

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD**

IRRIGATION SYSTEM, TAILWATER RECOVERY

(No.)

CODE 447

DEFINITION

A planned irrigation system in which all facilities utilized for the collection, storage, and transportation of irrigation tailwater and/or rainfall runoff for reuse have been installed.

PURPOSE

This practice may be applied as part of a conservation management system to support one or more of the following:

- Conserve irrigation water supplies
- Improve offsite water quality

CONDITIONS WHERE PRACTICE APPLIES

Tailwater recovery systems are suitable for use on lands that are served by a properly designed and installed irrigation system where recoverable irrigation runoff and/or rainfall runoff flows can be anticipated under current or expected management practices.

This standard applies to the planning and functional design of irrigation tailwater recovery systems including, but not limited to, pickup ditches, sumps, collecting basins, pumping plants and pipelines. It does not apply to detailed design criteria or construction specifications for individual structures or components of the recovery system.

CRITERIA

General Criteria Applicable To All Purposes

The installation and operation of a tailwater recovery system shall comply with all federal, state and local laws, rules and regulations. Laws and regulations of particular concern include those involving water rights, land use,

pollution control, property easements, wetlands, preservation of cultural resources, and endangered species.

Appropriate NRCS standards and specifications shall be used in the design and construction of facilities needed for a tailwater recovery system. The criteria for the design of components not addressed in a NRCS practice standard shall be consistent with sound engineering principles.

Collection Facilities. Facilities for the collection of irrigation tailwater can be an integral part of irrigation systems covered by NRCS Conservation Practice Standards (443)- Surface and Subsurface Irrigation Systems and (442)- Sprinkler Irrigation Systems. These facilities may include, but are not limited to, ditches, culverts, waterways, underground outlets, pipelines, water control and/or grade stabilization structures or other erosion control measures, as needed.

Outlets for collection facilities shall be protected from erosion by cantilevered pipelines, lined chutes, or other works of improvement as needed.

Storage Facilities. Facilities are needed to store the collected water until it is redistributed in the irrigation system. Runoff volume and rate, as well as the required level of water control at the point where the tailwater is returned to the irrigation system, should be considered in determining the size of the storage facility.

For systems where tailwater is discharged into a collecting basin or regulating reservoir or into a pipeline having facilities for regulating fluctuating flows (i.e. a float valve), small sumps with frequently cycling pumping plants may be used. For systems unable to regulate

flows, tailwater sumps or collection basins shall be made large enough to provide the regulation needed to permit efficient use of the water.

When energy sources for tailwater pump back systems are subject to interruption, safe emergency bypass areas cannot be provided, or tailwater discharges violate local or state regulations, tailwater storage requirements shall, as a minimum, include a volume adequate to store the complete runoff from a single irrigation set.

Sumps and collecting basins shall be equipped with inlets designed to protect the side slopes and the collection facilities from erosion. A dike, ditch, or water control structure shall be provided, if required by state law, to limit the entrance of rainfall runoff into the designed inlet. Sediment traps shall be installed as needed.

Storage sumps or collecting basins shall be designed and constructed according to NRCS Conservation Practice Standard 436-Irrigation Reservoir.

Conveyance Facilities. All tailwater recovery systems require facilities to convey water from the storage facility to a point of entry back into the irrigation system. These facilities may consist of a pumping plant and pipeline to return the water to the upper end of the field, or a gravity outlet having a ditch or pipeline to convey the water to a lower elevation in the irrigation system. Other components or combinations of components may be necessary as determined on a site-specific basis.

The capacity of conveyance facilities shall be determined by an analysis of the expected runoff rate, the planned irrigation collecting basin or regulating reservoir storage capacity, and the anticipated irrigation application. If the return flow is used as an independent irrigation supply rather than as a supplement to the primary irrigation water supply, the rate and volume of flow must be adequate for the method(s) of water application employed.

Pipelines, lined or unlined ditches, and pumping plants used in return facilities shall be designed and constructed according to applicable NRCS standards and specifications.

Pumping plants shall be placed at appropriate elevations to insure that storm water will not submerge the plant for a given storm event.

Vegetative cover. All areas where permanent vegetation has been disturbed during construction should be seeded following completion of construction. Seedbed preparation, seeding, sodding, fertilizing, and/or mulching shall comply with NRCS technical standards.

Additional Criteria Applicable To Improving Water Quality

Storage Facilities. Where additional storage is required to provide adequate retention time for the breakdown of chemicals in the runoff waters, storage facilities shall be sized accordingly. Allowable retention times shall be site specific to the particular chemical used.

Seepage from a storage facility shall be controlled to the extent possible when the storage facility is expected to receive chemical-laden waters. Control may be in the form of natural soil liners, soil additives, commercial liners, or other approved methods.

Where additional storage is required to provide for sediment deposition, storage facilities shall be sized accordingly. Allowable retention times shall be site specific to the particular soil type(s).

CONSIDERATIONS

Water Quantity

- Irrigation systems should be designed to limit tailwater volumes to that needed for effective operation. This reduces the need or minimizes the size and capacity of collection, storage, and transportation facilities.

Where tailwater recovery systems are used to collect rainfall runoff for storage and use as an irrigation water source, the size and capacity of collection and storage facilities will be sized according to expected runoff volumes and rates as well as the expected crop water needs.

- Changes in irrigation water management activities may be necessary to optimize the use of return flows.

- Downstream flows or aquifer recharge volumes dependent on runoff will be reduced and could cause undesirable environmental, social, or economic effects.

Water Quality

- Effects on surface and groundwater quality by the movement of sediment and soluble and sediment-attached substances should be considered. Chemical-laden water can create a potential hazard to wildlife, especially waterfowl that are drawn to ponded water.
- Nutrient and pest management measures should be planned to limit chemical-laden tailwater as much as practical.
- Protection of system components from storm events and excessive sedimentation should be considered.

For protection of system components from storm events, consider bypassing the collection system or the inlet structure for the collecting basin. For collecting basins or sumps, consider offsetting the structure from the drainageway a sufficient distance to bypass storm water.

Consider installing pump suction pipeline inlets as close as possible to sump, or reservoir inlets to minimize sediment accumulation in the pond. Or, as an alternative, consider using a two-stage tailwater pond. A first, smaller pond acts as a sediment trap and is designed for ease of cleaning. The second, larger pond is the primary tailwater storage pond.

Other Considerations

- This practice may adversely affect cultural resources and must comply with GM 420,

Part 401 during planning, installation, and maintenance.

- Effects on the visual quality of water resources should be also considered.

PLANS AND SPECIFICATIONS

Plans and specifications for irrigation tailwater recovery systems shall be prepared for specific field sites in accordance with this standard and shall describe the requirements for applying 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 operator responsible for operation and maintenance. The plan should provide specific instructions for operating and maintaining facilities to ensure they function properly. The plan shall include provisions to address the following, as a minimum:

- Periodic cleaning and re-grading of collection facilities to maintain proper flow lines and functionality.
- Periodic checks and removal of debris as necessary from trash racks and structures to assure proper operation.
- Periodic removal of sediment from traps and/or storage facilities to maintain design capacity and efficiency.
- Inspection or testing of all pipeline and pumping plant components and appurtenances, as applicable.
- Routine maintenance of all mechanical components in accordance with the manufacturer's recommendations.