NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

PUMPING PLANT

(No.)

CODE 533

DEFINITION

A pumping facility installed to transfer water for a conservation need.

PURPOSE

Provide a dependable water source or disposal facility for water management.

CONDITIONS WHERE PRACTICE APPLIES

Wherever water must be pumped to accomplish a conservation objective, which may include but is not limited to one of the following:

To provide a water supply for such purposes as irrigation, recreation, livestock, or wildlife;

To maintain critical water levels in swamps, marshes, open water, or for newly constructed wetlands and ponds;

To transfer wastewater for utilization as part of a waste management system;

To provide drainage by the removal of surface runoff water or groundwater.

CRITERIA

Design, installation, and operation of a pumping plant shall comply with all federal, state, and local laws, rules, and regulations.

The efficiency of units, type of power, quality of building, automation features, and other accessories installed shall be in keeping with the economic and environmental value of the system to accomplish the conservation objectives.

Criteria for the design of components not addressed in Natural Resources Conservation Service (NRCS) practice standards shall be consistent with sound engineering principles.

Pump requirements. Capabilities, range of operating heads, and general class and efficiency of equipment shall be determined by appropriate technical means. Size and number of pumps and their performance shall be determined on the basis of system conservation requirements in order to meet the intended purpose. Total head shall be determined for critical operating conditions, taking into account all hydraulic losses. Automatic controls shall be included as required.

Pumps utilized for the transfer of wastewater or manure shall be sized to transfer material at the required system head and flow rate determined by the waste management plan. The pump type shall be based on the consistency of material being pumped and manufacturer's recommendations.

The capacity of pumps installed in wells should be based on the system requirements. Generally, pump capacity shall not exceed 90 percent of the well capacity.

Power units. Power units shall be selected on the basis of availability of fuel or power costs, operating conditions, conservation needs, and objectives, including the need for automation. The power unit shall be matched to the pump and be capable of operating the pump efficiently and effectively within the range of operating conditions. The horsepower requirement, pump efficiency and total head on the pump shall be computed.

Electric motors may be powered by photovoltaic cells (solar panels). The number and size of solar panels will depend on the

amperage and voltage required by the pump to meet head-discharge requirements. Use the manufacturer's recommendations to determine solar panel size and number for the installation of the solar panels.

Suction and discharge pipes. The size of suction and discharge pipes shall be based on a hydraulic analysis, operating cost, and compatibility with other system components. The arrangement and length of discharge pipe shall be based on the need for recovery of head through siphoning action, and for delivery of water in keeping with conservation and environmental objectives. Gates, valves, pipe connections, discharge bays, and other protective devices shall be installed, as needed, for satisfactory pumping plant operation.

Federal, state, and local laws and regulations concerning back flow prevention shall be followed when pumping from wells or when chemigating.

Building and accessories. The design of the pumping plant and associated housing, if required, shall consider accessibility for equipment maintenance and repairs, and the need for protecting equipment from the elements, vandalism, and fire. The appearance of the plant shall be compatible with the surrounding environment, as applicable.

Pumping plant components used for livestock water such as booster pumps, pressure tanks, electrical controls, and gages should be installed in a pit or insulated building.

Foundations shall be designed to safely support the loads imposed. Sheet piling or other measures shall be used, as required, to prevent piping beneath the foundation.

Pumps may be mounted in the open, on piling or concrete foundations, in a well or pit, or by other appropriate means.

Solar panels may be elevated to reduce theft or vandalism.

Suction bays (or sumps) shall be designed to conform to the hydraulic characteristics established by the pump manufacturer.

The discharge bay or connection with the distribution system shall meet hydraulic and structural requirements. Provisions for repair or removal of pumps and engines shall be provided. Trash racks shall be provided, as needed, to exclude debris and trash from the pump.

All structural features and equipment shall provide adequate safety features to protect workers and the public from injury.

Other. Buried in-line pressure tanks that are adjacent to a well or combine a tank with a pitless adaptor installed on or inside a well casing are not allowed.

CONSIDERATIONS

General. When planning this practice, the following items should be considered, as applicable:

Effects on downstream flows or aquifer recharge volumes;

Effects on existing wetland hydrology;

Effects on surface and ground water by leaked or spilled fuels and lubricants;

Secondary containment of spilled fuel for water quality as may be required by federal and state laws or regulations;

Protection of system components from "natural" events such as floods.

Solar Powered Pumps. Design system to meet water needs during cloudy periods.

Utilize batteries to store power or utilize water tanks to store enough water for several days.

Tracking mechanisms that rotate the panels to face the sun provide optimum efficiency, but are susceptible to mechanical problems caused by wind. Maintenance problems can be expected in our extreme operating conditions.

Windmills. Design system to provide adequate storage during periods of no wind.

PLANS AND SPECIFICATIONS

Plans and specifications for constructing pumping plants shall be in compliance with this standard and describe the requirements for properly installing the practice to achieve its intended purpose.

OPERATION AND MAINTENANCE

An operation and maintenance plan specific to the facilities installed shall be prepared for use by the landowner or responsible operator. The plan shall provide specific instructions for operating and maintaining facilities to ensure the pumping plant functions properly. The plan shall include provisions to address the following, as a minimum:

Inspection or testing of all pumping plant components and appurtenances, as applicable.

Proper start-up procedures for the operation of the pumping plant.

Routine maintenance of all mechanical components (power unit, pump, drive train, etc.,) in accordance with the manufacturer's recommendations.

When applicable, the power unit, fuel storage facilities and fuel lines should be frequently checked for fuel or lubricant leaks and repaired as needed.

Periodic checks and removal of debris as necessary from trash racks and structures to assure adequate capacity reaches the pumping plant.

Periodic removal of sediment in suction bays to maintain design capacity and efficiency.

Inspect and maintain anti-siphon devices, if applicable.

Routinely test and inspect all automation components of the pumping plant to assure they are functioning as designed.

Inspect and maintain secondary containment facilities, if applicable.

Periodic inspection of all safety features to ensure they are in place and functional.

Prior to retrofitting any electrically powered equipment, electrical service must be disconnected and the absence of stray electrical current verified.

REFERENCES

National Engineering Handbook (NEH), Part 623, Section 15, Chapter 8, “Irrigation Pumping Plants.”