State	Connecticut
Discipline Group	Water Management Engineering
Practice Code/Name	533 - Pumping Plant
Scenario ID	22
Scenario Name	Auto Start
Scenario Description	An autostart system designed to remotely monitor and control irrigation, frost protection, and crop cooling through user-defined start and stop settings for temperature and soil moisture. This is the installation of a self-contained control unit, custom harness, one pump-house master radio, two field radios with up to 1 mile line of sight in protective enclosure each with wireless temperature and soil moisture sensors, heavy-duty discharge pressure sensor, and cellular communications kit. An internet connection is required. One auto-start system is required for each irrigation pump. Typical scenario is a 15 acre irrigated cranberry bog. Resource concerns: Insufficient water - Inefficient use of irrigation water; Inefficient energy use - Equipment and facilities and Farming/ranching practices and field operations. Associated Practices: 374 - Farmstead Energy Improvement; 430 - Irrigation Pipeline; 441 - Irrigation System, Microirrigation; 449 - Irrigation Water Management
Before Practice Situation	Irrigation Setting: Producer uses feel method to estimate soil moisture for scheduling irrigation in the fields, traveling to and from multiple pumps to manually start and stop them. Result is over/under water application, runoff, water loss and energy loss. Frost Protection Setting: Producer uses weather forecasts and thermometers to estimate air temperature in the fields, traveling to and from multiple pumps to manually start and stop them. Result is over/under water application, runoff, water loss and energy loss. Crop Cooling Setting: Producer uses weather forecasts, thermometers, and visual observation to estimate air temperature and crop stress in the fields, traveling to and from multiple pumps to manually start and stop them. Result is over/under water application, runoff, water loss and energy loss.
After Practice Situation	An autostart system is installed on an existing pumping plant meeting Nebraska performance criteria. The pump is remotely controlled allowing user-defined start and stop settings based on real-time data collected by soil moisture sensors and wireless temperature sensors in the fields, reducing water, energy usage, and runoff.
Scenario Feature Measure	Number of pumps ²
Scenario Unit	Each
Scenario Typical Size	1

Cost Summary:

Cost Category	Scenario Cost	Scenario Cost/Unit
Materials	\$6,688.61	\$6,688.61
Equipment/Installation	\$0.00	\$0.00
Labor	\$790.80	\$790.80
Mobilization	\$274.33	\$274.33
Acquisition of Technical Knowledge	\$0.00	\$0.00
Foregone Income	\$0.00	\$0.00
Total	\$7,753.74	\$7,753.74

Cost Details:

Cost Category	Component ID	Component Name	Component Description	Unit	Price (\$/unit)	Quantity	Cost
Materials	1135	Solar Panels, variable cost portion	Variable cost portion of the Solar Panels. This portion IS dependent on the total Kilowatt for the Solar Panels. The total cost of any Solar Panels will include this variable cost plus the fixed cost portion. The completed Solar Panels will include all materials (electrical, controllers, and service drop, etc). This cost will include material, labor and equipment.	Kilowatt	\$3,337.70	0.6	\$2,002.62
Materials	1195	Switches and Controls, radio system	Output radio, field transmitter, and receiver commonly used to control pumps and irrigation systems	Each	\$770.00	1	\$770.00
Materials	1194	Switches and Controls, Wi-Fi system and software	Software with built-in cellular or Wi-Fi communication commonly used to control pumps and irrigation systems	Each	\$750.00	1	\$750.00
Materials	1192	Switches and Controls, temp sensors	Temperature and soil moisture sensors installed as part of an electronic monitoring (with or without wireless telecommunications) commonly used to control pumps and irrigation systems	Each	\$708.00	1	\$708.00
Materials	1193	Switches and Controls, programmable controller	Programmable logic controller (with or without wireless telecommunications) commonly used to control pumps and irrigation systems	Each	\$149.00	1	\$149.00
Materials	314	Weather Station	Portable device which collects site specific atmospheric and weather related measurements.	Each	\$153.29	1	\$153.29
Materials	1031	Solar Panels, fixed cost portion	Fixed cost portion of the Solar Panels. This portion is a base cost for all Solar Panels and is not dependant on KiloWatt. The total cost of any Solar Panels will include this fixed cost plus a variable cost portion. The completed Solar Panels will include all materials (electrical, controllers, service drops and etc). This cost will include material, labor and equipment.	Each	\$2,155.70	1	\$2,155.70

Labor	230	Skilled Labor	Labor requiring a high level skill set: Includes carpenters, welders, electricians, conservation professionals involved with data collection, monitoring, and or record keeping, etc.	Hour	\$39.54	20	\$790.80
Mobilization	1139	Mobilization, medium equipment	Equipment with 70-150 HP or typical weights between 14,000 and 30,000 pounds.	Each	\$274.33	1	\$274.33

Scenario Worksheet

Practice and Scenario Description:

Information Type	Data
Region	New England
State	Connecticut
Discipline Group	Water Management Engineering
Practice Code/Name	533 - Pumping Plant
Scenario ID	1
Scenario Name	Electric-Powered Pump ≤ 3 Hp
Scenario Description	A 1 Hp submersible electric-powered pump is installed in a well or structure; or a close-coupled 1 Hp electric-powered centrifugal pump is mounted on a platform. It is used for watering livestock as part of a prescribed grazing system; or for pressurizing a small irrigation system; or for transferring liquid waste in a waste transfer system. Resource Concerns: Livestock Production Limitation - Inadequate livestock water; Water Quality degradation - Excess nutrients in surface and ground waters; Insufficient water - inefficient use of irrigation water. Associated Practices include: 374 - Farmstead Energy Improvement; 430 - Irrigation Pipeline; 441 - Irrigation System, Microirrigation; 449 - Irrigation Water Management; 516 - Livestock Pipeline; 313 - Waste Storage Facility; 634 - Waste Transfer; and 614 - Watering Facility.
Before Practice Situation	Livestock: The present gravity flow system is inadequate to provide the proper flow rate for a prescribed grazing system. Irrigation: Available water is at an insufficient pressure to allow for even distribution of water. Waste Transfer: Contaminated water needs to be moved to a containment facility.
After Practice Situation	Livestock: Water is transferred at a sufficient rate and pressure to meet the requirements of a prescribed grazing system. Irrigation: A properly designed pump is installed to improve irrigation efficiency and reduce energy usage. Waste Transfer: Liquid wastes that have been collected through a waste transfer system are now efficiently transferred to an appropriate treatment or storage facility.
Scenario Feature Measure	Pump Power Requirement
Scenario Unit	Horse Power
Scenario Typical Size	1

Cost Summary:

Cost Category	Scenario Cost	Scenario Cost/Unit
Materials	\$405.33	\$405.33
Equipment/Installation	\$132.20	\$132.20
Labor	\$404.34	\$404.34
Mobilization	\$0.00	\$0.00
Acquisition of Technical Knowledge	\$0.00	\$0.00
Foregone Income	\$0.00	\$0.00
Total	\$941.87	\$941.87

Cost Details:

Cost Category	Component ID	Component Name	Component Description	Unit	Price (\$/unit)	Quantity	Cost
Materials	1010	Pump, < 5 HP - Pump and motor, variable cost portion	Variable cost portion of the Pump: < 5 HP - Pump and motor. This portion IS dependent on the total horsepower for the Pump: < 5 HP. The total cost of any Pump: < 5 HP will include this variable cost plus the fixed cost portion. The completed Pump: < 5 HP - Pump and motor will include the motor and controls. This cost will include material, labor and equipment.	Horsepower	\$229.73	1	\$229.73
Materials	1009	Pump, < 5 HP - Pump and motor, fixed cost portion	Fixed cost portion of the Pump: < 5 HP - Pump and motor. This portion is a base cost for all Pump: < 5 HP and is not dependant on horsepower. The total cost of any Pump: < 5 HP will include this fixed cost plus a variable cost portion. The completed Pump: < 5 HP - Pump and motor will include the motor and controls. This cost will include material, labor and equipment	Each	\$175.60	1	\$175.60
Equipment/Installation	939	Truck, Pickup	Equipment and power unit costs. Labor not included.	Hour	\$26.51	2	\$53.02
Equipment/Installation	37	Concrete, CIP, slab on grade, reinforced	Steel reinforced concrete formed and cast-in-place as a slab on grade by chute placement. Typical strength is 3000 to 4000 psi. Includes materials, labor and equipment to transport, place and finish.	Cubic yard	\$316.71	0.25	\$79.18
Labor	231	General Labor	Labor performed using basic tools such as power tool, shovels, and other tools that do not require extensive training. Ex. pipe layer, herder, concrete placement, materials spreader, flagger, etc.	Hour	\$25.71	6	\$154.26
Labor	234	Supervisor or Manager	Labor involving supervision or management activities. Includes crew supervisors, foremen and farm/ranch managers time required for adopting new technology, etc.	Hour	\$41.68	6	\$250.08

Scenario Worksheet

Practice and Scenario Description:

Information Type	Data
Region	New England
State	Connecticut
Discipline Group	Water Management Engineering
Practice Code/Name	533 - Pumping Plant
Scenario ID	2
Scenario Name	Electric-Powered Pump ≤ 3 HP with Pressure Tank
Scenario Description	A 1 Hp submersible electric-powered pump is installed in a well or structure; or a close-coupled 1 Hp electric-powered centrifugal pump is mounted on a platform. It is used for watering livestock as part of a prescribed grazing system; or for pressurizing a small irrigation system. Resource Concerns: Livestock Production Limitation - Inadequate livestock water; Insufficient water - Inefficient use of irrigation water. Associated Practices include: 374 - Farmstead Energy Improvement; 430 - Irrigation Pipeline; 441 - Irrigation System, Microirrigation; 449 - Irrigation Water Management; 516 - Livestock Pipeline.
Before Practice Situation	Livestock: The present gravity flow system is inadequate to provide the proper flow rate for a prescribed grazing system. Irrigation: Available water is at an insufficient pressure to allow for even distribution of water.
After Practice Situation	Livestock: Water is transferred at a sufficient rate and pressure to meet the requirements of a prescribed grazing system. Irrigation: A properly designed pump is installed to improve irrigation efficiency and reduce energy usage.
Scenario Feature Measure	Pump Power Requirement
Scenario Unit	Horse Power
Scenario Typical Size	1

Cost Summary:

Cost Category	Scenario Cost	Scenario Cost/Unit
Materials	\$669.33	\$669.33
Equipment/Installation	\$132.20	\$132.20
Labor	\$404.34	\$404.34
Mobilization	\$0.00	\$0.00
Acquisition of Technical Knowledge	\$0.00	\$0.00
Foregone Income	\$0.00	\$0.00
Total	\$1,205.87	\$1,205.87

Cost Details:

Cost Category	Component ID	Component Name	Component Description	Unit	Price (\$/unit)	Quantity	Cost
Materials	1038	Pressure Tank, 40 gallon	0	Each	\$264.00	1	\$264.00
Materials	1010	Pump, < 5 HP - Pump and motor, variable cost portion	Variable cost portion of the Pump: < 5 HP - Pump and motor. This portion IS dependent on the total horsepower for the Pump: < 5 HP. The total cost of any Pump: < 5 HP will include this variable cost plus the fixed cost portion. The completed Pump: < 5 HP - Pump and motor will include the motor and controls. This cost will include material, labor and equipment.	Horsepower	\$229.73	1	\$229.73
Materials	1009	Pump, < 5 HP - Pump and motor, fixed cost portion	Fixed cost portion of the Pump: < 5 HP - Pump and motor. This portion is a base cost for all Pump: < 5 HP and is not dependant on horsepower. The total cost of any Pump: < 5 HP will include this fixed cost plus a variable cost portion. The completed Pump: < 5 HP - Pump and motor will include the motor and controls. This cost will include material, labor and equipment	Each	\$175.60	1	\$175.60
Equipment/Installation	939	Truck, Pickup	Equipment and power unit costs. Labor not included.	Hour	\$26.51	2	\$53.02
Equipment/Installation	37	Concrete, CIP, slab on grade, reinforced	Steel reinforced concrete formed and cast-in-place as a slab on grade by chute placement. Typical strength is 3000 to 4000 psi. Includes materials, labor and equipment to transport, place and finish.	Cubic yard	\$316.71	0.25	\$79.18
Labor	231	General Labor	Labor performed using basic tools such as power tool, shovels, and other tools that do not require extensive training. Ex. pipe layer, herder, concrete placement, materials spreader, flagger, etc.	Hour	\$25.71	6	\$154.26
Labor	234	Supervisor or Manager	Labor involving supervision or management activities. Includes crew supervisors, foremen and farm/ranch managers time required for adopting new technology, etc.	Hour	\$41.68	6	\$250.08

Scenario Worksheet

Practice and Scenario Description:

Information Type	Data
Region	New England
State	Connecticut
Discipline Group	Water Management Engineering
Practice Code/Name	533 - Pumping Plant
Scenario ID	4
Scenario Name	Electric-Powered Pump >10 to 40 HP
Scenario Description	This is a close-coupled, 3-phase, 25 Hp electric-powered centrifugal pump mounted on a platform for pressurizing a medium-sized (600 gpm and 50 psi) sprinkler or large microirrigation (850 gpm and 35 psi) system or a large-sized surface irrigation system (1,200 gpm) or a large-sized (1,200 gpm and 25 psi) waste transfer system. Resource Concerns: Water Quality degradation - Excess nutrients in surface and ground waters; Insufficient water - Inefficient use of irrigation water. Associated Practices include: 374 - Farmstead Energy Improvement; 430 - Irrigation Pipeline; 441 - Irrigation System, Microirrigation; 449 - Irrigation Water Management; 313 - Waste Storage Facility; 634 - Waste Transfer; and 614 - Watering Facility.
Before Practice Situation	Irrigation: An existing irrigation system employs an inefficient, improperly sized pump that prevents efficient water application resulting in water loss and high energy use. Waste Transfer: Various types of semi-solid or liquid waste are uncollected causing surface and ground water issues. Due to topography, gravity transfer is not possible and a properly sized pump is needed to transfer waste as part of a waste transfer system.
After Practice Situation	Irrigation: A properly designed and efficient pumping plant is installed, reducing energy use and improving irrigation efficiency. Waste Transfer: Collected wastes are now efficiently transferred to an appropriate treatment or storage facility or to a distribution system.
Scenario Feature Measure	Pump Power Requirement
Scenario Unit	Horse Power
Scenario Typical Size	25

Cost Summary:

Cost Category	Scenario Cost	Scenario Cost/Unit
Materials	\$4,883.65	\$195.35
Equipment/Installation	\$2,483.66	\$99.35
Labor	\$4,362.96	\$174.52
Mobilization	\$548.66	\$21.95
Acquisition of Technical Knowledge	\$0.00	\$0.00
Foregone Income	\$0.00	\$0.00
Total	\$12,278.93	\$491.16

Cost Details:

Cost Category	Component ID	Component Name	Component Description	Unit	Price (\$/unit)	Quantity	Cost
Materials	1011	Pump, > 5 HP - Pump and motor, fixed cost portion	Fixed cost portion of the Pump: > 5 HP - Pump and motor, 2.5" through 10" discharge size, flows to 7000 gpm and heads to 325 ft. This portion is a base cost for all Pump: > 5 HP and is not dependant on horsepower. The total cost of any Pump: > 5 HP will include this fixed cost plus a variable cost portion. The completed Pump: > 5 HP - Pump and motor will include the motor and controls. This cost will include materials only.	Each	\$2,247.40	1	\$2,247.40
Materials	1012	Pump, > 5 HP - Pump and motor, variable cost portion	Variable cost portion of the Pump: > 5 HP - Pump and motor, 2.5" through 10" discharge size, flows to 7000 gpm and heads to 325 ft. This portion IS dependent on the total horsepower for the Pump: > 5 HP. The total cost of any Pump: > 5 HP will include this variable cost plus the fixed cost portion. The completed Pump: > 5 HP - Pump and motor will include the motor and controls. This cost will include materials only.	Horsepower	\$105.45	25	\$2,636.25
Equipment/Installation	37	Concrete, CIP, slab on grade, reinforced	Steel reinforced concrete formed and cast-in-placed as a slab on grade by chute placement. Typical strength is 3000 to 4000 psi. Includes materials, labor and equipment to transport, place and finish.	Cubic yard	\$316.71	2	\$633.42
Equipment/Installation	939	Truck, Pickup	Equipment and power unit costs. Labor not included.	Hour	\$26.51	56	\$1,484.56
Equipment/Installation	926	Backhoe, 80 HP	Wheel mounted backhoe excavator with horsepower range of 60 to 90. Equipment and power unit costs. Labor not included.	Hour	\$45.71	8	\$365.68
Labor	234	Supervisor or Manager	Labor involving supervision or management activities. Includes crew supervisors, foremen and farm/ranch managers time required for adopting new technology, etc.	Hour	\$41.68	56	\$2,334.08
Labor	231	General Labor	Labor performed using basic tools such as power tool, shovels, and other tools that do not require extensive training. Ex. pipe layer, herder, concrete placement, materials spreader, flagger, etc.	Hour	\$25.71	56	\$1,439.76

Labor	230	Skilled Labor	Labor requiring a high level skill set: Includes carpenters, welders, electricians, conservation professionals involved with data collection, monitoring, and or record keeping, etc.	Hour	\$39.54	8	\$316.32
Labor	233	Equipment Operators, Heavy	Includes: Cranes, Hydraulic Excavators >=50 HP, Dozers, Paving Machines, Rock Trenchers, Trenchers >=12", Dump Trucks, Ag Equipment >=150 HP, Scrapers, Water Wagons.	Hour	\$34.10	8	\$272.80
Mobilization	1139	Mobilization, medium equipment	Equipment with 70-150 HP or typical weights between 14,000 and 30,000 pounds.	Each	\$274.33	2	\$548.66

Scenario Worksheet

Practice and Scenario Description:

Information Type	Data
Region	New England
State	Connecticut
Discipline Group	Water Management Engineering
Practice Code/Name	533 - Pumping Plant
Scenario ID	3
Scenario Name	Electric-Powered Pump >3 to 10 HP
Scenario Description	This is a close-coupled 7.5 Hp electric-powered centrifugal pump, mounted on a platform. It is for a large, high-pressure (200 psi) livestock pipeline, used for watering livestock as part of a prescribed grazing system; or for pressurizing a medium-sized (200 gpm and 40 psi) irrigation system; or a medium-sized (400 gpm and 20 psi) waste transfer system. Resource Concerns: Livestock Production Limitation - Inadequate livestock water; Water Quality degradation - Excess nutrients in surface and ground waters; Insufficient water - inefficient use of irrigation water. Associated Practices include: 374 - Farmstead Energy Improvement; 430 - Irrigation Pipeline; 441 - Irrigation System, Microirrigation; 449 - Irrigation Water Management; 516 - Livestock Pipeline; 313 - Waste Storage Facility; 634 - Waste Transfer; and 614 - Watering Facility.
Before Practice Situation	Livestock: Current system consists of a series of medium pressure and inefficient pump stations to transport water to a distant and higher-elevation watering facility. Irrigation: An existing irrigation system employs an inefficient, improperly sized pump, that prevents efficient water application resulting in water loss and high energy use. Waste Transfer: Various types of semi-solid or liquid waste are uncollected causing surface and ground water issues. Due to topography, gravity transfer is not possible and a properly sized pump is needed to transfer waste as part of a waste transfer system.
After Practice Situation	Livestock: A single, efficient, high-pressure pumping plant is installed, eliminating intermediate pump stations, reducing energy use and enabling better system management. Irrigation: A properly designed and efficient pumping plant is installed, reducing energy use and improving irrigation efficiency. Waste Transfer: Collected wastes are now efficiently transferred to an appropriate treatment or storage facility.
Scenario Feature Measure	Pump Power Requirement
Scenario Unit	Horse Power
Scenario Typical Size	7.5

Cost Summary:

Cost Category	Scenario Cost	Scenario Cost/Unit
Materials	\$3,038.28	\$405.10
Equipment/Installation	\$794.60	\$105.95
Labor	\$1,617.36	\$215.65
Mobilization	\$0.00	\$0.00
Acquisition of Technical Knowledge	\$0.00	\$0.00
Foregone Income	\$0.00	\$0.00
Total	\$5,450.23	\$726.70

Cost Details:

Cost Category	Component ID	Component Name	Component Description	Unit	Price (\$/unit)	Quantity	Cost
Materials	1011	Pump, > 5 HP - Pump and motor, fixed cost portion	Fixed cost portion of the Pump: > 5 HP - Pump and motor, 2.5" through 10" discharge size, flows to 7000 gpm and heads to 325 ft. This portion is a base cost for all Pump: > 5 HP and is not dependant on horsepower. The total cost of any Pump: > 5 HP will include this fixed cost plus a variable cost portion. The completed Pump: > 5 HP - Pump and motor will include the motor and controls. This cost will include materials only.	Each	\$2,247.40	1	\$2,247.40
Materials	1012	Pump, > 5 HP - Pump and motor, variable cost portion	Variable cost portion of the Pump: > 5 HP - Pump and motor, 2.5" through 10" discharge size, flows to 7000 gpm and heads to 325 ft. This portion IS dependent on the total horsepower for the Pump: > 5 HP. The total cost of any Pump: > 5 HP will include this variable cost plus the fixed cost portion. The completed Pump: > 5 HP - Pump and motor will include the motor and controls. This cost will include materials only.	Horsepower	\$105.45	7.5	\$790.88
Equipment/Installation	939	Truck, Pickup	Equipment and power unit costs. Labor not included.	Hour	\$26.51	24	\$636.24
Equipment/Installation	37	Concrete, CIP, slab on grade, reinforced	Steel reinforced concrete formed and cast-in-placed as a slab on grade by chute placement. Typical strength is 3000 to 4000 psi. Includes materials, labor and equipment to transport, place and finish.	Cubic yard	\$316.71	0.5	\$158.36
Labor	231	General Labor	Labor performed using basic tools such as power tool, shovels, and other tools that do not require extensive training. Ex. pipe layer, herder, concrete placement, materials spreader, flagger, etc.	Hour	\$25.71	24	\$617.04
Labor	234	Supervisor or Manager	Labor involving supervision or management activities. Includes crew supervisors, foremen and farm/ranch managers time required for adopting new technology, etc.	Hour	\$41.68	24	\$1,000.32

Scenario Worksheet

Practice and Scenario Description:

Information Type	Data
Region	New England
State	Connecticut
Discipline Group	Water Management Engineering
Practice Code/Name	533 - Pumping Plant
Scenario ID	5
Scenario Name	Electric-Powered Pump >40 HP
Scenario Description	This is a close-coupled, 3-phase, 50 Hp electric-powered centrifugal pump mounted on a platform for pressurizing a large-sized (1,200 gpm and 50 psi) sprinkler or very large microirrigation (1,700 gpm and 35 psi) system or a very large-sized surface irrigation system (2,800 gpm) or a very large-sized (2,400 gpm and 25 psi) waste transfer system. Resource Concerns: Water Quality degradation - Excess nutrients in surface and ground waters; Insufficient water - Inefficient use of irrigation water. Associated Practices include: 374 - Farmstead Energy Improvement; 430 - Irrigation Pipeline; 441 - Irrigation System, Microirrigation; 442 - Irrigation System, Sprinkler; 449 - Irrigation Water Management; 313 - Waste Storage Facility; and 634 - Waste Transfer.
Before Practice Situation	Irrigation: An existing irrigation system employs an inefficient, improperly sized pump that prevents efficient water application resulting in water loss and high energy use.
After Practice Situation	Irrigation: A properly designed and efficient pumping plant is installed, reducing energy use and improving irrigation efficiency.
Scenario Feature Measure	Pump Power Requirement
Scenario Unit	Horse Power
Scenario Typical Size	50

Cost Summary:

Cost Category	Scenario Cost	Scenario Cost/Unit
Materials	\$7,519.90	\$150.40
Equipment/Installation	\$2,483.66	\$49.67
Labor	\$4,362.96	\$87.26
Mobilization	\$548.66	\$10.97
Acquisition of Technical Knowledge	\$0.00	\$0.00
Foregone Income	\$0.00	\$0.00
Total	\$14,915.18	\$298.30

Cost Details:

Cost Category	Component ID	Component Name	Component Description	Unit	Price (\$/unit)	Quantity	Cost
Materials	1011	Pump, > 5 HP - Pump and motor, fixed cost portion	Fixed cost portion of the Pump: > 5 HP - Pump and motor, 2.5" through 10" discharge size, flows to 7000 gpm and heads to 325 ft. This portion is a base cost for all Pump: > 5 HP and is not dependant on horsepower. The total cost of any Pump: > 5 HP will include this fixed cost plus a variable cost portion. The completed Pump: > 5 HP - Pump and motor will include the motor and controls. This cost will include materials only.	Each	\$2,247.40	1	\$2,247.40
Materials	1012	Pump, > 5 HP - Pump and motor, variable cost portion	Variable cost portion of the Pump: > 5 HP - Pump and motor, 2.5" through 10" discharge size, flows to 7000 gpm and heads to 325 ft. This portion IS dependent on the total horsepower for the Pump: > 5 HP. The total cost of any Pump: > 5 HP will include this variable cost plus the fixed cost portion. The completed Pump: > 5 HP - Pump and motor will include the motor and controls. This cost will include materials only.	Horsepower	\$105.45	50	\$5,272.50
Equipment/Installation	37	Concrete, CIP, slab on grade, reinforced	Steel reinforced concrete formed and cast-in-placed as a slab on grade by chute placement. Typical strength is 3000 to 4000 psi. Includes materials, labor and equipment to transport, place and finish.	Cubic yard	\$316.71	2	\$633.42
Equipment/Installation	939	Truck, Pickup	Equipment and power unit costs. Labor not included.	Hour	\$26.51	56	\$1,484.56
Equipment/Installation	926	Backhoe, 80 HP	Wheel mounted backhoe excavator with horsepower range of 60 to 90. Equipment and power unit costs. Labor not included.	Hour	\$45.71	8	\$365.68
Labor	234	Supervisor or Manager	Labor involving supervision or management activities. Includes crew supervisors, foremen and farm/ranch managers time required for adopting new technology, etc.	Hour	\$41.68	56	\$2,334.08
Labor	231	General Labor	Labor performed using basic tools such as power tool, shovels, and other tools that do not require extensive training. Ex. pipe layer, herder, concrete placement, materials spreader, flagger, etc.	Hour	\$25.71	56	\$1,439.76

Labor	230	Skilled Labor	Labor requiring a high level skill set: Includes carpenters, welders, electricians, conservation professionals involved with data collection, monitoring, and or record keeping, etc.	Hour	\$39.54	8	\$316.32
Labor	233	Equipment Operators, Heavy	Includes: Cranes, Hydraulic Excavators >=50 HP, Dozers, Paving Machines, Rock Trenchers, Trenchers >=12", Dump Trucks, Ag Equipment >=150 HP, Scrapers, Water Wagons.	Hour	\$34.10	8	\$272.80
Mobilization	1139	Mobilization, medium equipment	Equipment with 70-150 HP or typical weights between 14,000 and 30,000 pounds.	Each	\$274.33	2	\$548.66

Scenario Worksheet

Practice and Scenario Description:

Information Type	Data
Region	New England
State	Connecticut
Discipline Group	Water Management Engineering
Practice Code/Name	533 - Pumping Plant
Scenario ID	23
Scenario Name	Fish Screens <= 400 gpm
Scenario Description	An inline intake screens assembly is designed according to applicable Federal and State guidelines, to avoid entrainment or trapping of aquatic organisms. Typical scenario is a screen assembly rated for 250gpm including the clamp, screen body, rings and adaptaters.
Before Practice Situation	The intake pipe of an irrigation system is not properly screened resulting in excessive velocities prejudicial to T&E fish species.
After Practice Situation	A clamp-on fish screen is installed on an existing pumping plant meeting Nebraska performance criteria. Reduced velocities at the intake pipe prevent intake of T&E fish through the pump.
Scenario Feature Measure	Number of pumps@
Scenario Unit	Each
Scenario Typical Size	1

Cost Summary:

Cost Category	Scenario Cost	Scenario Cost/Unit
Materials	\$1,195.60	\$1,195.60
Equipment/Installation	\$0.00	\$0.00
Labor	\$102.84	\$102.84
Mobilization	\$0.00	\$0.00
Acquisition of Technical Knowledge	\$0.00	\$0.00
Foregone Income	\$0.00	\$0.00
Total	\$1,298.44	\$1,298.44

Cost Details:

Cost Category	Component ID	Component Name	Component Description	Unit	Price (\$/unit)	Quantity	Cost
Materials	2070	Pump intake screen, Linear, variable cost portion	Variable cost portion of linear fish intake pump screen including all adapters, o-rings, mounting tabs, and other accessories. Includes materials and shipping only.	Gallon per Minute	\$2.91	250	\$727.50
Materials	2069	Pump intake screen, Linear, fixed cost portion	Fixed cost portion of linear fish intake pump screen including all adapters, o-rings, mounting tabs, and other accessories. This is the base cost for the system. Includes materials and shipping only.	Each	\$468.10	1	\$468.10
Labor	231	General Labor	Labor performed using basic tools such as power tool, shovels, and other tools that do not require extensive training. Ex. pipe layer, herder, concrete placement, materials spreader, flagger, etc.	Hour	\$25.71	4	\$102.84

Scenario Worksheet

Practice and Scenario Description:

Information Type	Data
Region	New England
State	Connecticut
Discipline Group	Water Management Engineering
Practice Code/Name	533 - Pumping Plant
Scenario ID	24
Scenario Name	Fish Screens > 400 gpm
Scenario Description	An inline intake screens assembly is designed according to applicable Federal and State guidelines, to avoid entrainment or trapping of aquatic organisms. Typical scenario is a screen assembly rated for 600gpm including the clamp, screen body, rings and adaptaters.
Before Practice Situation	The intake pipe of an irrigation system is not properly screened resulting in excessive velocities prejudicial to T&E fish species.
After Practice Situation	A clamp-on fish screen is installed on an existing pumping plant meeting Nebraska performance criteria. Reduced velocities at the intake pipe prevent intake of T&E fish through the pump.
Scenario Feature Measure	Number of pumps ²
Scenario Unit	Each
Scenario Typical Size	1

Cost Summary:

Cost Category	Scenario Cost	Scenario Cost/Unit
Materials	\$2,214.10	\$2,214.10
Equipment/Installation	\$0.00	\$0.00
Labor	\$102.84	\$102.84
Mobilization	\$0.00	\$0.00
Acquisition of Technical Knowledge	\$0.00	\$0.00
Foregone Income	\$0.00	\$0.00
Total	\$2,316.94	\$2,316.94

Cost Details:

Cost Category	Component ID	Component Name	Component Description	Unit	Price (\$/unit)	Quantity	Cost
Materials	2070	Pump intake screen, Linear, variable cost portion	Variable cost portion of linear fish intake pump screen including all adapters, o-rings, mounting tabs, and other accessories. Includes materials and shipping only.	Gallon per Minute	\$2.91	600	\$1,746.00
Materials	2069	Pump intake screen, Linear, fixed cost portion	Fixed cost portion of linear fish intake pump screen including all adapters, o-rings, mounting tabs, and other accessories. This is the base cost for the system. Includes materials and shipping only.	Each	\$468.10	1	\$468.10
Labor	231	General Labor	Labor performed using basic tools such as power tool, shovels, and other tools that do not require extensive training. Ex. pipe layer, herder, concrete placement, materials spreader, flagger, etc.	Hour	\$25.71	4	\$102.84

Scenario Worksheet

Practice and Scenario Description:

Information Type	Data
Region	New England
State	Connecticut
Discipline Group	Water Management Engineering
Practice Code/Name	533 - Pumping Plant
Scenario ID	18
Scenario Name	Hollow Piston Manure Pump
Scenario Description	Install a hollow piston manure pump to transfer manure from a barn to a waste storage facility. Costs include pump, delivery, appurtenances, installation, and a small insulated pump house installed to protect pump and appurtenances from freezing and wet weather. Associated practices include: Waste Transfer (634), Waste Storage Facility (313)
Before Practice Situation	Manure from the barn and barnyard is not collected or contained and is allowed to flow into nearby surface and subsurface water resources.
After Practice Situation	A hollow piston manure pump mechanically actuated, 12" or greater discharge, 10 HP w/ accessories is installed in conjunction with a manure transfer pipe (634-Waste Transfer) to convey manure from the barn to the waste storage facility. The transferred waste is disposed of in accordance with the CNMP.
Scenario Feature Measure	Number of Pumps
Scenario Unit	Each
Scenario Typical Size	1

Cost Summary:

Cost Category	Scenario Cost	Scenario Cost/Unit
Materials	\$10,818.00	\$10,818.00
Equipment/Installation	\$6,975.78	\$6,975.78
Labor	\$2,062.80	\$2,062.80
Mobilization	\$0.00	\$0.00
Acquisition of Technical Knowledge	\$0.00	\$0.00
Foregone Income	\$0.00	\$0.00
Total	\$19,856.58	\$19,856.58

Cost Details:

Cost Category	Component ID	Component Name	Component Description	Unit	Price (\$/unit)	Quantity	Cost
Equipment/Installation	931	Hydraulic Excavator, 1 CY	Track mounted hydraulic excavator with bucket capacity range of 0.8 to 1.5 CY. Equipment and power unit costs. Labor not included.	Hour	\$94.05	10	\$940.50
Equipment/Installation	38	Concrete, CIP, formed reinforced	Steel reinforced concrete formed and cast-in-place in formed structures such as walls or suspended slabs by chute placement. Typical strength is 3000 to 4000 psi. Includes materials, labor and equipment to transport, place and finish.	Cubic yard	\$502.94	12	\$6,035.28
Labor	231	General Labor	Labor performed using basic tools such as power tool, shovels, and other tools that do not require extensive training. Ex. pipe layer, herder, concrete placement, materials spreader, flagger, etc.	Hour	\$25.71	20	\$514.20
Labor	233	Equipment Operators, Heavy	Includes: Cranes, Hydraulic Excavators >=50 HP, Dozers, Paving Machines, Rock Trenchers, Trenchers >=12", Dump Trucks, Ag Equipment >=150 HP, Scrapers, Water Wagons.	Hour	\$34.10	10	\$341.00
Labor	234	Supervisor or Manager	Labor involving supervision or management activities. Includes crew supervisors, foremen and farm/ranch managers time required for adopting new technology, etc.	Hour	\$41.68	10	\$416.80
Labor	230	Skilled Labor	Labor requiring a high level skill set: Includes carpenters, welders, electricians, conservation professionals involved with data collection, monitoring, and or record keeping, etc.	Hour	\$39.54	20	\$790.80
Materials	2158	Pump, Manure, Hollow Piston	Pump, Manure, Hollow Piston, Mechanically Actuated, 12" or greater discharge, 10 HP w/ accessories. Includes delivery.	Each	\$10,818.00	1	\$10,818.00

Scenario Worksheet

Practice and Scenario Description:

Information Type	Data
Region	New England
State	Connecticut
Discipline Group	Water Management Engineering
Practice Code/Name	533 - Pumping Plant
Scenario ID	7
Scenario Name	Internal Combustion-Powered Pump ≤ 7½ HP
Scenario Description	The typical scenario supports replacement of a pump in an existing irrigation system on cropland with a 5 HP pump. Size of pump is determined by required GPM and pressure derived from a design for specific irrigation system on cropland. Scenario could also be used for a 5 HP pump for silage leachate, barnyard runoff, and milk house waste (as part of a waste transfer system) at farm headquarters. The combination of higher solids content and volume require a larger horse power pump. This liquid manure pump is used to transfer semi-solid manure from a small reception pit located either below a barnyard or at the end of a free-stall barn or scrape alley. Resource Concerns: Livestock Production Limitation - Inadequate livestock water; Water Quality degradation - Excess nutrients in surface and ground waters; Insufficient water - Inefficient use of irrigation water. Associated Practices include: 374 - Farmstead Energy Improvement; 430 - Irrigation Pipeline; 441 - Irrigation System, Microirrigation; 442 - Irrigation System, Sprinkler; 449 - Irrigation Water Management; 516 - Livestock Pipeline; 313 - Waste Storage Facility; 634 - Waste Transfer; and 614 - Watering Facility.
Before Practice Situation	Irrigation: Either an existing irrigation system employs an inefficient, improperly-sized pump that leads to inefficient water delivery resulting in high energy costs, or Waste Transfer: various types of semi-solid or liquid waste at the headquarters is uncollected causing surface and ground water issues.
After Practice Situation	Irrigation Setting: For irrigation system, a properly designed pump is installed, reducing water and energy usage. Waste Transfer Setting: For semi-solid or liquid waste, wastes that have been collected through a waste transfer system are now efficiently transferred to appropriate treatment or storage facilities or crop application. Due to topography, gravity transfer is not possible and a properly sized pump is needed to transfer waste as part of a waste transfer system.
Scenario Feature Measure	Pump Power Requirement
Scenario Unit	Horse Power
Scenario Typical Size	5

Cost Summary:

Cost Category	Scenario Cost	Scenario Cost/Unit
Materials	\$1,025.00	\$205.00
Equipment/Installation	\$132.20	\$26.44
Labor	\$269.56	\$53.91
Mobilization	\$0.00	\$0.00
Acquisition of Technical Knowledge	\$0.00	\$0.00
Foregone Income	\$0.00	\$0.00
Total	\$1,426.76	\$285.35

Cost Details:

Cost Category	Component ID	Component Name	Component Description	Unit	Price (\$/unit)	Quantity	Cost
Materials	1027	Pump, < 50 HP, Pump & ICE power unit	Materials, labor, controls: < 50 HP Pump & ICE power unit	Horsepower	\$205.00	5	\$1,025.00
Equipment/Installation	37	Concrete, CIP, slab on grade, reinforced	Steel reinforced concrete formed and cast-in-place as a slab on grade by chute placement. Typical strength is 3000 to 4000 psi. Includes materials, labor and equipment to transport, place and finish.	Cubic yard	\$316.71	0.25	\$79.18
Equipment/Installation	939	Truck, Pickup	Equipment and power unit costs. Labor not included.	Hour	\$26.51	2	\$53.02
Labor	234	Supervisor or Manager	Labor involving supervision or management activities. Includes crew supervisors, foremen and farm/ranch managers time required for adopting new technology, etc.	Hour	\$41.68	4	\$166.72
Labor	231	General Labor	Labor performed using basic tools such as power tool, shovels, and other tools that do not require extensive training. Ex. pipe layer, herder, concrete placement, materials spreader, flagger, etc.	Hour	\$25.71	4	\$102.84

Scenario Worksheet

Practice and Scenario Description:

Information Type	Data
Region	New England
State	Connecticut
Discipline Group	Water Management Engineering
Practice Code/Name	533 - Pumping Plant
Scenario ID	8
Scenario Name	Internal Combustion-Powered Pump > 7½ to 75 HP
Scenario Description	<p>The typical scenario supports installation of a pump in an existing irrigation system or installation of a new pump on cropland with a 45 BHP pump. Size of pump is determined by required GPM and pressure derived from a design for specific irrigation system on cropland. The combination of higher solids content and volume require a larger horse power pump. This liquid manure pump is used to transfer semi-solid manure from a small reception pit located either below a barnyard or at the end of a free-stall barn or scrape alley.</p> <p>Resource Concerns: Water Quality degradation - Excess nutrients in surface and ground waters; Insufficient water - Inefficient use of irrigation water.</p> <p>Associated Practices include: 374 - Farmstead Energy Improvement; 430 - Irrigation Pipeline; 441 - Irrigation System, Microirrigation; 449 - Irrigation Water Management; 313 - Waste Storage Facility; 634 - Waste Transfer; 436 - Irrigation Reservoir; and 447 - Irrigation System, Tailwater Recovery; and 614 - Watering Facility.</p>
Before Practice Situation	<p>Irrigation: Either an existing irrigation system employs an inefficient, improperly-sized pump that leads to inefficient water delivery resulting in high energy costs, or</p> <p>Waste Transfer: various types of semi-solid or liquid waste at the headquarters is uncollected causing surface and ground water issues.</p>
After Practice Situation	<p>Irrigation Setting: For irrigation system, a properly designed pump is installed, reducing water and energy usage.</p> <p>Waste Transfer Setting: For semi-solid or liquid waste, wastes that have been collected through a waste transfer system are now efficiently transferred to appropriate treatment or storage facilities or crop application. Due to topography, gravity transfer is not possible and a properly sized pump is needed to transfer waste as part of a waste transfer system.</p>
Scenario Feature Measure	Pump Power Requirement
Scenario Unit	Horse Power
Scenario Typical Size	45

Cost Summary:

Cost Category	Scenario Cost	Scenario Cost/Unit
Materials	\$9,225.00	\$205.00
Equipment/Installation	\$788.43	\$17.52
Labor	\$2,078.72	\$46.19
Mobilization	\$548.66	\$12.19
Acquisition of Technical Knowledge	\$0.00	\$0.00
Foregone Income	\$0.00	\$0.00
Total	\$12,640.81	\$280.91

Cost Details:

Cost Category	Component ID	Component Name	Component Description	Unit	Price (\$/unit)	Quantity	Cost
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Scenario Worksheet

Practice and Scenario Description:

Information Type	Data
Region	New England
State	Connecticut
Discipline Group	Water Management Engineering
Practice Code/Name	533 - Pumping Plant
Scenario ID	9
Scenario Name	Internal Combustion-Powered Pump > 75 HP
Scenario Description	The typical scenario supports replacement of a pump in an existing irrigation system or installation of a new pump on cropland that is 75 break HP pump or larger. Size of pump is determined by required GPM and pressure derived from a design for specific irrigation system on cropland. Scenario could also be used for a pump for silage leachate, barnyard runoff, and milk house waste (as part of a waste transfer system) at farm headquarters. Resource Concerns: Water Quality degradation - Excess nutrients in surface and ground waters; Insufficient water - Inefficient use of irrigation water. Associated Practices include: 374 - Farmstead Energy Improvement; 430 - Irrigation Pipeline; 441 - Irrigation System, Microirrigation; 449 - Irrigation Water Management; 313 - Waste Storage Facility; 634 - Waste Transfer; and 614 - Watering Facility.
Before Practice Situation	Irrigation: Either an existing irrigation system employs an inefficient, improperly-sized pump that leads to inefficient water delivery resulting in high energy costs, or Waste Transfer: various types of semi-solid or liquid waste at the headquarters is uncollected causing surface and ground water issues.
After Practice Situation	Irrigation Setting: For irrigation system, a properly designed pump is installed, reducing water and energy usage. Waste Transfer Setting: For semi-solid or liquid waste, wastes that have been collected through a waste transfer system are now efficiently transferred to appropriate treatment or storage facilities or crop application. Due to topography, gravity transfer is not possible and a properly sized pump is needed to transfer waste as part of a waste transfer system.
Scenario Feature Measure	Pump Power Requirement
Scenario Unit	Horse Power
Scenario Typical Size	100

Cost Summary:

Cost Category	Scenario Cost	Scenario Cost/Unit
Materials	\$14,200.00	\$142.00
Equipment/Installation	\$1,158.16	\$11.58
Labor	\$2,823.52	\$28.24
Mobilization	\$548.66	\$5.49
Acquisition of Technical Knowledge	\$0.00	\$0.00
Foregone Income	\$0.00	\$0.00
Total	\$18,730.34	\$187.30

Cost Details:

Cost Category	Component ID	Component Name	Component Description	Unit	Price (\$/unit)	Quantity	Cost
Materials	1029	Pump, > 70 HP, Pump & ICE power unit	Materials, labor, controls: > 70 HP Pump & ICE power unit	Horsepower	\$142.00	100	\$14,200.00
Equipment/Installation	37	Concrete, CIP, slab on grade, reinforced	Steel reinforced concrete formed and cast-in-place as a slab on grade by chute placement. Typical strength is 3000 to 4000 psi. Includes materials, labor and equipment to transport, place and finish.	Cubic yard	\$316.71	2	\$633.42
Equipment/Installation	939	Truck, Pickup	Equipment and power unit costs. Labor not included.	Hour	\$26.51	6	\$159.06
Equipment/Installation	926	Backhoe, 80 HP	Wheel mounted backhoe excavator with horsepower range of 60 to 90. Equipment and power unit costs. Labor not included.	Hour	\$45.71	8	\$365.68
Labor	234	Supervisor or Manager	Labor involving supervision or management activities. Includes crew supervisors, foremen and farm/ranch managers time required for adopting new technology, etc.	Hour	\$41.68	24	\$1,000.32
Labor	231	General Labor	Labor performed using basic tools such as power tool, shovels, and other tools that do not require extensive training. Ex. pipe layer, herder, concrete placement, materials spreader, flagger, etc.	Hour	\$25.71	48	\$1,234.08
Labor	230	Skilled Labor	Labor requiring a high level skill set: Includes carpenters, welders, electricians, conservation professionals involved with data collection, monitoring, and or record keeping, etc.	Hour	\$39.54	8	\$316.32
Labor	233	Equipment Operators, Heavy	Includes: Cranes, Hydraulic Excavators >=50 HP, Dozers, Paving Machines, Rock Trenchers, Trenchers >=12", Dump Trucks, Ag Equipment >=150 HP, Scrapers, Water Wagons.	Hour	\$34.10	8	\$272.80
Mobilization	1139	Mobilization, medium equipment	Equipment with 70-150 HP or typical weights between 14,000 and 30,000 pounds.	Each	\$274.33	2	\$548.66

Scenario Worksheet

Practice and Scenario Description:

Information Type	Data
Region	New England
State	Connecticut
Discipline Group	Water Management Engineering
Practice Code/Name	533 - Pumping Plant
Scenario ID	19
Scenario Name	Manure PTO Vertical Shaft Pump
Scenario Description	Install a PTO manure pump to transfer manure from a barn to a waste storage facility. Costs include pump, delivery, appurtenances, installation, and a small insulated pump house installed to protect pump and appurtenances from freezing and wet weather. Associated practices include: Waste Transfer (634), Waste Storage Facility (313)
Before Practice Situation	Manure from the barn and barnyard is not collected or contained and is allowed to flow into nearby surface and subsurface water resources.
After Practice Situation	A vertical shaft PTO manure pump, 6" discharge, HP 70 to 110 (540 RPM) or HP 125 to 140 (1000 RPM), with agitating nozzle and propeller is installed to convey manure from the barn to the waste storage facility. The transferred waste is disposed of in accordance with the CNMP.
Scenario Feature Measure	Number of Pumps
Scenario Unit	Each
Scenario Typical Size	1

Cost Summary:

Cost Category	Scenario Cost	Scenario Cost/Unit
Materials	\$10,938.70	\$10,938.70
Equipment/Installation	\$0.00	\$0.00
Labor	\$344.36	\$344.36
Mobilization	\$0.00	\$0.00
Acquisition of Technical Knowledge	\$0.00	\$0.00
Foregone Income	\$0.00	\$0.00
Total	\$11,283.06	\$11,283.06

Cost Details:

Cost Category	Component ID	Component Name	Component Description	Unit	Price (\$/unit)	Quantity	Cost
Labor	231	General Labor	Labor performed using basic tools such as power tool, shovels, and other tools that do not require extensive training. Ex. pipe layer, herder, concrete placement, materials spreader, flagger, etc.	Hour	\$25.71	4	\$102.84
Labor	234	Supervisor or Manager	Labor involving supervision or management activities. Includes crew supervisors, foremen and farm/ranch managers time required for adopting new technology, etc.	Hour	\$41.68	2	\$83.36
Labor	230	Skilled Labor	Labor requiring a high level skill set: Includes carpenters, welders, electricians, conservation professionals involved with data collection, monitoring, and or record keeping, etc.	Hour	\$39.54	4	\$158.16
Materials	2159	Pump, Manure, PTO, Vertical Shaft	Pump, Manure, PTO, Vertical Shaft, 6" discharge, HP 70 to 110 (540 RPM) or HP 125 to 140 (1000 RPM), with agitating nozzle and propeller. Includes delivery.	Each	\$10,938.70	1	\$10,938.70

Scenario Worksheet

Practice and Scenario Description:

Information Type	Data
Region	New England
State	Connecticut
Discipline Group	Water Management Engineering
Practice Code/Name	533 - Pumping Plant
Scenario ID	16
Scenario Name	Livestock Nose Pump
Scenario Description	A Nose Pump is a diaphragm pump located in a pasture for the purpose of providing water to cattle. For a permanent installation, it is typical to also install Heavy Use Area Protection (561) (separate contract item) where the cattle congregate around the pump. It is powered and operated by cattle to transfer water from a stream to a drinking bowl. The objective is to provide water to the cattle outside of a live stream or other natural water source thereby eliminating a significant erosion situation and while also improving water quality. The cattle thus have access to drinking water without having to enter the stream. Generally one nose pump is adequate for 20 cattle. Resource Concerns: Insufficient stockwater; Inefficient energy use - Equipment and facilities. Associated Practices include: 374 - Farmstead Energy Improvement; 382 - Fence; 516 - Livestock Pipeline; 561 - Heavy Use Area Protection; and, 614 - Watering Facility.
Before Practice Situation	Livestock have open access to a live stream or other existing natural water supply. Water supply is contaminated due to animal activity and stream banks are eroded on a daily basis. Improper cattle distribution results in poor water quality, poor grazing distribution, over grazing, and soil erosion.
After Practice Situation	One nose pump is installed with all appurtenances anchored to concrete pad with 6"x6"x10 Gauge reinforcement wire (9 ft x 4 ft x 5 in) or other appropriate secure base to supply water to cattle for improved livestock herd management. Additional Heavy Use Area Protection (561) in the form of crushed rock and at least 5 feet wide, may be installed (separate contract item) surrounding the concrete pad. Improved: water quality, soil quality, grazing management, plant diversity, and animal health.
Scenario Feature Measure	Number of Pumps
Scenario Unit	Each
Scenario Typical Size	1

Cost Summary:

Cost Category	Scenario Cost	Scenario Cost/Unit
Materials	\$392.62	\$392.62
Equipment/Installation	\$370.44	\$370.44
Labor	\$539.12	\$539.12
Mobilization	\$0.00	\$0.00
Acquisition of Technical Knowledge	\$0.00	\$0.00
Foregone Income	\$0.00	\$0.00
Total	\$1,302.18	\$1,302.18

Cost Details:

Cost Category	Component ID	Component Name	Component Description	Unit	Price (\$/unit)	Quantity	Cost
Materials	1052	Nose Pump	Materials and delivery	Each	\$392.62	1	\$392.62
Equipment/Installation	939	Truck, Pickup	Equipment and power unit costs. Labor not included.	Hour	\$26.51	8	\$212.08
Equipment/Installation	37	Concrete, CIP, slab on grade, reinforced	Steel reinforced concrete formed and cast-in-placed as a slab on grade by chute placement. Typical strength is 3000 to 4000 psi. Includes materials, labor and equipment to transport, place and finish.	Cubic yard	\$316.71	0.5	\$158.36
Labor	231	General Labor	Labor performed using basic tools such as power tool, shovels, and other tools that do not require extensive training. Ex. pipe layer, herder, concrete placement, materials spreader, flagger, etc.	Hour	\$25.71	8	\$205.68
Labor	234	Supervisor or Manager	Labor involving supervision or management activities. Includes crew supervisors, foremen and farm/ranch managers time required for adopting new technology, etc.	Hour	\$41.68	8	\$333.44

Scenario Worksheet

Practice and Scenario Description:

Information Type	Data
Region	New England
State	Connecticut
Discipline Group	Water Management Engineering
Practice Code/Name	533 - Pumping Plant
Scenario ID	10
Scenario Name	Tractor Power Take Off (PTO) Pump
Scenario Description	<p>This scenario involves a PTO driven pump to either transfer water for an irrigation system from a Pond - 378 (includes backflow prevention as appropriate) to cropland or; to transfer semi-solid/ liquid manure (as part of a waste transfer system) at the farm headquarters from a Waste Storage Facility - 313, to an irrigation system or waste treatment facility. In both cases, a PTO driven pump is selected because the landowner has equipment available to supply power to the pump. Electricity is not readily available and/or a stationary engine is not a practical alternative.</p> <p>Resource Concerns: Water Quality degradation - Excess nutrients in surface and ground waters; Insufficient water - Inefficient use of irrigation water.</p> <p>Associated Practices include: 430 - Irrigation Pipeline; 442 - Irrigation System, Sprinkler; 449 - Irrigation Water Management; 590 - Nutrient Management; 378 - Pond; 313 - Waste Storage Facility; and 634 - Waste Transfer.</p>
Before Practice Situation	Irrigation Setting: An existing surface irrigation system employs an inefficient, improperly sized pump that leads to inefficient water delivery resulting in high energy costs; Waste Transfer Setting: various types of semi-solid or liquid waste at the headquarters are uncollected causing surface and ground water issues. A transfer method for waste is needed. Due to topography, gravity transfer is not possible and a properly sized pump is needed to transfer waste as part of a waste transfer system.
After Practice Situation	Irrigation Setting: A properly designed PTO-driven pump is installed, to transfer water to an Irrigation Pipeline (430) or Irrigation Canal or Lateral (320). Waste Transfer Setting: Wastes that have been collected through a waste transfer system are now efficiently transferred from a Waste Storage Facility (313) to an appropriate treatment facility or to an irrigation system. The pump typically will move 2,000 gallons per minute and is portable so that it can be used at several locations.
Scenario Feature Measure	Pump Power Requirement
Scenario Unit	Horse Power
Scenario Typical Size	60

Cost Summary:

Cost Category	Scenario Cost	Scenario Cost/Unit
Materials	\$6,182.70	\$103.05
Equipment/Installation	\$1,057.58	\$17.63
Labor	\$1,078.24	\$17.97
Mobilization	\$0.00	\$0.00
Acquisition of Technical Knowledge	\$0.00	\$0.00
Foregone Income	\$0.00	\$0.00
Total	\$8,318.52	\$138.64

Cost Details:

Cost Category	Component ID	Component Name	Component Description	Unit	Price (\$/unit)	Quantity	Cost
Materials	1923	Pump, Ag Water PTO, 1,000 GPM	Materials, labor, controls: Ag Water PTO Pump 1,000 GPM - 8"	Each	\$6,182.70	1	\$6,182.70
Equipment/Installation	939	Truck, Pickup	Equipment and power unit costs. Labor not included.	Hour	\$26.51	16	\$424.16
Equipment/Installation	37	Concrete, CIP, slab on grade, reinforced	Steel reinforced concrete formed and cast-in-placed as a slab on grade by chute placement. Typical strength is 3000 to 4000 psi. Includes materials, labor and equipment to transport, place and finish.	Cubic yard	\$316.71	2	\$633.42
Labor	231	General Labor	Labor performed using basic tools such as power tool, shovels, and other tools that do not require extensive training. Ex. pipe layer, herder, concrete placement, materials spreader, flagger, etc.	Hour	\$25.71	16	\$411.36
Labor	234	Supervisor or Manager	Labor involving supervision or management activities. Includes crew supervisors, foremen and farm/ranch managers time required for adopting new technology, etc.	Hour	\$41.68	16	\$666.88

Scenario Worksheet

Practice and Scenario Description:

Information Type	Data
Region	New England
State	Connecticut
Discipline Group	Water Management Engineering
Practice Code/Name	533 - Pumping Plant
Scenario ID	12
Scenario Name	Photovoltaic-Powered Pump 0.25 HP
Scenario Description	<p>The typical scenario assumes installation of a photovoltaic-powered pumping plant with a design operating total head on pump less than 250 feet in a well, pond or a live stream. The installation includes the pump, wiring, drop pipe, solar panels, mounts, inverter, and all appurtenances. Note: It is generally not advisable to use a storage battery for a number of reasons. A storage tank is generally the most efficient method to store energy. Grazing - Livestock exclusion from surface water will result in improved surface water quality and reduced erosion. Irrigation - energy consumption will be reduced and the increased pressure and flow rates will improve irrigation efficiency.</p> <p>Resource Concerns: Insufficient stockwater. Associated Practices include: 374 - Farmstead Energy Improvement; 382 - Fence; 430 - Irrigation Pipeline; 436 - Irrigation Reservoir; 516 - Livestock Pipeline; 561 - Heavy Use Area Protection; and, 614 - Watering Facility.</p>
Before Practice Situation	Livestock: Inadequate supply or location of water for a prescribed grazing system. Eroded stream banks and degraded water quality due to livestock access to stream. Cattle are not well-distributed because of remote water location. Irrigation: Pressure and flow rate is insufficient for uniform irrigation.
After Practice Situation	The typical scenario assumes installation of a 230-watt photovoltaic (PV) panel, capable of operating a 1/4 Hp (0.25 Hp) solar-powered submersible pump in a well or other water source (Notes: 1) A PV panel is rated under standard and ideal conditions which will most likely not be replicated in the field; 2) 1 Hp is defined as 746 watts; 3) It is reasonable to expect a 1/4 Hp solar-powered submersible pump to deliver about 1.5 gpm and develop a pressure at the pump outlet of about 60 psi. 4) The installation includes the pump, wiring, pipeline in the well, solar panels, frame mounts, inverter, and all appurtenances. Water will be pumped to an existing storage tank at a higher elevation from which it will be used to pressurize the Livestock Pipeline (516) or Irrigation Pipeline (430). Grazing - Livestock exclusion from surface water will result in improved surface water quality and reduced erosion. Grazing has potential to be well distributed. Irrigation: Improved pressure and flow rate will improve irrigation efficiency.
Scenario Feature Measure	Each Pumping Plant
Scenario Unit	Each
Scenario Typical Size	1

Cost Summary:

Cost Category	Scenario Cost	Scenario Cost/Unit
Materials	\$3,156.40	\$3,156.40
Equipment/Installation	\$424.16	\$424.16
Labor	\$1,078.24	\$1,078.24
Mobilization	\$0.00	\$0.00
Acquisition of Technical Knowledge	\$0.00	\$0.00
Foregone Income	\$0.00	\$0.00
Total	\$4,658.80	\$4,658.80

Cost Details:

Cost Category	Component ID	Component Name	Component Description	Unit	Price (\$/unit)	Quantity	Cost
Materials	1031	Solar Panels, fixed cost portion	Fixed cost portion of the Solar Panels. This portion is a base cost for all Solar Panels and is not dependant on KiloWatt. The total cost of any Solar Panels will include this fixed cost plus a variable cost portion. The completed Solar Panels will include all materials (electrical, controllers, service drops and etc). This cost will include material, labor and equipment.	Each	\$2,155.70	1	\$2,155.70
Materials	1135	Solar Panels, variable cost portion	Variable cost portion of the Solar Panels. This portion IS dependent on the total Kilowatt for the Solar Panels. The total cost of any Solar Panels will include this variable cost plus the fixed cost portion. The completed Solar Panels will include all materials (electrical, controllers, and service drop, etc). This cost will include material, labor and equipment.	Kilowatt	\$3,337.70	0.23	\$767.67
Materials	1010	Pump, < 5 HP - Pump and motor, variable cost portion	Variable cost portion of the Pump: < 5 HP - Pump and motor. This portion IS dependent on the total horsepower for the Pump: < 5 HP. The total cost of any Pump: < 5 HP will include this variable cost plus the fixed cost portion. The completed Pump: < 5 HP - Pump and motor will include the motor and controls. This cost will include material, labor and equipment.	Horsepower	\$229.73	0.25	\$57.43
Materials	1009	Pump, < 5 HP - Pump and motor, fixed cost portion	Fixed cost portion of the Pump: < 5 HP - Pump and motor. This portion is a base cost for all Pump: < 5 HP and is not dependant on horsepower. The total cost of any Pump: < 5 HP will include this fixed cost plus a variable cost portion. The completed Pump: < 5 HP - Pump and motor will include the motor and controls. This cost will include material, labor and equipment	Each	\$175.60	1	\$175.60

Equipment/Installation	939	Truck, Pickup	Equipment and power unit costs. Labor not included.	Hour	\$26.51	16	\$424.16
Labor	231	General Labor	Labor performed using basic tools such as power tool, shovels, and other tools that do not require extensive training. Ex. pipe layer, herder, concrete placement, materials spreader, flagger, etc.	Hour	\$25.71	16	\$411.36
Labor	234	Supervisor or Manager	Labor involving supervision or management activities. Includes crew supervisors, foremen and farm/ranch managers time required for adopting new technology, etc.	Hour	\$41.68	16	\$666.88

Scenario Worksheet

Practice and Scenario Description:

Information Type	Data
Region	New England
State	Connecticut
Discipline Group	Water Management Engineering
Practice Code/Name	533 - Pumping Plant
Scenario ID	14
Scenario Name	Photovoltaic-Powered Pump 1.5 HP
Scenario Description	The typical scenario assumes installation of a photovoltaic-powered pumping plant with a design operating total head on pump greater than 400 feet in a well, pond or a live stream. The installation includes the pump, wiring, drop pipe, solar panels, mounts, inverter, and all appurtenances. Note: It is generally not advisable to use a storage battery for a number of reasons. A storage tank is generally the most efficient method to store energy. Grazing - Livestock exclusion from surface water will result in improved surface water quality and reduced erosion. Irrigation - energy consumption will be reduced and the increased pressure and flow rates will improve irrigation efficiency. Resource Concerns: Insufficient stockwater. Associated Practices include: 374 - Farmstead Energy Improvement; 382 - Fence; 430 - Irrigation Pipeline; 436 - Irrigation Reservoir; 516 - Livestock Pipeline; 561 - Heavy Use Area Protection; and, 614 - Watering Facility.
Before Practice Situation	Livestock: Inadequate supply or location of water for a prescribed grazing system. Eroded stream banks and degraded water quality due to livestock access to stream. Cattle are not well-distributed because of remote water location. Irrigation: Pressure and flow rate is insufficient for uniform irrigation.
After Practice Situation	The typical scenario assumes installation of a 1.4 Kwatt photovoltaic (PV) panel, capable of operating a 1.5 Hp solar-powered submersible pump in a well or other water source (Notes: 1) A PV panel is rated under standard and ideal conditions which will most likely not be replicated in the field; 2) 1 Hp is defined as 746 watts; 3) It is reasonable to expect a 1.5 Hp solar-powered submersible pump to deliver about 10 gpm and develop a pressure at the pump outlet of about 60 psi. 4) The installation includes the pump, wiring, pipeline in the well, solar panels, frame mounts, inverter, and all appurtenances. Water will be pumped to an existing storage tank at a higher elevation from which it will be used to pressurize the Livestock Pipeline (516) or Irrigation Pipeline (430). Grazing - Livestock exclusion from surface water will result in improved surface water quality and reduced erosion. Grazing has potential to be well distributed. Irrigation: Improved pressure and flow rate will improve irrigation efficiency.
Scenario Feature Measure	Each Pumping Plant
Scenario Unit	Each
Scenario Typical Size	1

Cost Summary:

Cost Category	Scenario Cost	Scenario Cost/Unit
Materials	\$7,348.68	\$7,348.68
Equipment/Installation	\$424.16	\$424.16
Labor	\$1,078.24	\$1,078.24
Mobilization	\$0.00	\$0.00
Acquisition of Technical Knowledge	\$0.00	\$0.00
Foregone Income	\$0.00	\$0.00
Total	\$8,851.08	\$8,851.08

Cost Details:

Cost Category	Component ID	Component Name	Component Description	Unit	Price (\$/unit)	Quantity	Cost
Materials	1031	Solar Panels, fixed cost portion	Fixed cost portion of the Solar Panels. This portion is a base cost for all Solar Panels and is not dependant on KiloWatt. The total cost of any Solar Panels will include this fixed cost plus a variable cost portion. The completed Solar Panels will include all materials (electrical, controllers, service drops and etc). This cost will include material, labor and equipment.	Each	\$2,155.70	1	\$2,155.70
Materials	1135	Solar Panels, variable cost portion	Variable cost portion of the Solar Panels. This portion IS dependent on the total Kilowatt for the Solar Panels. The total cost of any Solar Panels will include this variable cost plus the fixed cost portion. The completed Solar Panels will include all materials (electrical, controllers, and service drop, etc). This cost will include material, labor and equipment.	Kilowatt	\$3,337.70	1.4	\$4,672.78
Materials	1010	Pump, < 5 HP - Pump and motor, variable cost portion	Variable cost portion of the Pump: < 5 HP - Pump and motor. This portion IS dependent on the total horsepower for the Pump: < 5 HP. The total cost of any Pump: < 5 HP will include this variable cost plus the fixed cost portion. The completed Pump: < 5 HP - Pump and motor will include the motor and controls. This cost will include material, labor and equipment.	Horsepower	\$229.73	1.5	\$344.60
Materials	1009	Pump, < 5 HP - Pump and motor, fixed cost portion	Fixed cost portion of the Pump: < 5 HP - Pump and motor. This portion is a base cost for all Pump: < 5 HP and is not dependant on horsepower. The total cost of any Pump: < 5 HP will include this fixed cost plus a variable cost portion. The completed Pump: < 5 HP - Pump and motor will include the motor and controls. This cost will include material, labor and equipment	Each	\$175.60	1	\$175.60

Equipment/Installation	939	Truck, Pickup	Equipment and power unit costs. Labor not included.	Hour	\$26.51	16	\$424.16
Labor	231	General Labor	Labor performed using basic tools such as power tool, shovels, and other tools that do not require extensive training. Ex. pipe layer, herder, concrete placement, materials spreader, flagger, etc.	Hour	\$25.71	16	\$411.36
Labor	234	Supervisor or Manager	Labor involving supervision or management activities. Includes crew supervisors, foremen and farm/ranch managers time required for adopting new technology, etc.	Hour	\$41.68	16	\$666.88

Scenario Worksheet

Practice and Scenario Description:

Information Type	Data
Region	New England
State	Connecticut
Discipline Group	Water Management Engineering
Practice Code/Name	533 - Pumping Plant
Scenario ID	13
Scenario Name	Photovoltaic-Powered Pump 1 HP
Scenario Description	The typical scenario assumes installation of a photovoltaic-powered pumping plant with a design operating total head on pump greater between 251 and 400 feet in a well, pond or a live stream. The installation includes the pump, wiring, drop pipe, solar panels, mounts, inverter, and all appurtenances. Note: It is generally not advisable to use a storage battery for a number of reasons. A storage tank is generally the most efficient method to store energy. Grazing - Livestock exclusion from surface water will result in improved surface water quality and reduced erosion. Irrigation - energy consumption will be reduced and the increased pressure and flow rates will improve irrigation efficiency. Resource Concerns: Insufficient stockwater. Associated Practices include: 374 - Farmstead Energy Improvement; 382 - Fence; 430 - Irrigation Pipeline; 436 - Irrigation Reservoir; 516 - Livestock Pipeline; 561 - Heavy Use Area Protection; and, 614 - Watering Facility.
Before Practice Situation	Livestock: Inadequate supply or location of water for a prescribed grazing system. Eroded stream banks and degraded water quality due to livestock access to stream. Cattle are not well-distributed because of remote water location. Irrigation: Pressure and flow rate is insufficient for uniform irrigation.
After Practice Situation	The typical scenario assumes installation of a 930-watt photovoltaic (PV) panel, capable of operating a 1 Hp solar-powered submersible pump in a well or other water source (Notes: 1) A PV panel is rated under standard and ideal conditions which will most likely not be replicated in the field; 2) 1 Hp is defined as 746 watts; 3) It is reasonable to expect a 1 Hp solar-powered submersible pump to deliver about 7 gpm and develop a pressure at the pump outlet of about 60 psi. 4) The installation includes the pump, wiring, pipeline in the well, solar panels, frame mounts, inverter, and all appurtenances. Water will be pumped to an existing storage tank at a higher elevation from which it will be used to pressurize the Livestock Pipeline (516) or Irrigation Pipeline (430). Grazing - Livestock exclusion from surface water will result in improved surface water quality and reduced erosion. Grazing has potential to be well distributed. Irrigation: Improved pressure and flow rate will improve irrigation efficiency.
Scenario Feature Measure	Each Pumping Plant
Scenario Unit	Each
Scenario Typical Size	1

Cost Summary:

Cost Category	Scenario Cost	Scenario Cost/Unit
Materials	\$5,665.09	\$5,665.09
Equipment/Installation	\$424.16	\$424.16
Labor	\$1,078.24	\$1,078.24
Mobilization	\$0.00	\$0.00
Acquisition of Technical Knowledge	\$0.00	\$0.00
Foregone Income	\$0.00	\$0.00
Total	\$7,167.49	\$7,167.49

Cost Details:

Cost Category	Component ID	Component Name	Component Description	Unit	Price (\$/unit)	Quantity	Cost
Materials	1031	Solar Panels, fixed cost portion	Fixed cost portion of the Solar Panels. This portion is a base cost for all Solar Panels and is not dependant on KiloWatt. The total cost of any Solar Panels will include this fixed cost plus a variable cost portion. The completed Solar Panels will include all materials (electrical, controllers, service drops and etc). This cost will include material, labor and equipment.	Each	\$2,155.70	1	\$2,155.70
Materials	1135	Solar Panels, variable cost portion	Variable cost portion of the Solar Panels. This portion IS dependent on the total Kilowatt for the Solar Panels. The total cost of any Solar Panels will include this variable cost plus the fixed cost portion. The completed Solar Panels will include all materials (electrical, controllers, and service drop, etc). This cost will include material, labor and equipment.	Kilowatt	\$3,337.70	0.93	\$3,104.06
Materials	1010	Pump, < 5 HP - Pump and motor, variable cost portion	Variable cost portion of the Pump: < 5 HP - Pump and motor. This portion IS dependent on the total horsepower for the Pump: < 5 HP. The total cost of any Pump: < 5 HP will include this variable cost plus the fixed cost portion. The completed Pump: < 5 HP - Pump and motor will include the motor and controls. This cost will include material, labor and equipment.	Horsepower	\$229.73	1	\$229.73
Materials	1009	Pump, < 5 HP - Pump and motor, fixed cost portion	Fixed cost portion of the Pump: < 5 HP - Pump and motor. This portion is a base cost for all Pump: < 5 HP and is not dependant on horsepower. The total cost of any Pump: < 5 HP will include this fixed cost plus a variable cost portion. The completed Pump: < 5 HP - Pump and motor will include the motor and controls. This cost will include material, labor and equipment	Each	\$175.60	1	\$175.60

Equipment/Installation	939	Truck, Pickup	Equipment and power unit costs. Labor not included.	Hour	\$26.51	16	\$424.16
Labor	231	General Labor	Labor performed using basic tools such as power tool, shovels, and other tools that do not require extensive training. Ex. pipe layer, herder, concrete placement, materials spreader, flagger, etc.	Hour	\$25.71	16	\$411.36
Labor	234	Supervisor or Manager	Labor involving supervision or management activities. Includes crew supervisors, foremen and farm/ranch managers time required for adopting new technology, etc.	Hour	\$41.68	16	\$666.88

Scenario Worksheet

Practice and Scenario Description:

Information Type	Data
Region	New England
State	Connecticut
Discipline Group	Water Management Engineering
Practice Code/Name	533 - Pumping Plant
Scenario ID	17
Scenario Name	Solid Piston Manure Pump
Scenario Description	Install a 16" solid piston manure pump to transfer manure from a barn to a waste storage facility. Costs include pump, delivery, appurtenances, installation, and a small insulated pump house installed to protect pump and appurtenances from freezing and wet weather. Associated practices include: Waste Transfer (634), Waste Storage Facility (313)
Before Practice Situation	Manure from the barn and barnyard is not collected or contained and is allowed to flow into nearby surface and subsurface water resources.
After Practice Situation	A solid piston manure pump, hydraulically actuated, 12" or greater discharge, 7.5 HP w/ accessories is installed in conjunction with a manure transfer pipe (634-Waste Transfer) to convey manure from the barn to the waste storage facility. The transferred waste is disposed of in accordance with the CNMP.
Scenario Feature Measure	Number of Pumps
Scenario Unit	Each
Scenario Typical Size	1

Cost Summary:

Cost Category	Scenario Cost	Scenario Cost/Unit
Materials	\$23,402.00	\$23,402.00
Equipment/Installation	\$16,224.28	\$16,224.28
Labor	\$2,403.80	\$2,403.80
Mobilization	\$0.00	\$0.00
Acquisition of Technical Knowledge	\$0.00	\$0.00
Foregone Income	\$0.00	\$0.00
Total	\$42,030.08	\$42,030.08

Cost Details:

Cost Category	Component ID	Component Name	Component Description	Unit	Price (\$/unit)	Quantity	Cost
Materials	2157	Pump, Manure, Solid Piston	Pump, Manure, Solid Piston, Hydraulically Actuated, 12" or greater discharge, 7.5 HP w/ accessories. Includes delivery.	Each	\$23,402.00	1	\$23,402.00
Equipment/Installation	37	Concrete, CIP, slab on grade, reinforced	Steel reinforced concrete formed and cast-in-placed as a slab on grade by chute placement. Typical strength is 3000 to 4000 psi. Includes materials, labor and equipment to transport, place and finish.	Cubic yard	\$316.71	4	\$1,266.84
Equipment/Installation	931	Hydraulic Excavator, 1 CY	Track mounted hydraulic excavator with bucket capacity range of 0.8 to 1.5 CY. Equipment and power unit costs. Labor not included.	Hour	\$94.05	20	\$1,881.00
Equipment/Installation	38	Concrete, CIP, formed reinforced	Steel reinforced concrete formed and cast-in-placed in formed structures such as walls or suspended slabs by chute placement. Typical strength is 3000 to 4000 psi. Includes materials, labor and equipment to transport, place and finish.	Cubic yard	\$502.94	26	\$13,076.44
Labor	231	General Labor	Labor performed using basic tools such as power tool, shovels, and other tools that do not require extensive training. Ex. pipe layer, herder, concrete placement, materials spreader, flagger, etc.	Hour	\$25.71	20	\$514.20
Labor	233	Equipment Operators, Heavy	Includes: Cranes, Hydraulic Excavators >=50 HP, Dozers, Paving Machines, Rock Trenchers, Trenchers >=12", Dump Trucks, Ag Equipment >=150 HP, Scrapers, Water Wagons.	Hour	\$34.10	20	\$682.00
Labor	234	Supervisor or Manager	Labor involving supervision or management activities. Includes crew supervisors, foremen and farm/ranch managers time required for adopting new technology, etc.	Hour	\$41.68	10	\$416.80
Labor	230	Skilled Labor	Labor requiring a high level skill set: Includes carpenters, welders, electricians, conservation professionals involved with data collection, monitoring, and or record keeping, etc.	Hour	\$39.54	20	\$790.80

Scenario Worksheet

Practice and Scenario Description:

Information Type	Data
Region	New England
State	Connecticut
Discipline Group	Water Management Engineering
Practice Code/Name	533 - Pumping Plant
Scenario ID	6
Scenario Name	Variable Frequency Drive
Scenario Description	This is an installation of electrical and electronic components designed to vary the frequency of the voltage to an electric motor and thus the ability to vary the speed of the motor. This directly affects pressure and flowrate. This also could give the operator the flexibility to operate several systems separately or at the same time. Resource concerns: Insufficient water - Inefficient use of irrigation water; Inefficient energy use - Equipment and facilities and Farming/ranching practices and field operations. Associated Practices: 374 - Farmstead Energy Improvement; 430 - Irrigation Pipeline; 441 - Irrigation System, Microirrigation; 449 - Irrigation Water Management; 516 - Livestock Pipeline; and 614 - Watering Facility.
Before Practice Situation	Standard electrical connection from electrical utility to pump motor. No capability to match pump output pressure and/or flowrate to field(s) need(s). Result is over/under pressure(s) and/or flow rate(s), possible hydraulic anomalies, energy loss, and or inefficient water application in the irrigation system.
After Practice Situation	VFD Modifications are implemented on an existing pumping plant meeting Nebraska performance criteria to allow for varying the speed of a 40 Hp electric motor to match the pressure and flow requirements for a center pivot irrigation system.
Scenario Feature Measure	Pump Power Requirement
Scenario Unit	Horse Power
Scenario Typical Size	50

Cost Summary:

Cost Category	Scenario Cost	Scenario Cost/Unit
Materials	\$7,340.00	\$146.80
Equipment/Installation	\$0.00	\$0.00
Labor	\$0.00	\$0.00
Mobilization	\$0.00	\$0.00
Acquisition of Technical Knowledge	\$0.00	\$0.00
Foregone Income	\$0.00	\$0.00
Total	\$7,340.00	\$146.80

Cost Details:

Cost Category	Component ID	Component Name	Component Description	Unit	Price (\$/unit)	Quantity	Cost
Materials	1288	Variable Speed Drive, 50 HP	Variable speed drive for 50 Horsepower electric motor. Does not include motor. Materials only.	Horsepower	\$146.80	50	\$7,340.00

Scenario Worksheet

Practice and Scenario Description:

Information Type	Data
Region	New England
State	Connecticut
Discipline Group	Water Management Engineering
Practice Code/Name	533 - Pumping Plant
Scenario ID	21
Scenario Name	Solids Handling Wastewater Pump >2Hp
Scenario Description	Install a solids handling wastewater pump > 2Hp to transfer wastewater to a storage or treatment area. Costs include pump, delivery, appurtenances, installation. Associated practices include: Waste Transfer (634), Waste Storage Facility (313)
Before Practice Situation	Wastewater is not collected or contained and is allowed to flow into nearby surface and subsurface water resources.
After Practice Situation	A submersible 2" solids handling pump, ressed impeller, with 2" to 3" Discharge, > 2 HP is installed.
Scenario Feature Measure	Number of Pumps
Scenario Unit	Each
Scenario Typical Size	1

Cost Summary:

Cost Category	Scenario Cost	Scenario Cost/Unit
Materials	\$9,408.00	\$9,408.00
Equipment/Installation	\$0.00	\$0.00
Labor	\$344.36	\$344.36
Mobilization	\$0.00	\$0.00
Acquisition of Technical Knowledge	\$0.00	\$0.00
Foregone Income	\$0.00	\$0.00
Total	\$9,752.36	\$9,752.36

Cost Details:

Cost Category	Component ID	Component Name	Component Description	Unit	Price (\$/unit)	Quantity	Cost
Materials	1026	Pump, Chopper, Screw, >7 to 15 HP, includes pump & motor	Materials, labor, controls: Chopper/ Screw >7 to 15 HP includes pump & motor	Horsepower	\$700.00	10	\$7,000.00
Labor	231	General Labor	Labor performed using basic tools such as power tool, shovels, and other tools that do not require extensive training. Ex. pipe layer, herder, concrete placement, materials spreader, flagger, etc.	Hour	\$25.71	4	\$102.84
Labor	234	Supervisor or Manager	Labor involving supervision or management activities. Includes crew supervisors, foremen and farm/ranch managers time required for adopting new technology, etc.	Hour	\$41.68	2	\$83.36
Labor	230	Skilled Labor	Labor requiring a high level skill set: Includes carpenters, welders, electricians, conservation professionals involved with data collection, monitoring, and or record keeping, etc.	Hour	\$39.54	4	\$158.16
Materials	2162	Effluent pump appertenances	Controller for pump system with timer, event counter and run time meter, 3 float switch assembly and alarm system with electrical connections.	Each	\$2,408.00	1	\$2,408.00

Scenario Worksheet

Practice and Scenario Description:

Information Type	Data
Region	New England
State	Connecticut
Discipline Group	Water Management Engineering
Practice Code/Name	533 - Pumping Plant
Scenario ID	15
Scenario Name	Water Ram Pump
Scenario Description	A water ram is used to transfer water from a live stream to a watering facility (614) or small irrigation reservoir (436) utilizing the energy of moving water to transfer a portion of that water to a higher elevation. It is anchored to a small concrete pad. Bypass water (which could easily be 90% of the water diverted from the stream) is returned to the stream or transferred in a pipe, to a lower elevation tank (614 or 436), without erosion or impairment to water quality. In the livestock scenario, the objective is to provide water to the cattle outside of a live stream or other natural water source thereby eliminating a significant erosion situation while also improving water quality. The cattle thus have access to drinking water without having to enter the stream. The water ram may need to be fenced for protection from curious bovines. While it is generally not considered practical for irrigation, in the irrigation scenario, water can be retrieved from a stream and stored in a small 436 to provide water for a very small (0.1 acre) irrigation system. Resource Concerns: Insufficient stockwater. Associated Practices: 374 - Farmstead Energy Improvement; 382 - Fence; 430 - Irrigation Pipeline; 436 - Irrigation Reservoir; 516 - Livestock Pipeline; 561 - Heavy Use Area Protection; and, 614 - Watering Facility.
Before Practice Situation	Water in a nearby stream is not available at the desired location, pressure and/or flow rate.
After Practice Situation	A 2" diameter inlet pipe is installed and connected to a water ram pump with all appurtenances and anchored to a concrete pad (9 ft x 4 ft x 5 in) or other appropriate secure base. Depending upon the application, either a 1-inch diameter Livestock Pipeline (516) or an Irrigation Pipeline (430) is installed from the water ram to a 5,000 gallon storage facility. Improved water quantity or quality, grazing management, plant diversity, animal health, and/or irrigation purposes as outlined in the appropriate NRCS irrigation system standard. A 2" water ram, with 10 gpm of inlet flow and 10 feet of drop, can supply about 1.0 gpm to a location about 50 feet higher than the water ram.
Scenario Feature Measure	Nominal Diameter of Inlet Pipe
Scenario Unit	Inch
Scenario Typical Size	2

Cost Summary:

Cost Category	Scenario Cost	Scenario Cost/Unit
Materials	\$515.00	\$257.50
Equipment/Installation	\$582.52	\$291.26
Labor	\$1,078.24	\$539.12
Mobilization	\$0.00	\$0.00
Acquisition of Technical Knowledge	\$0.00	\$0.00
Foregone Income	\$0.00	\$0.00
Total	\$2,175.76	\$1,087.88

Cost Details:

Cost Category	Component ID	Component Name	Component Description	Unit	Price (\$/unit)	Quantity	Cost
Materials	1114	Pump, Ram	Materials only for 2" Ram Pump Kit	Each	\$515.00	1	\$515.00
Equipment/Installation	939	Truck, Pickup	Equipment and power unit costs. Labor not included.	Hour	\$26.51	16	\$424.16
Equipment/Installation	37	Concrete, CIP, slab on grade, reinforced	Steel reinforced concrete formed and cast-in-place as a slab on grade by chute placement. Typical strength is 3000 to 4000 psi. Includes materials, labor and equipment to transport, place and finish.	Cubic yard	\$316.71	0.5	\$158.36
Labor	231	General Labor	Labor performed using basic tools such as power tool, shovels, and other tools that do not require extensive training. Ex. pipe layer, herder, concrete placement, materials spreader, flagger, etc.	Hour	\$25.71	16	\$411.36
Labor	234	Supervisor or Manager	Labor involving supervision or management activities. Includes crew supervisors, foremen and farm/ranch managers time required for adopting new technology, etc.	Hour	\$41.68	16	\$666.88

Scenario Worksheet

Practice and Scenario Description:

Information Type	Data
Region	New England
State	Connecticut
Discipline Group	Water Management Engineering
Practice Code/Name	533 - Pumping Plant
Scenario ID	11
Scenario Name	Windmill-Powered Pump
Scenario Description	A windmill is installed in order to supply a reliable water source for livestock and/or wildlife. The windmill includes the tower, concrete footings, wheel blade unit, sucker rod, down pipe, gear box, pump, plumbing, and well head protection concrete pad. The typical scenario will be a windmill system with a 10 ft diameter mill and 27-foot tower which is pumping from a 150-foot well. As a result of installing this windmill, resource concerns of inadequate stock water, plant establishment, growth, productivity, health, and vigor, and water quantity can be addressed. Resource Concerns: Insufficient stockwater.
Before Practice Situation	In a rangeland or pasture setting, a reliable source of water for livestock is not available, or the spacing between water sources is such that grazing distribution and plant health are adversely impacted.
After Practice Situation	A windmill, with a wheel ranging from 6' to 16' in diameter, will be installed over a well that is located to provide a reliable source of livestock water at the rate of at least 2 gpm, to facilitate proper grazing distribution and improved plant health. To increase reliability, water is pumped into a storage tank to provide a given number of days of supply. Installation includes the footings, wellhead protection concrete pad, tower, gear box, sail, sucker rod, down hole accessories, and a short outlet pipe to a storage tank.
Scenario Feature Measure	Diameter of Mill Wheel
Scenario Unit	Foot
Scenario Typical Size	10

Cost Summary:

Cost Category	Scenario Cost	Scenario Cost/Unit
Materials	\$6,159.20	\$615.92
Equipment/Installation	\$1,097.86	\$109.79
Labor	\$1,489.60	\$148.96
Mobilization	\$548.66	\$54.87
Acquisition of Technical Knowledge	\$0.00	\$0.00
Foregone Income	\$0.00	\$0.00
Total	\$9,295.32	\$929.53

Cost Details:

Cost Category	Component ID	Component Name	Component Description	Unit	Price (\$/unit)	Quantity	Cost
Materials	1036	Windmill, 10', fan diameter	Includes materials costs for windmill head and 27' tower	Each	\$6,159.20	1	\$6,159.20
Equipment/Installation	939	Truck, Pickup	Equipment and power unit costs. Labor not included.	Hour	\$26.51	4	\$106.04
Equipment/Installation	1893	Aerial lift, telescoping bucket	Aerial lift, bucket truck or cherry picker, typical 40' boom. Equipment only.	Hour	\$44.80	8	\$358.40
Equipment/Installation	37	Concrete, CIP, slab on grade, reinforced	Steel reinforced concrete formed and cast-in-place as a slab on grade by chute placement. Typical strength is 3000 to 4000 psi. Includes materials, labor and equipment to transport, place and finish.	Cubic yard	\$316.71	2	\$633.42
Labor	231	General Labor	Labor performed using basic tools such as power tool, shovels, and other tools that do not require extensive training. Ex. pipe layer, herder, concrete placement, materials spreader, flagger, etc.	Hour	\$25.71	32	\$822.72
Labor	234	Supervisor or Manager	Labor involving supervision or management activities. Includes crew supervisors, foremen and farm/ranch managers time required for adopting new technology, etc.	Hour	\$41.68	16	\$666.88
Mobilization	1139	Mobilization, medium equipment	Equipment with 70-150 HP or typical weights between 14,000 and 30,000 pounds.	Each	\$274.33	2	\$548.66