

## **Drainage Water Management (Ac.) 554**

### **DEFINITION**

The process of managing water discharges from surface and/or subsurface agricultural drainage systems.

### **PURPOSE**

The purpose of this practice is:

- Reduce nutrient, pathogen, and/or pesticide loading from drainage systems into downstream receiving waters
- Improve productivity, health, and vigor of plants
- Reduce oxidation of organic matter in soils
- Reduce wind erosion or particulate matter (dust) emissions
- Provide seasonal wildlife habitat

### **CONDITIONS WHERE PRACTICE APPLIES**

This practice is applicable to agricultural lands with surface or subsurface agricultural drainage systems that are adapted to allow management of drainage discharges.

The practice may not apply where saline or sodic soil conditions require special considerations.

This practice does not apply to the management of irrigation water supplied through a subsurface drainage system. For that purpose, use NRCS Conservation Practice Standard, Irrigation Water Management (449).

### **CRITERIA**

#### **General Criteria Applicable to All Purposes**

Drainage water management shall be planned, designed, and installed in accordance with all federal, state, local, and tribal laws and regulations.

The control elevation is the elevation of the soil surface at the lowest spot in the area of the field impacted by the operation of the water control structure.

The management of gravity drained outlets shall be accomplished by adjusting the elevation of the drainage outlet.

The management of pumped drainage outlets shall be accomplished by raising the on-off elevations for pump cycling.

Design of physical components shall be in accordance with the applicable NRCS Conservation Practice standard such as Subsurface Drain (606), Surface Drain, Main or Lateral (608), Structure for Water Control (587), and Pumping Plant (533).

Structures or pumps shall be located where they are accessible to facilitate operation and control, unless automated.

Raising the outlet elevation of the flowing drain shall result in an elevated free water surface within the soil profile.

When operated in free drainage mode, water control structures shall not restrict the flow of the drainage system.

Drainage discharges and water levels shall be managed in a manner that does not cause adverse impacts to other properties or drainage systems. Water control structures shall be designed so that water is not backed up into a main or lateral tile beyond a property line (tile flowline elevation at property line) unless the upstream landowner has given written permission.

Release of water from control structures shall not allow flow velocities in surface drainage system components to exceed acceptable velocities

prescribed by NRCS Conservation Practice Standard, Surface Drainage, Main or Lateral (608).

Release of water from flow control structures shall not allow flow velocities in subsurface drains to exceed velocities prescribed by NRCS Conservation Practice Standard, Subsurface Drain (606).

**Additional Criteria to Reduce Nutrient, Pathogen, and/or Pesticide Loading**

During non-cropped periods, the system shall be in managed drainage mode within 30 days after the season's final field operation until at least 30 days before commencement of the next season's field operations, except during system maintenance periods or to provide trafficability when field operations are necessary.

The drain outlet shall be raised prior to and during liquid manure applications to minimize direct leakage of manure into drainage pipes through soil macro pores (cracks, worm holes, root channels).

Manure applications shall be in accordance with NRCS Conservation Practice Standards, Nutrient Management (590) and Waste Utilization (633).

When using this practice for control of pesticide loading, apply in conjunction with NRCS Conservation Practice Standard, Pest Management (595).

**Additional Criteria to Improve Productivity, Health, and Vigor of Plants**

When managing drainage outflow to maintain water in the soil profile for use by crops or other vegetation, the elevation at which the outlet is set shall be based on root depth and soil type.

If using this practice to control rodents, apply in conjunction with NRCS Conservation Practice Standard, Pest Management (595).

**Additional Criteria to Reduce Oxidation of Organic Matter in Soils**

Drainage, beyond what is necessary to provide an adequate root zone for the crop, shall be minimized.

To reduce oxidation of organic matter, the outlet elevation shall be set to enable the water table to rise to the ground surface, or to a designated maximum elevation, for sufficient time to create anaerobic soil conditions. The implementation of this practice must result in a reduced average annual thickness of the aerated layer of the soil.

**Additional Criteria to Reduce Wind Erosion or Particulate Matter (Dust) Emissions**

When the water table is at the design elevation, the system shall provide a moist field soil surface, either by ponding or through capillary action from the elevated water table.

**Additional Criteria to Provide Seasonal Wildlife Habitat**

During the non-cropped season, the elevation of the drainage outlet shall be managed in a manner consistent with a habitat evaluation procedure that addresses targeted species.

**CONSIDERATIONS**

Consider the potential effects of drainage water management on the cultural, archeological, historic and economic resources.

In-field water table elevation monitoring devices can be used to improve water table management.

Reducing mineralization of organic soils may decrease the release of soluble phosphorus, but water table management may increase the release of soluble phosphorus from mineral soils.

Elevated water tables may increase the runoff portion of outflow from fields. Consider conservation measures that control sediment loss and associated nutrient discharge to waterways.

Consider manure application setbacks from streams, flowing drain lines, and sinkholes, to reduce risk of contamination.

To maintain proper root zone development and aeration, downward adjustments of the drainage outlet control elevation may be necessary, especially following significant rainfall events.

Monitoring of root zone development may be necessary if the free water surface in the soil profile is raised during the growing season.

### **PLANS AND SPECIFICATIONS**

Plans and specifications shall be prepared in accordance with the criteria of this standard and shall describe the requirements for applying the practice to achieve its intended use. Application of this standard may include job sheets or similar documents that specify the applicable requirements, system operations, and components necessary for applying and maintaining the practice to achieve its intended use.

Drainage water management plan and support data documentation requirements are as described in the NRCS-Michigan Statement of Work for Drainage Water Management (554).

### **OPERATION AND MAINTENANCE**

The Drainage Water Management Plan shall include an Operation and Maintenance plan that identifies the intended purpose of the practice, safety requirements, and water table elevations and periods of operation necessary to meet the intended purpose.

If in-field water table observation points are not used, the relationship of the control elevation settings relative to critical field water table depths shall be provided in the operation plan.

The Operation and Maintenance plan shall include instructions for operation and maintenance of critical components of the drainage management system, including instructions necessary to maintain flow velocities within allowable limits when lowering water tables.

Where the structures used to control the water elevation have their own Operation and Maintenance plans, the drainage water management Operation and Maintenance plan shall identify the need to follow those structural Operation and Maintenance plans.

The Operation and Maintenance plan shall specify that the drainage water management system be

inspected annually and after significant storm events to identify repair or maintenance needs.

To identify the water table elevations and periods of operation necessary to meet the intended purpose, the Operation and Maintenance plan shall include a schedule with target timing (e.g. planting, harvest) and elevations for each water control structure addressing the following objectives, as applicable:

1. Prior to tillage, harvest, and other field operations, the outlet elevation should be set at a depth to provide trafficability throughout the field (typically the designed depth of the drainage outlet).
2. After planting and other necessary field operations, the outlet elevation should be set to allow infiltration from rainfall to potentially bring the water table to the desired level to provide capillary water to the plant root zone. This will vary, depending on crop, stage of growth, and soil.
3. Operation of the outlet elevation in the control structure during the crop season should be such that prolonged saturation of the root zone does not occur (as observed in the water table observation wells).
4. During the fallow period, the outlet elevation in the control structure should be operated to allow the water table to potentially rise to near the soil surface or to an elevation specified by the planner.
5. To minimize leakage of liquid manure applications into drain pipes, the plan shall specify the elevation of the raised drainage outlet and the number of days prior to and after the application that a raised outlet elevation is to be maintained.

### **REFERENCES**

- USDA, NRCS. 2001. National Engineering Handbook, Part 624, Sec. 16, Drainage of agricultural land.
- USDA, NRCS. 2001. National Engineering Handbook, Part 650, Engineering Field Handbook, Chapter 14, Water management (Drainage).