NEI 16-05: External Flooding Assessment Guidelines

NEI Fukushima Flooding Task Force

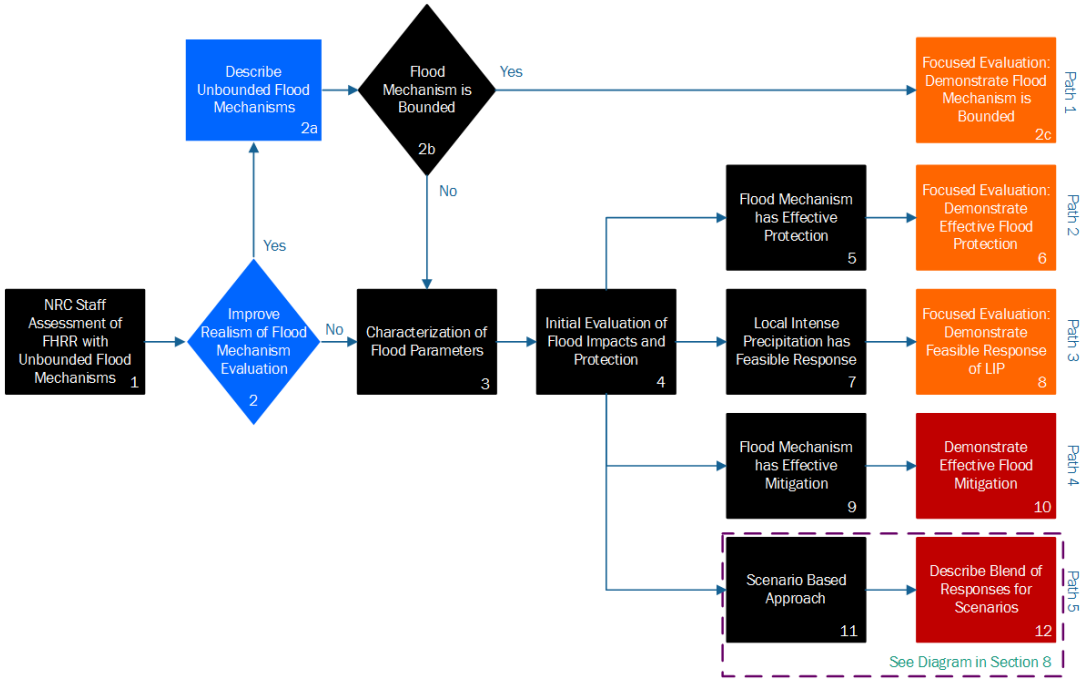
NRC Public Meeting

March 15, 2016 • NRC HQ One White Flint

Purpose of NEI 16-05

- Develop a graded approach in meeting the 50.54(f) request and incorporating concepts of the related COMSECYs
- Goals of development of NEI 16-05
  - Focus on sites with the most potential for safety enhancements
  - Improve realism in establishing the bounding hazard
  - Consider flood protection and available physical margin
  - Build on information developed in MSAs
  - Allow for consideration of initiating event frequency

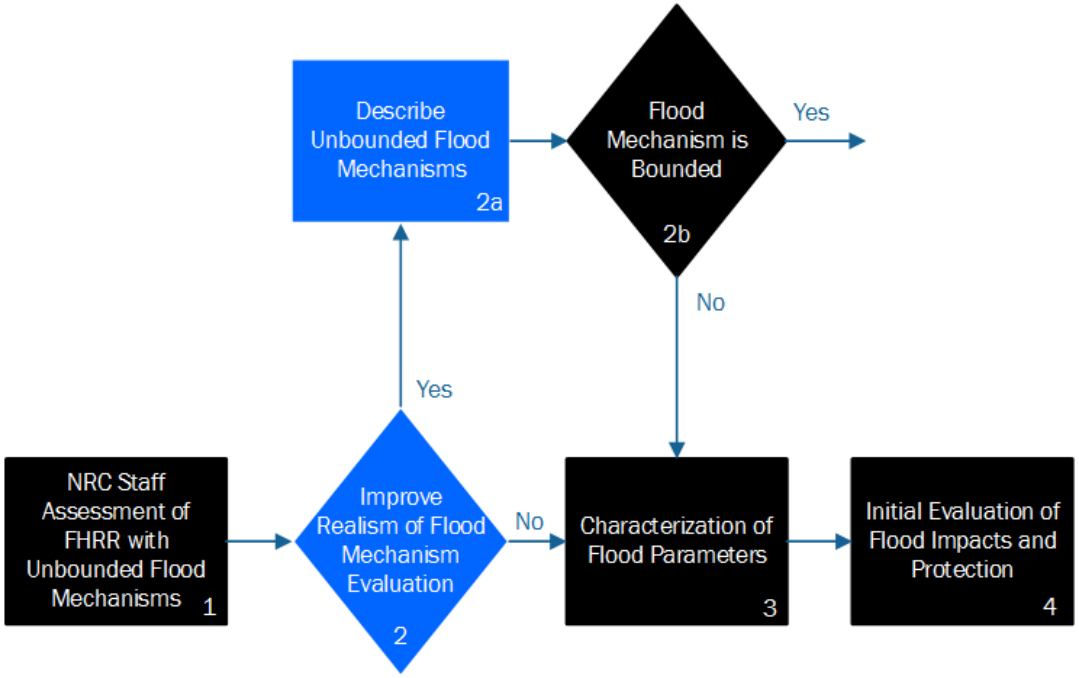
Flooding Impact Assessment Process



Flooding Impact Assessment Process

Path	Required level of Evaluation	Elements to be Evaluated	Relevant Guidance
Path 1 (Section 7.1)	Flood Hazard Evaluation	Flood Mechanism Parameters	NEI 16-05 Appendix A
Path 2 (Section 7.2)	Effective Flood Protection	Available Physical Margin	NEI 16-05 Appendix B
		Reliability of Protection Features	NEI 16-05 Appendix B
		Dependable Site Response	NEI 16-05 Appendix C
Path 3 (Section 7.3)	Feasible Flood Response (Protection and/or Mitigation)	Reliability of Protection Features and Mitigation Equipment	NEI 12-06
		Feasibility of Manual Actions	
Path 4 (Section 8.1)	Effective Flood Mitigation	Reliability of Mitigation Equipment	NEI 16-05 Appendix B
		Dependable Site Response	NEI 16-05 Appendix C
Path 5 (Section 8.2)	Scenario Based Approach (Blend of Responses)	Various	Various

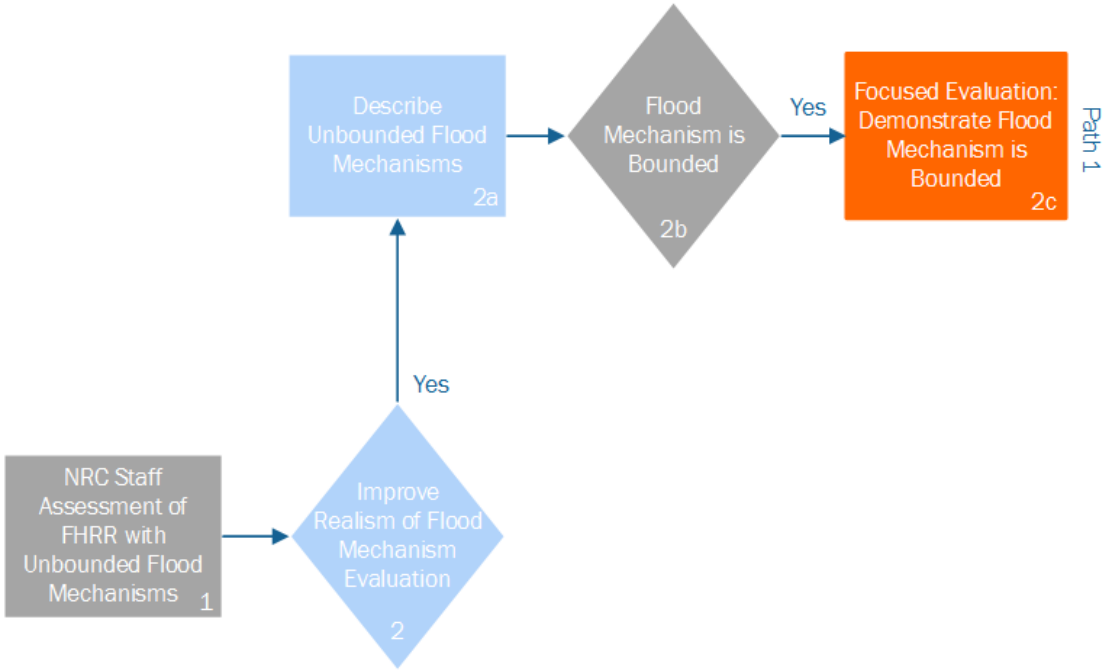
Initial Evaluation Process



Initial Evaluation Process

- Process Steps
  - Identification of unbounded flood mechanisms
  - Improve realism of flood mechanisms using Appendix A (Optional)
  - Characterize flood parameters for each mechanism
  - Identification Key SSCs (associated with failure of Key Safety Functions)
  - Identification of flood impacts on Key SSCs for each mechanism
    - Identify critical elevations
    - Identify flood protection features
    - Determine APM
  - Decision of evaluation path for each mechanism

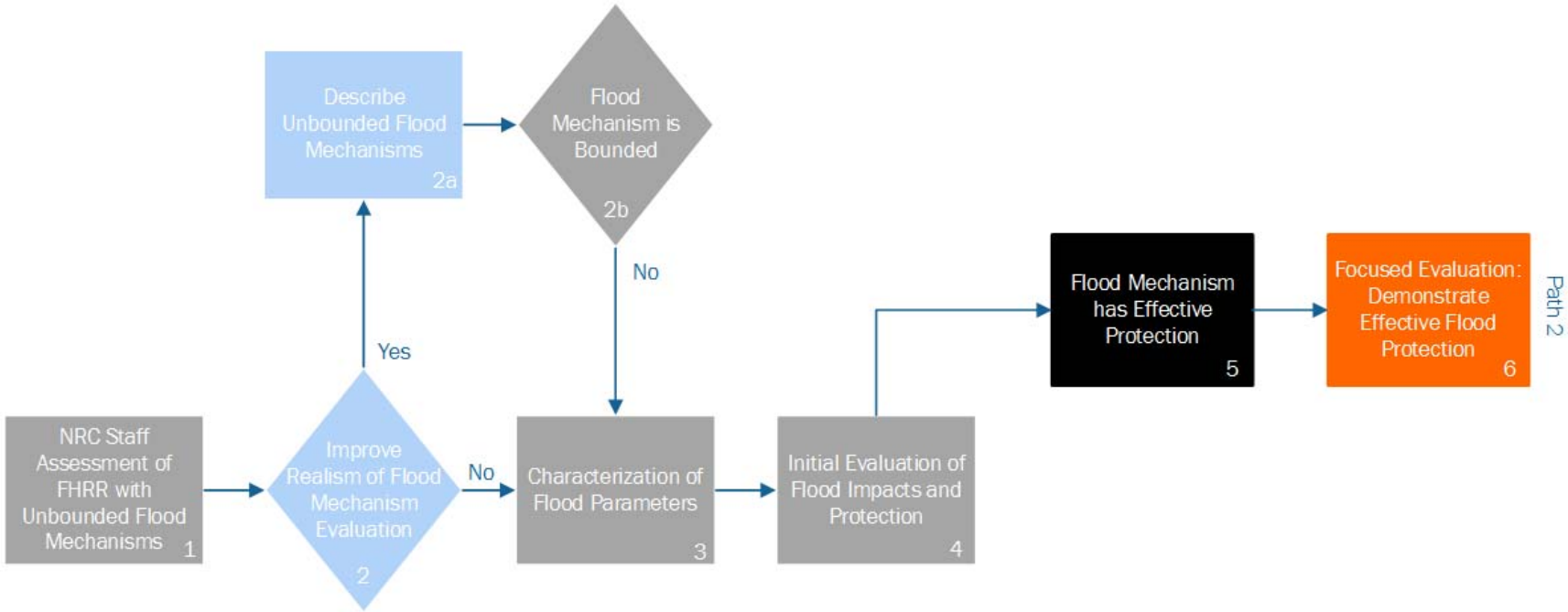
FE Path 1: Bounded Flood Mechanism



FE Path 1: Bounded Flood Mechanism

- Process steps for each mechanism:
  - Comparison of revised flood parameters to design/licensing basis flood parameters
  - Demonstrate that all parameters are bounded

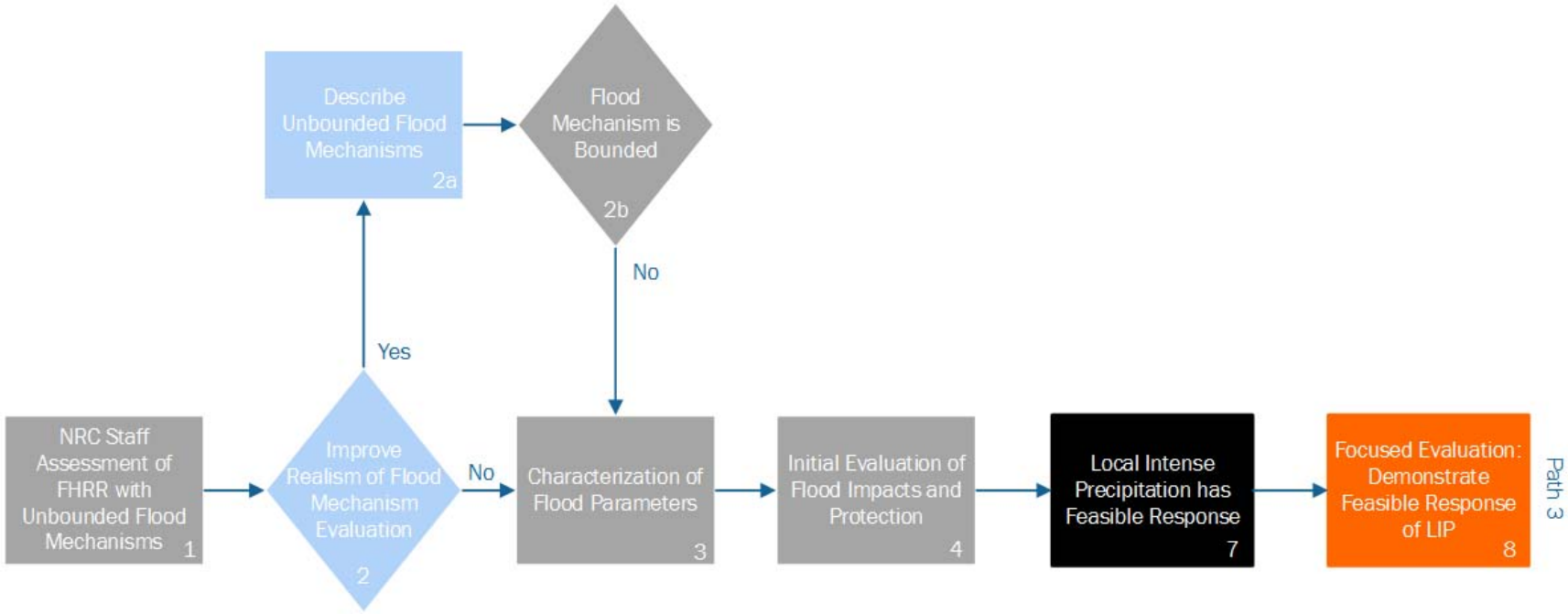
FE Path 2: Effective Protection



FE Path 2: Effective Protection

- Process steps for each mechanism
  - Demonstrate available physical margin is adequate (Appendix B)
  - Passive and/or active flood protection features are reliable (Appendix B)
  - Site response is dependable (Appendix C)

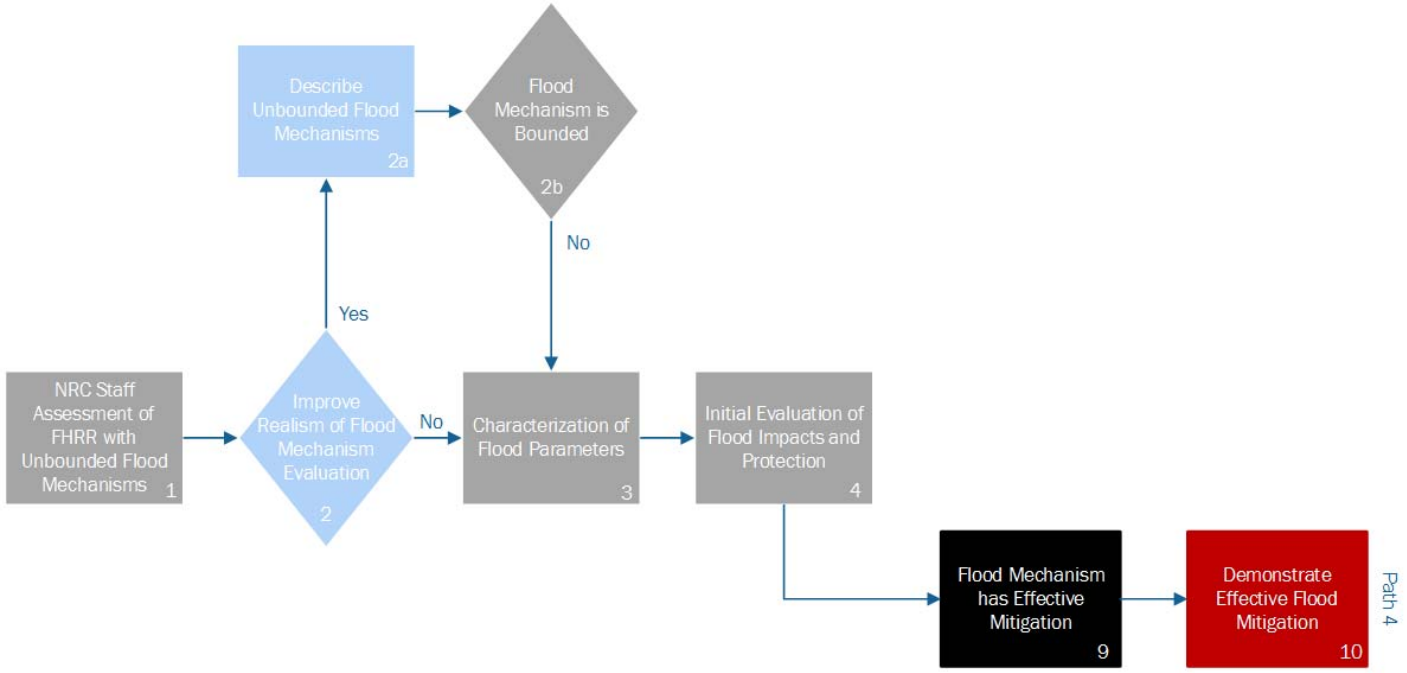
FE Path 3: Feasible Response to LIP



FE Path 3: Feasible Response to LIP

- Process steps for LIP mechanism
  - Evaluate MSA information and determine if appropriate to use
  - Describe feasible response using NEI 12-06 and utilize information from MSA

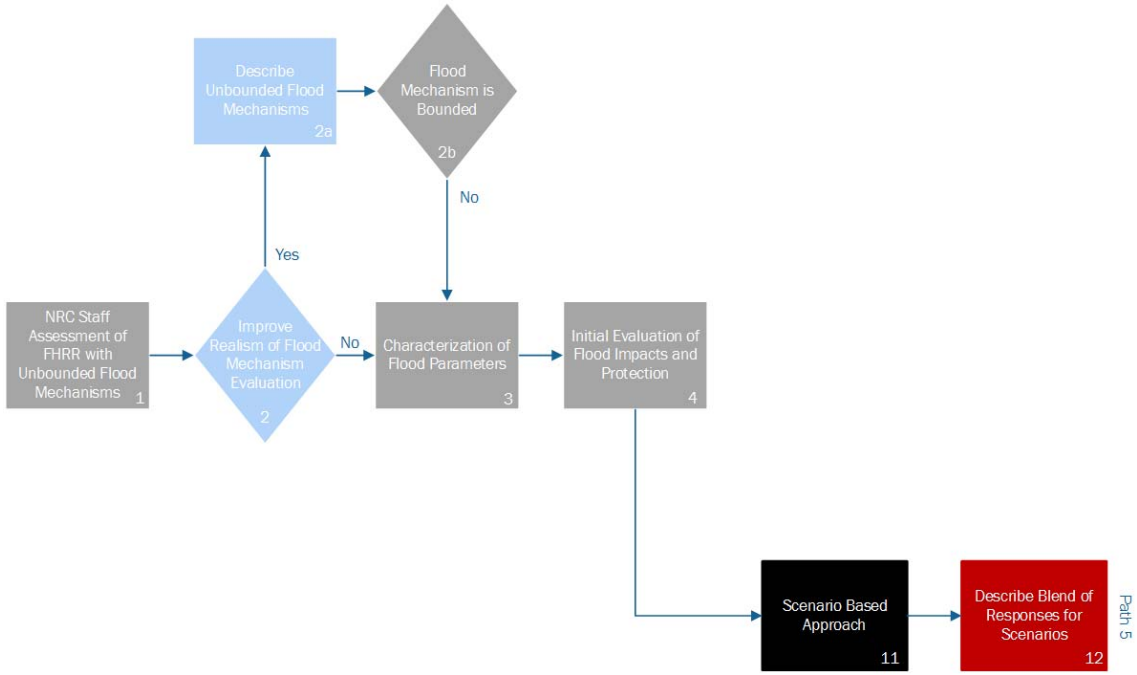
IA Path 4: Effective Flood Mitigation



IA Path 4: Effective Flood Mitigation

- Process steps for each mechanism:
  - Demonstrate that the mitigation equipment is reliable (Appendix B)
  - Site response is dependable (Appendix C)

IA Path 5: Scenario Based Approach



Appendix A

- Reduction of Conservatisms
  - Provides a catalog of potential conservatisms to consider (e.g combined effects, storm drains)
  - Discuss basis of why reducing conservatism is appropriate and evaluation is still bounding
  - Address any actions to validate new assumptions
- EPRI developing a report on improving realism in flood hazard development

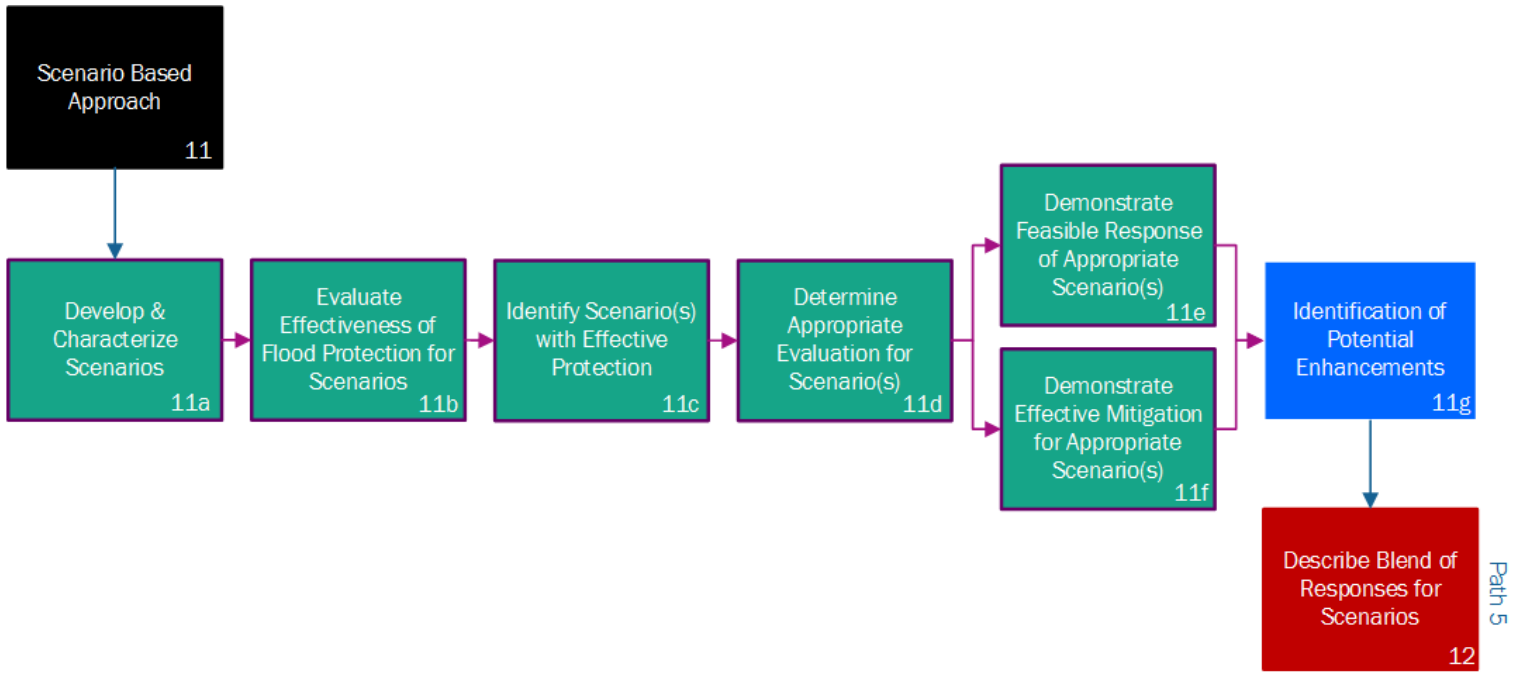
Appendix B

- Evaluation of Passive and Active Components
  - Determination of available physical margin and adequacy
    - Features engineered in the design/licensing basis as having a flood protection function
    - Features engineered for a purpose other than flood protection in the design/licensing basis but are now being credited.
  - Guidance on reliability of passive and/or active flood protection features

Appendix C

- Evaluation of Site Response
  - Define critical path and identify TSAs
  - Determine if individual TSAs are feasible using NEI 12-06
  - Determine if overall site response is dependable:
    - Clear procedural triggers
    - Established organizational response
    - Detailed flood response timeline
    - Considers environmental conditions
    - Determine overall site response time margin is adequate

IA Path 5: Scenario Based Approach (Detailed)



Example of Scenario Development

Scenario	WSE (ft)
Scenario 1	105
Scenario 2	107
Scenario 3	110

- Site with ground elevation at 100 ft
- Flood barrier height of 105 ft
- A transformer for offsite power or emergency diesel generators at 107 ft
- Maximum still water elevation of 110 ft from the PMF

Determining Appropriate level of Evaluation

Scenario	WSE (ft)	Scenario Frequency (1/yr)	Response Strategy to be Demonstrated
Scenario 1	105	7.3E-3	Effective Protection
Scenario 2	107	1.0E-4	Effective Mitigation
Scenario 3	110	<<1.0E-4	Feasible Response