

STATE: West Virginia COUNTY: \_\_\_\_\_ FIELD OFFICE: \_\_\_\_\_

PROJECT/LANDOWNER: \_\_\_\_\_

Designed by: Date \_\_\_\_\_ Checked by: Date \_\_\_\_\_ Approved by: Date \_\_\_\_\_

Document the following information for planning a Pumping Plant.

1. Describe location of pumping plant? \_\_\_ well, \_\_\_ next to open water, \_\_\_ from storage tank, \_\_\_ spring, \_\_\_ other.
2. Describe existing equipment. \_\_\_ Pump \_\_\_ Type, \_\_\_ Model, \_\_\_ HP, \_\_\_ Model #, \_\_\_ Year
3. Elevation of Pump \_\_\_ ft. @ \_\_\_ (\_\_\_ assumed or \_\_\_ MSL elevation)
4. Elevation of Water \_\_\_ ft. @ \_\_\_ (\_\_\_ above or \_\_\_ below ground)
5. What will be pumped? \_\_\_ Water, \_\_\_ slurry, \_\_\_ other?
6. Check the pump purpose; document the volume water required per day and rate per minute.
 

___ Irrigation;	___ Gallons/day;	___ Gallons/minute	
___ Nursery;	___ Gallons/day;	___ Gallons/minute	
___ Livestock;	___ Gallons/day;	___ Gallons/minute	
___ Irrigation;	___ Gallons/day;	___ Gallons/minute	
___ Other _____	(explain);		___ Gallons/day; ___ Gallons/minute
7. Document the source and quality of water during normal and drought periods. \_\_\_ river; \_\_\_ stream; \_\_\_ lake; \_\_\_ pond; \_\_\_ spring; \_\_\_ shallow well; \_\_\_ deep well; \_\_\_\_\_ (other).
8. What is the planned pumping plant source of energy? \_\_\_ solar (\_\_\_ watts); \_\_\_ wind \_\_\_ (watts), \_\_\_; \_\_\_ commercial electricity (110, 220); \_\_\_ gravity; \_\_\_ hydraulic power; \_\_\_ power take-off, \_\_\_ diesel; \_\_\_ gasoline; \_\_\_ other.
9. The source of power is \_\_\_\_\_ ft. away from the pump.
10. The pump \_\_\_ will be ; \_\_\_ will not be permanent (removed during winter operations or flood conditions).
  - a. What type of pump is planned? \_\_\_ Deep Well Turbine (wells), \_\_\_ Propeller Pump (large water quantity under low heads), \_\_\_ Centrifugal (horizontal or vertical, near source of open water or shallow wells), \_\_\_ Piston or Ram, \_\_\_ other.
  - b. If the source is a well, estimate; Recovery Rate \_\_\_ GPM: Drawdown Water Level \_\_\_\_\_ ft. (below static water level): Inside Diameter of Well Casing \_\_\_\_\_ in.
  - c. What is the minimum \_\_\_ (PSI) pressure and maximum \_\_\_ (PSI) pressure of the water pressure tank?
  - d. What is the maximum elevation or static vertical lift;
    - i. from the \_\_\_ Centerline of the Pump (CLP) \_\_\_ Elevation; \_\_\_ Water Level \_\_\_ Elevation; \_\_\_ Pressure Tank \_\_\_ Elevation
    - ii. To the \_\_\_ Pressure Water Tank \_\_\_ Elevation; \_\_\_ Highest Point of \_\_\_ Water Trough/tank; \_\_\_ Water Storage Tank: \_\_\_ Field; \_\_\_ Elevation \_\_\_ not applicable.
    - iii. What is the maximum pipeline length (from the pumping plant or water level to the remotest location)? \_\_\_ (ft)

- iv. What is the maximum pipeline elevation (from the pumping plant or water level to the remotest location? \_\_\_\_ (ft)
11. Type of Water Storage Tank Planned or in Use: \_\_\_\_ Above Ground, \_\_\_\_ Below Ground, \_\_\_\_ Other, \_\_\_\_ None. What size of tank is recommended \_\_\_\_\_ gallons? What month(s) will water be required? \_\_\_\_\_. Is frost protection required? \_\_\_\_ Yes, \_\_\_\_ No.
12. Is there anything unique to the site? \_\_fog, \_\_high winds, \_\_corrosive environment, \_\_water ph?

Provide a general layout (north arrow and scale) for planning, showing location, elevation and distance(s) from the source of water to the pump and the distance and elevation from the pump to the planned location of use (troughs, irrigation fields, ponds); include the highest (summit) and lowest elevations along with the planned pipe distribution layout. Irrigation systems require a survey of the irrigation field on a minimum 2' contour with the proposed bed layout and boundary of the irrigation area, well location, stream crossings (top of bank, toe of bank and stream crossing width).

All pumps are sized according to the amount of water a system needs to pump over a given time (GPM) and the amount of pressure against which the unit has to work to push the water. The Total Dynamic Head (TDH) is the summary of the Total Static or Suction Head (elevation difference), Pressure Head (required PSI pressure for tanks, irrigation sprinklers, etc.) plus the Friction Head, documented in feet. All pump design must include the planned TDH and the associated pump curve. The curve relates to the pump HP and TDH.

General guidelines for selecting a Pump

When choosing a pump, (see drawings) it is necessary to gather accurate data on the fluctuations of the water table in a well or the free surface as in a water pond or river. The lower level fluctuation should be chosen for the pump design.

**PUMP DATA**

TYPE: \_\_\_\_\_, HP: \_\_\_\_\_ DISCHARGE GPM: \_\_\_\_\_, TDH \_\_\_\_\_ FT., MANUFACTURER

MODEL #: \_\_\_\_\_

PUMP CURVE: \_\_\_\_\_ PUMP EFFICIENCY (PE): \_\_\_\_\_ (See Attached Pump Curve)

TOTAL DYNAMIC HEAD (TDH):

Static or Elevation Head \_\_\_\_\_ ft.

Pressure Head (psi) x 2.31' = \_\_\_\_\_ ft.

Friction Head (pipe and fittings friction losses) \_\_\_\_\_ ft.

TDH \_\_\_\_\_ Ft. = Elev. Head \_\_\_\_\_ ft. + Pressure Head \_\_\_\_\_ ft. + Friction Head \_\_\_\_\_ ft.

**Brake Horsepower (BHP):** Reference applicable pump Curve and attach to document

\_\_\_\_\_ BHP = \_\_\_\_\_ TDH x \_\_\_\_\_ Flow Rate (GPM) x 100 / 3960 x \_\_\_\_\_ % Pump Efficiency (65%-75%)

DOES PUMP MEET IRRIGATION/WATERING REQUIREMENTS? \_\_\_\_YES \_\_\_\_NO

OPERATE PUMP AT \_\_\_\_\_ PSI TO DELIVER \_\_\_\_\_ GPM

IF FOR IRRIGATION, THE PUMPING RATE \_\_\_\_\_ GPM CAN SUPPLY 125% OF THE IRRIGATION RATE \_\_\_\_\_ GPM (SEE PUMP CURVE)?

OPERATE PRESSURE REGULATING VALVE AT \_\_\_\_\_ PSI

PRESSURE RANGE WITHIN ZONE: \_\_\_\_\_

FERTIGATION AND CHEMIGATION - YES OR NO

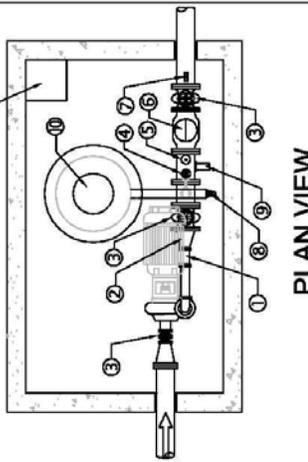
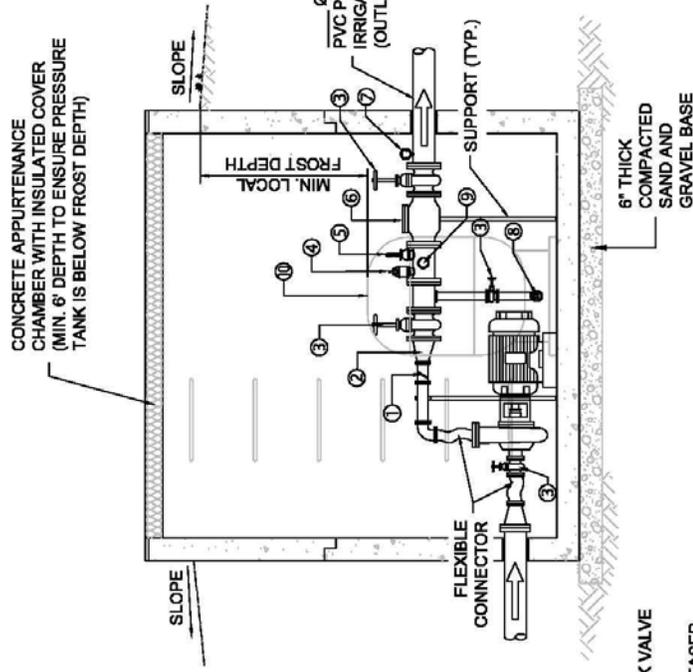
- TYPE OF INJECTOR: \_\_\_\_\_, RATE OF INJECTION: \_\_\_\_\_
- CHEMIGATION: TYPE OF INJECTOR: \_\_\_\_\_, RATE OF INJECTION: \_\_\_\_\_
- TYPE OF BACKFLOW PREVENTION DEVICE (required): \_\_\_\_\_

Solar Water Pumping General Information

The following charts (developed by Solar Water Technology (SWT), Inc.) show the required volts and watts for vertical lift versus flow (GPM). By knowing the required flow (GPM) and the Total Lift (FT), estimate the required Solar Panel Output.

<b>*SWT Single Panel Solar Systems: Models SWT 50 and SWT 75</b>						
<b>Total Vertical Lift *</b>		<b>Flow Rate Per Hour *</b>		<b>Solar Panel Output</b>		
<b>Feet</b>	<b>Meters</b>	<b>Gallons</b>	<b>Liters</b>	<b>Amps</b>	<b>Volts</b>	<b>Watts</b>
0	0	76.0	287.7	1.10	17	19
20	6	74.0	280.1	1.40	17	24
40	12	60.0	227.1	1.7	17	29
60	18	54.0	204.4	2.05	17	35
80	24	48.0	181.7	2.30	17	39
100	30	45.0	170.3	2.55	17	43
120	37	39.0	147.6	2.80	17	48
140	43	36.0	136.3	2.95	17	50
160	49	35.0	132.5	3.05	17	52
180	55	32.0	121.1	3.20	17	54
200	60	25.0	94.6	3.50	17	60
Note: Production Data Is A Representative Sample. Actual Performance May Vary According To Environmental Conditions. * Information from Solar Water Technology						
<b>SWT Dual Panel Solar Systems: Models SWT 100 - SWT 150 and SWT 180</b>						
<b>Total Vertical Lift *</b>		<b>Flow Rate Per Hour *</b>		<b>Solar Panel Output</b>		
<b>Feet</b>	<b>Meters</b>	<b>Gallons</b>	<b>Liters</b>	<b>Amps</b>	<b>Volts</b>	<b>Watts</b>
0	0	126.0	476.9	1.68	30	50
20	6	120.0	454.2	1.80	30	54
40	12	111.0	420.2	2.00	30	60
60	18	105.0	397.5	2.35	30	71
80	24	99.0	374.7	2.65	30	80
100	30	93.0	352.0	3.00	30	90
120	37	90.0	340.7	3.20	30	96
140	43	87.0	329.3	3.40	30	102
160	49	84.0	318.0	3.45	30	104
180	55	81.0	306.6	3.55	30	107
200	60	50.0	189.3	3.65	30	110
Note: Production Data Is A Representative Sample. Actual Performance May Vary According To Environmental Conditions. * Information from Solar Water Technology SWT™ Systems utilizes a Pressure Relief Valve, which engages at 85 PSI. Systems can be designed in excess of 200 feet of head, but these simplified charts do not reflect this.						

PUMP MODEL # \_\_\_\_\_  
 DEPTH OF PUMP BELOW GROUND SURFACE \_\_\_\_\_ FT HEAD  
 GPM PUMP @ \_\_\_\_\_ INLET DIAMETER  
 AIR RELIEF VALVE SIZE \_\_\_\_\_  
 PRESSURE RELIEF VALVE SIZE \_\_\_\_\_  
 IRRIGATION PIPELINE SIZE \_\_\_\_\_  
 GAL. PRESSURE TANK RATED @ \_\_\_\_\_



**PLAN VIEW**

- ① CHECK VALVE
- ② INCREASER
- ③ GATE VALVE
- ④ AIR RELIEF VALVE
- ⑤ PRESSURE RELIEF VALVE
- ⑥ FLOW METER
- ⑦ PRESSURE GAUGE
- ⑧ PRESSURE TANK DRAIN
- ⑨ CHEMIGATION INLET LOCATION (AS REQUIRED)
- ⑩ PRESSURE TANK

**NOTES:**

**GENERAL:**  
 CARE MUST BE TAKEN DURING PERIODS OF PRECIPITATION TO ENSURE THE CHAMBER DOES NOT FILL WITH WATER.

**ELECTRIC MOTOR:**  
 ELECTRICAL WIRING MUST COMPLY WITH LOCAL CODES AND MANUFACTURERS REQUIREMENTS. ELECTRICAL PLUG OR DISCONNECT TO BE LOCATED NEARBY MOTOR TO PERMIT ELECTRICITY TO BE SHUT OFF PRIOR TO PUMP SERVICE.

**PAINT:**  
 ALL NON-PAINTED PARTS ARE TO BE EITHER GALVANIZED OR PAINTED WITH 2 COATS OF PRIMER AND ONE COAT OF ALUMINUM PAINT OR EQUAL.

**PIPELINE:**  
 ALL APPURTENANCES TO BE ONE PRESSURE GRADE HIGHER THAN THE PIPELINE. LINK SEAL SHALL BE USED WHERE PIPE PENETRATES UNDERGROUND STRUCTURE. PIPELINE TO BE SUPPORTED AT TWO LOCATIONS MINIMUM. DESIGNER TO VERIFY LINE VELOCITY MEETS NRCS REQUIREMENTS.

Date \_\_\_\_\_  
 Designed \_\_\_\_\_  
 Drawn \_\_\_\_\_  
 Checked \_\_\_\_\_  
 Approved \_\_\_\_\_

**WEST VIRGINIA IRRIGATION  
 PUMPING PLANTS  
 ELECTRIC BELOW GRADE IRRIGATION STATION**



File Name 42356-06  
 Drawing No. \_\_\_\_\_  
 Sheet \_\_\_\_\_ of \_\_\_\_\_

<p>PUMP MODEL # _____</p> <p>DEPTH OF PUMP BELOW GROUND SURFACE _____</p> <p>GPM PUMP @ _____ FT HEAD _____</p> <p>WELL DIAMETER _____</p> <p>AIR RELIEF VALVE SIZE _____</p> <p>PRESSURE RELIEF VALVE SIZE _____</p> <p>IRRIGATION PIPELINE SIZE _____</p> <p>GAL. PRESSURE TANK _____</p> <p>PRESSURE TANK RATING _____</p>		<p>① CHECK VALVE</p> <p>② INCREASER</p> <p>③ GATE VALVE</p> <p>④ AIR RELIEF VALVE</p> <p>⑤ PRESSURE RELIEF VALVE</p> <p>⑥ FLOW METER</p> <p>⑦ PRESSURE GAUGE</p> <p>⑧ PRESSURE TANK DRAIN</p> <p>⑨ CHEMIGATION INLET LOCATION (AS REQUIRED)</p> <p>⑩ PRESSURE TANK</p>
<p>DESIGNED _____</p> <p>DRAWN _____</p> <p>CHECKED _____</p> <p>APPROVED _____</p> <p>DATE _____</p>	<p><b>WEST VIRGINIA IRRIGATION PUMPING PLANTS</b></p> <p>ELECTRIC WELL IRRIGATION STATION</p>	

**NOTES:**

**ELECTRIC MOTOR:**  
ELECTRIC WIRING MUST COMPLY WITH LOCAL CODES AND MANUFACTURERS REQUIREMENTS. ELECTRICAL PLUG OR DISCONNECT TO BE LOCATED NEARBY MOTOR TO PERMIT ELECTRICITY TO BE SHUT OFF PRIOR TO PUMP SERVICE.

**WELL:**  
TO BE INSTALLED BY QUALIFIED DRILLER IN ACCORDANCE WITH LOCAL, STATE AND FEDERAL REGULATIONS.

**PAINT:**  
ALL NON-PAINTED PARTS ARE TO BE EITHER GALVANIZED OR PAINTED WITH 2 COATS OF PRIMER AND ONE COAT OF ALUMINUM PAINT OR EQUAL.

**PIPELINE:**  
ALL APPURTENANCES TO BE ONE PRESSURE GRADE HIGHER THAN THE PIPELINE. EXPANSION BOARD SHALL BE PLACED BETWEEN THE FACE OF THE PIPE AND CONCRETE AT ALL PENETRATIONS. DESIGNER TO VERIFY LINE VELOCITY MEETS NRCS REQUIREMENTS.

**PRESSURE TANK:**  
PRESSURE TANK AND ALL APPURTENANCES TO BE INSTALLED IN FROST FREE BUILDING OR DRAINED PRIOR TO FREEZING TEMPERATURES.

**PLAN VIEW**

**Natural Resources Conservation Service**

File Name 42356-06	Drawing No.
Sheet — of —	

Pump Model # \_\_\_\_\_  
 GPM Pump \_\_\_\_\_  
 (FT/PSI) Pump Head Pressure \_\_\_\_\_  
 H.P. Motor Required \_\_\_\_\_  
 Inch Diameter Pump \_\_\_\_\_  
 FT Net Positive Suction Head \_\_\_\_\_  
 Inch Suction Pipe Diameter \_\_\_\_\_  
 Inch Outlet Pipe Diameter \_\_\_\_\_  
 Air Relief Valve Size \_\_\_\_\_  
 Pressure Relief Valve Size \_\_\_\_\_

Pump Shade to be at landowner's discretion  
 Pressure Gauge \_\_\_\_\_  
 Pressure Increase \_\_\_\_\_  
 Gate Valve \_\_\_\_\_  
 Reducer \_\_\_\_\_  
 Stationary Diesel Engine or Electric Motor \_\_\_\_\_  
 6" Thick Reinforced Concrete Slab \_\_\_\_\_  
 Thrust Block \_\_\_\_\_  
 6" Sch. PVC Pipe to Irrigation System (Outlet Pipe) \_\_\_\_\_  
 Local Frost Depth \_\_\_\_\_  
 Existing Grade \_\_\_\_\_  
 Thrust Block \_\_\_\_\_  
 6" Thick Sand and Gravel Base \_\_\_\_\_  
 Pump Supports (as required) \_\_\_\_\_  
 Water Level \_\_\_\_\_  
 Heavy Duty Inline Trash Guard Max. Opening Size \_\_\_\_\_  
 Anti-Seep Collar \_\_\_\_\_  
 PVC Inlet Pipe (Suction Pipe) \_\_\_\_\_  
 Pipe to Pump Station \_\_\_\_\_

Stationary Diesel Motor:  
 Motor is to be installed in accordance with manufacturer specifications. Diesel motor to have proper ventilation and exhaust.

Paint:  
 All non-painted parts are to be either galvanized or painted with 2 coats of primer and one coat of aluminum paint or equal.

Pipeline:  
 All appurtenances to be one pressure grade higher than the pipeline.

Notes:  
 Electrical wiring must comply with local codes and manufacturer requirements. Electrical plug or disconnect to be located nearby motor to permit electricity to be shut off prior to pump service.

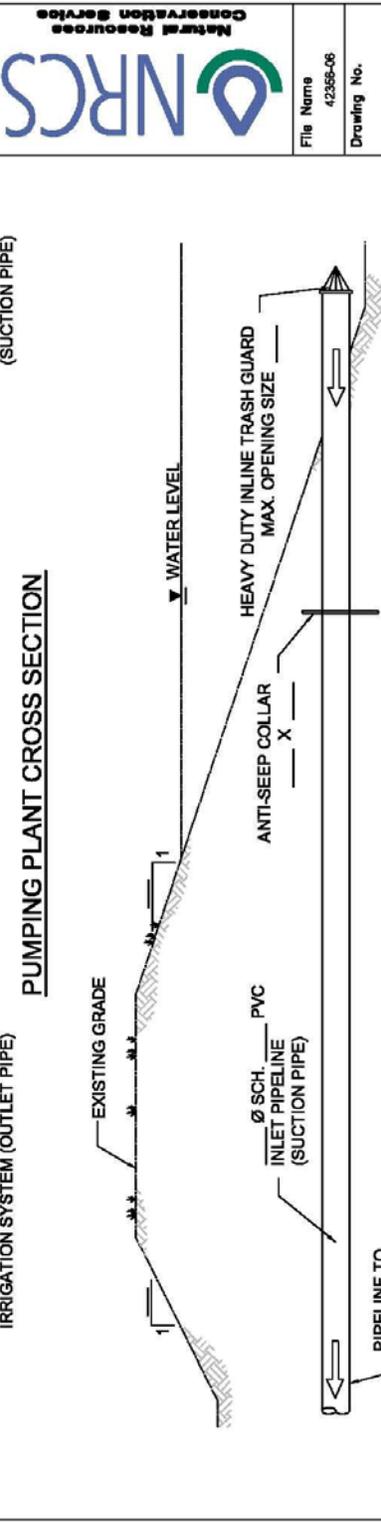
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 Checked \_\_\_\_\_  
 Approved \_\_\_\_\_  
 Date \_\_\_\_\_

**WEST VIRGINIA IRRIGATION PUMPING PLANTS**  
 DIESEL / ELECTRIC POND PUMPING STATION  
 Natural Resources Conservation Service

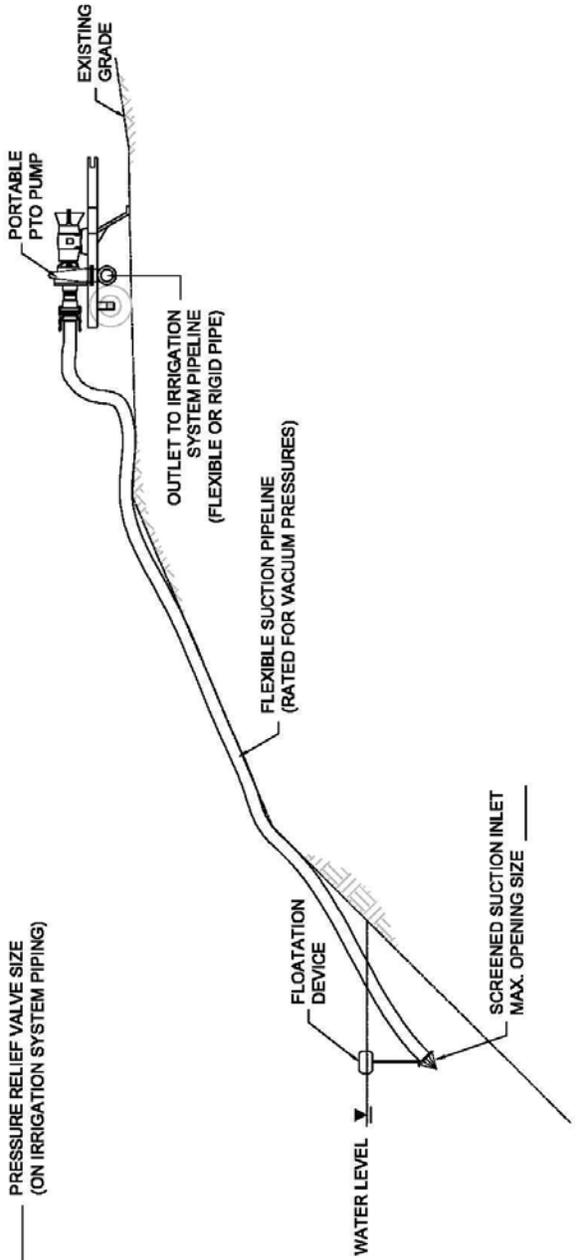
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 Sheet \_\_\_\_\_ of \_\_\_\_\_

**PUMPING PLANT CROSS SECTION**

**POND CROSS SECTION**



PUMP MODEL # \_\_\_\_\_  
 GPM PUMP AT \_\_\_\_\_ (FT/PSI) HEAD PRESSURE  
 H.P. MOTOR REQUIRED \_\_\_\_\_  
 INCH DIAMETER PUMP \_\_\_\_\_  
 FEET NET POSITIVE SUCTION HEAD \_\_\_\_\_  
 INCH SUCTION PIPE DIAMETER \_\_\_\_\_  
 INCH OUTLET PIPE DIAMETER \_\_\_\_\_  
 AIR RELIEF VALVE SIZE \_\_\_\_\_  
 (ON IRRIGATION SYSTEM PIPING)  
 PRESSURE RELIEF VALVE SIZE \_\_\_\_\_  
 (ON IRRIGATION SYSTEM PIPING)



Date \_\_\_\_\_  
 Designed \_\_\_\_\_  
 Drawn \_\_\_\_\_  
 Checked \_\_\_\_\_  
 Approved \_\_\_\_\_

**WEST VIRGINIA IRRIGATION  
 DIESEL / ELECTRIC POND PUMPING STATION**



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