



DESIGN AND IMPLEMENTATION ACTIVITY

Drainage Water Management Design

DEFINITION

Design the drainage volume and water table elevation by regulating the flow from a surface or subsurface agricultural drainage system. Implementation requirements for CPS 554 Drainage Water Management along with other supporting conservation practices are developed.

CRITERIA

General Requirements

A Design and Implementation Activity (DIA) is the planning and designing of a single practice or any combination of structural, vegetative, or land management practices and management activities to treat one or more resource concerns.

The DIA documents the verification of the client's conservation plan, and the development of the implementation requirements or plans and specifications for each planned conservation practice.

TSP will complete Preliminary and Final Designs for structural practices as outlined in each state adopted CPS, SOW, and the NRCS National Engineering Manual (NEM). The steps in the NEM include:

1. Preliminary engineering work, site investigations, data collection, and documentation
2. Adherence to CPS criteria, cost estimates, preliminary alternatives
3. Client's selection
4. Preparation of final plans and specifications based on client's selections
5. Design report and engineer's cost estimate
6. Operation and maintenance plan
7. Quality assurance plan.

The TSP will maintain an ongoing record of DIA related discussions with the client. The TSP will document on a conservation assistance notes form (CPA-6) or other format that includes all components of the CPA-6 (client objectives, dates of assistance, all parties present, notes of significant information, alternatives considered, and decisions reached). Any correspondence between the TSP and the client related to the development of the DIA will be included in the record.

The TSP may use any of the Conservation Practice Documents, such as Job Sheets, templates, Standard Detail Drawings, etc. located in the state's Field Office Technical Guide.

This activity includes one or more conservation practices that manage the drainage volume and water table elevation by regulating the flow from a surface or subsurface agricultural drainage system.

The activity will meet the Natural Resource Conservation Service (NRCS) planning criteria for one or more of the following resource concerns:

- Water Quality Degradation
- Poor Plant Productivity and Health
- Oxidation of Organic Matter in Soils

The activity will meet the state adopted NRCS Conservation Practice Standards (CPS) and Statements of Work (SOW) included in the client's conservation plan or EQIP Contract and include at least one of following:

- Code 554 Drainage Water Management (Code and Name of Conservation Practice)
- Code 604 Saturated Buffer
- Code 605 Denitrifying Bioreactor
- Code 606 Subsurface Drain
- Code 607 Surface Drain, Field Ditch
- Code 608 Surface Drain, Main or Lateral
- Code 587 Structure for Water Control
- Code 590 Nutrient Management
- Code 340 Cover Crop

DELIVERABLES

Two copies (hardcopy or electronic) of the plan must be developed—one for the client and one for the NRCS field office. At the client's request, Technical Service Provider (TSP) can deliver NRCS's copy to the NRCS Field Office. The client's copy must include the implementation requirements or plans, specifications, operation and maintenance, and quality assurance plan, unless the client requests other documents from this section. The NRCS copy must include all items identified herein. An additional electronic copy of the plan should also be uploaded on NRCS Registry.

1. Cover Page

Cover page reporting the technical services provided by the TSP. Cover page(s) must include the following:

- a. Client information: Name, farm bill program, contract number, and contract item number.
- b. TSP information: name, address, phone number, email, TSP number, TSP expiration date; and county of service.
- c. Farm identification:
 - i. Farm name, owner name, street address, and county/state.
 - ii. Primary phone number of the client.

- iii. **List of all practice and/or scenario designs included in this plan.**
- d. Statement by TSP that services provided:
 - i. Comply with all applicable Federal, State, Tribal, and local laws and requirements.
 - ii. Meet applicable NRCS standards, specifications, and program requirements.
 - iii. Are consistent with the conservation program goals and objectives for which the program contract was entered into by the client.
 - iv. Incorporate alternatives that are both cost effective and appropriate to address the resource issues.
- e. TSP certification statement: signature and date.
- f. Client acceptance statement:
 - i. A statement that the plans and specifications adequately represent existing conditions and the selected preliminary design alternatives, and the client understands and will abide with the operation and maintenance plans.
 - ii. Signature of the client and date the client received the plans.
- g. Block for NRCS reviewer acceptance (to be completed by NRCS).

2. Conservation Assistance Notes and Correspondence

- a. Conservation Assistance Notes (NRCS-CPA-6) or other format that includes all components of the CPA-6.
 - i. Document the client's objectives.
 - ii. Document each interaction with the client, include notes and results of that interaction, date, and initials of the TSP.
 - iii. Document each site visit, activity in the field, results of each site visit, all parties present, date, and initials of the TSP.
- b. Any correspondence between the TSP and the client relating to the development of the DIA.

3. Maps

- a. Maps to include, but not be limited to:
 - i. General location map of the implementation areas showing access roads to the location.
 - ii. Conservation Plan map (this may consist of several maps to account for the entire implementation area). This map may be obtained from the client.
 - iii. Other maps, as needed, with appropriate interpretations.
- b. At a minimum, all maps developed for the DIA will include:
 - i. Title block showing:
 - Map title.
 - Client's name (individual or business).
 - Prepared with assistance from USDA – NRCS
 - Assisted By [TSP planner's name].
 - Name of applicable conservation district, county, and State.
 - Date prepared.
 - ii. Map scale.
 - iii. Information needed to locate the implementation area, such as geographic coordinates, public land survey coordinates, etc.

- iv. North arrow.
- v. Appropriate map symbols and a map symbol legend on the map or as an attachment.

4. Planning

- a. Include and update, when needed, results from the NRCS approved assessment or tool used to evaluate drainage water conservation opportunities and the client's conservation plan.
 - i. Location, condition, and approximate size of existing systems. Document reasons for any failures or inadequacy (e.g., broken or collapsed sections).
 - ii. Inventory of soils, crops, yields, land capabilities, topography, wetlands, ecologically sensitive areas, existing physical features, and irrigation systems within area being considered for drainage (e.g., soils on-site, crops grown, field high and low points, source water location, above-ground and buried utilities, existing structures for water control, and existing power equipment).
 - iii. Areas in which crops show damage or area of surface ponding or saturation, high-water marks or damaging floods and dates of floods.
 - iv. Size, extent, and ownership of the area being considered for drainage as well as potential impacts outside the area being evaluated.
 - v. Sources of excess water from upslope land or channel overflow.
 - vi. Documentation of past drainage water management by crop and/or land use.
 - vii. Basis of existing drainage water management performance data (e.g., field measurement, original equipment manufacturer (OEM) specification, etc.) and report any differences between reported and expected performance attributed to age, operation, maintenance of equipment or similar factors.
 - viii. Rationale for drainage water management changes, if any, based on either:
 - Client's needs (e.g., reduce nutrients, pathogens, and pesticide loading from drainage systems into downstream receiving waters); or
 - to comply with CPS criteria.
 - ix. Drainage water conservation recommendations that can meet CPS criteria and will improve water quality degradation, plant vigor, oxidation of organic matter in soils, and/or address the drainage water management concerns of the client's operation.
- b. Using the criteria in the applicable state adopted CPS and the client's needs, develop preliminary design alternatives for each practice and/or scenario contracted in this DIA.
 - i. If applicable, provide a variety of different conditions for the same recommendation. For example:
 - Operation and maintenance changes of the existing drainage system(s).
 - Adding technologies to improve surface, subsurface, interception, water table, or pumping drainage management (e.g., automated structure for water control).
 - ii. Estimate installation cost, in dollars, of each preliminary design alternative. Work includes developing preliminary layouts, determining feasibility of current infrastructure, determining performance specifications of proposed equipment, computing approximate quantities of all components, and

- estimating costs of equipment, materials, labor, permits, certifications, and related items required for installation and start-up of the system.
- iii. All preliminary design alternatives must be linked to improved management of drainage volume and water table elevation by regulating the flow from a surface or subsurface agriculture drainage system.
- iv. Determine the applicable NRCS financial assistance payment schedule scenario, quantity and payment rates for the implementation of each preliminary design.
- c. Present each preliminary design alternative to the client and obtain the client's selections. Document the selections and date received.

5. Documentation

- a. Provide documentation of the following:
 - i. Surveys
 - ii. Geological Investigations
 - iii. Testing
 - iv. Layouts of all components
 - v. Material specifications
 - vi. Infrastructure and other considerations
 - vii. Structural, foundation, hydraulic, and other design computations and analysis
 - viii. Design checking and reviews
 - ix. Facilitating practices or components that support the drainage system(s) or management modification.
- b. Computations, analysis, and other items that support and ensure adherence to the CPS criteria and are needed to develop the plans and specifications.
- c. Engineer's cost estimate of each final design, including costs of components, materials, equipment, and labor required for demolition, relocation, installation, disposal and start-up; fees for disposal, permits, and certifications; charges for testing and other quality assurance activities; and all other costs associated with the implementation of each design.
- d. Quality assurance activities that are required during installation to ensure the equipment, materials, and installations meet the design intent, function properly, provide the computed conservation benefits, and can be certified as meeting the plans and specifications.
- e. Other information as required in the CPS Statement of Work, including but not limited to, practice purpose, list of permits, facilitating practices, and state required items that affect safety and other environmental concerns.
 - i. Computed conservation benefits of each design using the appropriate baseline of constituents leaving the farm field, retained volume of drainage outflow for vegetative use, and thickness of aerated layer of the soil, by crop or land use.
 - ii. Analysis and evaluation of resource inventory conducted during preliminary design phase (e.g., soils tests, to include nutrient levels, organic matter content, soil's mechanical properties, and seasonal high water table and/or water tests, to include nutrients, pathogens, salinity, pH, and trace elements).

- iii. Method planned to measure constituents leaving the farm field, retained volume of drainage outflow for vegetative use, and thickness of aerated layer of the soil, by crop or land use.
- iv. Documentation of the scientific method planned for scheduling the drainage discharge and water levels based on the methods identified in the CPS.
- v. A soils map that includes field boundaries, with the predominant soils listed and area quantified.
- vi. A drainage system map that includes the materials, diameters, dimensions and locations of mains and laterals. Flowline of any tile line leaving the field is labeled. If any changes to an existing drainage system are proposed to facilitate drainage water management, include the proposed configuration as a separate map.
- vii. Wetland delineation map. If no wetland, a statement to the effect in lieu of map.
- viii. A topographic map that shows elevation contours no greater than 2 feet. The drainage system map and topographic map are to the same scale, and be at least 1:1,600 (1 inch = 300 feet) or closer. The topographic map includes, at a minimum, all of the drained area as defined above and at least one point identified at the site (e.g., benchmark) with a known elevation and coordinates to facilitate final design of the DWM system at a later date.
- ix. An overlay of the above maps with location, size, control elevation, and impacted area identified for each planned control structure.
- x. Document associated conservation practices and components required to comprise a conservation system for

6. Implementation Requirements

- a. Develop written Implementation Requirements for each design.
 - i. Include, as a minimum, all items listed in each CPS “Plans and Specifications” section and the SOW “Design” section.
 - ii. Include both graphical and narrative descriptions of the work. Provide descriptive information on the quality of the completed work and the quantities of all materials required for completion of the work.
 - iii. A location map, plan view and written information are required. These items may be included in a single document where all specification information is included on the plans, or in multiple documents where the specifications are independent of the plans.
 - iv. Include the following certification on the plans, along with the seal and/or signature of the TSP: “To the best of my professional knowledge, judgment, and belief, these plans meet applicable NRCS standards.” (Title 210, NEM, Part 505, “Non-NRCS Engineering Services”, Subpart B, Section 505.10(3)).
- b. Prepare an operation and maintenance plan for each design that the client will use after implementation of the practices are complete.
 - i. Include, as a minimum, all items listed in each CPS “Operation and Maintenance” section and the SOW “Design” section.
 - ii. Include requirements to obtain all applicable manufacturer installation guides, user manuals and warranty information.
 - iii. The time after harvest to replace boards and the designated outlet elevation

- during the winter months (or fallow season).
- iv. The time in the spring to release water.
- v. Guidelines for the control of drainage and the management of the water table during the growing season.

References

USDA Natural Resources Conservation Service. Field Office Technical Guide.

<https://efotg.sc.egov.usda.gov/#/>

USDA Natural Resources Conservation Service. National TSP Website.

<https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/technical/tsp/>

USDA Natural Resources Conservation Service. National TSP Resources.

<https://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/programs/technical/tsp/?cid=nrcseprd1417414>