22P - ENGINEERING ANALYSIS AND DESIGN/PROJECT COST ESTIMATES

The engineering and design plan will provide descriptions of all engineering and design efforts necessary to implement the project. Pursuant to Engineering Regulation (ER) 1110-2-1150, *Engineering and Design for Civil Works Projects*, dated August 31, 1999, required engineering feasibility phase work includes, but is not limited to, the following elements: plan formulation support; hydrology and hydraulic studies; development of data for the NEPA document; establishment of the preliminary design; development of surveying and mapping information in conjunction with the real estate division; identification and design of utilities and facilities proposed for relocation; determination and design of the improvements required on lands to enable the proper disposal of dredged or excavated material (if applicable); development of geotechnical information; development of hazardous, toxic and radioactive waste (HTRW) information; design of project alternatives; structural, electrical and mechanical design analysis; development of construction procedures; identification of construction materials including borrow and spoil areas; and identification of OMRR&R requirements and costs.

Cost Engineering and Design

This account includes all the design and cost estimates needed to support formulation of alternative plans and the plan recommended for authorization. Preliminary design and cost estimates for screening plan components will be prepared to support plan formulation and optimization of the plan components. The preliminary design and cost analysis will include estimates of construction, average annual operation, maintenance and replacement, engineering, design, supervision, and administration costs. After the preliminary assessment of alternative plans has been completed, the plans will be screened to select those alternatives that warrant further study. As designs are refined, modified, and updated, cost figures will be supplied to selectively eliminate alternatives. A cost estimate will be prepared for the recommended plan, and a locally preferred plan, if different from the recommended plan, using the Micro Computer Aided Cost Engineering System (MCACES). The cost estimate will contain sufficient detail to incorporate the requirements of *ER 1110-2-1302, Civil Works Cost Engineering*. Summary sheets from the MCACES cost estimates will be included as part of a separate engineering appendix to the Feasibility Report. Costs attributable to work in this account include the effort required to prepare input for the preliminary draft, draft, and final Feasibility Report, as well as participation in any required review conferences and resolution of comments resulting from the conferences.

Engineering Design for Preliminary Assessment of Alternatives - Preliminary civil design for formulating, scoping, and qualitative assessment of alternative plans will include

review of existing field data (surveys, quad sheets and aerial photography), as required; site layout; identification of project features; typical cross sections; profiles; and location of facilities/utilities. Alternate combinations of types of construction and alignments will be screened to ensure optimum plans are identified.

Screening Level Cost Estimates - Cost engineering will assist in the selection of the components of the plans that will be considered during the preliminary assessment of plan alternatives. MCACES cost estimates will not be required for the preliminary assessment of plan alternatives.

Engineering Design Final Alternatives - After the preliminary assessment of plan alternatives is completed and during the time leading up to the selection of plans for further study, information on additional components, as the individual project plans are refined, will be required input for engineering design and cost estimation refinement. This work will include development of scope for additional surveys and aerial photography that may be required. This will be necessary for the final plan alternatives to be accomplished.

Preliminary Cost Estimates for Final Alternatives - After the preliminary assessment of plan alternatives is completed and during the time leading up to the tentative selection of a plan, modified and updated cost figures will be supplied as the individual project plans are refined in order to eliminate alternatives. The cost estimates will be based on quantities, which will be provided as a result of engineering design efforts for both construction and operation, maintenance, rehabilitation, repair and replacement (OMRR&R) items.

Finalize Design for Recommended Plan - After final alternative screening is complete, the designs for the recommended plan and a locally preferred plan (if different from the recommended plan), will be completed. This effort will include developing structural designs for elements of the recommended plan (e.g. culverts, bridges, levees, canals, spillways, and pump stations); developing the drawings; deriving quantities; determining location of existing utilities and determine required relocations; determining real estate requirements, including rights-of-way and temporary construction easements; providing engineering input for required NEPA documentation and permits; and identifying operation and maintenance costs.

Civil Design Write-Up for Preliminary Draft Report - This activity includes preparation of the narrative report which documents all work leading up to submission of the preliminary draft Report, including write-up and plates, which present the elements of the project design considerations and construction procedures. If this work is accomplished by the USACE, Engineering Design Branch shall coordinate all technical input from other Engineering Division elements.

Cost Estimating Write-Up - This activity includes the effort to prepare a narrative summary and the associated cost tables, documenting all the work performed leading up to submission of the preliminary draft Feasibility Report.

MCACES Cost Estimate - This work involves preparing the initial MCACES cost estimate for the recommended plan and the locally preferred plan, if different from the recommended plan. A detailed MCACES cost estimate will be prepared for the selected plan(s). The cost estimate will include detailed cost evaluations of the requirements for construction and OMRR&R activities. The cost estimate will be accompanied by a cost estimate summary describing major design features and important assumptions made in putting together the MCACES cost estimate.

Design and Cost Estimating Participation in the Alternatives Formulation Briefing (AFB)- This activity includes preparation of work appropriate for presentation and participation in the AFB.

Finalize MCACES Cost Estimate - Provide detailed cost figures for refinement and/or changes in the final project design before the final report. Included will be a detailed evaluation of the requirements for OMRR&R activities. These will be incorporated into the final MCACES cost estimate for the selected plan. Also included is the effort required to modify the report write-up and the appropriate cost tables, if necessary, before submission of the final Feasibility Report.

Comment Responses & Finalize Write-Up - This task includes the effort required to address all comments generated by the ITR and at the AFB by revising drawings and the report write-up as well as documenting the comments and resolutions in the Project Guidance Memorandum.

During the plan formulation process of identifying alternative measures to be evaluated in the preliminary assessment of plans, and in actually performing the screening of alternatives to select plans that warrant further study, the St. Johns River Water Management District (SJRWMD) will need to work closely with the USACE. SJRWMD will review draft designs and provide comments. SJRWMD's responsibility in this area will continue throughout the study as more features are formulated and designs developed. SJRWMD will provide input to the USACE regarding operation and maintenance costs for the alternatives. SJRWMD will also assist in the process of locating existing utilities in the project area.