Water Quantity Enhancement Activity – WQT03 – Irrigation pumping plant evaluation

State Criteria (same as NATIONAL CRITERIA)
Irrigation Pumping Plant Evaluation shall be conducted in accordance with the Technical Irrigation Pumping Plant Test Procedure Manual (1982, University of Nebraska Institute of Agriculture and Natural Resources).

Documentation Requirements (SEE NATIONAL ENHANCEMENT ACTIVITY JOBSHEET)
Complete the Table below:

To be completed by NRCS and Producer during planning			To be completed by Producer during certification process	
1	**2**	**3**	**4**	**5**
Tract	**Field(s)**	**Acres Planned**	**No. of pumping plants evaluated**	**Date of irrigation pumping plant evaluation**
Ex. T100	2b	7.3		

Ex. = example. NRCS completes column 1, 2 & 3 (Tract, Field and Acres Planned). Operator completes remaining columns.

Participant Acknowledgement Statement:
I agree to apply this enhancement under the terms and conditions of my CSP contract and understand the requirements of the activity.

I certify that the Irrigation Pumping Plant Evaluation on the field(s) listed in the table above meets these specifications and that the following documentation has been provided to NRCS:

1. Documentation must include a completed Irrigation Pumping Plant Analysis Worksheet for each pumping plant evaluated.
2. Copies of dated receipts for equipment or services purchased.

I understand that it is my responsibility to obtain all necessary permits and to comply with all laws, regulations and ordinances pertaining to the application of these activities.

Certified by: _____ **Date:**_____

IRRIGATION PUMPING PLANT EVALUATION

Name _____ County _____ Tract No. _____
NDNR Well Registration Number_____
Static Water Level (ft)_____ Pumping Water Level (ft) _____
Pump Brand _____ Stages _____ Serial No. _____
Pump Setting _____ Pump Shaft Dia. _____ Threads/in_____
Pump RPM _____ Motor RPM _____

Pumping Head

Pumping Head										
Pressure at Pump Outlet (psi)		Pressure Conversion		Elevation Difference Between Pump Outlet and Pumping Water Surface (ft)		Estimated Friction Loss in Column or Suction Pipe (ft)		Miscellaneous Friction Loss (ft)		**(A)** Pumping Head (ft)
	×	2.31	+		+		+		=	

Flow Test

Flow Meter Test													
Meter Type	Minutes	Seconds		Time of Test (min)	Gallons at End of Test		Gallons at Beginning of Test		Total Gallons		Time of Test (min)		**(B)** Flow (gpm)
Propeller			=			-		=		÷		=	
Ultra Sonic or Magnetic													

Collins Flow Gauge:

10 Pt. Setting	Setting Position	Right		Left	
.158D					
.275D					
.354D					
.420D					
.475D					

Pipe I.D. _____ Average Velocity _____ x 2.45 x D^2 = _____ gpm **(B)**

General Power Unit Inventory

- ☐ Internal combustion engine, diesel, gasoline, or propane (complete page 3, Tables 1 and 2)
- ☐ Internal combustion engine, natural gas (complete page 3, Tables 3 and 4)
- ☐ Electric Motor (complete page 4, Tables 5-7)

Diesel, Gasoline, or Propane Energy Use Test

Table 1. Diesel, Gasoline, or Propane Energy Use Test

Fuel Type	Weight at Start of Test (lbs)		Weight at Stop of Test (lbs)		Net Weight Used (lbs)		Unit Weight of Fuel (lbs/gal)		Total Time of Test (hrs)		**(C)** Energy Use (gal/hr)
Diesel		-		=		÷	7.10	÷		=	
Gasoline		-		=		÷	6.00	÷		=	
Propane		-		=		÷	4.25	÷		=	

Table 2. Diesel, Gasoline, or Propane Performance Rating

Fuel Type	**(A)** Pumping Head (ft)		**(B)** Flow (gpm)		Horsepower Conversion		Water horsepower (whp)		**(C)** Energy Use (gal/hr)		Actual Plant Performance (whp hr/gal)		NPPPC (whp hr/gal)				**(D) Performance Rating (%)**
Diesel		×		÷	3960	=		÷		=		÷	12.5	×	100	=	
Gasoline		×		÷	3960	=		÷		=		÷	8.66	×	100	=	
Propane		×		÷	3960	=		÷		=		÷	6.89	×	100	=	

Natural Gas Energy Use Test

Table 3. Natural Gas Energy Use Test

		Dial Capacity		Dial Revolutions		Time of Test (sec)				Correction Factor		**(C)** Energy Use (mcf/hr)	Gas Pressure (psi)	Elevation
3.6	×		×		÷		=		×		=			

Table 4. Natural Gas Performance Rating

Fuel Type	**(A)** Pumping Head (ft)		**(B)** Flow (gpm)		Horsepower Conversion		Water horsepower (whp)		**(C)** Energy Use (mcf/hr)		Actual Plant Performance (whp hr/mcf)		NPPPC (whp hr/mcf)				**(D) Performance Rating (%)**
Natural Gas		×		÷	3960	=		÷		=		÷	66.7	×	100	=	

Electric Energy Use Test

Table 5. Electric Energy Use Test									
Meter Type			Disc Revolutions		Kh		Time of Test (sec)		**(C)** Energy Use (kW)
Dial	3.6	×		×		÷		=	
Digital									

Table 6. Electrical Characteristics				
	Leg 1	Leg 2	Leg 3	Average
Volts				
Amps				

Table 7. Electric Performance Rating																	
Energy Source	**(A)** Pumping Head (ft)		**(B)** Flow (gpm)		Horsepower Conversion		Water horsepower (whp)		**(C)** Energy Use (kW)		Actual Plant Performance (whp hr/(kWh)		NPPPC (whp hr/kWh)				**(D) Performance Rating (%)**
Electric		×		÷	3960	=		÷		=		÷	0.885	×	100	=	

Potential Savings

If the performance rating calculated for the pumping plant is less than 100 %, potential annual savings can be estimated using Tables 8 and 9. A performance rating at, or above 100% indicates that the pumping plant is operating at, or above the expected performance level as defined by the Nebraska Pumping Plant Performance Criteria (NPPPC). A performance rating below 100% indicates the pumping plant is using more energy than the criteria calls for.

Table 8. Potential Energy Savings Estimated from Annual Hours																				
		(D) Performance Rating (%)								**(C)** Energy Use (unit/hr)		**(E)** Excess Energy Consumed (unit/hr)		Annual Hours of Operation (hr/season)		Excess Energy (unit/season)		Unit Cost of Energy ($/unit)		Potential Annual Savings ($/season)
100	-		=		÷	100	=		×		=		×		=		×		=	

Table 9. Potential Energy Savings Estimated from Annual Inches Applied																			
(B) Flow (gpm)				**(F)** Water Application Capacity (ac-in/hr)	**(E)** Excess Energy Consumed (unit/hr)		Unit Cost of Energy ($/unit)		Excess Energy Cost ($/hr)		**(F)** Water Application Capacity (ac-in/hr)		Cost per Acre-Inch ($/Ac-in)		Irrigated Acres		Annual Inches Applied (in/season)		Potential Annual Savings ($/season)
	÷	452	=			×		=		÷		=		×		×		=	

Field Pump Test Data

While performing the energy use test it is required to document field pump test data. Document current pump configuration and if adjustments were made below.

Observation No.	Flow (GPM)	Well Pressure (psi)	Drawdown Pumping Level (ft)	Constant RPM ☐ Motor RPM ☐ Pump RPM
1				
2				
3				
4				

Note: Field pump test data must show data for all columns above. Flow points should be documented at a constant RPM.

Pump Adjustments*

_____ Pumping Head x _____ Downthrust = _____ Total Downthrust
_____ Shaft Stretch x _____ Shaft Length/100 = _____ Total Stretch x _____ Threads/in = _____ Turns of Nut

Age and Condition of Pumping Plant and Components_____
_____

	Current Configuration	After Adjustments*
Pumping Water Level	_____ Feet	_____ Feet
Operating Pressure	_____ psi	_____ psi
Operating Flow Rate	_____ gpm	_____ gpm
Power Requirements	_____ Whp	_____ Whp
Pump RPM	_____ RPM	_____ RPM
Engine RPM	_____ RPM	_____ RPM
Performance Rating	_____ %	_____ %

Adjustments, remarks and recommendations
_____
_____
_____
_____
_____

Date of Test: _____
Test completed by: _____
Contact Number of Tester: _____

* It is recommended that the pump adjustment be made only by trained professionals. Adjustments are not required to meet the requirements of the Conservation Security Program Enhancement Water Quality Enhancement Activity WQT03, Irrigation Pumping Plant Evaluation.
Copies of this Field Data form should be completed for each test performed and submitted to NRCS.
Form modified from Cooperative Extension Service Agricultural Engineering Department, University of Nebraska – Lincoln