



DESIGN AND IMPLEMENTATION ACTIVITY

Irrigation Water Management Design

DEFINITION

Design the volume, frequency, and application rate of irrigation water. Implementation requirements for CPS 449 Irrigation 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 determine and control the volume, frequency, and application rate of irrigation water on irrigated lands.

The activity will meet the Natural Resource Conservation Service (NRCS) planning criteria for

one or more of the following resource concerns:

- Inefficient Irrigation Water Use
- Irrigation-induced Soil Erosion
- Water Quality Degradation
- Concentration of Salts or other Chemicals within Crop Root Zone
- Degraded Air, Soil, or Plant Micro-climate
- Poor Plant Productivity and Health
- Inefficient Energy Efficiency of Equipment and Facilities

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 449 Irrigation Water Management
- Code 441 Irrigation System, Microirrigation
- Code 442 Sprinkler System
- Code 443 Irrigation System, Surface and Subsurface
- Code 430 Irrigation Pipeline
- Code 428 Irrigation Ditch Lining
- Code 388 Irrigation Field Ditch
- Code 320 Irrigation Canal or Lateral
- Code 587 Structure for Water Control
- Code 436 Irrigation Reservoir
- Code 447 Irrigation and Drainage Tailwater Recovery
- Code 533 Pumping Plant
- Code 464 Irrigation Land Leveling
- Code 450 Anionic Polyacrylamide (PAM) Application
- Code 610 Saline and Sodic Soil Management

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 irrigation water conservation opportunities and the client's conservation plan.
 - i. Performance characteristics of existing irrigation systems and management (e.g., estimates of irrigation system Distribution Uniformity (DU), and soil moisture by feel and appearance estimation method).
 - ii. Inventory of soils, crops, topography, water supply, existing physical features, drainage systems, and energy resources (e.g., soils on-site, crops grown, field high and low points, source water location, above-ground and buried utilities, existing surface and subsurface drainage facilities, and existing power equipment).
 - iii. Documentation of past water withdrawals and application, by crop.
 - iv. Basis of existing irrigation system and 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.
 - v. Rationale for irrigation system of management changes, if any, based on either:
 - Client's needs (e.g., manage salinity levels to within crop tolerance levels); or
 - to comply with CPS criteria.
 - vi. Irrigation water conservation recommendations that can meet CPS criteria and will improve irrigation efficiency, irrigation-induced soil erosion, water quality degradation, concentration of crop root zone constituents, degraded micro-climate, plant vigor, energy efficiency, and/or address the 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 irrigation system(s).

- Adding technologies to improve demand management (e.g., irrigation scheduling, and conversion of irrigated cropland to dryland farming).
- Adding technologies to improve supply management (e.g., reuse of drainage water, and increased water storage capacity).
- 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 monitoring and management of the volume, frequency, and application rate of irrigation water on irrigated lands.
- 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 irrigation 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 past water withdrawals, applications, irrigation system uniformity, and energy consumption, by crop.
- ii. Analysis and evaluation of resource inventory conducted during preliminary design phase (e.g., soils tests, to include nutrient levels and salinity and/or water tests, to include nutrients, pathogens, salinity, pH, and trace elements).
- iii. Method planned to measure or quantify future water withdrawals, irrigation applications, and energy consumption.
- iv. Documentation of the scientific method planned for scheduling the timing and amount of irrigation applications, based on the methods identified in the CPS. Irrigation scheduling method includes:
 - Estimated volume of water applied by field, irrigation event, season, and/or year;
 - Estimated frequency or timing of irrigation applications, by field;
 - Estimated application rates and depths of irrigation events.
- v. Document associated conservation practices and components required to comprise a conservation system for IWM.

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.

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>