



**US Army Corps
of Engineers.**

**PROJECT REVIEW PLAN
FOR PROJECT CLOSEOUT DOCUMENTS**

**TUTTLE CREEK DAM SAFETY ASSURANCE PROJECT
BIG BLUE RIVER, KANSAS**

Appendix H of Program Management Plan

Enclosure H-1 - PDT Certification
Enclosure H-2 - DQC Certification
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Enclosure H-4 - Statement of Technical Review

April 6, 2010

REVIEW PLAN

FOR TUTTLE CREEK DAM, BIG BLUE RIVER, KANSAS DAM SAFETY ASSURANCE PROJECT

April 6, 2010

1.0 PROJECT DESCRIPTION

Tuttle Creek Dam is located on the Big Blue River, in the Kansas River basin, approximately 6 miles north of the City of Manhattan in eastern Kansas. Tuttle Creek Lake covers approximately 12,500 surface acres at normal pool with over two million acre-feet of storage below the flood control pool. The dam is a rolled earth fill and hydraulic fill embankment, 7,500 feet in length, standing 137 feet high with a crown width of 50 feet and a base width of 1,050 feet on an alluvial foundation. The dam is located in a zone of moderate seismicity dominated by the Nemaha Ridge and Humboldt fault zone. Seismic and geotechnical investigations have established that an earthquake larger than a 5.7 magnitude could cause liquefaction of the foundation sands and potential failure of the embankment. The Maximum Credible Earthquake for consideration at the dam is a 6.6 magnitude event at approximately 20 kilometers from the dam site. Depending on the magnitude of the earthquake, deformation of the embankment and release of the lake is possible. In order to address the risk of embankment breach during an earthquake, the downstream foundation was stabilized using cement bentonite slurry walls under the downstream slope of the dam. A relief well buried collector system and upstream riprap overlay were also constructed as part of the overall project.

In addition to modification of the earthen dam, a spillway rehabilitation was included in the project. This work involved structurally modifying the 18 Tainter gates for trunnion bearing friction loading, inspection and repair of all welds, replacement of all of the bearing assemblies, the removal of all lead paint, and repainting.

Foundation modification work, spillway work, and most other work on the project have or soon will be completed. Project closeout documents are currently being developed.

2.0 PURPOSE OF REVIEW PLAN

This Review Plan is intended to ensure quality-engineering products developed by the Kansas City District Corps of Engineers. The Review Plan covers the following work:

- Project Closeout Documents. Seismic Stabilization Completion Report, O&M manual update, As-Built Drawings, and DDR update. These reports document the construction modifications to the dam and revise pre-existing documents/manuals.

3.0 RISK

The dam foundation modification is complete along with other construction activities that included excavation of portions of the dam or foundation. The Tainter gate project is complete. Final site grading, restoration, and riprap placement will soon be complete. There is essentially no life safety risk inherent to the remaining construction activities. The project closeout documents are simply a summary of project activities and an update of existing dam safety files which were originally completed prior to construction. These documents will be updated to include as-built conditions along with summarizing design/construction activities. There is no life safety risk inherent in the project closeout files.

4.0 SCHEDULE

The schedule for the project closeout files reviews is as follows:

- 35% peer review (complete) - 31 January, 2010
- * 50% DQC/ATR review - 31 March, 2010
- * 95% DQC/ATR review - 31 July, 2010
- 100% completion - 31 August, 2010

** Until this Review Plan is formally approved, the existing approved project Quality Control Plan will be followed. With the exception of the review name/title, the Review Plan review team members are the same as those in the approved Quality Control Plan.*

5.0 CERTIFICATIONS AND CRITERIA

PDT, DQC, and ATR review is required for the project closeout documents per EC 1165-2-209. The certification sign-off sheets are included in the Enclosures. Based on the limited risks as described in section 3.0, IEPR is not required.

5.1 PDT Review. PDT review will be conducted throughout the product development phase. The PDT Certification form is attached in the enclosures.

5.2 DQC Review. The DQC will be conducted in Dr.Checks. DQC independent reviewers will review the products at 50% and 95% completion status. The DQC Certification Form will be signed and dated upon completion of submittal reviews and after all comments have been resolved. The DQC Certification is attached in the enclosures.

5.3 ATR Review. The ATR will be conducted in Dr.Checks. ATR independent reviewers will review the products at 50% and 95% completion status. After all comments have been resolved, a Technical Review Statement will be signed by the District. The ATR team and Technical Review Statement are listed in the enclosures.

5.4 IEPR Type I. This project is in the implementation phase, and therefore IEPR Type 1 is not required.

5.5 IEPR Type II. This project is in the final stages of cleanup and minor grading. The risk to public safety remaining for this project is very low and does not merit the Safety Assurance Review at this stage. [REDACTED], CENWD-BTD discussed the need for this review

with [REDACTED], Chief BTD, [REDACTED], NWD Dam Safety, and [REDACTED] (Risk Management Center), and it was agreed this review was not necessary based on the remaining risk.

5.6 Criteria. The following are being used as criteria for the project closeout documents:

- ER 1110-2-1150 Engineering and Design for Civil Works Projects
- ER 1110-1-1901 Engineering and Design - Project Geotechnical and Concrete Materials Completion Report for Major USACE Projects
- EC 1165-2-209 Civil Works Review Policy

**ENCLOSURE H-1
PDT CERTIFICATION**

PRODUCT DEVELOPMENT TEAM CERTIFICATION

PROJECT: Tuttle Creek Dam DSAP

PRODUCT: Project Closeout Documents (Seismic Stabilization Completion Report, DAR update, As-Built Drawings, and O&M Update)

PRODUCT PHASE: 50%

The undersigned certify that the appropriate level of coordination has taken place and all significant conflicts and comments have been resolved during the 50% and 95% reviews.

DISCIPLINE	PDT MEMBER	SIGNATURE	DATE
Project Manager	██████████		
Geotechnical Engineering	██████████		
	██████████		
	██████████		
	██████████		
Geology	██████████		
Construction	██████████		
Structural	██████████		
Operations	██████████		
Civil	██████████		

Review Team Leader: ██████████

PRODUCT DEVELOPMENT TEAM CERTIFICATION

PROJECT: Tuttle Creek Dam DSAP

PRODUCT: Project Closeout Documents (Seismic Stabilization Completion Report, DAR update, As-Built Drawings, and O&M Update)

PRODUCT PHASE: 95%

The undersigned certify that the appropriate level of coordination has taken place and all significant conflicts and comments have been resolved during the 50% and 95% reviews.

DISCIPLINE	PDT MEMBER	SIGNATURE	DATE
Project Manager	[REDACTED]		
Geotechnical Engineering	[REDACTED]		
	[REDACTED]		
	[REDACTED]		
	[REDACTED]		
Geology	[REDACTED]		
Construction	[REDACTED]		
Structural	[REDACTED]		
Operations	[REDACTED]		
Civil	[REDACTED]		

Review Team Leader [REDACTED]

**ENCLOSURE H-2
DQC CERTIFICATION**

DISTRICT QUALITY CONTROL CERTIFICATION

PROJECT: Tuttle Creek Dam DSAP

PRODUCT: Project Closeout Documents (Seismic Stabilization Completion Report, DAR update, As-Built Drawings, and O&M Update)

PRODUCT PHASE: 50%

The undersigned certify that the product is in general compliance with established policy, criteria and engineering practice, utilizes justifiable and valid assumptions and provides a reasonable product meeting customer requirements consistent with law and existing Corps policy. The undersigned acknowledge that the issues and concerns associated with the document writers have been discussed and resolved.

DISCIPLINE	DQC MEMBER	SIGNATURE	DATE
Geotechnical	██████████ ED-GD		
Geology	██████████ ED-GD		
Structural	██████████ ED-DS		
Operations	██████████ OD-TM		
Civil	██████████ ED-GC		

Review Team Leader: ██████████

DISTRICT QUALITY CONTROL CERTIFICATION

PROJECT: Tuttle Creek Dam DSAP

PRODUCT: Project Closeout Documents (Seismic Stabilization Completion Report, DAR update, As-Built Drawings, and O&M Update)

PRODUCT PHASE: 95%

The undersigned certify that the product is in general compliance with established policy, criteria and engineering practice, utilizes justifiable and valid assumptions and provides a reasonable product meeting customer requirements consistent with law and existing Corps policy. The undersigned acknowledge that the issues and concerns associated with the document writers have been discussed and resolved.

DISCIPLINE	DQC MEMBER	SIGNATURE	DATE
Geotechnical	██████████ ED-GD		
Geology	██████████ ED-GD		
Structural	██████████ ED-DS		
Operations	██████████ OD-TM		
Civil	██████████ ED-GC		

Review Team Leader: ██████████

**ENCLOSURE H-3
ATR TEAM**

AQENCY TECHNICAL REVIEW TEAM

PROJECT: Tuttle Creek Dam DSAP
PRODUCT: Project Closeout Documents (Seismic Stabilization Completion Report, DAR update, As-Built Drawings, and O&M Update)
PRODUCT PHASE: 50% and 95%

DISCIPLINE	ATR MEMBER
Advisory Panel-Chairman	*Francke Walberg, PE Former COE Geotechnical Engineering Branch Chief
Advisory Panel-Foundation Modification Expert	*Dr. Timothy Stark, Ph. D., PE Professor, University of Illinois
Foundation Modification Expert	██████████ Geotechnical Engineer Sacramento District

*Individuals do not currently work for the COE, but are independent experts in the field of the specialty work being performed.

Review Team Leader: ██████████

ENCLOSURE H-4
STATEMENT OF TECHNICAL REVIEW

STATEMENT OF TECHNICAL REVIEW

COMPLETION OF QUALITY ASSURANCE REVIEW AND AGENCY TECHNICAL REVIEW

The District has completed the Tuttle Creek DSAP Project Closeout Documents. Notice is hereby given that (1) a Quality Assurance review has been conducted as defined in the Quality Assurance Plan and (2) an agency technical review that is appropriate to the level of risk and complexity inherent in the project, has been conducted as defined in the project's Quality Management Plan. During the agency technical review, compliance with established policy principles and procedures, utilizing justified and valid assumptions, was verified. This included review of: assumptions, methods, procedures, and material used in analyses, alternatives evaluated, the appropriateness of data used and level obtained, and reasonableness of the result, including whether the product meets the customer's needs consistent with law and existing Corps policy. The review also assessed the DQC documentation and made the determination that the DQC activities employed appear to be appropriate and effective. The agency technical review was accomplished by Stark Consultants. All comments resulting from QA and ATR have been resolved.

[Redacted]
ATR Team Leader

Date

[Redacted]
Project Manager

Date

CERTIFICATION OF QUALITY ASSURANCE REVIEW AND AGENCY TECHNICAL REVIEW

As noted above, all concerns resulting from agency technical review of the project have been fully resolved.

[Redacted]
Chief, Engineering Division

Date

[Redacted]
Chief, Planning, Programs, and Project Management Division

Date