DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS
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CECW 28-Jul-2025

MEMORANDUM FOR HEADQUATERS AND MAJOR SUBORDINATE COMMANDS, DISTRICTS, AND FIELD OPERATING UNITS.

SUBJECT: Guidance for Induced Flooding

1. References

a. ER 1105-2-100 Planning Guidance Notebook, 22 April 2000

b. ER 1105-2-103, Policy for Conducting Civil Works Planning Studies, 7 December 2023

c. ER 405-1-12, Real Estate Handbook, Chapter 12, 1 May 1998

d. EM 1110-2-1619, Risk-Based Analysis for Flood Damage Reduction Studies, 1 August 1996

2. Purpose

This guidance is intended to clarify the processes for identifying and evaluating potential induced flooding that may be caused by a proposed project or proposed modifications, including structural or operational changes, to an existing project. The guidance provides a step-by-step overview of when and how questions concerning potential induced flooding should be addressed within existing processes.

3. This guidance is applicable to Headquarters and all Major Subordinate Commands, Districts, and Field Operating Units of the U.S. Army Corps of Engineers with Civil Works responsibilities for planning, designing and implementing projects.

4. Background

Recent court decisions on the takings implications of induced flooding have prompted questions concerning how and when project teams should evaluate the potential for project-induced flooding and the steps teams should take if models predict an increase in flooding. The Fifth Amendment's Takings Clause guarantees that private property shall not be taken for public use, without just compensation. A taking can occur when a federal project, or other federal action such as changes to an existing project, induces flooding on private property or public property owned by state and local governments.

This guidance reiterates that project teams should follow existing guidance to the maximum extent practicable.:

a. ER 405-1-12, Paragraph 12-16(c)(9): "A discussion of whether there will be flooding induced by the construction or the operation and maintenance of the project. If induced flooding is reasonably anticipated, the [Real Estate Plan] REP should briefly describe the nature and extent thereof and whether additional acquisition of [lands, easements, or rights of way] LER must, or should, occur as a result. Where significant induced flooding is anticipated, or where otherwise required, a written analysis (i.e., a physical takings analysis) separate from the REP should be prepared with the conclusions of such analysis included in the REP. The analysis should incorporate the facts relating to the depth, frequency, duration, and extent of the expected induced flooding; discuss such facts in relationship to relevant case law regarding physical invasion takings and just compensation payment requirements; and present a reasoned conclusion on whether the expected induced flooding would rise to the level of a taking for which just compensation would be owed."

b. ER 405-1-12, Paragraph 12-15(a): "It is essential that the real estate requirements for a water resource project are adequately identified and that the estimated costs and schedule for land acquisition are accurately established before authorization."

c. ER 405-1-12, Paragraph 12-17(c): "The preparation of Attorney's Opinions of Compensability for purposes of finally determining and performing necessary relocation items requires a large degree of certainty regarding project impact as well as significant time to properly investigate the underlying facts and form appropriate legal conclusions based on those facts and applicable law. Since significant time may pass from a feasibility level study phase to performance of relocation items and since project impacts may not be fully understood during a feasibility level of study, a lesser degree of certainty and formality is required for Attorney's Opinions prepared for study purposes rather than for final determination and performance purpose." Although this section refers to preparation of Attorney's Opinions of Compensability for relocation of utilities and facilities, this process can be applied to preparation of Physical Takings Analysis opinions.

d. ER 1105-2-103, Paragraph 4-7. *f.*: "When a project results in transferring risk by increasing damages within or outside the immediate project area, risk reduction should be investigated and recommended, if cost effective and appropriate. Reduction of induced flooding may be appropriate when the benefits exceed the

costs or there are overriding reasons of public safety, economic, or social concerns, or a determination of a real estate taking has been made."

5. Guidance

In light of recent court decisions, the instruction in ER 405-1-12 that a physical takings analysis will be prepared only when "*significant* induced flooding is anticipated" [emphasis added] may no longer be sufficient to encompass all potential takings. A physical takings analysis will be prepared when project teams anticipate, based on initial model results or other information, that a proposed project or project change may induce any increase in flooding. It should not be assumed, in lieu of a takings analysis, that takings will not result merely because any induced flooding will be slight, or because the induced flooding is temporary or intermittent in nature.

a. Timing. Induced flooding, potential physical takings, and the influence of mitigation are important considerations for the plan formulation process. Because potential takings from induced flooding can result in significant additional project costs, which may influence plan formulation, project teams are encouraged to evaluate and identify potential induced flooding and coordinate on potential physical takings implications of any induced flooding with Counsel at the earliest practical stage. The evaluation of induced flooding may be an iterative process. For example, initial, preliminary takings analysis may inform further consideration and justification of mitigation measures, and a reduction in induced flooding from mitigation measures may further inform the preliminary physical takings analysis. The level of precision in the takings analysis should roughly correspond with the level of precision in information inputs (e.g., H&H model results) or other related work product (e.g., the real estate plan) at each planning milestone.

(1) For feasibility studies, a preliminary takings analysis should be completed no later than the tentatively selected plan (TSP) milestone. At the TSP stage, the preliminary takings analysis should be based on model results and information available at this stage in the planning process. The preliminary takings analysis should be considered tentative and subject to change as project plans are developed, models are refined, or other additional information is produced. The analysis will be updated as additional information is available. See ER 405-1-12, Paragraph 12-17 which addresses preparation of preliminary Attorney's Opinion of Compensability and recognizes the concept that project impacts may not be fully understood during a feasibility level of study and a lesser degree of certainty and formality is required for study purposes, similar to preparing the preliminary physical takings analysis.

(2) It is essential that engineering models be run to predict the possibility of induced flooding during feasibility and that a physical takings analysis be completed if the project is expected to induce flooding.

(3) Paragraph 6.a. provides further guidance on model outputs, mapping, and information needs to support the physical takings analysis.

(4) District Quality Control (DQC) and Agency Technical Review (ATR) will validate the analyses/methods used to assess the results of induced flooding.

b. Consideration of mitigation

(1) When project teams identify the potential for induced flooding, mitigation should be investigated in accordance with ER 1105-2-100 and ER 1105-2-103. Mitigation may include engineered solutions or other design revisions that reduce or mitigate the induced risk but may also include flowage easements or other real estate acquisitions. Project teams should consider whether any mitigation measures may be justified in accordance with ER 1105-2-103. The project team may consider mitigation measures in parallel with a takings analysis, but when mitigation measures are incorporated, the takings analysis should be updated to reflect the influence of mitigation.

(2) If a taking is expected to occur, the team must determine the most cost-effective mitigation solution. The project team should examine the costs of acquisition of the interests in lands needed for just compensation and compare the estimated just compensation costs to the costs and benefits of engineered solutions that could mitigate the takings determination. Engineering solutions which involve voluntary nonstructural measures such as structure elevations or floodproofing cannot be considered as mitigation measures for induced flooding. Formulation to avoid impacts may result in changes to the alternative including additional real estate acquisition or additional engineered solutions. It is possible to have justified measures and a takings determination or justified measures and no takings determination.

(3) It is possible for mitigation to generate additional benefits, if the mitigation would reduce damages beyond the induced flooding impacts. If the structures or land was flooded during the future without project condition and the mitigation would eliminate those damages, these benefits can be included in the project justification.

(4) The following action matrix should be followed when considering what should be recommended when induced flooding has been identified. **See Table 1 below.**

Table 1
Action Matrix to Determine the Recommended Plan

	Mitigation of the induced flooding is justified	**Mitigation is unjustified**
No taking is determined	1/	2/
Determination of a taking	3/	4/
1/ Justified mitigation measures should be included as part of the recommended plan for implementation.		
2/ No mitigation of the induced flooding is pursued.		
3/ Justified mitigation measures should be included as part of the recommended plan for implementation. If the justified measures do not resolve all of the induced impacts, reexamine just compensation of any residual induced flooding that may be remaining to determine if a taking still occurs and the just compensation remaining.		
4/ Compare the just compensation to the other mitigation measures to determine the most cost-effective manner to mitigate the induced impacts. If the other mitigation measures are cost effective but do not resolve all of the induced impacts, reexamine just compensation of any residual induced flooding that may be remaining to determine if a taking still occurs and the just compensation remaining.		

c. Coordination with Non-federal interests. Non-federal sponsors will be informed regarding the cost of any additional real estate acquisition and/or the cost of other measures needed to mitigate the takings and their obligation to acquire the appropriate real estate interest. Coordination with non-federal sponsors ideally will be conducted during feasibility before the TSP milestone but in all cases will be concluded prior to initiation of construction. The additional costs are included as a part of the implementation costs of the project.

d. Real Estate Plan. If the physical takings analysis determines that the induced flooding is a taking of property rights for which compensation may be required, the Real Estate Plan must include the acreage of the area projected to be flooded in the acquisition plan, must determine the appropriate estate(s) to be acquired, and must estimate the value of the estate(s) to be acquired. The estimate of value for these acquisitions will be part of the total real estate costs included in the Micro-computer Aided Cost Engineering System (MCASES) in the 01 Lands and Damages account. Acquisition of these property rights will be the responsibility of the non-federal Sponsor as part of its responsibility to provide lands, easements, rights-of-way, relocations, and disposal areas (LERRDs) for the project.

6. Responsibilities

a. Engineering elements are responsible for running numerical models to determine whether construction of the project features and/or operation of the project will induce flooding and the extent of such flooding. Engineering elements will define the differences with respect to inundation to depict with and without project features and/or project operations. These differences will be depicted in map format, which include the right-of-way of the project feature that induces flooding, the flooding impact lines, and the estimated acreage of lands that are predicted to be flooded. In addition, Engineering elements will define these differences as part of the Engineering appendix to the decision document, which includes the following:

(1) Details regarding the project feature operation, or details regarding project construction and the impact to surrounding lands which are not in the project right-of-way.

(2) Historical water elevation of surrounding properties (without project condition).

(3) Determination of the elevation/depth of standing water on the surrounding properties after project construction and/or operation (with project condition).

(4) Frequency of flooding over surrounding properties.

(5) Velocity of water flowing over properties.

(6) Duration of each flooding event (how long will the water remain over properties).

(7) Uncertainty of numerical modeling data utilized for the project and/or operational change analysis as referenced in EM 1110-2-1619.

b. Real Estate is responsible for requesting the physical takings analysis from Office of Counsel. The memo request must include:

(1) A copy of the Engineering appendix noted above (including map).

(2) Current physical attributes of properties.

(3) Projected physical attributes of properties after induced flooding.

(4) Current use of properties.

(5) Projected impact of flooding on use of properties.

(6) If known, estimated impact of flooding on property values.

c. Office of Counsel will prepare a physical takings analysis which is a legal opinion as to whether induced flooding rises to the level of a taking of real property rights based on an analysis of the facts of the project construction and operation, the information regarding the projected induced flooding, the impacts of the flooding on the surrounding properties, and an analysis of relevant case rulings. The physical takings analysis is an internal document which will not be included in the Feasibility report nor in the Real Estate Plan; these documents can only report the conclusion of the analysis.

7. Guidance applied to specific activities

a. Feasibility studies. The feasibility study project delivery team must follow the guidance outlined above. For feasibility studies, each alternative in the final array of alternatives is evaluated for post-construction hydrologic/hydraulic changes that could potentially cause induced flooding within the project area.

b. Approved and/or authorized but unconstructed projects. Presumably, any mitigation that was justified during feasibility is already included in the proposed project. Accordingly:

(1) For projects not yet in the design phase but for which the project team identified induced flooding during the feasibility phase. This category of projects will follow the above guidance at the initiation of the preconstruction engineering and design (PED) phase to identify the source of the induced flooding and evaluate potential additional mitigation in a cost-effective manner, if it is determined that it is a taking. This may require a new approval for the study and reauthorization of the additional costs and/or measures if the changes are not within the Chief's discretionary authority.

(2) For projects in PED that identified induced flooding during the feasibility phase. During the PED phase, if a project identified induced flooding during feasibility, the updated engineering in PED will be utilized to conduct the physical takings analysis and follow the guidance above. This may require a new approval for the study and reauthorization of the additional costs and/or measures if the changes are not within the Chief's discretionary authority.

c. Post-construction changes to projects that reduce the level of flood risk reduction previously provided. This category of changes could include changes to water

control manuals or temporary deviations and/or temporary interim risk reduction measures for dam safety. The below procedures should be followed when considering any additional flood risk that might result from such changes.

(1) Permanent operational changes to a water control manual. If changes to a water control manual are expected to result in increased flooding upstream and/or downstream from the project or structure, a physical takings analysis should be conducted. Mitigation measures to avoid any increase in flood risk can be formulated and recommended, provided the measures are justified and Counsel determines the measures are within existing project authorities. If the expected inducement does result in a determination of a real estate taking, the nature of the interest and the amount of just compensation will be determined following the previous guidance in this memorandum. Those costs as well as the costs of any mitigation measures will need to be considered in a cost-effective manner in determining if the operational changes to the water control manual are justified. Some operational changes may be unavoidable and the mitigation and just compensation will then be conducted in accordance with the previous action matrix.

(2) Temporary deviations: If temporary deviations from a water control manual are expected to result in increased flooding upstream and/or downstream from the structure, a physical takings analysis may need to be conducted. Counsel should be consulted about the need to conduct a physical takings analysis. If Counsel prepares a physical takings analysis and reaches a determination that physical takings will result from the temporary deviation, the project team should follow the guidance for permanent operational changes above.

The point of contact for this guidance is Mr. Jeffrey Strahan, Senior Economic Policy Advisor, Planning and Policy Division. Mr. Strahan can be reached at Jeffery.P.Strahan@usace.army.mil or (771) 210-0624.

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