

NATURAL RESOURCES CONSERVATION SERVICE  
VIRGINIA 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**

Conform to all federal, State, and local laws 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.

Use the appropriate Virginia Conservation Practice Standards and specifications in the design and construction of facilities needed for a tailwater recovery system. The criteria for the design of components not addressed in NRCS Conservation Practice Standards 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 Virginia Conservation Practice Standards *Irrigation System, Surface and Subsurface (Code 443)* and *Irrigation System, Sprinkler (Code 442)*. These facilities may include, but are not limited to, ditches, culverts, pipelines, water control and/or grade stabilization structures or other erosion control measures, as needed.

**Storage Facilities**

Facilities are needed to store the collected water until it is redistributed in the irrigation system. Consider 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 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

Conservation practice standards are reviewed periodically and updated if needed. To obtain the current version of this standard, contact your Natural Resources Conservation Service [State Office](#) or visit the [electronic Field Office Technical Guide](#).

sumps with frequently cycling pumping plants may be used. For systems unable to regulate flows, size tailwater sumps or collection basins 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, include a volume adequate to store the complete runoff from a single irrigation set for the tailwater storage requirements.

Equip sumps and collecting basins with inlets designed to protect the side slopes and the collection facilities from erosion. Provide a dike, ditch, or water control structure, if required by state law, to limit the entrance of rainfall runoff into the designed inlet. Install sediment traps as needed.

### **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.

Determine the capacity of conveyance facilities 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, make sure the rate and volume of flow is adequate for the method(s) of water application employed.

### **Additional Criteria Applicable To Improving Water Quality**

Where additional storage is required to provide adequate retention time for the breakdown of chemicals in the runoff waters, size storage facilities accordingly. Ensure that allowable

retention times are site specific to the particular chemical used.

Control seepage from a storage facility 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, size storage facilities accordingly. Ensure that allowable retention times are site specific to the particular soil type(s).

### **CONSIDERATIONS**

Design irrigation systems 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 need to 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 could be reduced and could cause undesirable environmental, social, or economic effects.

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.

The 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.

Record all required information in an engineer field book, on a plan sheet or design computation sheet, or in another appropriate location.

### DESIGN DATA

1. Completed Environmental Evaluation and subsequent requirements.
2. Soils investigation.
3. Survey and plot data: profile, cross-sections, topography, as needed.
4. Design computations, including purpose of practice and references used.
  - a. All design data required by other Virginia Conservation Practice Standards, such as *Pumping Plant (Code 533)*, *Irrigation Reservoir (Code 436)*, *Irrigation System, Sprinkler (Code 442)*, or *Irrigation System, Surface and Subsurface (Code 443)*, as applicable.
  - b. Runoff calculations.
  - c. Appurtenance design.
  - d. Irrigation Water Management Plan (Virginia Conservation Practice Standard *Irrigation Water Management (Code 449)*).
5. Plan view of site with existing and planned features, including dimensions, distances, etc.
6. Standard Cover Sheet (VA-SO-100A).
7. Materials and quantities needed. Identify borrow material and/or spoil area, as needed.
8. Vegetation and/or ground cover requirements.
9. Identification of needed Erosion & Sediment Control measures.
10. Supplemental practices required.
11. Virginia Conservation Practice Specifications (700 Series).
12. Operation and Maintenance Plan.

### CHECK DATA

1. As-built survey.
2. As-built plans including dimensions, types and quantities of materials installed, and variations from design. Include justification for variations.
3. Locations of appurtenant practices.
4. Adequacy of vegetation and/or ground cover.
5. Complete as-built section of Cover Sheet.

### OPERATION AND MAINTENANCE

Prepare an Operation and Maintenance plan specific to the facilities installed for use by the landowner or operator responsible for operation and maintenance. Provide specific instructions for operating and maintaining facilities to ensure they function properly. 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.

### REFERENCES

1. USDA-Natural Resources Conservation Service. Electronic Field Office Technical Guide (eFOTG), Section IV [Online]. Available at <http://www.nrcs.usda.gov/technical/eFOTG>
2. USDA-Natural Resources Conservation Service. National Engineering Handbook, Sections 5 and 15.
3. USDA-Natural Resources Conservation Service. National Engineering Handbook – Part 650, Engineering Field Handbook.

4. USDA-Natural Resources Conservation Service. National Engineering Handbook

– Part 652, Irrigation Guide.

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