

SECTION 408 & DIPPs

REQUESTER'S GUIDE TO DEVELOPING A DRILLING & INVASIVE PROGRAM PLAN

Purpose

This guide provides an overview of when and how to prepare a **drilling and invasive program plan (DIPP)** for drilling and invasive activities at a dam or levee in accordance with U.S. Army Corps of Engineers (USACE) Engineer Regulation 1110-1-1807. This includes **horizontal direction drilling (HDD)**. This guide is not all inclusive and is a summary of the references listed below. These references should be consulted for full requirements and considerations.

References

1. Engineer Regulation (ER) 1110-1-1807, Drilling and Invasive Activities at Dams and Levees, U.S. Army Corps of Engineers, 1 June 2023.
2. Engineer Manual (EM) 1110-2-2902, Conduits, Pipes, and Culverts Associated with Dams and Levee Systems, U.S. Army Corps of Engineers, 31 December 2020.
3. Engineer Manual (EM) 1110-1-1804, Geotechnical Investigations, U.S. Army Corps of Engineers, 1 January 2001.
4. Engineer Manual (EM) 1110-1-1913, Design and Construction of Levees, U.S. Army Corps of Engineers, 30 April 2000.
5. Engineer Manual (EM) 1110-1-1902, Slope Stability, U.S. Army Corps of Engineers, 31 April 2003.

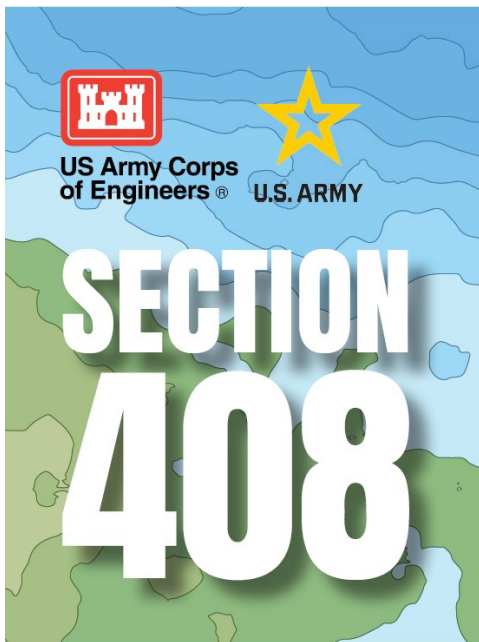
Overview

A DIPP is a document required prior to any drilling or invasive activities located in, on, or under all USACE dams or levees, or if owned and operated by non-federal sponsors, within the real property identified and acquired for USACE dams and levees, and near enough to potentially cause damage. DIPP submitted as part of a Section 408 request are reviewed by the local USACE district that has jurisdiction over the dam or levee.

If drilling fluid or other stabilizing or circulating medium is proposed, an additional technical review of the DIPP is required by the USACE Geotechnical, Geology, and Materials Community of Practice (GGM CoP) Standing Committee on Drilling.

After completion of review by the district and GGM CoP (if required), the DIPP is ultimately approved by the district Dam Safety Officer (DSO) or Levee Safety Officer (LSO).

A DIPP is required for all proposed horizontal direction drilling, or HDD, as part of a Section 408 request. The HDD DIPP should be in full compliance with the DIPP requirements referenced in ER 1110-1-1807; however, given the complexity and risk associated with HDD, special additional items (detailed later) should be considered and included in the DIPP. These items are essential to the design of the HDD and are outlined as part of this guide and in EM 1110-2-2902. All HDD DIPP require review by the district and GGM CoP Standing Committee on Drilling.



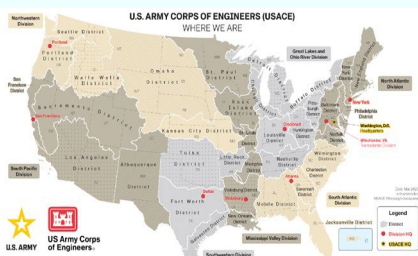
What is a DIPP?

A drilling and invasive program plan, or DIPP, is a document required prior to any drilling or invasive activities located in, on, or under all USACE dams or levees, or if owned and operated by non-federal sponsors, within the real property identified and acquired for USACE dams and levees, and near enough to potentially cause damage.

Questions?

Questions on Section 408 DIPP requests should be directed to the local district Section 408 Coordinator. They are there to help and guide you.

USACE District Locator



<https://www.usace.army.mil/Missions/Locations>

Guidelines

1. General Guidelines for Drilling and Invasive Program Plans

The following outlines the minimum of what should be included in a DIPP (ER 1110-1-1807 provides an in-depth breakdown of what is required):

- a. Objective and Justification: Summarize the purpose of the drilling or invasive activities and why it is needed. Drilling and invasive activities should be minimized to reduce the potential for damage to the dam or levee as much as possible. Drilling and invasive activities should be for a valid engineering purpose.
- b. Exploration Team: DIPP's must be prepared and signed by a licensed professional engineer or professional geologist. The DIPP must list members of the exploration team that will be doing the work and include credentials and experience of those supervising the work and the operators performing the work.
 - i. All drilling and invasive activities must be conducted in the presence of a licensed professional engineer or geologist who has a minimum of five years' experience performing the work.
 - ii. Drill rig and equipment operators must have a minimum of three years' experience with the type of equipment proposed, on at least two dam and or levee projects, and be familiar with the DIPP and USACE guidelines.
- c. Existing Information Review: Review and summarize all available background information of the existing dam or levee. Background information might be available through the local district, local sponsor, or a local government entity, for example.
- d. Essential Geologic and Engineering Drawings: Summarize available site information, site geometry, and existing boring/instrumentation data into one comprehensive plan and cross section drawing. This drawing should be updated when the proposed drilling is completed and supplied to the USACE district.
- e. Drilling Scope and Methodology: Provide a boring location plan and schedule of drilling. Discuss the methods of borehole advancement, sampling, equipment, tooling, expected materials to be encountered, utility clearances, site access, lab testing, instrumentation construction, and borehole abandonment. Methods for advancing and abandoning boring should be developed to minimize risk of hydraulic fracture. Similar information should be supplied for any invasive activity, including means and methods for the activity and how the hole will be backfilled to mitigate any potential damage caused by the activity including basic plans and specifications for the mitigation.
- f. Risk Evaluation: Provide an evaluation of the risk of hydraulic fracturing, erosion, drainage contamination, heave, or other damage. The evaluations should include:
 - i. Description of drilling fluid, the circulation system and where it will contact soil, and the pressures expected.
 - ii. Monitoring to detect fluid loss or other complications.
 - iii. Measures to minimize risk to dam or levee foundation and other features.
 - iv. Emergency action plan (EAP) that includes a list of equipment and supplies to have onsite in addition to the project's EAP including the project point of contact and backups.
- g. DSO/LSO Certification Page: Provide a certification page with appropriate DSO/LSO signature and exact certification statement as per ER 1110-1-1807.

2. Special Considerations for Horizontal Direction Drilling

A DIPP for HDD should follow and meet the requirements of ER 1110-1- 1807. The design of the HDD should follow the criteria included in EM 1110-2-2902, with special focus on Section 5.6. The DIPP for an HDD should include the specific sections stated in EM 1110-2-2902; Section 5.6.7, Work Plan Requirements.

These specific sections include:

- a. Contractor Qualifications: The contractor should provide a list of projects where trenchless installations related to dams and levees have been successfully completed by the company. The driller must have successfully completed at least two trenchless installations in the past five years of similar size, type, location, project environment, pipeline diameter, and length of installation.
- b. Entry and Exit Pit/Shaft Design: Entry and exit pit/shafts must be located at the greater of 300 feet or 20 times the embankment height from the levee centerline. This is a minimum requirement and could vary based on the district. Verify entry/exit location requirements with the district issuing the permit. Excavation design of entry and exit areas must include stability and seepage evaluations that indicate compliance with the requirements outlined in Table 3-1 of EM 1110-2-1902 and Table 6-1a of EM 1110-2-1913. Pit and shaft designs must be able to resist forces from pipe installation, disturbance of utilities behind thrust blocks, and weight of installation equipment.
- c. Drill Path Design: Drill path design must include the planned pipe alignment, location of entry and exit points or excavations, results of the subsurface investigation, settlement evaluation of the embankment or floodwall, hydraulic fracture evaluation and annular grouting plan (reference EM 1110-2-2902; Appendix E), drilling fluid design, pre-construction surveys and project stationing, required minimum clearances from existing structures, right of way lines, and diameter of the trenchless bore and drill pipe. Geotechnical borings drilled to support the HDD alignment under the levee must be drilled under a DIPP that follows the general guidelines above. Borings should penetrate to an elevation at least 5 bore diameters or 30 feet (whichever is more) below the depth of the proposed drill path to provide information for design modifications and anticipated deviations during construction. Pipe design calculations must include installation and long-term service loads, pipe material, pipe thickness, joint design or connections, and corrosion/protective coatings.
- d. Pipe Locating and Tracking: Pipe locating and tracking is required when drilling within or beneath a USACE embankment or floodwall. Risk and design parameters will dictate the accuracy required for the bore.
- e. Contingency and Decommissioning Plan: Documented procedures to address inadvertent fluid losses (hydraulic fracture), a high-water event during drilling operations and decommissioning (in the form of a decommissioning plan), must be completed prior to initiation of work. Pipes installed by trenchless methods must incorporate shutoff valves.
- f. Requirements for Protecting Existing Structures and Site Features: The plan must include procedures for preserving existing property from damage and for employing construction methods that will not produce damaging vibrations, soil movement, soil loss, or instability of existing structures.
- g. Construction Methods and Equipment: The plan should include the schedule of activities associated with drilling fluid and spoil management, the boring procedure, the size of the working/layout areas, traffic control requirements, and a safety plan.

- h. Quality Control and Quality Assurance: A USACE representative and/or independent construction specialist must be provided full-time access to the drill cab and all instruments to adequately observe and document the drilling parameters and downhole annular pressures. Submittal requirements should include daily logs of pressure measurements and cutting head locations at frequent intervals.
- i. Ground Movement Monitoring: A detailed plan for monitoring possible ground surface movements caused by trenchless pipe installations is required. This requirement may be waived by the respective USACE district if the depth of drilling is sufficiently deep and measurable surface settlements are not anticipated.
- j. Site Restoration: The plan must include a method to restore surfaces affected by the work to their preconstruction condition.
- k. Post Construction Documentation: The plan must outline the post construction documents that will be provided to USACE upon completion of the project. As-built drawings including both alignment and profile must be provided upon completion of trenchless installations.

3. Risk Evaluation

All DIPPs must contain an analysis of the potential to cause damage to the structure, features of the structure, and the foundation. DIPPs should include hydraulic fracture calculations along the borehole path for both drilling fluids and backfill. The requirements for these analyses vary for HDD applications and all other invasive activities application.

- a. Test Borings: Calculations for hydraulic fracture should be performed using at least two methods, as described in ER 1110-1-1807. A minimum factor of safety of 1.3 against hydraulic fracture is required for drilling and backfilling borings. A toolbox has been developed and is available for use at the following location:
<https://www.rmc.usace.army.mil/Software/RMC-Toolboxes/RMC-Hydraulic-Fracture-Toolbox/>
- b. HDD Application: Calculations and minimum factors of safety for hydraulic fracture should be performed and portrayed as shown in EM 1110-2-2902. A minimum factor of safety of 1.5 is required for this application.



For more information, or if you have any questions about Section 408, please visit <https://www.usace.army.mil/Missions/Civil-Works/Section408> or email HQ-Section408@usace.army.mil.
