

**ANIMAL WASTEWATER LAND APPLICATION SYSTEM PLANS**  
**DESIGN CHECK LIST**

**1. Waste Utilization Plan**

- Operator has acceptable waste utilization plan
- Planned irrigation system is compatible with type of waste storage facility, soils, crops and pumping schedule shown in the waste utilization plan

**2. Field Specifications (Use USDA-NRCS Table 1 or Similar Table)**

- Legible FSA photocopies and county tax maps of effluent disposal fields
- Legible soil survey map of effluent disposal fields
- FSA Field numbers shown (Show FSA tract number when there is more than one tract involved)
- Maximum useable acreage of each field is shown excluding buffer or restricted irrigation areas. The designer will decide usable irrigation area of each field.
- Soil types of each field.
- Average slope of each field.
- Crops to receive animal waste are shown for each field.
- Recommended maximum average precipitation rate in each field (where there is more than one soil/crop combination that results in a different recommended precipitation rate, show the recommended maximum average precipitation rate for each combination)
- Recommended maximum application amount per irrigation cycle in each field (where there is more than one soil/crop combination that results in a different recommended application amount, indicate the recommended maximum application amount for each combination)

### 3. Working Map or Sketch

- Legible to scale map or sketch with north arrow. Scale should not be greater than 1"=200'
- Ditches, perennial streams, wetland areas, and other bodies of water are identified along with the size of each.
- Surrounding water wells are located
- Surrounding dwellings, schools, hospitals and other important structure locations are shown.
- Highway right-of-way locations are indicated
- Location of farm roads, fences and other obstructions are shown to scale on map
- Critical property boundaries are shown
- Location of waste storage facility and buildings are shown
- Critical elevations that are used in total dynamic head computations are shown
- Location of irrigation mains and laterals, sprinkler or gun hydrants, thrust blocks, etc. are shown with the design spacing of hydrants and pipelines recorded on the map or sketch. This will be accomplished by the irrigation system's designer.

### 4. Irrigation Design Parameters (Use USDA-NRCS Irrigation Design Parameter Worksheets or Similar Worksheets)

- A. Traveling Gun Parameters (USDA-NRCS Table 2 or Other)
  - Type of speed compensation (USDA-NRCS Table 4 or Other)
  - Design travel speed for each pull
  - Design precipitation rate for each pull
  - Design application amount shown for each travel speed
  - Effective width (lane spacing) and effective length for each pull
  - Operating pressure at the reel and the gun for each pull
  - Nozzle diameter in inches, indicate type of nozzle
  - Wetted diameter at specified operating pressure
  - Arc pattern for each pull
  - Hose length and inside diameter

## APPENDIX 6.5

- ❑ Make, model and type of traveler and gun with manufacturer specifications included
  - ❑ Computations of acres receiving uniform coverage
  - ❑ Specifications on hydrant type and construction
- B. Solid Set/Permanent Sprinkler or Gun Parameters (USDA-NRCS Table 3 or Other)
- ❑ Design hydrant or sprinkler spacing and pipeline spacing
  - ❑ Operating pressure at sprinklers or guns
  - ❑ Nozzle diameter in inches, indicate type of nozzle for gun sprinkler
  - ❑ Wetted diameter of sprinkler or gun and operating pressure
  - ❑ Arc pattern and location of partial circle sprinklers or guns
  - ❑ Specification on method of connection of the sprinkler or gun to the lateral line to include materials required and method of connection to the lateral line
  - ❑ Design precipitation rate for full and partial circle sprinklers or guns
  - ❑ Design operation time for full and partial circle sprinklers or guns
  - ❑ Computations of acreage receiving uniform coverage
  - ❑ Make, model and type of sprinkler or gun is shown with manufacturer specifications
- C. Parameters of Other Irrigation System Type:
- ❑ Design operating pressure at the sprinklers/gun
  - ❑ Design precipitation rate
  - ❑ Travel speed for system
  - ❑ Design application amount for each travel speed
  - ❑ Computations of acreage receiving uniform coverage
  - ❑ Make, model and type of equipment along with manufacturer's literature
- D. Pipelines
- ❑ Size, type and pressure rating of pipelines shown on the working map or sketch
  - ❑ Computations for spacing of hydrants and lines

- ❑ Computations of velocity in main lines from equations on pipe chart
- ❑ Computations to verify the adequacy of the pressure rating of all pipelines and fittings
- ❑ Locations of check valves, air/vacuum relief valves and pressure relief valves
- ❑ Thrust block locations and computations of the required size (USDA-NRCS Table 5 or other)
- ❑ Pipeline installation specifications including depth of coverage, type of connection and method of backfill and compaction

### 5. Pump and Power Drive Requirements

- ❑ Static discharge head computations
- ❑ Static suction lift
- ❑ Sprinkler or gun discharge pressure head
- ❑ Computations for friction loss in the pipeline along the critical design path
- ❑ Computations for minor losses through elbows, valves, and other fittings (it is generally acceptable to use 5 percent of the total headloss from the previous losses computed)
- ❑ A summary of the total dynamic head (TDH) of the system
- ❑ Computations of the required brake horsepower
- ❑ Computations of the required engine horsepower
- ❑ Computations of the Net Positive Suction Head Available (NPSHA). Insure that NPSHA is greater than NPSHR
- ❑ Net Positive Suction Head Required (NPSHR) at operating conditions from pump curve
- ❑ Manufacturer's specifications and performance curves for the irrigation pump and power drive
- ❑ Size and type of suction pipe and strainer and method of connecting suction pipe to suction inlet

### 6. Operation, Maintenance and Calibration (USDA-NRCS Worksheet Page 6 or Other)

- ❑ Specific operating procedures for the operator
- ❑ System maintenance recommendations
- ❑ Calibration procedures (recommend that materials developed by Dr. Evans and Dr. Barker be included with the design)

### 7. Certification

- ❑ Design is signed and dated by an Irrigation Technical Specialist (USDA-NRCS Worksheet Page 5 and Other) or Professional Engineer depending on legal requirement

### 8. Installation

- ❑ Insure that spacing of sprinklers, guns or hydrants are according to design specifications
- ❑ Insure that depth of pipe placement meets or exceeds specifications
- ❑ Insure that placement and size of all thrust blocks meets or exceeds specifications
- ❑ Insure that backfill over pipe does not contain large rocks, stones, or other foreign matter and that placement and compaction has been properly accomplished
- ❑ Operate all zones of the system and insure that there are no leaks, that all sprinklers, guns or other application devices and mechanical equipment operate as specified to include travel speed, depth of application and that specifications are met or exceeded
- ❑ Consider use of a permanent post (marker) located where the sprinkler cart begins a travel lane
- ❑ Insure that all air/vacuum relief valves and pressure relief valves are properly located and operative
- ❑ Insure that gate valves, ball valves, butterfly valves, check valves and pressure gages are in place and properly operating. Pressure gages should be glycerin filled and located at the pump, on the sprinkler for a traveler and near the end of the most distance sprinkler

- Note on the design drawing where modifications may have been made in pipe or sprinkler location
- Insure that the pump meets or exceeds TDH and gpm specifications
- Note where changes may have been made in specified product
- During the actual installation, check behind the contractor to insure that substandard installation techniques are not being used.

### 9. General

- Irrigation specifications should include a pumping schedule for each field giving the number of pumping hours required to meet the crop PAN requirements. This schedule should indicate the gallons or acre-inches to be applied per acre, the amount of each application and the total number of applications. The schedule should also give some idea of the timing of the applications.
- The Plan should discuss application record keeping, need for sample analysis, need for soil sampling and length of time to maintain records
- The Plan should mention the need for an Emergency Action Plan (EAP). The EAP is the responsibility of the grower.
- The Plan should include information on annual system evaluation
- The Plan should discuss soil type(s), soil(s) maximum infiltration rate, total PAN generation to include sludge, loading rate(s) based on Realistic Yield Expectations (RYE), and maximum loading rates both during summer months and wetter winter months.
- An optional item of the Plan is a bill of materials. Normally, this is supplied by the installer and not required by the designer. The designer should specify pipe and fittings pressure ratings or schedule, pipe size, valve sizes, valve pressure rating and minimum specifications of all equipment and specialty items.