# House Water Committee

## January 20th, 2026

# Certified Irrigation System Assessment (CISA) Program

Kansas Water Office

# WISE Program

## WATER INNOVATION SYSTEMS AND EDUCATION

The WISE program is an expansion of our legacy Water Technology Farm and PACE Farm programs, started in 2016. (10-Years!)

Focused on pilot projects and feasibility studies used to advise policy, planning, research and cost-share programs in Kansas

Public/private partnership program that focuses on fostering the implementation of field practices, equipment, technologies, management strategies, and education.

Goal: Result in measurable and scalable water conservation, improved water quality, overall ecological soundness, and enhanced public health – all using economically viable solutions.

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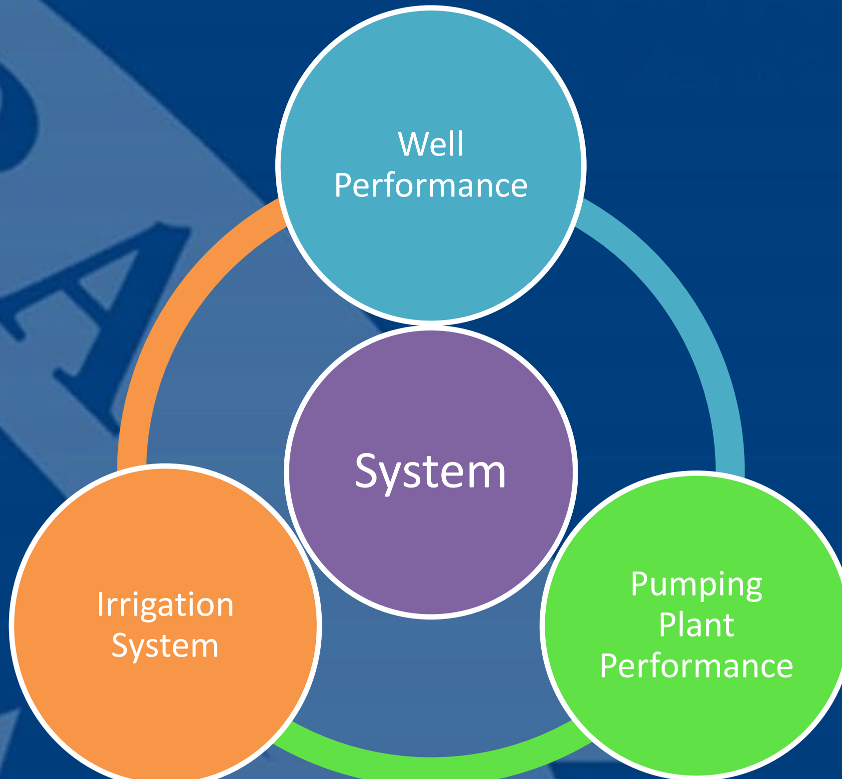
# CISA

## CERTIFIED IRRIGATION SYSTEM ASSESSMENT




IF WE DON'T MEASURE…

…WE CAN'T MANAGE!

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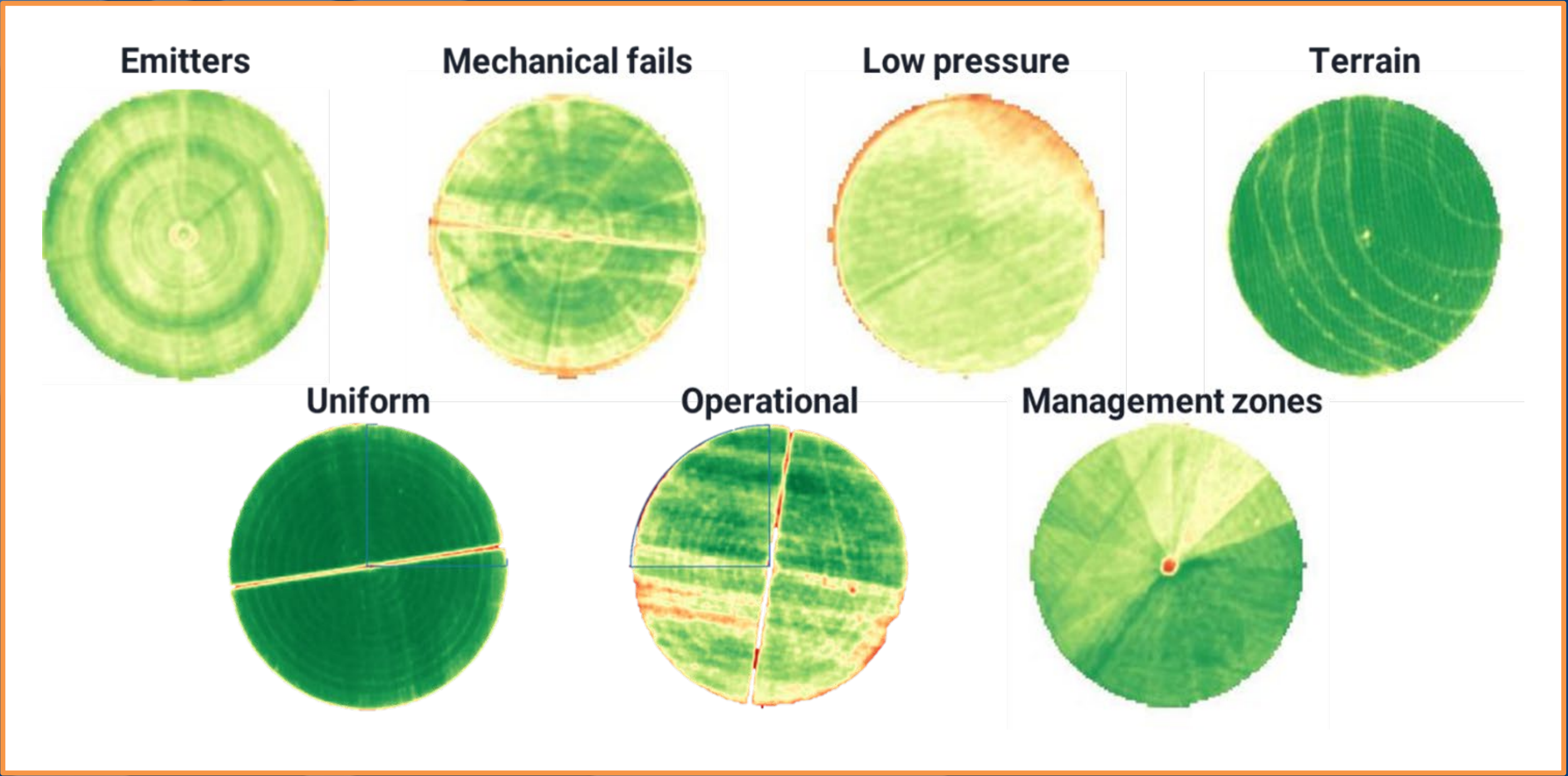
## CERTIFIED IRRIGATION SYSTEM ASSESSMENT

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## CERTIFIED IRRIGATION SYSTEM ASSESSMENT

A system to develop a targeted list of recommendations, based on objective findings, where cost-share dollars can be utilized to make measurable improvements.

Achieve better Water Duty while conserving water resources. Get more water into the root zone and used by the crop. More crop acres watered uniformly for the same or less amount of energy used and with less water pumped. (Return on Investment).

Develop productive feedback to landowners to help them achieve optimal irrigation water use.

Performed by trained and certified professionals; many of which are also NRCS Technical Service Providers (TSP)

CISA reports qualifies irrigated fields for Kansas ITI, HPA-RCPP, plus USDA EQIP and REAP grants.

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## CERTIFIED IRRIGATION SYSTEM ASSESSMENT

20,000+ irrigations systems in Kansas – 94% are center pivot (3 million acres of crop land).

Rattlesnake NRCS-CIG (2021-2023): 60+ CISA

KWO-WISE (2023-2025): 38 CISA

NRCS-HPA-RCPP / DOC-ITI (2024-2025): 132 CISA

TOTAL CISA: 230+ (to-date)

Approx. cumulative Water Duty (%): 58%-63% Effective WD

(Does not include 0.35-0.40 of loss due to ET)

We had one certified CISA evaluator at the beginning of 2025. Now there are four: Lee Wheeler, Dan Spare, Jack Polifka and John Maxwell. Five others are still in training and plan to certify in 2026.

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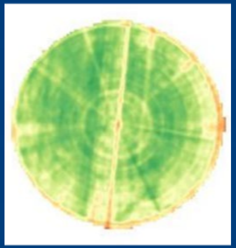

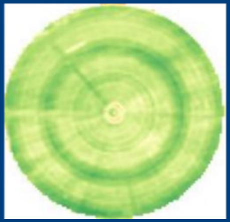

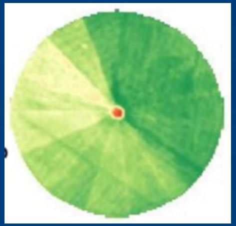

Continue to include and require the CISA on all State cost-share programs. Establish a baseline by which to focus cost-share dollars into improvements with measurable outcomes, using established and uniform protocols.

Continue to fund and develop our CISA training and certification program.

Recruit, train and certify more CISA Certified evaluators (Industry, producers, agency staff, university graduates, vocational students, etc.)

Continue to develop efficient onboarding tools and train cost-share program administrators.

Develop a pre-screen irrigation uniformity assessment protocol (satellite imagery analysis [remote sensing], Quick-Flow-Pressure test, self reporting, etc.)

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## PILLARS

### PILLAR I: WELL EVALUATION

Static Water Levels (SWL), Pumping Water Levels (PWL), specific capacity (GPM/Drawdown), well depth, drillers log, SWL at drilling, pump test, screen intervals, pump location.

### PILLAR II: THE PUMP

Flow Rate GPM, PWL, PSI at Discharge, Energy use per hour, Overall Efficiency

### PILLAR III: IRRIGATION SYSTEM

Sprinkler Package Design (i.e. WISH), test GPM and PSI, uniformity pattern comparisons

### PILLAR IV: IRRIGATION WATERMANAGEMENT

Compare ET crop (irrigation + effective rainfall) to actual crop water budget, spot check water budget.

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## ONBOARDING

**ELEVATIONS**

Measure elevation at each well/pump, base of pivot, and at the end tower.

**SPRINKLER PACKAGE DESIGN**

Design from irrigation supply dealer(e.g. WISH, V-Chart, Z-Chart).•

**KANSAS GEOLOGICAL SURVEY INFORMATION**

WIMAS, WWC5, WIZARD, or any other useful documents.•

**WELL AND PUMPING PLANT SPECIFICATIONS**

Depth of well and pump intake, as well as pump assembly and design specifications.

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## ONBOARDING

### PSI/POSITION GRAPH

Water pressure information from past and current years from the irrigation management software (e.g. AgSense, FieldNet, AP). Desired location is the end tower.

### PRESSURE GAUGE ISOLATION VALVE ATTACHMENT

At pump discharge, before/after each butterfly valve, and base of pivot or on riser.

### ANNUAL ENERGY USE REPORTING

Annual energy report, water use report, diesel usage, natural gas usage, KWh total, money spent on energy total.

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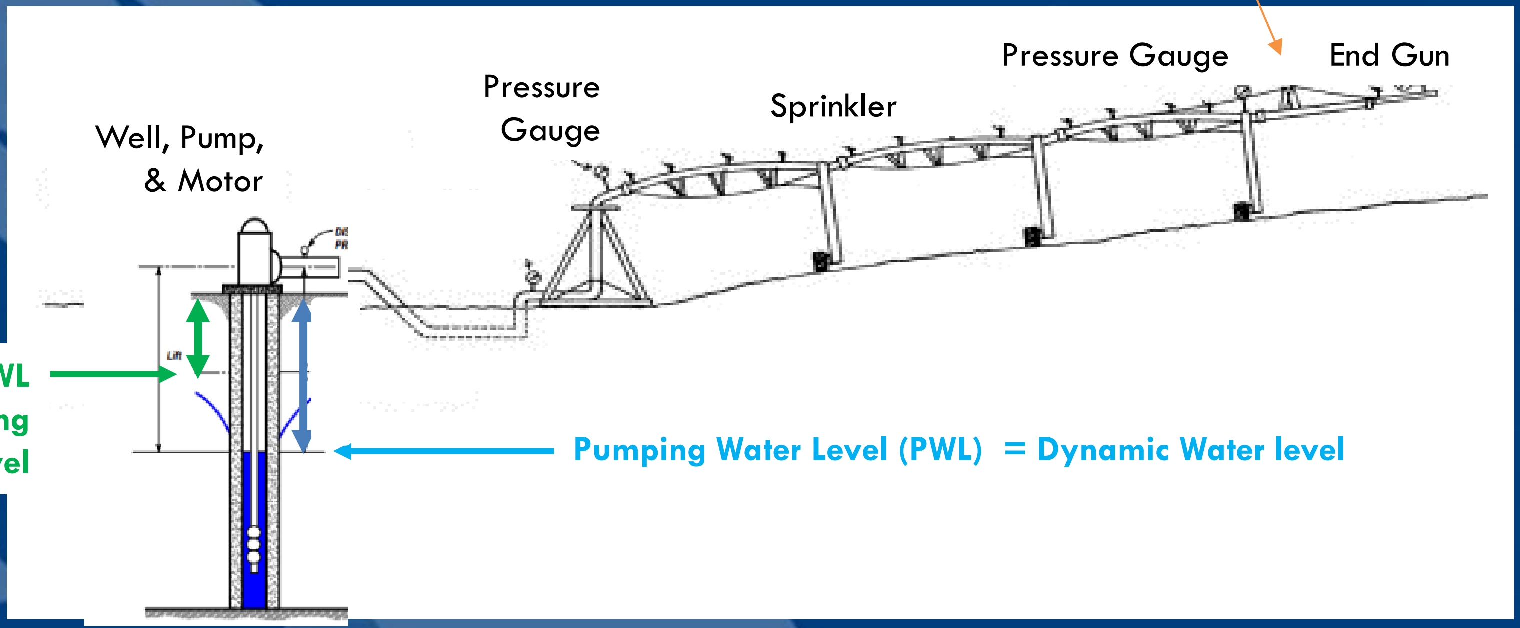
TESTING

Drawdown = PWL - SWL

Minimum Pressure = regulator setting + 5 psi




Static Water Level, SWL
= non-pumping
ground water level

Pumping Water Level (PWL) = Dynamic Water level

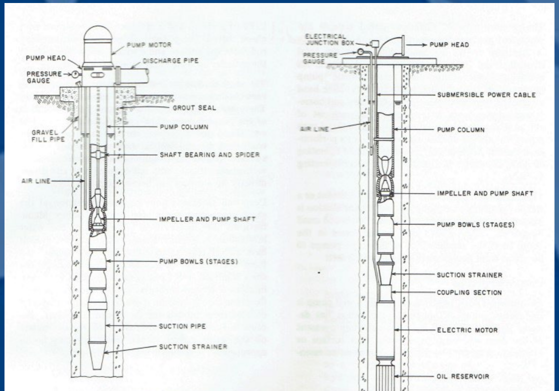


Fig. 5.2. Deep well turbine pump.

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## TESTING

Lee Wheeler Engineering; Cactus Hill Ag Consulting 11/2024 Version

### ELECTRIC MOTOR PUMP/SYSTEM TEST FORMAT

| | | |
|---|---|---|
| Date: ________ Farm: ______________________ | Motor Make: | VOLTS: |
| Field (s): ______________________ | Service Factor: | AMPS: |
| Well ID or Location: | HP: | RPM: |
| Farm Flow Meter S/N: ______________ Flow Meter GPM (Needle): __________ | Timed flow meter: Units _____Multiplier:______ Time_______<br>Timed GPM: ______________ Date: ______________________ | |

**Sprinkler System Information** **Package Design: ________ GPM ______PSI Date: __________**

| | | | |
|---|---|---|---|
| System Make: | No. of Towers: | HP per Tower:: | |
| Height: | Pipe Size (O.D.): | Coating: | |
| Nozzle Type: | Nozzle Height: | End Gun Type: | End Gun Size: |
| Distance to End Tower: ___________ Ft. | Speed at 100% to Travel ______ ft: _________ | Fastest Circle: Hr. | |
| 20%: | 50 %: | Cycle Time: | |

**Collins Meter/FUJI Flow Measurement Data**

| | | |
|---|---|---|
| Pipe ID: ________ (ID=OD-2Xpipe thickness) | Collins Pitot Stops/Bar spacing: | Collins Multiplier ((2.55 X (D x D)) - D):<br>Multiplier (2.45 X (D x D)*** For >10" Pipe ID |

**Operating Data: (Ground Surface is reference point)**

| | | |
|---|---|---|
| Static Water Level: ___________ (Ft) | Pressure at Pivot: | Pressure at End: |
| | Height of Gauge at Pivot: | Height of gauge at end: |
| **Specific Capacity:** ____ GPM /D.D. ____ Ft<br>SC: = ________ (D.D. = PWL-SWL) | Start Pumping W L: _______ (Ft)<br>Pumping WL: _____ (Ft) after ____ Hrs | End Gun: _____ ON _____ OFF |
| Corner System: ______ Extended ______ Tucked | | |

| | | | | | |
|---|---|---|---|---|---|
| **Collins Meter Velocities:** | 1) | 2) | 3) | 4) | **Avg: ft/sec** |
| **FUJI Gallons:** | | Time: | | Collins Flow: AVG Ft. Sec X Multiplier = | |

**Flow Rate (Velocity X Multiplier) =** GPM

**TOTAL DYNAMIC HEAD (T.D.H.):Final Pressure @ Gauge ________psi X 2.31= ___________ Ft. Pressure Head**

**T.D.H =** ______Ft. Pressure Head + Final Pumping Water Level ______ ft + Height of Pressure Gauge ______ Ft. + Column Pipe Loss (5ft/100ft of pump setting) ______ft + Minor Losses (conveyance, bends etc) ______Ft = ______**Ft. T.D.H.**

**Water Horsepower W.H.P. =** (T. D. H. ________ Ft X System Flow __________ GPM)/3960 = _______________ **W. H. P.**

**3 Phase Line Amperages : ________________, ________________, ________________ at _______________ Volts**

**Power Meter Kh : ______________ Meter # : ___________ Company: ________ Meter Reading: ___________ KWh**

| | | |
|---|---|---|
| **Time to Complete 10 Revolutions:** ______ **SEC** | Timer Setting % _____ | Meter Max KW: ______________________<br>End Gun Booster: ______ ON ________ OFF |

**Meter Motor Horsepower M.H.P. = (** 10 Rev X _____ Kh X 4.82 **) /** _______ Sec. = __________ **M. H. P.** (Inc. Tower Motors)

**Equation Motor Horsepower M.H.P. =Avg. Amps X Avg. Volts X √3 X P.F. (0.85)/746 = __________ Eq. M. H. P.**

**Adjust M.H.P. for system and Booster Pump to get Pump Motor only MHP =** _____

| | |
|---|---|
| **System K.W.D. =** ______________ | **Pump K.W.D. =** ______________ |

**PUMPING PLANT EFFICIENCY = WHP / MHP (pump only) X 100** _________ **65-70% Excellent; 60-65% Good; 55-60% OK; 50-55% Fair: <50% Poor**

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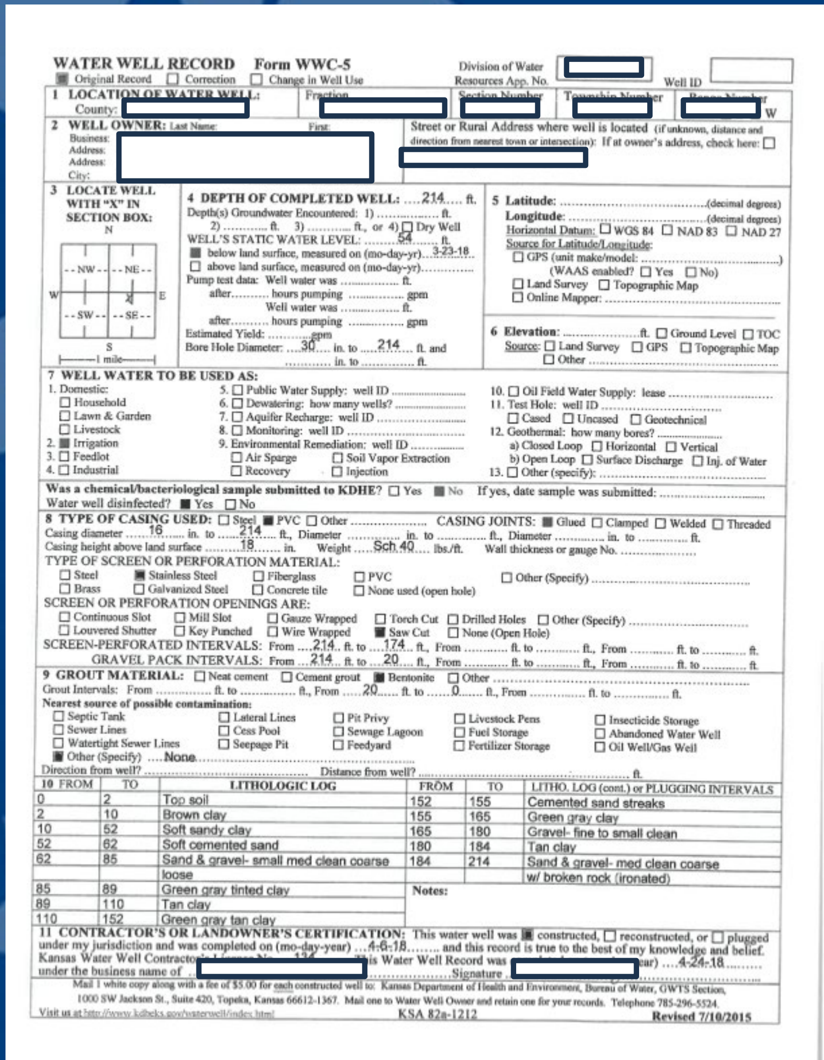
## TESTING



**WATER WELL RECORD** **Form WWC-5**

■ Original Record ☐ Correction ☐ Change in Well Use

Division of Water Resources App. No. [redacted] Well ID

**1 LOCATION OF WATER WELL:** County: [redacted] Fraction [redacted] Section Number [redacted] Township Number [redacted] Range Number [redacted] W

**2 WELL OWNER:** Last Name: First: Business: Address: Address: City: [redacted]

Street or Rural Address where well is located (if unknown, distance and direction from nearest town or intersection): If at owner's address, check here: ☐ [redacted]

**3 LOCATE WELL WITH "X" IN SECTION BOX:** N, W, E, S; NW, NE, SW, SE; X; 1 mile

**4 DEPTH OF COMPLETED WELL:** ....214.... ft.
Depth(s) Groundwater Encountered: 1) ............ ft. 2) ............ ft. 3) ............ ft., or 4) ☐ Dry Well
WELL'S STATIC WATER LEVEL: ....54.... ft.
■ below land surface, measured on (mo-day-yr)...3-23-18
☐ above land surface, measured on (mo-day-yr)............
Pump test data: Well water was ............ ft. after.......... hours pumping ............ gpm
Well water was ............ ft. after.......... hours pumping ............ gpm
Estimated Yield: ............gpm
Bore Hole Diameter: ....30.... in. to ....214.... ft. and ............ in. to ............ ft.

**5 Latitude:** ............(decimal degrees)
**Longitude:** ............(decimal degrees)
Horizontal Datum: ☐ WGS 84 ☐ NAD 83 ☐ NAD 27
Source for Latitude/Longitude:
☐ GPS (unit make/model: ............) (WAAS enabled? ☐ Yes ☐ No)
☐ Land Survey ☐ Topographic Map
☐ Online Mapper: ............

**6 Elevation:** ............ft. ☐ Ground Level ☐ TOC
Source: ☐ Land Survey ☐ GPS ☐ Topographic Map ☐ Other ............

**7 WELL WATER TO BE USED AS:**
1. Domestic: ☐ Household ☐ Lawn & Garden ☐ Livestock
2. ■ Irrigation
3. ☐ Feedlot
4. ☐ Industrial
5. ☐ Public Water Supply: well ID ............
6. ☐ Dewatering: how many wells? ............
7. ☐ Aquifer Recharge: well ID ............
8. ☐ Monitoring: well ID ............
9. Environmental Remediation: well ID ............ ☐ Air Sparge ☐ Soil Vapor Extraction ☐ Recovery ☐ Injection
10. ☐ Oil Field Water Supply: lease ............
11. Test Hole: well ID ............ ☐ Cased ☐ Uncased ☐ Geotechnical
12. Geothermal: how many bores? ............ a) Closed Loop ☐ Horizontal ☐ Vertical b) Open Loop ☐ Surface Discharge ☐ Inj. of Water
13. ☐ Other (specify): ............

Was a chemical/bacteriological sample submitted to KDHE? ☐ Yes ■ No If yes, date sample was submitted: ............
Water well disinfected? ■ Yes ☐ No

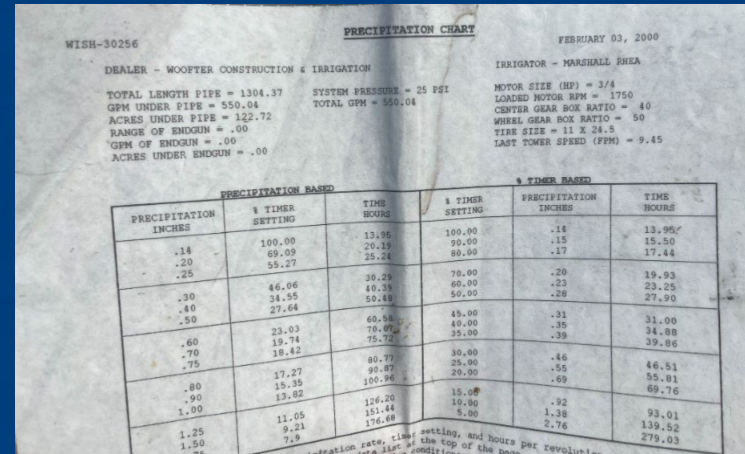
**8 TYPE OF CASING USED:** ☐ Steel ■ PVC ☐ Other ............ CASING JOINTS: ■ Glued ☐ Clamped ☐ Welded ☐ Threaded
Casing diameter ....16.... in. to ....214.... ft., Diameter ............ in. to ............ ft., Diameter ............ in. to ............ ft.
Casing height above land surface ....18.... in. Weight ....Sch 40.... lbs./ft. Wall thickness or gauge No. ............
TYPE OF SCREEN OR PERFORATION MATERIAL:
☐ Steel ■ Stainless Steel ☐ Fiberglass ☐ PVC ☐ Other (Specify) ............
☐ Brass ☐ Galvanized Steel ☐ Concrete tile ☐ None used (open hole)
SCREEN OR PERFORATION OPENINGS ARE:
☐ Continuous Slot ☐ Mill Slot ☐ Gauze Wrapped ☐ Torch Cut ☐ Drilled Holes ☐ Other (Specify) ............
☐ Louvered Shutter ☐ Key Punched ☐ Wire Wrapped ■ Saw Cut ☐ None (Open Hole)
SCREEN-PERFORATED INTERVALS: From ....214.. ft. to ....174.. ft., From ............ ft. to ............ ft., From ............ ft. to ............ ft.
GRAVEL PACK INTERVALS: From ....214.. ft. to ....20.... ft., From ............ ft. to ............ ft., From ............ ft. to ............ ft.

**9 GROUT MATERIAL:** ☐ Neat cement ☐ Cement grout ■ Bentonite ☐ Other ............
Grout Intervals: From ............ ft. to ............ ft., From ....20.... ft. to ....0.... ft., From ............ ft. to ............ ft.
**Nearest source of possible contamination:**
☐ Septic Tank ☐ Sewer Lines ☐ Watertight Sewer Lines ■ Other (Specify) ....None............
☐ Lateral Lines ☐ Cess Pool ☐ Seepage Pit
☐ Pit Privy ☐ Sewage Lagoon ☐ Feedyard
☐ Livestock Pens ☐ Fuel Storage ☐ Fertilizer Storage
☐ Insecticide Storage ☐ Abandoned Water Well ☐ Oil Well/Gas Well
Direction from well? ............ Distance from well? ............ ft.

| 10 FROM | TO | LITHOLOGIC LOG | FROM | TO | LITHO. LOG (cont.) or PLUGGING INTERVALS |
|---|---|---|---|---|---|
| 0 | 2 | Top soil | 152 | 155 | Cemented sand streaks |
| 2 | 10 | Brown clay | 155 | 165 | Green gray clay |
| 10 | 52 | Soft sandy clay | 165 | 180 | Gravel- fine to small clean |
| 52 | 62 | Soft cemented sand | 180 | 184 | Tan clay |
| 62 | 85 | Sand & gravel- small med clean coarse | 184 | 214 | Sand & gravel- med clean coarse |
| | | loose | | | w/ broken rock (ironated) |
| 85 | 89 | Green gray tinted clay | Notes: | | |
| 89 | 110 | Tan clay | | | |
| 110 | 152 | Green gray tan clay | | | |

**11 CONTRACTOR'S OR LANDOWNER'S CERTIFICATION:** This water well was ■ constructed, ☐ reconstructed, or ☐ plugged under my jurisdiction and was completed on (mo-day-year) ....4-6-18........ and this record is true to the best of my knowledge and belief. Kansas Water Well Contractor's [redacted] This Water Well Record was [redacted] ear) ....4-24-18........ under the business name of ... [redacted] ............Signature ... [redacted]

Mail 1 white copy along with a fee of $5.00 for each constructed well to: Kansas Department of Health and Environment, Bureau of Water, GWTS Section, 1000 SW Jackson St., Suite 420, Topeka, Kansas 66612-1367. Mail one to Water Well Owner and retain one for your records. Telephone 785-296-5524.
Visit us at http://www.kdheks.gov/waterwell/index.html KSA 82a-1212 **Revised 7/10/2015**



WISH-30256

**PRECIPITATION CHART**

FEBRUARY 03, 2000

DEALER - WOOFTER CONSTRUCTION & IRRIGATION

IRRIGATOR - MARSHALL RHEA

TOTAL LENGTH PIPE = 1304.37
GPM UNDER PIPE = 550.04
ACRES UNDER PIPE = 122.72
RANGE OF ENDGUN = .00
GPM OF ENDGUN = .00
ACRES UNDER ENDGUN = .00

SYSTEM PRESSURE = 25 PSI
TOTAL GPM = 550.04

MOTOR SIZE (HP) = 3/4
LOADED MOTOR RPM = 1750
CENTER GEAR BOX RATIO = 40
WHEEL GEAR BOX RATIO = 50
TIRE SIZE = 11 X 24.5
LAST TOWER SPEED (FPM) = 9.45

| PRECIPITATION BASED | | | % TIMER BASED | | |
|---|---|---|---|---|---|
| PRECIPITATION INCHES | % TIMER SETTING | TIME HOURS | % TIMER SETTING | PRECIPITATION INCHES | TIME HOURS |
| .14 | 100.00 | 13.95 | 100.00 | .14 | 13.95 |
| .20 | 69.09 | 20.19 | 90.00 | .15 | 15.50 |
| .25 | 55.27 | 25.24 | 80.00 | .17 | 17.44 |
| .30 | 46.06 | 30.29 | 70.00 | .20 | 19.93 |
| .40 | 34.55 | 40.39 | 60.00 | .23 | 23.25 |
| .50 | 27.64 | 50.48 | 50.00 | .28 | 27.90 |
| .60 | 23.03 | 60.58 | 45.00 | .31 | 31.00 |
| .70 | 19.74 | 70.67 | 40.00 | .35 | 34.88 |
| .75 | 18.42 | 75.72 | 35.00 | .39 | 39.86 |
| .80 | 17.27 | 80.77 | 30.00 | .46 | 46.51 |
| .90 | 15.35 | 90.87 | 25.00 | .55 | 55.81 |
| 1.00 | 13.82 | 100.96 | 20.00 | .69 | 69.76 |
| 1.25 | 11.05 | 126.20 | 15.00 | .92 | 93.01 |
| 1.50 | 9.21 | 151.44 | 10.00 | 1.38 | 139.52 |
| 1.75 | 7.9 | 176.68 | 5.00 | 2.76 | 279.03 |

...ipitation rate, timer setting, and hours per revolution ...
... data list at the top of the page. ...
... conditions; ...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# CISA TESTING

| | | | | | |
|---|---|---|---|---|---|
| Pump Well Pivot Evaluation | | | | | |
| KWO WISE | | Electrical Conversion IF Electricity were Available | | Stay with | |
| "April 2024 | Twin R55 Nelson | New Pumps, Motors | | Diesel | |
| Diesel Engine Well is 1300 West of | No Booster | | | New Pump | |
| Pivot | Egs OFF | | | | |
| Flow Rate timed McCrometer | 693 | | | | |
| | | Modify orifices for new flow rate 700 gpm | | | |
| Needle reading McCrometer | 700 | With No End Guns | | | |
| Pressure at pump | 41 | Flow Rate | 700 | 700 | |
| Pressure at pivot base | 39 | Press at end tower | 20 | 20 | |
| Press on top of pivot | 33 | HF pivot friction loss psi | 7.43 | 7.43 | |
| Nozzling Package Design GPM | 800 | Psi loss to highest pt in field | 1.73 | 1.73 | |
| PSI on top of pivot | 45 | Measured Hf to pivot base | 2 | 2 | |
| Pressure REG setting | 15 | | | | |
| Sprinkler Type | R-3000 Org pad | Required Press at Pump | 36.36 | 36.36 | |
| In highest elevation of field -psi | 23.84 | Required Press at Pivot on Top | 29.16 | 29.16 | |
| Required Pressure Minimum | 15 | | | | |
| Pressure at End Boom bottom drop | 26 | Design Total Dynamic Head, TDH | 149.21 | 149.21 | |
| Static Water Level | 31 | Includes 5 future GW decline | | | |
| Pumping Water Level | 53 | Water HP | 26.38 | 26.38 | |
| Well's Specific Capacity | | Pumping Water Level Future | 58 | 58 | |
| gpm/ft of DD | 31.50 | | | | |
| | | Mainline to Pivot Hydraulics Pipe ID | 7.8 | | |
| Total Dynamic Head | 154.71 | Length ft | 1300 | Use NPPPC 14 WHP/g | |
| Water HP | 27.07 | Hf friction loss psi | 5.00 | 1.88 | gal/hr i |
| Adjusted WHP for GenSet/HydT&L | 29.57 | | | | |
| Diesel Fuel Consumption gal/hr | 2.60 | Cost per Diesel gallon | $3.25 | | |
| Gearhead Ratio | 4 to 3 | Energy Use Comparison | | | |
| PUMP shaft RPM | 1500 | AS IS gallons Diesel | 3,488 | 2,502 | Gallons |
| Engine RPM | 2000 | Energy Cost AS IS | $11,334 | | Hot Dry |
| Engine Tach Reading | NA | OP Hours at Design Flow Rate | 1,328 | | |
| GENSET T and L Hydraulic | GenSet | New Pump Water HP | 26.38 | $8,131 | |
| Volts | | Brake HP 82% pump efficiency | 32.17 | | |
| amps | | Motor Size | 40 | | |
| Pfactor | | Pump KWDemand | 27.27 | | |
| Estimated Motor HP | | | | | |
| Estimated Water HP equivalent | 2.50 | Total kWhours | 36,209 | | |
| | | Cost of kWh | $0.13 | | |
| WHP/gal/hr Diesel | 11.37 | | | | |
| | Fair | Total Electrical Annual Cost | $4,707 | | |
| NPPPC standard | 14.50 | Savings in Energy Cost | $6,627 | $3,204 | |
| % of NPPPC standard | 78% | | | | |
| | | Total BTU As Is | 483,682,996 | 483,682,996 | |
| Permit number | | Total BTU Future | 123,581,793 | 349,472,641 | |
| Alloted Acres | 320 | Savings in BTU per year | 360,101,203 | 134,210,355 | |
| Maximum Flow rate | 690 | % Energy Savings | 74.45% | 27.75% | |
| Alloted AF | 171 | | | | |
| Actual acres irrigated | 128 | Eligible REAP Improvement Costs | | | |
| Well Depth WWC5 | 97 | | | | |
| SWL at Well Drilling | | New Pump Assembly. | $10,000 | $10,000 | |
| | | Just installed all new column pipe and line shaft | | | |
| Operating Hours Calculations | shares with SW | New Motor, Electrical Work,VFD | $30,000 | | |
| Max Inches applied per acre | 16.03 | New Sprinkler Package Orifices only | $400 | $400 | |
| OP Hours in a drier year | 1,341 | | | | |
| | | Total COSTS | $40,400 | $10,400 | |
| Elevation at Pivot | 1886 | | | | |
| Elevation at Well | 1890 | Payback Years | 6.10 | 3.25 | |
| Elevation at Highest pt in field | 1890 | | | | |
| Lowest | 1877 | Possible NRCS EQIP IRA Climate Smart 2025 | $39,000 | 29,000 | |
| | | Net Cost | $1,400 | -$18,600 | |
| | | Payback Net after EQIP | 0.21 | | |

| | | | |
|---|---|---|---|
| John McClure WISE | | | |
| Pump/Well/System Testing | Electric Motors | Improving Pump to new efficiency status | |
| April 1 2024 | R55 Nelson EG | Reducing pressure to just what is needed for | |
| ! Well on West side | No Booster ON | Current sprinkler package | |
| | SW 21-24-12 | | |
| Flow Rate timed McCrometer | 521 | Flow Rate | 550 |
| Needle reading McCrometer | 520 | Press at end tower | 18 |
| Pressure after Butterfly at Pump | NA | HF pivot friction loss psi | 4.75 |
| Pressure at pump | 37 | Psi loss to highest pt in field | 0.00 |
| Pressure at pivot base | 38 | Measured PSI loss to pivot base | -1 |
| Press on top of pivot | 32 | (adjusted to design flow rate | |
| Nozzling Package Design GPM | 550 ?? | Required Press at Pump | 26.95 |
| PSI on top of pivot | 19 ?? | Required Press at Pivot on Top | 22.75 |
| Pressure REG setting | 6 psi | | |
| Estimated Pressure at End Tower | On Top | Design Total Dynamic Head, TDH | 130.37 |
| In highest elevation of field -psi | 27.25 | Includes 5 future GW decline | |
| Required Pressure Minimum | 12 | Water HP | 18.11 |
| | | Pumping Water Level Future | 61 |
| Static Water Level | 35 | | |
| Pumping Water Level | 55 | Mainline to Pivot Hydraulics Pipe ID | 7.8 |
| Well's Specific Capacity | | Length ft | 1400 |
| gpm/ft of DD | 26.05 | Hf friction loss psi | 3.23 |
| Total Dynamic Head | 146.47 | Cost per kWh | $0.13 |
| Water HP | 19.27 | Energy Use Comparison | |
| | | AS IS kWh | 28,704 |
| Nameplate HP | 40 | Energy Cost AS IS | $3,674 |
| Rated Amps/Volts | 50/460 | OP Hours at Design Flow Rate | 969 |
| Tested Amps | 40.5,41,40.3 | New Pump Water HP | 18.11 |
| Tested Volts | 491 | Brake HP 82% pump efficiency | 22.08 |
| Electric Meter # | 162225530 | Motor Size | 25 |
| Kh | 21.6 | Pump KWDemand | 18.72 |
| Time to complete 10 rev - sec | 29.3 | | |
| Meter MHP | 35.53 | | |
| Meter Multiplier | 1.00 | Total kWhours | 18,131 |
| Equation MHP | 39.73 | Cost of kWh | $0.13 |
| Overall PUMP Plant Efficiency | 51.21% | Total Electrical Annual Cost | $2,321 |
| NPPPC standard | 65% | Savings in Energy Cost | $1,353 |
| % of NPPPC standard | 79% | | |
| Pump KWDemand | 28.07 | | |
| Efficiency Overall | OK | | |
| Permit number | 22611 | Combined BTU As Is | 97,967,435 |

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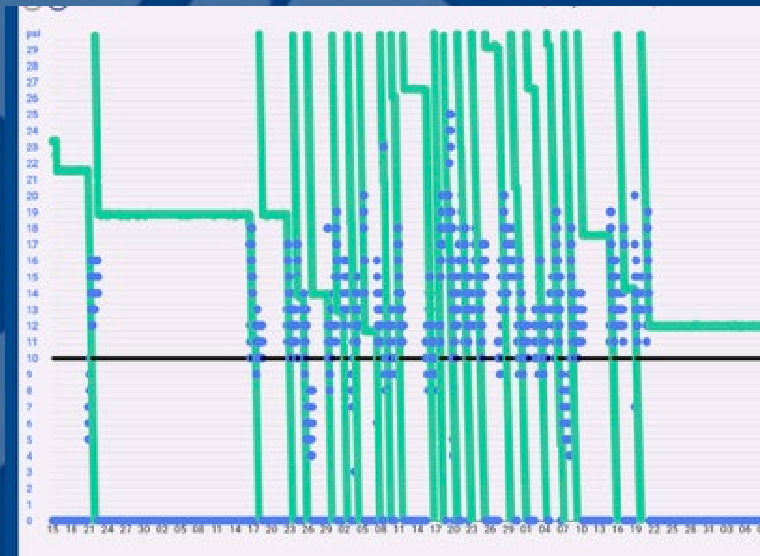
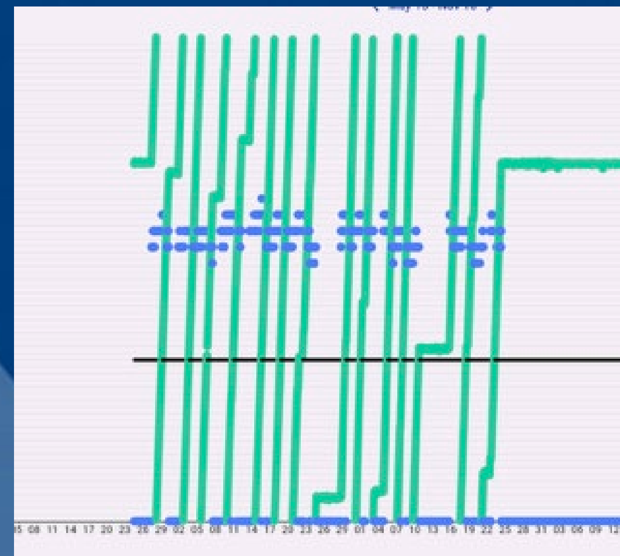
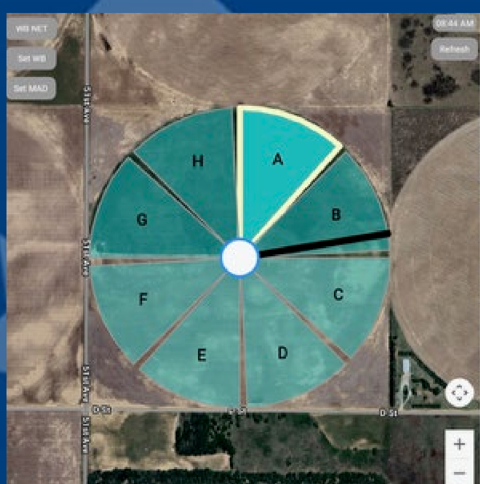
TESTING









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## FINDINGS AND SUGGESTED IMPROVEMENTS

Water Duty should be the primary objective.
Obtain similar yields with less irrigation water

Water Duty = Yield/Irrigation inch applied.

After Harvest calculate Water Duty on similar crops to learn and discover Opportunities.

Low pressure operation is too common,

Possibly greater than half the pivots tested!

Use butterfly valves at pump discharge to reduce well's flow rate usually due to air pumping.  This robs needed pressure from pivot package.

Flow meter piping has been made too small supposedly for better operation of flow meter. This also robs needed pressure from Pivot Package.

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## FINDINGS AND SUGGESTED IMPROVEMENTS

Column pipe size too small on submersible pumps causing 5-10 psi of excess friction loss

Install end tower GPS/PSI monitoring equipment (Ag Sense, FieldNet, AP, Field Wise).

Upgrade pumping plant for sufficient pressure and/or better energy efficiency.

Pressure regulators are essential and must be working properly. Many pivots tested have worn out regulator springs. When worn out more pressure comes thru to orifice. Often leads to low PSI. Replace or Add regulators if there are none.

Un-Balanced Pumping Water Levels on multiple well systems. Change RPM if IC engine, add VFD if electrical, upgrade pumping plant.

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## FINDINGS AND SUGGESTED IMPROVEMENTS

Pipelines have excessive friction loss from well to pivot, especially on multiple pivot/well systems. May be caused by insufficient air relief (add CAV, Continuous Acting Air Release). Pipe size, constrictions, partial collapse, fittings compromised (find main culprit and upgrade).

Pipeline may be low pressure (20 psi rating) from flood irrigation days.  This caused low pressure operation if 20 psi maximum operation is too low for pivot design pressure.

Air pumping cascading water due to pumping water level (PWL) is below top of well screen, exceeded sustainable GPM from well.

Reduce GPM of well by re-orificing package. If multiple wells, balance PWLs

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## FINDINGS AND SUGGESTED IMPROVEMENTS

No well drillers log from KGS (WWC5), nor pump repair measurement of well depth, static water level, SWL, and pump intake depth. Plan to measure when pump pulled for repair.

No Access to measure water levels.  This occurs in about one-quarter of the CISA tests.

Install airline or other water level measurement access before scheduled pump repair.  Do it with pump still in well. Pump companies should be encouraged to ALWAYS install water level measurement Access during pump repair.

Consider well video survey if no WWC5, while pump is out of well, essentially recreating the WWC5.

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## FINDINGS AND SUGGESTED IMPROVEMENTS

Excess Energy costs due to pumping plant efficiencies significantly less than Nebraska Pumping Plant Performance Criteria (NPPPC). Replace or repair pump assembly for “new” efficiency.

Electric submersible motor pumping plants (3500 rpm) are less efficient than vertical turbine (1750 rpm) with VHS motor.   Could be 7-15% more energy cost. Preference should be to not use submersible unless efficiencies are similar or capital cost is significantly higher to stay with 1750 rpm vertical turbine; mostly due to column pipe, shafting and bearing not re-usable.

Electric motors sometimes have Imbalanced amps.

*Check electric connections, Grid transformers problems, or Open Delta (just 2 transformers).*

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## FINDINGS AND SUGGESTED IMPROVEMENTS

Natural Gas engines sometimes have engine manifold pressure too high; greater than 3.5 oz/sq.in. *Adjust "pancake" regulator to 2.5 – 3.5* oz/sq.in.

Aquifer Resiliency Needs Attention to preserve performance of well (GPM/FT. of drawdown) and sustainable GPM by avoiding over-pumping of well capacity, especially during Start Up-filling the irrigation system.

*Make sure sprinkler package flow rate does not exceed safe sustainable yield of well. Re-orifice package if regulators still good.*

*Add VFD and program it for automatic SLOW gentle start Up.*

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## FINDINGS AND SUGGESTED IMPROVEMENTS

*Use an automatic Nelson type Pressure Regulating Valve (PRV), with a Flow Control Paddle to reduce filling GPM.*

*Use a butterfly valve for non-VFD electric start-up or manually reduce IC engine speed until pivot is filled and pressured up. Then open fully for long term operation.*

*Encourage pump vendor to install water level measurement access if "pulling" a pump for repairs.*

Energy costs can be reduced:

Upgrade pump to new efficiency

Use VFD + pressure transducer

Convert to electric from IC; especially if diesel.

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## FINDINGS AND SUGGESTED IMPROVEMENTS

Irrigation Water Management (IWM):

Improve Water Duty (yield/inch irrigation)

Use Root Zone Water Balance

Accurate rain gauge with telemetry at pivot point.

Measure PSI/GPM for real-time irrigation depths for water balance.

Improve application uniformity.

Improve surface and root-zone  infiltration.

Wider wetted footprint (Boom-back systems)

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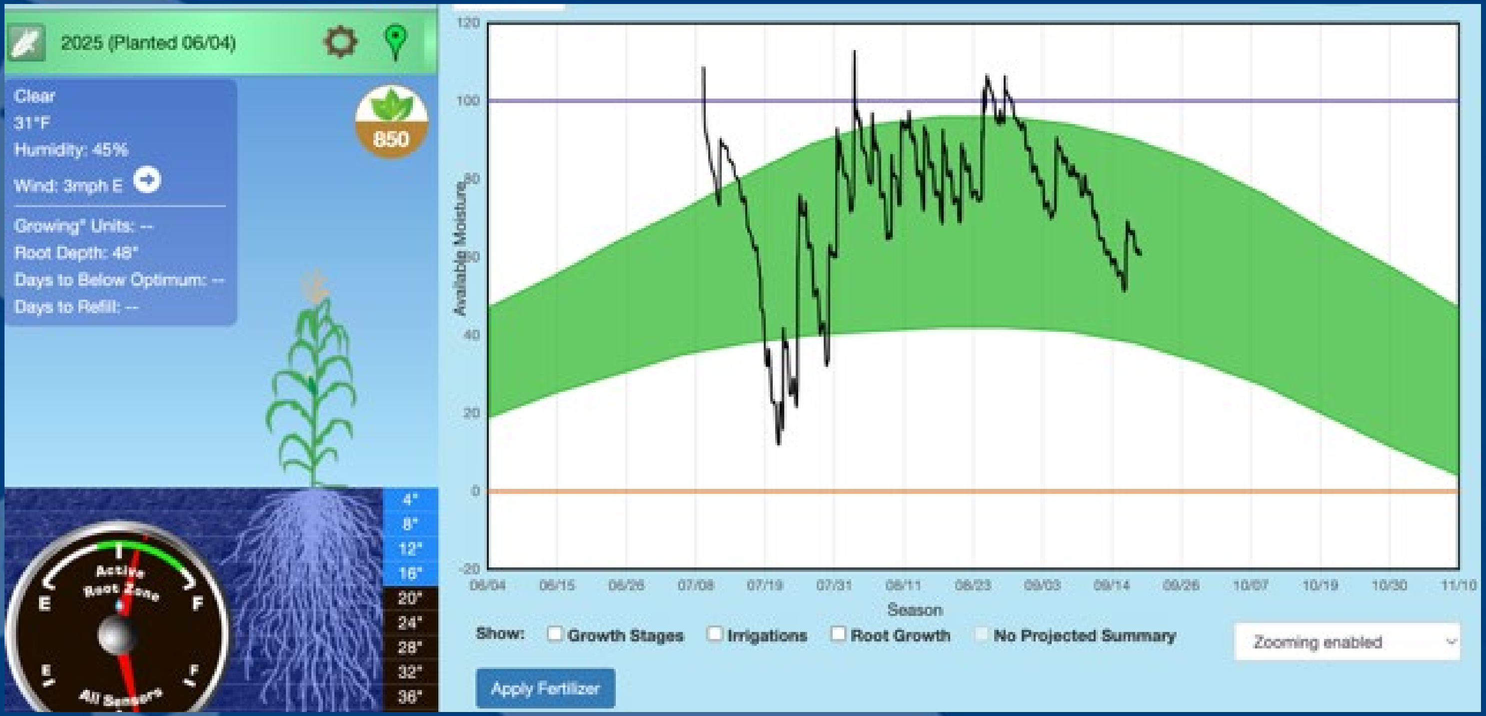
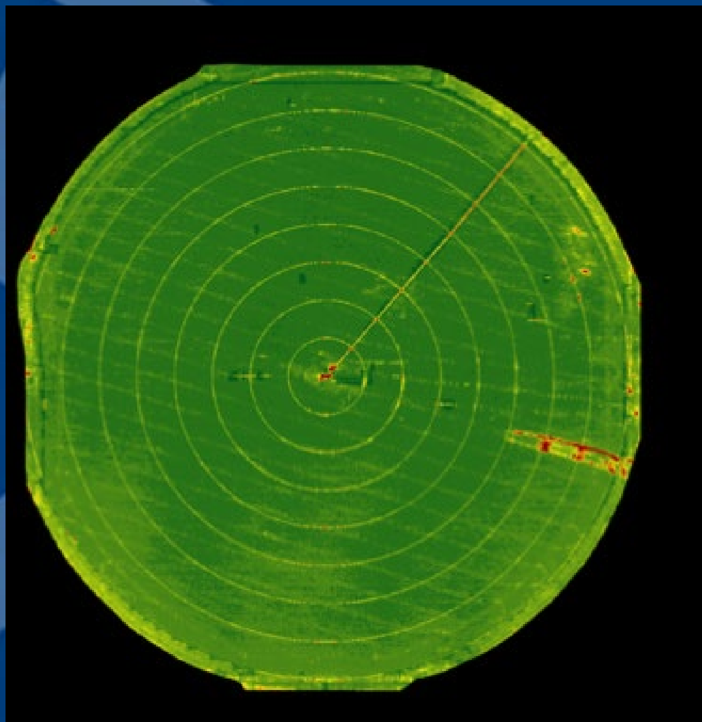
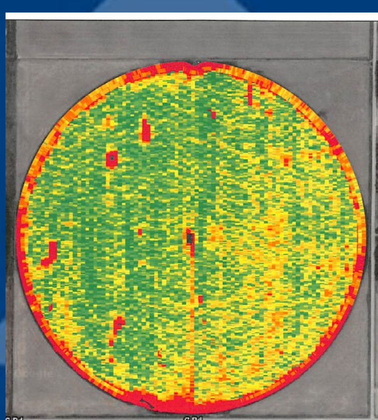

2025 (Planted 06/04)
Clear
31°F
Humidity: 45%
Wind: 3mph E
Growing° Units: --
Root Depth: 48"
Days to Below Optimum: --
Days to Refill: --
850
4"
8"
12"
16"
20"
24"
28"
32"
36"
Active Root Zone
All Sensors
E
F
Available Moisture
120
100
80
60
40
20
0
-20
06/04
06/15
06/26
07/08
07/19
07/31
08/11
08/23
09/03
09/14
09/26
10/07
10/19
10/30
11/10
Season
Show:
Growth Stages
Irrigations
Root Growth
No Projected Summary
Zooming enabled
Apply Fertilizer





Achieve better Water Duty while conserving water resources. Get more water into the root zone and used by the crop.

We use less water when each drop does more!

More economic return for every drop of water used! Win-Win!

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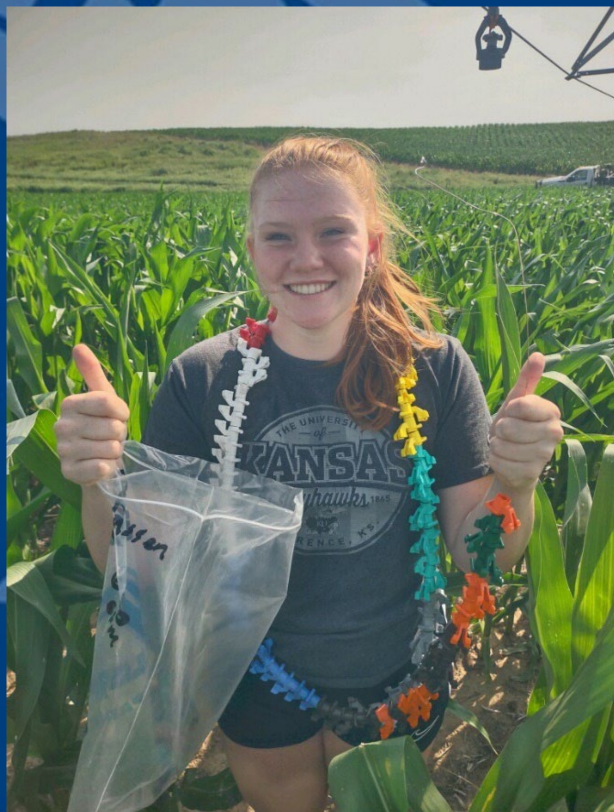
# KEEP BUILDING THE FUTURE OF KANSAS

## *TOGETHER!*





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