

US ARMY CORPS OF ENGINEERS
National Planning Centers of Expertise

***Assuring Quality of Planning Models – Model
Certification/Approval Process***

Standard Operating Procedures

February, 2012

Background and Purpose

The Planning Centers of Expertise (PCX) requested Standard Operating Procedures (SOP) that US Army Corps of Engineers (USACE) Districts and other model proponents could reference during pursuit of planning model certification or model approval for use, per requirements and guidance established in Engineer Circular (EC) 1105-2-412. The SOP depicts activities, estimated durations and costs, and responsible parties associated with initiation and execution of review activities central to any request for HQUSACE certification or approval for use of planning models. The goal of the SOP is to provide members of study and review teams with an efficient and consistent process that will help with the timely completion of planning model certification/approval activities and contribute to broader planning model quality assurance efforts of the USACE. All durations and costs described in this document are generalized estimates. Further time and cost savings can be realized as improvements in documentation and coordination practices are realized.

Planning Model Certification/Approval Applicability

Planning model certification/approval falls under the larger umbrella of USACE Model Quality Assurance, which encompasses engineering models, planning models, and other special cases. In accordance with USACE policy expressed in EC 1105-2-412 (31 March 2011)¹, Assuring Quality of Planning Models certification or approval for use is mandatory for all planning models currently in use, in development, or those yet to be developed that are used during the definition of water resources management problems and opportunities, formulation of potential alternatives to address problems and take advantage of opportunities, evaluation of potential effects of alternatives, and to support decision-making. This requirement is applicable to all planning models used during development of USACE decision documents, with the exception of those associated with Continuing Authority Program (CAP) studies per Director of Civil Works' Policy Memorandum #1 – Continuing Authority Program Planning Process Improvements (19 Jan 2011)². Models that represent engineering systems such as those used to perform hydrologic and hydraulic analyses are considered engineering and not planning models, and therefore are not subject to this SOP or the above policy, but rather are subject to quality assurance practices established by the Science and Engineering Technology Program (SET). See Engineering and Construction Bulletin No. 2007-6 (10 April 2007)³ for further guidance on engineering models.

This SOP presents a strategy and establishes the process for initiating, executing, and closing-out of planning model certification/approval activities. This SOP is applicable to all Headquarters (HQUSACE) elements, major subordinate commands (MSC), districts, laboratories, and field operating activities engaged in the development of tools, techniques, or information relevant to the development of all USACE planning decision documents subject to the EC 1105-2-412 policy.

The process outlined in this SOP is the same whether models are being considered for certification (for models developed by or for the USACE) or approval for use (for models

¹ http://planning.usace.army.mil/toolbox/library/Ecs/EC_1105-2-412_2011Mar.pdf

² <http://planning.usace.army.mil/toolbox/library/MemosandLetters/CAPPlanningProcessImprovementsMemo1-19-11.pdf>

³ http://planning.usace.army.mil/toolbox/library/Misc/015_Model%20Certification%20Issues%20for%20Eng.%20Software%20in%20Planning%20Studies.pdf

developed by others or models being used only for a single study). However, the process and level of effort is intended to be scalable and commensurate with the level of review needed.

This SOP does not describe procedures or activities associated with review of a model's application to a particular study. This SOP describes only those activities associated with the review and certification/approval of the model itself with respect to its satisfaction of technical, system, and usability requirements. Review of model selection and application to a particular study is subject to the normal study peer review process, as outlined in EC 1165-2-209, Civil Works Review Policy (31 Jan 2010)⁴.

While every attempt has been made to ensure the accuracy of this SOP, personnel involved in the model certification/approval process should be knowledgeable of the regulations cited above and any subsequent updates to these (or related) documents.

⁴ http://planning.usace.army.mil/toolbox/library/ECs/EC1165-2-209_31Jan2010.pdf

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1.0 Model Certification/Approval Process - Summary

This section illustrates relationships between specific tasks and decisions associated with the model certification/approval process; and begins with initiation of consultation with the appropriate PCX following the start of an investigation. Figure 1 displays the flow of activities and decisions typically associated with pursuit of certification/approval of a planning model. Tasks are color-coded to reflect the organization with primary responsibility for executing an action, and documented with estimated activity durations expressed in calendar days. Each of the numbered tasks in the diagram corresponds to a more detailed task description in section 2.0 (standard operating procedures). The detailed task description further clarifies the roles and responsibilities of each organization, and provides an estimate of task durations, level of effort involved, and associated costs. If multiple responsible parties are identified under a task description, the party identified as the lead generally will have the primary responsibility for initiating and monitoring the progress of the task, unless it is otherwise delegated. It should be noted that durations and costs will vary greatly depending on the scope and nature of the model being considered, and therefore the durations/costs presented in this SOP are offered only as a guideline, and should be refined in consultation with the appropriate PCX early on in the model certification/approval process based on the specifics of the model(s) to be reviewed.

Figure 1. Logic Diagram for Model Certification/Approval Process

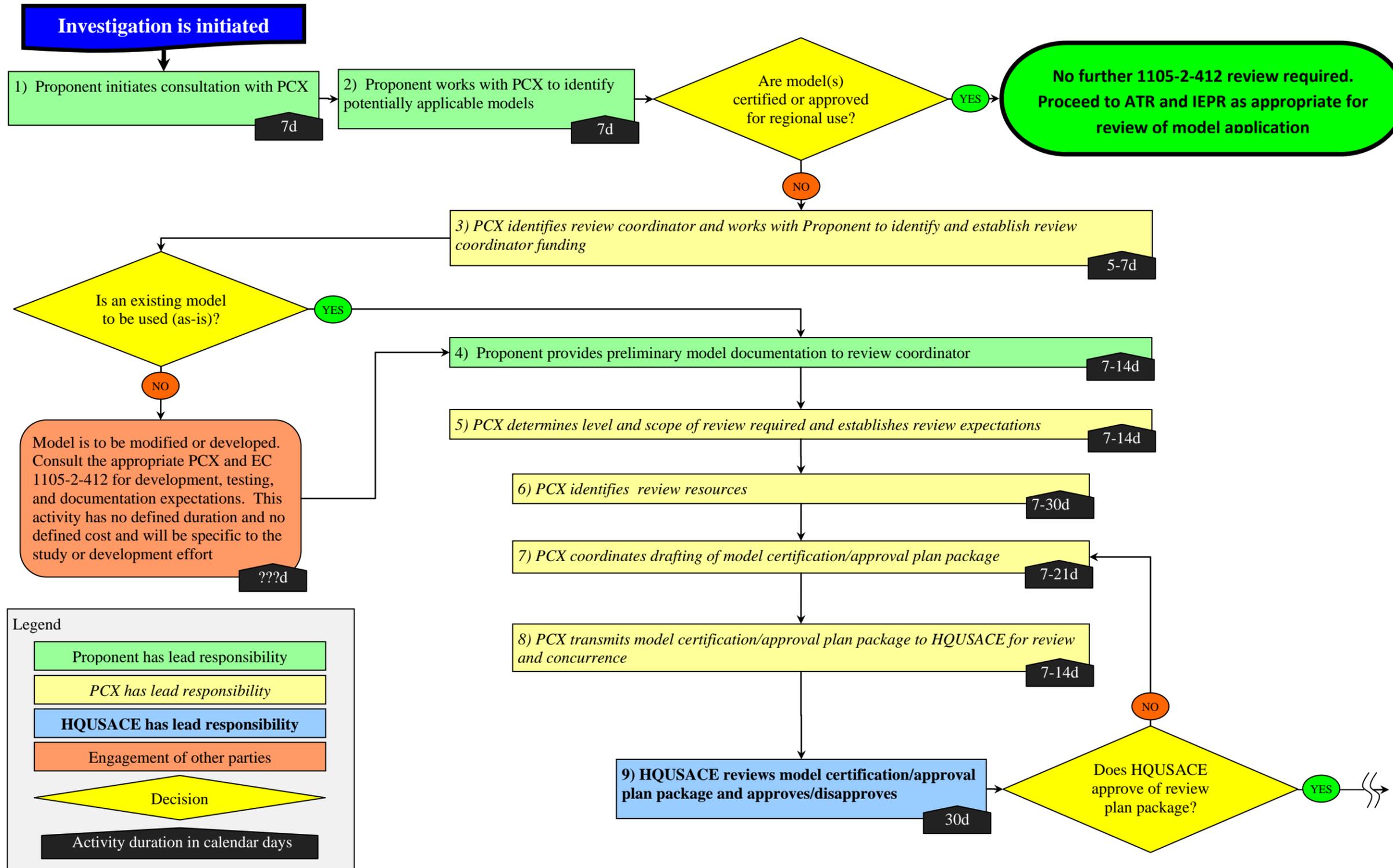
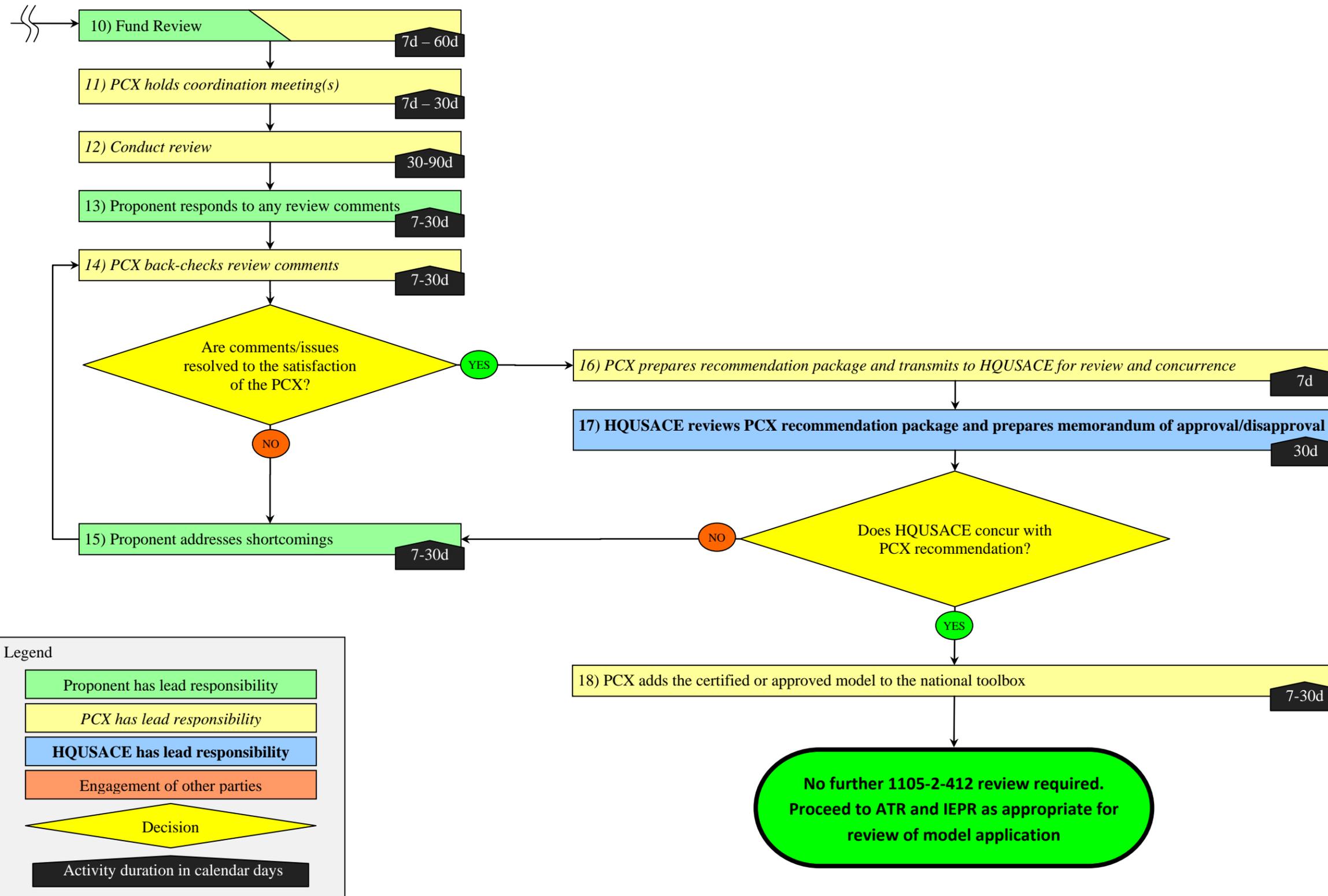


Figure 1. Logic Diagram for Model Certification/Approval Process Continued



2.0 Model Certification/Approval Process – Standard Operating Procedures

Task 1 – Proponent initiates consultation with PCX

DESCRIPTION:	This task serves as the initial contact between the proponent and PCX to discuss models identified in the project review plan and to identify any potential need for certification/approval efforts as specified in EC 1105-2-412.
RESPONSIBLE PARTY:	Proponent (Lead), PCX
DURATION:	7 Calendar Days
ASSOCIATED EFFORT:	Proponent = 8 hours; PCX = 8 – 16 hours
APPROXIMATE COSTS:	Proponent = \$1,000; PCX \$1,000 to \$2,000

Task 2 – Proponent works with PCX to identify potentially applicable models.

DESCRIPTION:	This task advances the discussion between the potential model proponents and the PCX regarding identification and selection of models intended for use in a specific study, whether these models are certified/approved for use, and whether other models for the study will need to be reviewed for certification/approval. Prior to the discussion, the proponent should provide the PCX with enough project information so that the PCX can provide adequate feedback. This information should include project problems, opportunities, goals, and objectives, as well as any conceptual modeling that has been done. If the identified models are study appropriate and already certified or otherwise approved for use, no further EC 1105-2-412 actions are required.
RESPONSIBLE PARTY:	Proponent (Lead), PCX
DURATION:	7 Calendar Days
ASSOCIATED EFFORT:	Proponent = 1-24 hours; PCX = 8 - 16 hours
APPROXIMATE COSTS:	Proponent = \$125 to \$3,000, PCX \$1,000 to \$2,000

Task 3 – PCX identifies review coordinator and works with Proponent to identify and establish review coordinator funding.

DESCRIPTION: The lead PCX will assign a review coordinator to work with the model proponent. The review coordinator will work with the proponent to establish a framework for coordinating the receipt of model documentation, development of the model certification/approval plan, and determining the appropriate level of funding for these activities. The lead PCX will coordinate with appropriate PCXs if the models involve multiple project purposes. Funding provided to the PCX in this task should be sufficient to fund the review coordinator through completion of the certification/approval process (i.e. through task 17).

RESPONSIBLE PARTY: PCX (Lead), Proponent

DURATION: 5-7 Calendar Days

ASSOCIATED EFFORT: Proponent = 4 - 8 hours, PCX = 1-4 hours

APPROXIMATE COSTS: Proponent = \$500 to \$1,000, PCX = PCX (direct) \$125 to \$500, PCX (coordinator) = \$10,000 to \$32,000 (funds provided by proponent to fully fund remaining increments of PCX labor associated with review Tasks 4 - 18).

Task 4 – Proponent provides preliminary model documentation to review coordinator.

DESCRIPTION: The Proponent will provide to the lead PCX sufficient documentation to prepare the model certification/approval plan. The review coordinator will also work with the proponent at this time to identify the complete documentation that will need to be submitted for the review. The amount of documentation needed will be commensurate with the complexity of the model and will be determined on a case by case basis. See review plan template (Attachment 1) for suggested components of model documentation.

RESPONSIBLE PARTY: Proponent (Lead), PCX

DURATION: 7-14 Calendar Days

ASSOCIATED EFFORT: Proponent = 8-24 hours, PCX = 4-12 hours

APPROXIMATE COSTS: Proponent = \$1,000 to \$3,000, PCX = \$500 to \$1,500 (Increment of funding provided to PCX by Proponent during Task 3)

Task 5 – PCX determines level and scope of review required and establishes review expectations.

DESCRIPTION: The PCX review coordinator will review the model documentation provided and make a recommendation regarding what level of model review is appropriate. The review coordinator may request additional model documentation at this time if necessary. The level of review will be specified as extensive, intermediate, limited, or general as defined in EC 1105-2-412. All models will be reviewed based on three general criteria, which are: technical quality, system quality, and usability. The model will also need to conform to Corps guidance ER 1105-2-100 in regards to addressing and conducting a risk-based analysis.

RESPONSIBLE PARTY: PCX

DURATION: 7 to 14 Calendar Days

ASSOCIATED EFFORT: PCX = 8-24 hours

APPROXIMATE COSTS: PCX = \$1,000 to \$3,000 (Increment of funding provided to PCX by Proponent during Task 3)

Task 6 – PCX identifies review resources.

DESCRIPTION: The review coordinator will identify appropriate Corps and external reviewers as appropriate. External reviewers may be necessary if qualified and independent internal reviewers are not available and/or if the model’s application is likely to controversial and/or subject to notable challenge. External reviewers are generally obtained through a contract vehicle organization (CVO) with assistance of the PCX. Selection of a CVO will be based on, but not limited to, the following: technical requirements of the review, schedule requirements, existing contract capacity, and other specific requirements or considerations related to the completion of the review. Selection of the appropriate contract vehicle organization (CVO) should consider the timelines, cost and availability of CVO resources. Note that this task does not entail the actual solicitation and execution of the contract, merely the identification of said resource.

In some cases, the PCX may also be able to identify external reviewers who may potentially be retained directly without solicitation for contracted services (i.e. academic services, etc).

RESPONSIBLE PARTY: PCX
DURATION: 7 to 30 Calendar Days
ASSOCIATED EFFORT: PCX = 8-24 hours
APPROXIMATE COSTS: PCX = \$1,000-\$3,000 (Increment of funding provided to PCX by Proponent during Task 3).

Task 7 – PCX coordinates drafting of certification/approval plan package

DESCRIPTION: The model certification/approval plan is developed cooperatively between the proponent and the review coordinator. A template model certification/approval plan is included as Attachment 1. Generally, the proponent will provide a first draft of the model certification/approval plan, which the PCX will then edit as appropriate. The plan will identify the type and scope of the review, describe review tasks, document composition and expected experience/expertise of reviewers (and names and qualifications of reviewers if they have been identified at this point), and include the charge to the reviewers, anticipated schedule of deliverables, cost estimates, and other information as appropriate and necessary. The review plan package will include the model certification/approval plan and all associated model documentation and support material, which was provided by the proponent to the review manager in Task 4. The review plan package will be approved by the appropriate lead PCX prior to headquarters submittal.

RESPONSIBLE PARTY: PCX (Lead), Proponent
DURATION: 7 to 21 Calendar Days
ASSOCIATED EFFORT: Proponent = 8-24 hours; PCX = 8-24 hours
APPROXIMATE COSTS: Proponent = \$1,000-\$3,000; PCX = \$1,000-\$3,000 (Increment of funding provided to PCX by Proponent during Task 3).

Task 8 – PCX transmits model certification/approval plan package to HQUSACE for review and concurrence.

DESCRIPTION: The lead PCX will transmit the certification/approval plan package to HQUSACE. If the model to be reviewed is associated with the development of a decision document, the model certification/approval plan will be sent to the proponent’s RIT. If the model is not tied to a study, it will be sent to the PCoP HQUSACE (CECW-P). The package will include an approval

memorandum by the PCX. The PCX should coordinate with the RIT or PCOP on the number of hard copies of the certification/approval plan package that are required.

RESPONSIBLE PARTY: PCX
DURATION: 7 to 14 Calendar Days
ASSOCIATED EFFORT: PCX = 4 hours
APPROXIMATE COSTS: PCX = \$500

Task 9 - HQUSACE reviews review plan package and approves/disapproves.

DESCRIPTION: During this Task, HQUSACE reviews and responds to the certification/approval plan package. Upon receipt of the review plan package from the PCX, a subject matter expert(s) is assigned to the review. The review plan package is then logged in to the Office of Water Project Review (OWPR) for review, typically for two weeks. The review will address things such as: 1/ appropriate level of review, 2/ appropriateness of review disciplines/reviewers based on level of review effort, 3/ appropriate review scope commensurate with the level of review (tasks and charge), etc.

Upon conclusion of the review of the submitted package, the subject matter expert makes a recommendation to the Model Certification Panel. If approved, the Deputy Chief of Planning and Policy (CECW-P) will draft an approval memorandum and send it to the appropriate PCX, at which point the model review may commence. If significant comments arise, the review plan package may need to be revised and resubmitted by the PCX to HQUSACE (tasks 7 and 8).

RESPONSIBLE PARTY: HQUSACE (CECW-P, CECW-PC, CECW-CP)
DURATION: 30 Calendar Days
ASSOCIATED EFFORT: N/A
APPROXIMATE COSTS: GE Funded

Task 10 – Fund review

DESCRIPTION: Funding for the review itself is provided by the proponent. The review cost will vary greatly depending on the level of review,

whether the reviewers are internal or external to the Corps, and whether a CVO is utilized. If the review involves contracted labor, this task will include development of a scope of work, independent government estimate, and awarding of contract (the details of the steps involved to actually execute the contract are considered outside of this SOP). For example, a simple tool or spreadsheet may require one reviewer at a cost of several thousand dollars where an extensive review by an external panel coordinated through a CVO may cost over a hundred thousand dollars. Also at this step, the PCX should reaffirm that sufficient funds are available for their coordination of the review through completion of the remainder of the process (through Task 16). The primary purpose of this activity is to align and ensure availability of funds and resources necessary to execute and complete a review of the planning model's technical quality, system quality, and usability.

RESPONSIBLE PARTY: Proponent (Lead if decision document is involved), PCX (Lead if no decision document)

DURATION: 7 to 60 Calendar Days

ASSOCIATED EFFORT: 8 - 40 hours (may be Proponent, PCX, or some combination of both depending on who executes the funding and/or contracting)

APPROXIMATE COSTS: \$1,000 - \$5,000 for executing funding and/or contracting. Review Cost = \$2,000 - \$200,000. NOTE, COSTS CAN BE HIGHLY VARIABLE.

Task 11 - PCX holds coordination meeting(s).

DESCRIPTION: This task serves as the preparation for and the holding of the review kickoff meeting. Depending on the level of review and whether or not the reviewers are internal to the Corps or external, this may be the meeting that begins the review itself (see next task) or the first of a series of meetings. Discussion will include topics from the review plan such as: 1/ charge to reviewers, 2/ time frames, 3/ review expectations, 4/ mechanism for making, responding to, and addressing comments, and 5/ comment resolution process. This coordination among the Proponent, PCX, and reviewers is critical for a successfully executed review.

RESPONSIBLE PARTY: PCX (Lead), Proponent

DURATION: 7 - 30 Calendar Days depending on number of meetings needed.

ASSOCIATED EFFORT: Proponent = 8-24 hours; PCX = 8-40 hours

APPROXIMATE COSTS: Proponent = \$1,000 to \$3,000; PCX = \$1,000 to \$5,000 (Increment of funding provided to PCX by Proponent during Task 3)

Task 12 – Conduct review

DESCRIPTION: The PCX will oversee this task. The review is executed and comments are provided to the Proponent and the PCX by the reviewers. The review will examine appropriate facets of the model and its documentation as outlined in the model certification/approval plan. Reviewers are to focus their efforts on technical quality, system quality, and usability of the model. While the reviewers' contractual obligations may be considered complete upon their provision of review comments, the sufficiency of proponent's responses to comments and any requirements for backchecking responses to review comments will be at the discretion of the PCX and/or HQUSACE (see tasks 13 and 14).

The duration of the review may vary greatly depending on the level of review required. Comments should follow and address the charge contained in the review plan and discussed in the PCX and Proponent coordination meeting. Comments will be provided using the mechanism discussed at the PCX/Proponent kickoff meeting.

RESPONSIBLE PARTY: PCX

DURATION: 30 – 90 Calendar Days

ASSOCIATED EFFORT: 8 –24 hours

APPROXIMATE COSTS: PCX = \$1,000 to \$3,000 (Increment of funding provided to PCX by Proponent during Task 3). Funds for reviewer labor and any external coordination services are obligated by the Proponent during Task 10.

Task 13 – Proponent responds to any review comments.

DESCRIPTION: The proponent will draft preliminary responses to the review comments. At a minimum, the proponent's response to each comment should include – 1) whether or not they agree with the comment (if not, why), and 2) any actions or strategies proposed to address or effectively close-out the comment. The nature of the comments should first be discussed between the proponent and PCX before responses are drafted.

RESPONSIBLE PARTY: Proponent (Lead), PCX

DURATION: 7 to 30 Calendar Days

ASSOCIATED EFFORT: Proponent = 16-40 hours; PCX = 4-8 hours

APPROXIMATE COSTS: Proponent = \$2,000 to \$5,000; PCX = \$500 to \$1,000 (Increment of funding provided to PCX by Proponent during Task 3 as adjusted during Task 10).

Task 14 – PCX back checks review comments.

DESCRIPTION: The PCX will review the proponent responses to comments and determine if the proposed actions are adequate. If they are not deemed adequate, the PCX will identify additional actions or modifications the proponent needs to undertake in order to gain a PCX recommendation for certification or approval.

RESPONSIBLE PARTY: PCX

DURATION: 7 to 30 Calendar Days

ASSOCIATED EFFORT: PCX = 8-24 hours

APPROXIMATE COSTS: PCX = \$1,000 to \$3,000 (Increment of funding provided to PCX by Proponent during Task 3 as adjusted during Task 10).

Task 15 – Proponent addresses shortcomings.

DESCRIPTION: The proponent will implement actions as specified by the PCX in Task 14. The associated effort and cost provided for this task assumes that revisions are required only for model documentation or any revisions to the actual model itself are relatively minor. Should major revisions to the model be required, the duration, associated effort, and cost can dramatically increase from those listed below. This task will continue until the determination is made by the PCX that all comments/issues have been addressed to the satisfaction of the PCX and HQUSACE, and may include one or more issue resolution meetings involving one or more HQ subject matter expert(s), if requested by the PCX.

RESPONSIBLE PARTY: Proponent

DURATION: 7 to 30 Calendar Days

ASSOCIATED EFFORT: Proponent = 8 – 80 hours, PCX = 4-8 hours

APPROXIMATE COSTS: Proponent = \$1,000 - \$10,000, PCX = \$500 to \$1,000 (Increment of funding provided to PCX by Proponent during Task 3 as adjusted during Task 10).

Task 16 - PCX prepares recommendation package and transmits to HQUSACE for review and concurrence.

DESCRIPTION: Based on resolution of all comments/issues, the PCX will compile and send its recommendation package to HQUSACE. If the model is associated with the development of a decision document, the package will be sent to the proponent's RIT. If the model is not tied to a study, the package will be sent to the PCoP HQUSACE (CECW-P). This package will include, at a minimum, some combination of the following based on the level of review and whether it is a certification or approval for use: 1/ PCX recommendation memorandum, 2/ model review documentation, 3/ the model itself, 4/ user manual and/or model appendix, and 5/ plan for training users. The PCX should coordinate with the RIT or PCOP on the number of hard copies of the model package that are required.

RESPONSIBLE PARTY: Proponent, PCX

DURATION: 7 Calendar Days

ASSOCIATED EFFORT: Proponent = 8 hours; PCX = 8-16 Hours

APPROXIMATE COSTS: Proponent = \$1,000; PCX=\$1,000 to \$2,000 (Increment of funding provided to PCX by Proponent during Task 3 as adjusted during Task 11).

Task 17 - HQUSACE reviews PCX recommendation package and prepares memorandum of approval/disapproval.

DESCRIPTION: This task serves as review and concurrence of the model recommendation package by HQUSACE. Upon receipt of the model recommendation package from the PCX, a subject matter expert(s) is/are assigned to the review. The model recommendation package is then logged in to the Office of Water Project Review (OWPR) for review, typically for two week duration. Upon conclusion of the review, the subject matter expert makes a recommendation to the Model Certification Panel. The model certification panel will make a decision based on the

recommendations by the PCX and HQUACE Subject Matter Expert. If approved, HQUSACE (CECW-P) will issue a certification/approval memorandum. If HQUSACE does not approve, they will issue a memorandum to the PCX indicating the cause for denial. It may be that additional revisions can be made in order to gain certification or approval for use.

RESPONSIBLE PARTY: HQUSACE (CECW-P, CECW-PC, CECW-CP)

DURATION: 30 Calendar Days

ASSOCIATED EFFORT: N/A

APPROXIMATE COSTS: GE Funded

Task 18 – PCX adds the certified/approved model to the National Toolbox.

DESCRIPTION: PCX adds the model to the online repository of certified/approved models.

RESPONSIBLE PARTY: PCX

DURATION: 7 to 30 Calendar Days

ASSOCIATED EFFORT: None

APPROXIMATE COSTS: PCX overhead

3.0 Model Certification/Approval Process – Summary of Costs and Durations

Table 1 contains an estimate of the range of total costs and durations for the entire model certification/approval process, depending on the review level needed for the model. Table 2 is summary of the range of estimated costs for each individual task, and Table 3 is a summary of the range of estimated labor hours needed for each task.

Review Level	Cost	Duration
Extensive	> \$100,000	> 12 months
Intermediate	\$50,000 - \$125,000	9 - 12 months
Limited	\$22,000 - \$75,000	6 - 9 months
General	\$22,000 - \$50,000	6 months

Table 1: Model certification/approval total cost and duration estimates.

Table 2: Model certification/approval estimated cost ranges by task.

Task	Description	Low Cost	High Cost	Low Cost	High Cost	Low Cost	High Cost
1	Proponent initiates consultation with PCX	\$1,000	\$1,000	\$1,000	\$2,000		
2	Proponent works with PCX to identify potentially acceptable models	\$125	\$3,000	\$1,000	\$2,000		
3	PCX identifies review coordinator and works with proponent to identify and establish review coordinator functions	\$500	\$1,000	\$125	\$500		
4	Proponent provides preliminary model documentation to review coordinator	\$1,000	\$3,000	\$500	\$1,500		
5	PCX determines level and scope of review required and establishes review expectations			\$1,000	\$3,000		
6	PCX identifies necessary review resources			\$1,000	\$3,000		
7	PCX coordinated drafting of certification/approval plan package	\$1,000	\$3,000	\$1,000	\$3,000		
8	PCX transmits certification/approval plan package to HQUASACE for review and concurrence			\$500	\$500		
9	HQUASACE reviews review plan package and approves/disapproves	HQUASACE ACTIVITY					
10	Fund review	\$1,000 to \$5,000				\$2,000	\$200,000
11	PCX holds coordination meeting(s)	\$1,000	\$3,000	\$1,000	\$5,000		
12	Conduct review			\$1,000	\$3,000		
13	Proponent responds to any review comments	\$2,000	\$5,000	\$500	\$1,000		
14	PCX back checks review comments			\$1,000	\$3,000		
15	Proponent addresses shortcomings	\$1,000	\$10,000	\$500	\$1,000		
16	PCX prepares recommendation package and transmits to HQUASACE for review and concurrence	\$1,000	\$1,000	\$1,000	\$2,000		
17	HQUASACE reviews PCX recommendation package and prepares memorandum of approval/disapproval	HQUASACE ACTIVITY					
18	PCX adds the certified/approved model to the National Toolbox						
Estimated Potential Ranges (Total)		\$9,625	\$35,000	\$12,125	\$35,500	\$2,000	\$200,000

Table 3: Model certification/approval estimated task and labor duration ranges needed by task.

Task	Description	Task Duration (calendar days)		Estimated Proponent Labor (FTE-days)		Estimated PCX Labor (FTE-days)	
		Low Duration	High Duration	Low Cost	High Cost	Low Cost	High Cost
1	Proponent initiates consultation with PCX	7	7	1	1	1	2
2	Proponent works with PCX to identify potentially acceptable models	7	7	0.1	3	1	2
3*	PCX identifies review coordinator and works with proponent to identify and establish review coordinator functions	5	7	0.5	1	0.1	1
4	Proponent provides preliminary model documentation to review coordinator	7	14	1	3	0.5	1.5
5	PCX determines level and scope of review required and establishes review expectations	7	14			1	3
6	PCX identifies necessary review resources	7	30			1	3
7	PCX coordinated drafting of certification/approval plan package	7	21	1	3	1	3
8	PCX transmits certification/approval plan package to HQUISACE for review and concurrence	7	14			0.5	0.5
9	HQUISACE reviews review plan package and approves/disapproves	30	30	HQUISACE ACTIVITY			
10	Fund review	7	60	1 to 5			
11	PCX holds coordination meeting(s)	7	30	1	3	1	5
12	Conduct review	30	90			1	3
13	Proponent responds to any review comments	7	30	2	5	0.5	1
14	PCX back checks review comments	7	30			1	3
15	Proponent addresses shortcomings	7	30	1	10	0.5	1
16	PCX prepares recommendation package and transmits to HQUISACE for review and concurrence	7	7	1	1	1	2
17	HQUISACE reviews PCX recommendation package and prepares memorandum of approval/disapproval	30	30	HQUISACE ACTIVITY			
18	PCX adds the certified/approved model to the National Toolbox	7	30				
Estimated Potential Ranges (Total)		193	481	10	35	11	31

Attachment 1

Model Certification/Approval Plan Template

Note: This template contains suggested language that can be used in the model certification/approval plan. A separate plan should be created for each model under consideration. Text in BLUE should be edited before finalizing.

1. Purpose: The purpose of this review plan is to outline the requirements necessary for review of the “Insert Model Name, Model Version or Release Date”, as submitted from “Insert proponent name” to “Insert PCX name” in support of the Certification/Approval for Use (if model is only applicable to a certain region, indicate the region)/Approval for Single Use (Insert study) of the model. The technical quality, system quality, and usability (if one of these criteria are not applicable, include a statement and justification to that affect – for instance, system quality may not be pertinent if the model is not a software application) of the model will be reviewed, as well as its conformance with current Corps policy.

2. References and Guidance:

EC 1105-2-412, Assuring Quality of Planning Models. March 31, 2011.

3. Background:

Provide sufficient background on the model indicating, if available: model development history and model version, model platform, purpose, and applicability, who the model was developed by, overview of model inputs and outputs, and summary of previous model applications.

4. Documentation to be provided by proponent:

Insert name/reference of all documents to be provided to the reviewers. Any of the following documents, if available, should also be included as part of the review plan submittal. Model documentation can include the model itself (e.g. software, spreadsheet, guidebook, etc), associated users manuals and/or model appendices, supporting literature (e.g. journal articles, technical notes, etc), and any completed or ongoing QA/QC or previous model review documentation. One of the items in the documentation package should be a completed version of the outline contained in Table 2 of EC 1105-2-412 (included here as Supplement 1).

a) Model Technical Documentation

Insert document names and full citation if available.

b) Model User Documentation

Insert document names and full citation if available and applicable. If not available or applicable indicate N/A and reason.

c) Model Support Literature

Insert document names and full citation if available and applicable. If not available or applicable indicate N/A and reason.

d) Model QA/QC Documentation/Activities

Insert document names and full citation if available and applicable. If not available or applicable indicate N/A and reason.

5. Type/Scope of Review

Per EC-1105-2-412, 31 March 2011, the model is recommended to undergo an Extensive/Intermediate/Limited/General Review, which is applicable to... (select appropriate description from below):

Extensive: highly complex models used in decision-making where there could be a high risk of making an incorrect investment decision that could result in major negative impacts.

Intermediate: models of lesser complexity with lower risks of making an incorrect investment decision that could result in minimum impacts.

Limited: routine and non-complex models that have a minor impact on project decision-making.

General: frequently used models that have withstood historical informal reviews, have been developed according to prescribed standards, and have been thoroughly tested and validated.

The following language defines the scope of the review and will be provided to the model reviewers:

a) Preliminary charge for reviewers of *Insert Model Name, and Version or Release Date*

Input being sought to help the US Army Corps of Engineers *Insert Appropriate PCX* determine the degree to which the subject model can be described as technically sound relative to its design objectives. In addition to the underlying theory, conceptualization, and computational aspects of the model, reviewers are asked to comment on aspects of the model that potentially affect its usability and reliability as a potential producer of information to be used to influence planning decisions.

While the specific review questions included below are intended to prompt the reviewer for information specific to the efforts to *certify/approve for use (list region if applicable)/approve for single use (list study)*, please feel free to offer comments believed relevant and appropriate to any elements of the technical quality and usability of the model(s) as documented in the provided review materials. Accordingly, please provide responses to the sought scientific and technical topics listed below and perform a broad review of the *Insert Model Name* focusing on your areas of expertise, experience, and technical knowledge. Listed below are the model review charge questions.

Note that the following questions are provided as examples and should be modified as needed. Depending on the model and its purpose, not all questions listed below may be relevant, and additional questions may need to be added.

General Questions

1. Are the model's design objectives and intended uses clearly communicated?
2. To what extent does the model meet the expressed design objectives?
3. To what extent is the model suitable for the expressed intended uses?

Technical Quality

4. Comment on the quality of the model's technical documentation.
5. Comment on the technical quality of the model relative to its expressed design objectives.
6. Comment on the temporal and spatial granularity/resolution with which the model is designed to be applied.

7. Comment on the geographic range/applicability of the model. Could the model be applied to a broader geographic range with modifications to the variables/functions?
8. Comment on the degree to which the assumptions and limitations of the model are clearly communicated.
 - a. Comment on the degree to which apparent limitations impact the ability of the model to be used for characterization of the simulated system/resources.
 - b. Comment on the degree to which apparent limitations impact the ability of the model to be used for forecasting of the simulated system/resources.
 - c. Comment on the degree to which apparent limitations impact the ability of the model to be used for planning and forecasting of impacts resulting from a project or action.
 - d. Please provide recommendations for resolving or overcoming identified limitations.
9. Comment on the degree to which the model is based on well-established contemporary theory.
10. Does the model adequately emulate or otherwise address the suite of critical attributes necessary to characterize system/resources?
11. Does the model effectively allow for reasonable variation of variables critical to the intended uses (i.e., application of the model during planning of water resource activities)?
12. Are the input requirements of the model evident to the user (i.e., types of inputs as well as assumed/intended accuracy and precision)?
13. Is it evident to the user how the inputs are used by the model?
14. Comment on sensitivities of the model and identify the variables/factors to which the model is most sensitive.
15. Comment on the precision and accuracy of the model outputs and identify which variables/factors have the greatest impact on model precision and accuracy.
16. Are assumptions critical to valid application clearly identified and characterized such that violation of a critical assumption would be apparent to the user?
17. Comment on the degree to which model assumptions might invalidate the model's use for specific applications.
18. Comment on the degree to which the model facilitates/accommodates sensitivity, uncertainty, and risk analyses.
19. Comment on the degree to which the model can be used as a tool to forecast conditions anticipated to occur during the period of analysis.
20. Are the formulas used in the model(s) correct?
 - a. Are model computations adequately documented?
 - b. Are model computations correct throughout the document?
 - c. Are model computations (mathematical logic) appropriate?
21. Comment on the degree to which the model is consistent with USACE policies and accepted procedures.
22. Comment on the degree to which the model is configured to accept/facilitate modification of assumptions and inputs regarding future global events such as, but not limited to, global climate change.

System Quality

23. Comment on the hardware, software, and operating system requirements of the model (if any) and the degree and the degree to which they complicate use of the model.
24. Comment on the degree to which the model has been tested for errors.

25. Comment on the capacity of the model to inform users of erroneous or inappropriate inputs.
26. Comment on the degree to which post-audits of model applications are documented (i.e., documentation of a validation process whereby statistical comparisons of conditions resulting from a planned action/project are made to model outputs produced during the planning of the action/project)? If so:
 - a. do results of the validation process indicate the model's tendency to reasonably characterize existing conditions;
 - b. do results of the validation process indicate the model's tendency to reasonably forecast future conditions; and
 - c. what model outputs were found to most greatly deviate from actual conditions (please comment on the likely cause of the deviation if possible)?

Usability

27. Is user documentation user friendly and complete?
28. Comment on the model's practicality and application/input requirements.
29. Comment on the availability of the data required by the model.
30. Comment on the understandability of model output(s).
31. Comment on the transparency of model output(s).
32. Comment on how useful the model is for characterization of near-term conditions.
33. Comment on how useful the model is for characterization of future conditions
34. Comment on the usability of the model for selecting the best course/plan of action.
35. Comment on your perception of the level of difficulty likely to be encountered when attempting to assess the model's sensitivities to alternative ranges/values of inputs?
36. Are the model's functions and computations transparent and do they allow for easy verification of calculations and outputs?
37. Comment on the model's ease of use.

6. Description of Review Tasks

a) Reviewers will review all documentation provided, as per the scope of review outlined above.

b) Reviewers will provide comments regarding the model. Comments should follow a four part structure:

1. The nature and substance of the review concern in terms of technical quality, system quality, or usability.
2. The basis for the concern
3. The significance/impact of the concern as it relates to technical quality, system quality, or usability.
4. The probable specific action needed to resolve the concern
- 5.

The comment should also indicate whether it is related to the technical quality, system quality, or usability of the model.

c) The Proponent will prepare preliminary responses to all comments. Responses, at a minimum, will include whether or not the proponent concurs with the comments, and what actions will be take to address the comment concern.

c) At the discretion of the PCX, the reviewers may back check proponent responses. Final back check of comment responses is always the responsibility of the PCX.

7. Certification Review Team Composition

The following disciplines have been identified as needed to conduct the review. [Insert review disciplines needed and qualifications needed \(such as years of experience, academic credentials, knowledge of specific model elements, etc.\)](#)

[If specific reviewers have been identified at this stage, list the reviewer name, affiliation, and biography.](#)

Example:

The model reviewers will include the following:

- 1) [Plan Formulation Expert. The reviewer will have an understanding of USACE ecosystem restoration planning policies and demonstrated experience/expertise with application of models during the planning and evaluation of ecosystem restoration projects or regulated activities, with one or more degrees in planning, biology, engineering, or physical sciences.](#)
- 2) [Wetland Ecologist. The reviewer will have demonstrated experience/expertise in the wetland ecology of the southeastern Coastal Plain. Reviewer will be knowledgeable in southeastern riverine wetlands, including headwater systems and large floodplain systems \(bottomland hardwoods\) and be familiar with ecosystem output evaluation, particularly the HGM approach. They will have one or more degrees in wildlife biology, ecology or a closely-related discipline.](#)
- 3) [Spreadsheet Auditor/Specialist. The reviewer will have demonstrated experience with the development, testing of spreadsheets for purposes of characterizing functionality and ease of use, identifying errors, characterizing susceptibility to delivering flawed results, and developing/prioritizing recommendations for enhancing the potential to deliver reliable information with the reviewed spreadsheet\(s\)](#)

8. Schedule of Deliverables

Insert an anticipated schedule for major tasks/deliverables:

Example:

Task	Milestone Date / Dates	Activity	Working Days
	21 Jan 11	(Funding in place for model review team)	
1	21 Jan 11	Provide model documentation to reviewers	
2	26 Jan 11	Kickoff meeting	--
3	4 Mar 11	Receive review comments	27
4	11 Mar 11	Meeting to discuss findings	5
5	25 Mar 11	Proponent addresses comments and issues	10
6	8 Apr 11	PCX backcheck of responses and revisions	10
7-8	NLT 6 May 11	PCX prepares final model review report, certification and recommendation	10

9. Cost Estimate

Insert anticipated cost to conduct review by task, and organization (refer to SOP for guidance)

Example:

	Hours	Rate	Cost
USACE Labor:			
PCX review manager	32		\$ 4,000
Model Review and Testing:			
Economics	120		\$ 15,000
Spreadsheet Functionality	40		\$ 5,000
Non-USACE Labor and Expenses:			\$ --
Grand Total:			\$ 24,000

Supplement 1: Model Documentation Outline

Complete Outline and include as part of model documentation. If item is not applicable to the subject model, indicate N/A. These can also be used to develop the charge questions.

- a. Model Name
- b. Functional Area
- c. Model Proponent
- d. Model Developer

Background

- a. Purpose of Model
- b. Model Description and Depiction
- c. Contribution to Planning Effort
- d. Description of Input Data
- e. Description of Output Data
- f. Statement on the capabilities and limitations of the model
- g. Description of model development process including documentation on testing conducted

Technical Quality

- a. Theory
- b. Description of system being represented by the model
- c. Analytical requirements
- d. Assumptions
- e. Conformance with Corps policies and procedures
- f. Identification of formulas used in the model and proof that the computations are appropriate and done correctly

System Quality

- a. Description and rationale for selection of supporting software tool/programming language and hardware platform
- b. Proof that the programming was done correctly
- c. Availability of software and hardware required by model
- d. Description of process used to test and validate model
- e. Discussion of the ability to import data into other software analysis tools

Usability

- a. Availability of input data necessary to support the model
- b. Formatting of output in an understandable manner
- c. Usefulness of results to support project analysis
- d. Ability to export results into project reports
- e. Training availability
- f. Users documentation availability and whether it is user friendly and complete
- g. Technical support availability
- h. Software/hardware platform availability to all or most users
- i. Accessibility of the model
- j. Transparency of model and how it allows for easy verification of calculations and outputs

