Irrigation: Trials and Tribulations of Establishing Irrigation

**Principal Investigator:** Jon Leuck, Superintendent Pinney Purdue Agricultural Center, Purdue University.

**Co-Principal Investigator:** Steve Hawkins, Assistant Director Purdue Agricultural Centers & Coordinator of Building Projects Purdue College of Agriculture, Purdue University
Initial Discussion Phase

- Research land is needed with irrigation, especially after 2012 drought
- Land availability
- Decide on a possible location
- Water seems abundant
- Need to look at soil profile and types
- Check local well log records
- A test well should be done to decide on yield first
- How large of a system or irrigator is desired – Formula: 6 gallons per acre x 142 acres = 852 gallons per minute well capacity
- Power sources available/expense – diesel versus electric
Soil Survey of Purdue University Rice Farm
## Rice Farm Soil Summary

### Map Unit Legend Summary

**LaPorte County, Indiana**

<table>
<thead>
<tr>
<th>Map Unit Symbol</th>
<th>Map Unit Name</th>
<th>Acres in AOI</th>
<th>Percent of AOI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Br</td>
<td>Bourbon sandy loam</td>
<td>13.9</td>
<td>1.7</td>
</tr>
<tr>
<td>BtA</td>
<td>Brems fine sand, 0 to 3 percent slopes</td>
<td>7.2</td>
<td>0.9</td>
</tr>
<tr>
<td>Gf</td>
<td>Gilford fine sandy loam</td>
<td>528.5</td>
<td>66.1</td>
</tr>
<tr>
<td>Mm</td>
<td>Maumee loamy fine sand</td>
<td>232.8</td>
<td>29.1</td>
</tr>
<tr>
<td>Mx</td>
<td>Morocco loamy fine sand</td>
<td>3.5</td>
<td>0.4</td>
</tr>
<tr>
<td>Sb</td>
<td>Sebewa loam, shaly sand substratum</td>
<td>10.5</td>
<td>1.3</td>
</tr>
<tr>
<td>We</td>
<td>Warners silt loam</td>
<td>3.0</td>
<td>0.4</td>
</tr>
</tbody>
</table>
Neighboring Well Locations
## Surrounding Well Logs

<table>
<thead>
<tr>
<th>Reference Number</th>
<th>Driving directions to well</th>
<th>Date completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>96684</td>
<td></td>
<td>May 27, 1993</td>
</tr>
</tbody>
</table>

### Owner-Contractor Details
- **Owner**: JOHN GORSKI
- **Driller**: JOE BROWN
- **Operator**: JOE BROWN
- **Address**: LACROSSE, IN
- **Telephone**: 120

### Construction Details
- **Well**: User Industry
  - **Depth**: 57.0 ft
  - **Length**: 20.0 ft
- **Screen**: Material: STEEL
  - **Material**: 5.5
- **Pump Details**: Pump type: Water quality: CLEAR
  - **Diameter**: 17.0
  - **Diameter**: 17.0

### Well Capacity Test
- **Type of test**: Rate 800 gpm for 2.0 hrs.
- **Test rate**: Rate 800 gpm for 2.0 hrs.
- **Static water level**: 5.0 ft.
- **Water level**: 5.0 ft.
- **Builer Drawdown**: 0.

### Grouting Information
- **Material**: 60 to 30.0
- **Installation Method**: TREMBLE

### Well Abandonment
- **Sealing material**: 60 to 30.0
- **Number of bags used**: 12.0

### Administrative Details
- **County**: laporte
- **Section**: 5W of the NE of the SW of Section 17
- **Township**: 33N Range: 3W
- **Topo map**: ENGLISH LAKE
- **Grant Number**: 6438
- **Field located by**: BHI
- **Location accepted w/ verification by**: on: Aug 08, 1994
- **Lot number**: 51400.0
- **Height above NL**: 666.0
- **Ground elevation**: 666.0
- **UTM Easting**: 517564.7
- **UTM Northing**: 457626.0

### Well Log
- **Top**: 0.0
- **Bottom**: 57.0
- **Formation**: SAND
- **SAND**: 57.0
- **SMALL GRAVEL**: 75.0
- **FINE SAND**: 75.0
- **SHALE**: 75.0

### Comments
- **MC, VERIFIED BY DIRECTIONS, WELL 1400 FT N OF 21098**

https://secure.in.gov/apps/dnr/water/dnr_waterwell?refNo=96684&__from=SUMMARY&__ 8/15/2012
Bidding Out The Well Work

• We are a public entity and must follow codes, processes, inspections, and competitive bidding
• Ultimately this raises the cost but at the same time is supposed to lower the risk
• We can use this to our advantage to build low maintenance and low start up costs
• Consequently we tend to build more robust systems but this can be beneficial in the long run
• Our bid package asked for the test well, production well, and electric
Bids Are Returned

RICE FARM IRRIGATION WELL INSTALLATION - 2013
PURDUE UNIVERSITY WEST LAFAYETTE CAMPUS
SMALL PUBLIC WORKS
FEBRUARY 1, 2013

<table>
<thead>
<tr>
<th>BIDDERS</th>
<th>COMPLETE CONSTRUCTION</th>
<th>Base Bid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Layne Christensen Company, Beecher, IL</td>
<td>Resource Construction, Inc., Indianapolis, IN</td>
<td>$313,609.00</td>
</tr>
</tbody>
</table>

- Bids returned are rejected due to extreme cost
- Union Labor and Prevailing Wage requirements, the test well, the scope of the electrical work, quality of materials requested, and the schedule of work anticipating overtime labor increased the final bid results.
Bidding the Test Well, Production Well, and Electrical Work Separately

<table>
<thead>
<tr>
<th>Line</th>
<th>Item Description</th>
<th>Part Number</th>
<th>Qty</th>
<th>Unit</th>
<th>Unit Price</th>
<th>Extended Amount</th>
<th>Need by Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Test Well Drilling</td>
<td></td>
<td>1</td>
<td>LO</td>
<td>4,200.00</td>
<td>4,200.00</td>
<td>08/17/2013</td>
</tr>
</tbody>
</table>

For questions on the order, please contact:
Temecula Name: Judith H Close
Email: jclose@purdue.edu
Phone: 765-494-8380
Fax: 765-494-1371

Supply:
Pallace Midwest Inc
32980 Russell Industrial Plaza
Elkhart, IN 46515-7500
Phone: 217-354-9961
Fax: 1-574-234-0950
Contact:

Ship To:
Purdue University - West Lafayette Campus
Programming Cares
NCVE
19605 5.800
West Lafayette, IN 47907-0900
Phone: 765-494-5280
Fax: 765-494-5280

Bill To:
Purdue University
Freestor Hall of Admin. Services
Accounts Payable Dept.
401 South Grant Street
West Lafayette, IN 47907-2048
Phone: 765-494-7370
Fax: 765-494-1371

Invoicing:
Shipping Point
Payment Terms: Net 30 - No Discount; 30 days from Document Date
Test Well Drilling
## Test Well Sieve Results

### Alloy Machine Works, Inc.
19102 E. Hardy Rd.
Houston, TX 77073

### Sold To: Peerless Midwest
Address: 55860 Russell Industrial Pk
City, St, Zip: Mishawaka, IN

### Ship To: Peerless Midwest
Address: 55860 Russell Industrial Pk
City, St, Zip: Mishawaka, IN

### Driller: Engineer:
Well: Purdue Rice Farm

<table>
<thead>
<tr>
<th>U.S. SIEVE NO.</th>
<th>SLOT OPENING RANGES</th>
<th>WEIGHT RETAINED</th>
<th>PERCENT RETAINED</th>
<th>CUMULATIVE RETENTION</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.6</td>
<td>0.223</td>
<td>0</td>
<td>0%</td>
<td>0%</td>
<td>Depth (Beginning) 34</td>
</tr>
<tr>
<td>4</td>
<td>0.187</td>
<td>6</td>
<td>9%</td>
<td>9%</td>
<td>Depth (Ending) 39</td>
</tr>
<tr>
<td>6</td>
<td>0.132</td>
<td>2</td>
<td>2%</td>
<td>11%</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>0.094</td>
<td>1</td>
<td>1%</td>
<td>12%</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>0.066</td>
<td>6</td>
<td>5%</td>
<td>17%</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>0.047</td>
<td>15</td>
<td>15%</td>
<td>32%</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>0.033</td>
<td>32</td>
<td>32%</td>
<td>64%</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>0.023</td>
<td>22</td>
<td>22%</td>
<td>86%</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>0.016</td>
<td>9</td>
<td>9%</td>
<td>95%</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>0.012</td>
<td>8</td>
<td>8%</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>70</td>
<td>0.008</td>
<td>0</td>
<td>0%</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>0.006</td>
<td>0</td>
<td>0%</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>120</td>
<td>0.0049</td>
<td>0</td>
<td>0%</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>140</td>
<td>0.0041</td>
<td>0</td>
<td>0%</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>170</td>
<td>0.0036</td>
<td>0</td>
<td>0%</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>200</td>
<td>0.0029</td>
<td>0</td>
<td>0%</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>PAN</td>
<td>0</td>
<td>0</td>
<td>0%</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>100</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Calculated Gravel Pack
- Calculated Gravel Pack: 0.227 x 0.161

### Median Gravel Size
- Median Gravel Size: 0.1891

### Uniformity Coefficient
- D60/D10 = 2.4031

### Natural Development
- Slot Recommendation: 40%
- Retention: 0.0422

### SAND ANALYSIS

![Graph showing sand analysis with U.S. standard sieve numbers]
Test Well Results
## Area Well Production

Table 1: Attachment B. Area Registered High Capacity Wells, Purdue Rice Farm, LaCrosse, Indiana.

<table>
<thead>
<tr>
<th>IDNR Registration Number</th>
<th>Water Use</th>
<th>Facility Name</th>
<th>Well ID</th>
<th>UTM Easting</th>
<th>UTM Northing</th>
<th>Pump Rating (gpm)</th>
<th>Well Depth (Feet)</th>
<th>Well Diameter (inches)</th>
<th>Aquifer</th>
</tr>
</thead>
<tbody>
<tr>
<td>04543</td>
<td>IR</td>
<td>Schofer Farms</td>
<td>1</td>
<td>511480</td>
<td>4576225</td>
<td>800</td>
<td>20</td>
<td>8</td>
<td>SG</td>
</tr>
<tr>
<td>04543</td>
<td>IR</td>
<td>Schofer Farms</td>
<td>2</td>
<td>511980</td>
<td>4575580</td>
<td>800</td>
<td>20</td>
<td>8</td>
<td>SG</td>
</tr>
<tr>
<td>04543</td>
<td>IR</td>
<td>Schofer Farms</td>
<td>3</td>
<td>514290</td>
<td>4575790</td>
<td>800</td>
<td>20</td>
<td>8</td>
<td>SG</td>
</tr>
<tr>
<td>04543</td>
<td>IR</td>
<td>Schofer Farms</td>
<td>4</td>
<td>511900</td>
<td>4574970</td>
<td>700</td>
<td>34</td>
<td>12</td>
<td>SG</td>
</tr>
<tr>
<td>04543</td>
<td>IR</td>
<td>Schofer Farms</td>
<td>5</td>
<td>514310</td>
<td>4579070</td>
<td>800</td>
<td>20</td>
<td>8</td>
<td>SG</td>
</tr>
<tr>
<td>04543</td>
<td>IR</td>
<td>Schofer Farms</td>
<td>6</td>
<td>511900</td>
<td>4574200</td>
<td>700</td>
<td>34</td>
<td>12</td>
<td>SG</td>
</tr>
<tr>
<td>04779</td>
<td>IR</td>
<td>Gorski, Carey</td>
<td>1</td>
<td>515275</td>
<td>4573575</td>
<td>700</td>
<td>34</td>
<td>12</td>
<td>SG</td>
</tr>
<tr>
<td>04779</td>
<td>IR</td>
<td>Gorski, Carey</td>
<td>2</td>
<td>518000</td>
<td>4575000</td>
<td>800</td>
<td>50</td>
<td>12</td>
<td>SG</td>
</tr>
<tr>
<td>04780</td>
<td>RU</td>
<td>Gorski Brothers Partnership</td>
<td>1</td>
<td>518225</td>
<td>4573525</td>
<td>200</td>
<td>43</td>
<td>6</td>
<td>SG</td>
</tr>
<tr>
<td>05987</td>
<td>IR</td>
<td>Gorski Brothers Partnership</td>
<td>1</td>
<td>517570</td>
<td>4572575</td>
<td>800</td>
<td>57</td>
<td>12</td>
<td>SG</td>
</tr>
<tr>
<td>04496</td>
<td>IR</td>
<td>Four Grand Farms LLC</td>
<td>1</td>
<td>514385</td>
<td>4573100</td>
<td>250</td>
<td>33</td>
<td>12</td>
<td>SG</td>
</tr>
<tr>
<td>04496</td>
<td>IR</td>
<td>Four Grand Farms LLC</td>
<td>2</td>
<td>514425</td>
<td>4573100</td>
<td>250</td>
<td>33</td>
<td>12</td>
<td>SG</td>
</tr>
<tr>
<td>04496</td>
<td>IR</td>
<td>Four Grand Farms LLC</td>
<td>3</td>
<td>514475</td>
<td>4573100</td>
<td>250</td>
<td>33</td>
<td>12</td>
<td>SG</td>
</tr>
<tr>
<td>03493</td>
<td>IR</td>
<td>Gorski Brothers Partnership</td>
<td>1</td>
<td>513800</td>
<td>4572925</td>
<td>300</td>
<td>37</td>
<td>8</td>
<td>SD</td>
</tr>
<tr>
<td>03493</td>
<td>IR</td>
<td>Gorski Brothers Partnership</td>
<td>2</td>
<td>513800</td>
<td>4572850</td>
<td>300</td>
<td>37</td>
<td>8</td>
<td>SD</td>
</tr>
<tr>
<td>03493</td>
<td>IR</td>
<td>Gorski Brothers Partnership</td>
<td>3</td>
<td>513800</td>
<td>4572775</td>
<td>300</td>
<td>37</td>
<td>8</td>
<td>SD</td>
</tr>
<tr>
<td>03493</td>
<td>IR</td>
<td>Gorski Brothers Partnership</td>
<td>4</td>
<td>513800</td>
<td>4572775</td>
<td>300</td>
<td>37</td>
<td>8</td>
<td>SD</td>
</tr>
<tr>
<td>04442</td>
<td>IR</td>
<td>Gorski, Carey</td>
<td>1</td>
<td>515150</td>
<td>4572200</td>
<td>170</td>
<td>40</td>
<td>6</td>
<td>SG</td>
</tr>
<tr>
<td>04442</td>
<td>IR</td>
<td>Gorski, Carey</td>
<td>2</td>
<td>515150</td>
<td>4572200</td>
<td>170</td>
<td>40</td>
<td>6</td>
<td>SG</td>
</tr>
<tr>
<td>04442</td>
<td>IR</td>
<td>Gorski, Carey</td>
<td>3</td>
<td>515170</td>
<td>4572200</td>
<td>165</td>
<td>40</td>
<td>6</td>
<td>SG</td>
</tr>
<tr>
<td>03175</td>
<td>IR</td>
<td>Gorski, John</td>
<td>1</td>
<td>515900</td>
<td>4572575</td>
<td>600</td>
<td>38</td>
<td>12</td>
<td>SG</td>
</tr>
<tr>
<td>03175</td>
<td>IR</td>
<td>Gorski, John</td>
<td>2</td>
<td>515900</td>
<td>4572475</td>
<td>400</td>
<td>38</td>
<td>8</td>
<td>SG</td>
</tr>
<tr>
<td>03175</td>
<td>IR</td>
<td>Gorski, John</td>
<td>3</td>
<td>516050</td>
<td>4572400</td>
<td>400</td>
<td>38</td>
<td>8</td>
<td>SG</td>
</tr>
<tr>
<td>04777</td>
<td>IR</td>
<td>Gorski, Brandon</td>
<td>1</td>
<td>513500</td>
<td>4571800</td>
<td>800</td>
<td>34</td>
<td>12</td>
<td>SG</td>
</tr>
<tr>
<td>03488</td>
<td>IR</td>
<td>Stoller, Duane</td>
<td>1</td>
<td>513525</td>
<td>4570870</td>
<td>600</td>
<td>40</td>
<td>6</td>
<td>SG</td>
</tr>
<tr>
<td>03118</td>
<td>IR</td>
<td>Scarborough, Linda</td>
<td>1</td>
<td>515980</td>
<td>4571725</td>
<td>700</td>
<td>45</td>
<td>12</td>
<td>SH</td>
</tr>
<tr>
<td>02974</td>
<td>IR</td>
<td>Swanson, David</td>
<td>1</td>
<td>511800</td>
<td>4569675</td>
<td>500</td>
<td>44</td>
<td>12</td>
<td>SG</td>
</tr>
</tbody>
</table>

### Table Notes:
- Easting and Northing data presented as UTM, NAD 27, Zone 16 coordinates.
- IR - Irrigation
- SG - Sand & Gravel
- SD - Sand
- SH - Shale

### Averages
- 485
Conclusions and Recommendations

The conditions at the Site appear favorable for developing an irrigation groundwater supply from the surficial sand and gravel aquifer. However, it may require more than one well to achieve the desired 850 gpm supply. The average production from a 40 foot deep well in this aquifer is approximately 485 gpm (Attachment C).

A 12 inch diameter production well completed at TB13A and designed with a partially penetrating screen installed at the base of the surficial sand and gravel aquifer will maximize the available drawdown at the Site. Assuming a static water level of approximately 5 feet bgl, and 10 feet of well screen installed from 30 to 40 feet bgl, an estimated safe available drawdown at this location (5 feet above the top of the screen) would be approximately 20 feet.

The sieve analysis results would suggest the outwash aquifer is poorly sorted with granular material ranging from fine sand to gravel. Based on the analysis, a production well completed adjacent to the TB13A location will support 0.120 inch slot size screen with a 1/4” by 1/8” Northern gravel pack. However, PMI experience shows outwash deposits can be highly stratified, meaning well sorted lenses of fine grained material can be present. To account for any fine-grained lenses and to reduce the potential for sand pumping in the production well, we recommend installing a more conservative screen design. For the production well design, we recommend installing 10 feet of 12 inch diameter, 0.080 slot screen with a Northern #2 (#5x#12) gravel pack. This design can provide up to 644 gpm at 0.1 feet per second entrance velocity.
Production Well Specifications

• SPECIFICATIONS FOR IRRIGATION WELL AT PURDUE MARY S. RICE FARM

• Well:

• Establishment of irrigation water well at the Purdue Mary S. Rice Farm in Laporte County, to supply water to an irrigation rig approximately 1,300 in length.

• 4 – 8 gallons per minute (gpm)/acre; 6 gallons per minute average watering 140 acres or 840 gallons per minute well.

• Option 1: Single well producing 900 gallons per minute.

• Option 2: Multiple wells tied together producing 900 gallons per minute.

• Variable Frequency Drive Submersible Pump (VFD) offers the soft start up and would be good to have in terms of energy usage and flexibility of future irrigation possibilities.

• Gear head or pump drive with appropriate horsepower to achieve desired gallons per minute.

• Gear head or pump drive will run from 3-phase electric power drive.
Production Well Specifications

- Well or wells will be located as close to the center of the pivot point as possible whether from option 1 or 2. The vendor will provide all equipment, materials and labor to install the new water well for irrigation purposes, producing 900 gallon per minute (gpm) at the Mary S. Rice Farm site.

- The well shall be drilled, developed and grouted per the Indiana Department of Natural Resources guidelines.
- Design and construction of this well are based on the American Society of Agricultural and Biological Engineers Standards.

- It is required that this well or wells be tested for output, flow, and pressure to determine gpm in relation to gpm required. In addition test will be used for particulate size to determine appropriate screen size. The wells shall have a continuous stainless steel screen, length determined by the well driller, with appropriate gravel pack.

- In the event the test well indicates the need for a sand separator system, a Lakos PPS separator for turbine pumps will be installed.

- Flanged outlet for irrigation vendor connection will be required.

- A gear head or pump drive such as a Johnson or a Randolph brand.
# Bidding the Two Production Wells

**RICE FARM IRRIGATION WATER WELL INSTALLATION - 2013**  
**PURDUE UNIVERSITY WEST LAFAYETTE CAMPUS**  
**SMALL PUBLIC WORKS**

<table>
<thead>
<tr>
<th>BIDDERS</th>
<th>Complete Construction Base Bid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Layne Christensen Company</td>
<td>$238,825.00</td>
</tr>
<tr>
<td>Beecher, IL</td>
<td></td>
</tr>
<tr>
<td>Dilden Brothers Inc.</td>
<td>$112,772.00</td>
</tr>
<tr>
<td>Lafayette, IN</td>
<td></td>
</tr>
<tr>
<td>Ortman Drilling &amp; Water Services</td>
<td>$69,850.00</td>
</tr>
<tr>
<td>Kokomo, IN</td>
<td></td>
</tr>
<tr>
<td>Peerless Midwest, Inc.</td>
<td>$87,758.00</td>
</tr>
<tr>
<td>Mishawaka, IN</td>
<td></td>
</tr>
</tbody>
</table>
Efficiencies & Strategies In Irrigation

• The key is to pump only water that is Effective
• Uniform application of water – End gun stop adjustment, water supply over or under design, incorrect end gun orifice and sprinkler tips, leaks, plugs, and non turning sprinklers
• Preventing irrigation runoff – consider slope, heavy soils, pressure, sprinkler package, application rate, and compaction
• Do not over fill the soil profile
• Scheduling-water the crop when it needs it
• Use the least pressure or lift possible to Effectively deliver water
• Use the least cost energy source
Power Options to Run Your Irrigation System

Irrigation power cost vary:

• Power source – electric, diesel, or propane
• Power cost – electric was the most economical versus the higher cost of diesel fuel and most recently propane
• System pressure – Cost varies for all 3 power sources depending on the system pressure requirements. <35 psi, 35 – 95 psi, and >100 psi, electric power cost per acre inch was the better source of power
• On our system 3 phase electric was available and utilized
## Bidding the Electrical Work

### RICE FARM IRRIGATION WELL ELECTRICAL INSTALLATION - 2013
**PURDUE UNIVERSITY WEST LAFAYETTE CAMPUS**
**SMALL PUBLIC WORKS**

<table>
<thead>
<tr>
<th>BIDDERS</th>
<th>Martell Electric, LLC</th>
<th>Michiana Contracting, Inc.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>South Bend, IN</td>
<td>Plymouth, IN</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COMPLETE CONSTRUCTION</th>
<th>Base Bid</th>
<th>$92,970.00</th>
<th>$72,900.00</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Irrigation Rig System

• SPECIFICATIONS FOR IRRIGATION SYSTEM AT PURDUE RICE FARM

• Vendors: Valley, Zimmatic, and Reinke

• Galvanized pipe construction, non-towable irrigation system, stationary pivot with concrete pad, centered on a 160 acre field complete with installation and setup. 3 phase electric energy. This system will be a full circle coverage unit.

• Drive wheel application speed to allow for quickest application time. This would be useful in terms of research. The highest drive wheel application speed available.

• Standard system height, Heavy construction for durability.

• System to function uniformly with a Variable Frequency Drive pump. Well will be supplying 850 gallon per minute.
Irrigation Rig System

• Booster pump and end gun for maximum end gun watering.
• The 14.9 x 24 tire can be mounted on an 8” – 10” galvanized rim.
• End tower and pivot strobe light.
• Monitoring abilities that check rainfall, wind speed and offsite location positioning.
• As the well is developed and gallon per minute, flow and pressure are determined it will be at this time when a sprinkler and regulator package will be chosen, depending on well output results.
• Top of the pipe sprinklers. Sprinklers close to the towers or lower ends of the spans to be raised for reduced water contact, allowing for maximum sprinkler application.
Irrigation Rig System

- Installation of a blank spool for future installation of Chemigation/Fertigation injection valve will be provided and installed by irrigation vendor.
- Variable Rate Irrigation applied by speed control and appropriate control panel.
- Pressure, flow, voltage and temperature shut down parameters.
- Control panel to include cellular and internet connectivity, position, control of irrigation, chemigation, fertigation, end gun controlling, scheduling, programmability, for precision of application and efficiency. Including direction, pressure, voltage, temperature, flow sensor, and run time hours.

- Lightning and voltage protection.
Separating out the test well, production well, and electric seemed to be the most logical process to rebidding the work for a lower cost. However keeping the test well and production well together would be positive since they are so closely tied to one another. Coordination and communication with all the working parts: well drillers, electrical contractors, and irrigation system installers would have been beneficial for all those involved since only purchasing and physical facilities can execute contracts. By bidding the test and production wells together, acquiring the yield results, design and bidding the electric to the needs, and specifying the desired system requires all aspects to be working in unison.
Overall Project Summary

• Keep your main goal in perspective – for us it was to provide the basic potential for irrigation. In the beginning design it simple
• Do your homework to assess your irrigation potential. Look at well logs, soil structure, and utilize test well results
• Be flexible in your planning, specs, and design to allow for growth. All for the implementation of features such as injection, variable rate applications, and remote monitoring
• Bring all parties to the discussion table to ensure the best communication toward a continuing effort
• Always invest in safety
Questions?