



FENOC – NRC Pre-Submittal Meeting
Proposed Request for Licensing Action
Perry Flood Hazards
June 29, 2017

FENOC – NRC Pre-Submittal Meeting

Proposed Request for Licensing Action

Perry Flood Hazards

- Introductions
- Meeting Purpose
 - Site Design Basis External Flood Hazard Reconstitution direction and scope of License Amendment Request
- Topics for today's discussion
 - History
 - Flood Hazards
 - Proposed Licensing Action Scope
 - Requested Licensing Action

FENOC Representatives

- ❑ Ben Huck, Manager – Design Engineering
- ❑ Tom Lentz, Manager – Fleet Licensing
- ❑ Phil Lashley, Supervisor – Fleet Licensing
- ❑ Mark Bensi, Design Engineering
- ❑ John Sabo, Design Engineering
- ❑ Steve Osting, Project Manager
- ❑ Kathy Nevins, Fleet Licensing

History

March 12, 2012;
NRC Issues
50.54(f) letter

April 11, 2013;
Prompt
Functionality
Assessment
Condition Report
2013-05625,
Updated by CR
2015-05079 and
2015-08036

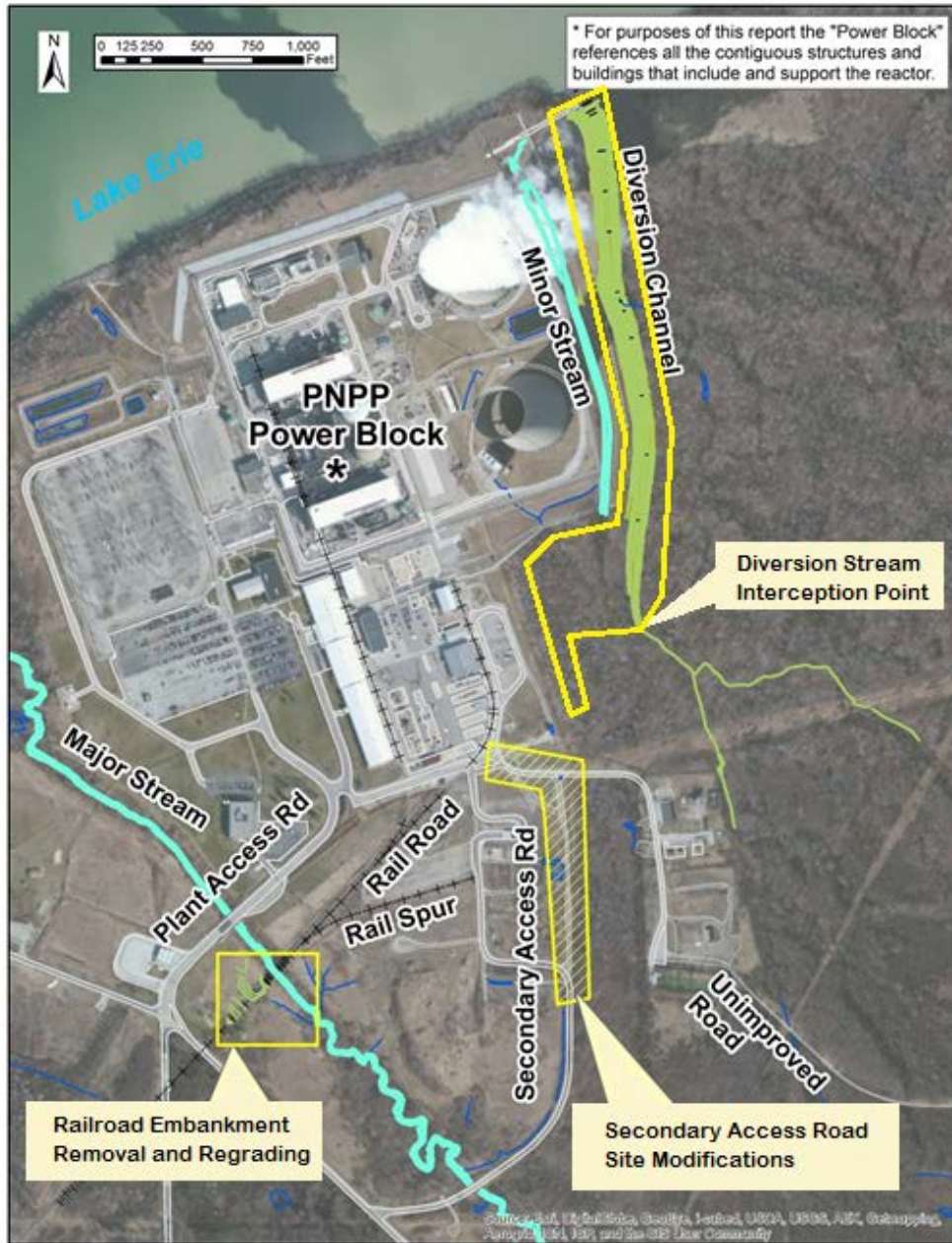
March 10, 2015;
Rev. 0 Flood
Hazard Re-
evaluation Report
(FHRR) Submitted

November 3, 2015;
New Diversion
Channel and
Stream
Modifications, Field
Implemented

March 24, 2016;
Rev. 1 Flood
Hazard Re-
evaluation Report
Submitted

July 25, 2016;
NRC Interim Staff
Response –Flood
Hazard Re-
evaluation Report
Audit

July 25, 2017;
Submittal to NRC of
Mitigating
Strategies
Assessment
Summary
Document



Flood Hazards

- ❑ Dam Breaches and Failures
 - ❑ No traditional dams in Perry watershed
- ❑ Storm Surge and Seiche
 - ❑ Passively protected by bluff height
- ❑ Tsunami – N/A
- ❑ Ice-Induced Flooding – N/A,
 - ❑ High bluffs, stream ice blockage bounded by all-season event
- ❑ Channel Migration or Diversion – N/A
 - ❑ No cooling water channels exist
- ❑ Flooding in Streams and Rivers
 - ❑ New diversion channel installed
 - ❑ Railroad embankment removed for major stream
 - ❑ Secondary access road raised
- ❑ LIP
 - ❑ Reevaluation of LIP remains a challenge



Proposed Request for Licensing Action Scope

- ❑ All hazards with the exception of LIP have been mitigated.
 - ❑ Site drainage
- ❑ Items required for Design Basis LIP analyses and mitigation in proposed licensing action scope:
 - ❑ Technical Specification for time-based warning protection
 - ❑ Incorporated barriers for mitigation of LIP event
 - ❑ FLO-2D computer program
 - ❑ Credit all building exteriors as flood boundaries
 - ❑ Credit plant storm system

Time-Based Warning Protection

(License Amendment Request)

- ❑ Provide “Hardened Protection” for all events up to and including the Standard Project Storm/Standard Project Flood (SPF)
 - ❑ Standard Project Storm (SPS) for PNPP determined to be 28.4% of PMP
 - ❑ SPS determined using the guidance of EM 1110-2-1411
 - ❑ SPS process provides an event “reasonably characteristic of the region”
 - ❑ SPF results will be developed using process consistent with LIP PMF (FLO-2D)
- ❑ Technical Specification to provide limiting condition for operations for potential flood conditions
- ❑ Proceduralized response for events in excess of SPS/SPF
 - ❑ Advanced warning to be received from FE Meteorology Dept.
 - ❑ Warning response to be incorporated into plant procedures
 - ❑ Plant personnel to deploy temporary “incorporated barriers”
 - ❑ Similar to approach adopted for Beyond Design Basis hazards
- ❑ Similar in concept to Regulatory Position 2 of RG 1.59, Rev. 2
 - ❑ Warning time will be sufficient to reach cold shutdown, if required
 - ❑ SSCs needed for cold shutdown will utilize temporary barriers for PMF effects

Incorporated Barriers for Mitigation of LIP Event

(License Amendment Request)

- ❑ LIP remains an issue, anticipated flood levels may exceed doors thresholds, installation of flood panels, ramps, thresholds needed to mitigate event
- ❑ Incorporated barriers
 - ❑ Permanent ramps
 - ❑ Permanent door thresholds
 - ❑ Permanent/temporary flood panels
- ❑ Preventative maintenance

Flood Barriers for Mitigation of LIP Event

Flood Panel Storage



ESW Pumphouse Ramp



Flood Panel & Threshold



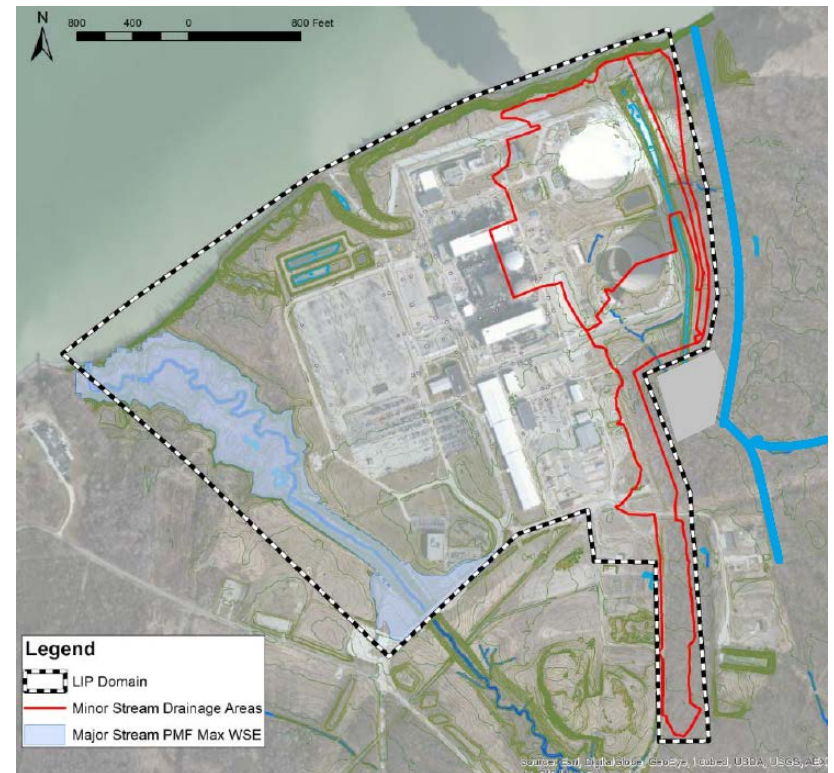
FLEX Bay Ramp



FLO-2D Computer Program

(License Amendment Request)

- ❑ FLO-2D program employs an unsteady state modeling technique;
 - ❑ Change in analytical methodology
- ❑ Utilized in Beyond Design Basis event calculations
- ❑ Complex Flooding Simulation
 - ❑ Conservation of mass
 - ❑ Water storage
 - ❑ Site runoff
 - ❑ Timing of rainfall event
- ❑ Validation
 - ❑ Vendor Appendix B Program
 - ❑ FEMA
 - ❑ Maricopa County, Arizona



FLO-2D Computer Program

(License Amendment Request)

- ❑ FLO-2D program employs an unsteady state modeling technique
 - ❑ Also known as a transient flow technique
 - ❑ Unsteady state modeling is described in ANSI N170-1976
- ❑ Underlying computational methodology of FLO-2D, the program employs the use of the shallow water equations (also known as Saint Venant's Equations).
 - ❑ Numerical solution of these equations are referenced in Section 5.4 of ANSI N170-1976 (Reference 1 of Section 5.4.2.1 is Strelkoff's "Numerical Solution of Saint-Venant Equation" as published in ASCE's Journal of the Hydraulics Division, Jan. 1970)
- ❑ One of the key capabilities of the program is the ability to perform storage routing functions
 - ❑ Storage routing is referenced in the PNPP USAR in that the USAR credits the topographic storage of six inches of precipitation for LIP domain analyses

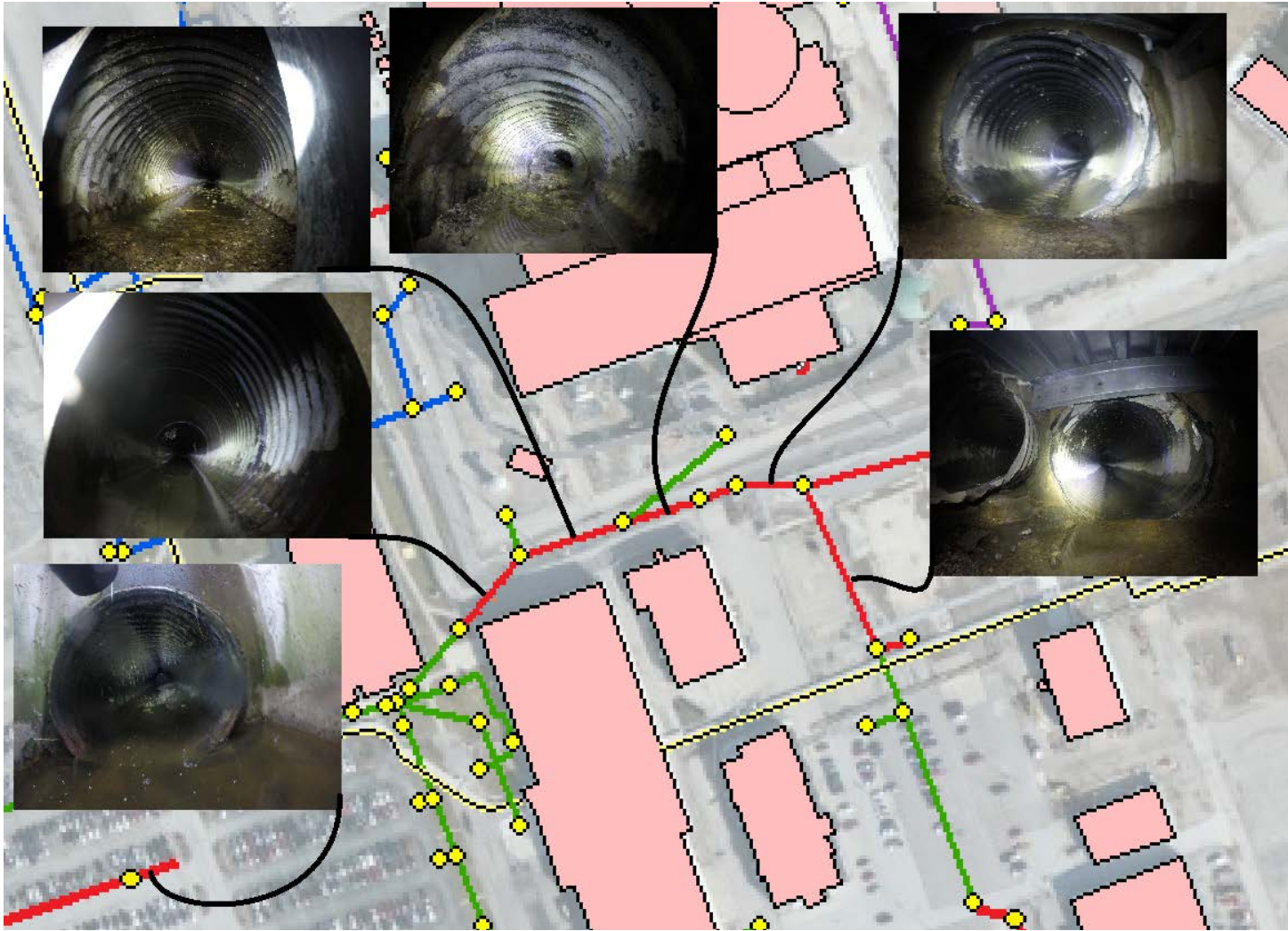
Crediting Building Exteriors (Exemption Request)

- Anticipated flood levels to exceed nuclear island
- Calculations to evaluate forces to building structures
 - Water height
 - Flow velocity
- Building construction standards (safety and non safety)
 - Concrete – ACI 318 or ACI 349
 - Steel – AISC 7th Edition
- Periodic maintenance inspections to maintain building conditions
 - Utilize existing Maintenance Rule walkdowns
 - Update to include flood protection criteria
 - Calculations for crediting structures will be established for critical characteristics for periodic inspections

Credit Plant Storm System (Exemption Request)

- Storm Sewers
 - Minimizes water surface elevation during LIP
 - Reduces duration of LIP event
 - Corrugated metal with paved invert
 - AASHTO M190 Bituminous Coated
 - AASHTO M218 Galvanized
 - Cleaned and inspected in 2016
 - Included in FLO-2D model
 - Roof drains
 - Conservatively included in FLO-2D model
 - Roof drains would result in roof storage if inoperable
- Periodic maintenance inspections to maintain conditions
 - Critical characteristics for periodic inspections will be identified

Credit Plant Storm Drain System



Requested Licensing Action

Next Step:

- ❑ Submittal planned for December 2017
- ❑ Nominal 12 month review requested
- ❑ Items required for Design Basis LIP analyses and mitigation in proposed licensing action scope:
 - ❑ Technical Specification for time-based warning protection
 - ❑ Incorporated barriers for mitigation of LIP event
 - ❑ FLO-2D computer program
 - ❑ Credit all building exteriors as flood boundaries
 - ❑ Credit plant storm drain system