TAKING THE MYSTERY OUT OF USACE’S
ER 1110-1-1807 DRILLING IN EARTH EMBANKMENT
DAMS AND LEVEES

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PURPOSE OF ENGINEERING REGULATION 1110-1-1807
DRILLING IN EARTH EMBANKMENT DAMS AND LEVEES

This regulation establishes policy and requirements and provides guidance for drilling in or near dam and levee earth embankments and/or their earth and rock foundations. The primary purpose of this regulation is to prevent damage from hydraulic fracturing, erosion, filter/drain contamination, heave, or other mechanisms during drilling operations, sampling, in-situ testing, instrumentation installation, utility installation, borehole completion, and borehole abandonment.

The purpose of the boring does not matter.
POLICY

An approved Drilling Program Plan (DPP) is required prior to any drilling, sampling, grouting, or any other invasive in-situ testing. This includes drilling activities related to investigation, construction, and remediation.

Justification for drilling shall include an approved recommendation from a risk assessment if performed in support of the Dam or Levee Safety risk management process, or justification in support of modifications by outside entities (this includes utility crossings via horizontal directional drilling).
WHEN DO THEY APPLY

Any drilling or investigation into or near a structure with Federal Interest including Dams, Locks, and Levees (Includes those in PL84-99)

If the investigation is being instituted by an outside group it requires a 408 Permit

Section 408 – Authorized in Section 14 of the Rivers and Harbors Appropriations Act of 1899 (33 USC 408): Provides that the Secretary of the Army may, on recommendation of the Chief of Engineers, grant permission for the alteration of a public work as long as that alteration is not injurious to the public interest and will not impair the usefulness of the work.
DRILLING PROGRAM PLANS

- Paramount that all existing subsurface information is thoroughly evaluated and understood by the exploration team prior to developing a plan.
- Existing subsurface information shall be assimilated into essential plan and section drawings showing the proposed drill holes, target sample areas and/or proposed instrumentation.

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<th>Location</th>
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<th>Tenting</th>
<th>Instrumentation</th>
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- Calculate the conditions, stratigraphy, and characteristics of the subsurface geologic and hydrogeologic parameters through the boreholes and samples. These parameters are essential to assess the geotechnical conditions and vertical gradients in the testing, excavation, and foundation.

Figure 7.6 Plan view of preliminary borehole locations (D-14-100 to D-14-105) through the Moleon spillway channel.

Taking the mystery out of 1807
RESTRICTION ON USE OF DRILLING FLUIDS

Drilling programs in Dams and Levees should be designed to minimize the need for any pressurized drilling fluid such as air, gas, water, mud, polymers, slurries or any other drilling fluid.

If drilling fluids must be used DPP shall contain an analysis of the potential to cause damage (hydraulic fracture analysis) and a plan that covers the measures that will be used to minimize the risk.

Pressurized air or foam is not permitted.
DPP CONTENTS

- Objective and Justification
- Exploration Team
- Existing Information Review
- Essential Geologic and Engineering Drawings
- Drilling Scope and Methodology
- Risk Evaluation
- DSO/LSO Certification
OBJECTIVE AND JUSTIFICATION (PFMA/RISK ASSESSMENT)

- Purpose of the drilling and how the information will be used
- Need must be thoroughly justified.
- Non-destructive alternatives considered
- Justification should include approved recommendation from a risk assessment for USACE plans
- For outside entities Why are you planning on drilling and What information do you hope to generate.

The investigation is to support the design of a replacement bridge across the New River.

Investigations to support a more detailed risk assessment or design of a modification to a dam or levee.
PERSONNEL

• Drill rig operators shall have a minimum of 5 years experience drilling with the equipment and procedures described in the drilling program on dams and levees.

• All drilling activities on USACE dams or levees shall be conducted in the presence of a registered professional geotechnical engineer or geologist who shall be responsible for maintaining the integrity of the structure.

• Include resumes of Key Personnel – Plan Developers, Field Personnel, Drillers
ESSENTIAL GEOLOGIC AND ENGINEERING DRAWINGS

COMPILATION OF INFORMATION TO IDENTIFY DATA GAPS

- Locations of prior and planned subsurface explorations (borings, test pits, instruments, tunnels, adits, etc.)
- Location of all structures
- Embankment zones and other features
- Details of subsurface material classification
- Geologic contacts and continuity interpretations
- Depth of the top of rock or other important layer
- Piezometer showing screened influence zones
- Piezometric levels tied to the pool
- Other instrumentation in context of the geology and structure
- Test Results defining Engineering Properties.
- Geophysical data
- Estimated extent of any zones of interest, including natural and made-made
- Seepage areas tied to Geology

Taking the mystery out of 1807
EXISTING INFORMATION REVIEW

- Project records available in district and project offices
- Archived records
- Geologic mapping, boring logs
- Geotechnical files and reports
- Foundation Completion Reports
- Embankment Construction Reports
- As-built drawings, Construction Reports, and Photos
- Periodic Inspection Reports
- Instrumentation plans, data, and reports
DRILLING SCOPE AND METHODOLOGY

- Utilities, surface and underground obstacles, and accessibility
- Number and location of proposed borings
- Depth, diameter, and inclination of borings
- Materials to be drilled, sampled, and tested
- Drilling, sampling, and testing methods
- Details of the proposed drilling equipment
- Required sample type, location, and reason for sampling
- Instrumentation and borehole completion requirements
DRILLING SCOPE AND METHODOLOGY

• Evaluation of the risk of contamination of drainage features, heave, or other damage
• Evaluation of the risk of hydro-fracturing
  ▪ Detail description of any drilling fluid
  ▪ Details on the circulation system,
  ▪ Locations where fluid will contact soil
  ▪ Circulation pressures that will be used

• Measures to minimize the risk of damage to the dam or foundation.
• Nearby instruments to be monitored and their expected response

• Contingency plans for unexpected response.
• List of emergency equipment and supplies onsite
BOREHOLE COMPLETION – HOW IS THE HOLE FILLED?

• All boreholes and other penetrations shall be sealed after completion

• Backfilling with drill cuttings is not acceptable

• Penetrations in the impervious zones shall be backfilled by tremie placed cement-bentonite grout or bentonite pellets

• Penetrations in the pervious zones shall be backfilled by tremie placed filter and drainage compatible materials
RISK EVALUATION

• Detailed description of any drilling fluid used including circulation and pressures
• Need to monitor
  ▪ Loss of fluids
  ▪ Sudden drop in casing/drill string
  ▪ Rapid changes in piezometer levels
• Measures to minimize the risk
• Measures to prevent cross-contamination between aquifers
• Measures to prevent contact with structural members
• Emergency action plan
**REVIEW PROCESS**

- Drilling plans are submitted through the local district in support of the 408 process
- District to the USACE drilling review plan coordinator
- Plans are reviewed by 3 experienced engineers or geologists
- Comments are consolidated and transmitted back to the District

- Revised Plan is submitted by the district or outside entity
- Revised plan is back checked
- When the plan address all of the received comments the Community of Practice (CoP) lead is notified
- The CoP lead then sends concurrence with the plan back to the District
REVIEW TIME FRAME

Typical Plans – goal is 2 weeks for the initial review

Back check – typical less than a week

Atypical plans can take longer

Plan on longer review times at the end of the fiscal and calendar years