Enclosure C
L-21-002

Request for Exemption No. 2
(8 pages follow)

Subject: Request for Exemption from Certain Requirements of 10 CFR 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to Credit the Plant Storm Drain System in the Mitigation of Flooding

1.0 PURPOSE

Pursuant to 10 CFR 50.12, "Specific exemptions," Energy Harbor Nuclear Corp. requests an exemption for Perry Nuclear Power Plant, Unit No. 1 (PNPP) from certain requirements of 10 CFR 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants." The requested exemption would credit the plant storm drain system, a non-safety related system, as performing a flood mitigation function for safety-related structures, systems, and components (SSCs) during external flood hazard events.

The requested exemption supports a license amendment request that includes a change in methodology used for analysis of flooding hazards at the site and a new flood hazard protection scheme. The request also supports a reconstitution effort for the design basis of the original probable maximum flood (PMF) event (small stream flood) and local intense precipitation (LIP) domain analyses (as well as other, less significant external flood hazards).

2.0 BACKGROUND

On March 12, 2012, the Nuclear Regulatory Commission (NRC) issued a letter titled, "Request for Information Pursuant to Title 10 of the *Code of Federal Regulations* 50.54(f) Regarding Recommendations 2.1, 2.3, and 9.3, of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident" (hereafter referred to as the 10 CFR 50.54(f) letter). During development of the response to the 10 CFR 50.54(f) letter, Energy Harbor Nuclear Corp. was unable to locate some of the analyses supporting the PNPP Updated Safety Analysis Report (USAR) discussions regarding external flooding hazards. As a result, Energy Harbor Nuclear Corp. initiated an effort reconstitute the design basis of the original PMF event (small stream flood) and LIP domain analyses.

In addition, throughout the life of the facility, various changes to the immediate (local) plant area have occurred that have influenced the LIP watershed. Changes such as installation of various security features (vehicle barrier system and jersey barriers, as well as the multi-layered perimeter fence) have affected the runoff characteristics of overland flow within and out of the LIP domain. Site improvement initiatives, such as the paving of grass and gravel areas, have resulted in changes to drainage patterns and runoff coefficients. These changes are being incorporated into the reconstituted analyses.

Based on the reconstituted analyses, water surface elevations (WSE) resulting from external flood hazard events are above the nominal flood elevation of doors leading into plant structures at various locations.

As described in NUREG-0887, *Safety Evaluation Report related to the operation of Perry Nuclear Power Plant, Units 1 and 2*, Section 3.4.1, "Flood Protection," the PNPP site was a "dry site" as defined in Regulatory Guide 1.102, "Flood Protection for Nuclear Power Plants," Position C.1. For the purposes of Regulatory Guide 1.102, the Design Basis Flooding Level (DBFL) is defined as the maximum water elevation attained by the controlling flood, including coincident wind-generated wave effects. In the case of a dry site, the plant is built above the DBFL, and therefore safety-related SSCs are not affected by flooding.

10 CFR 50, Appendix A, General Design Criterion (GDC) 1, "Quality standards and records," states:

> Structures, systems, and components important to safety shall be designed, fabricated, erected, and tested to quality standards commensurate with the importance of the safety functions to be performed. Where generally recognized codes and standards are used, they shall be identified and evaluated to determine their applicability, adequacy, and sufficiency and shall be supplemented or modified as necessary to assure a quality product in keeping with the required safety function. A quality assurance program shall be established and implemented in order to provide adequate assurance that these structures, systems, and components will satisfactorily perform their safety functions. Appropriate records of the design, fabrication, erection, and testing of structures, systems, and components important to safety shall be maintained by or under the control of the nuclear power unit licensee throughout the life of the unit.

10 CFR 50, Appendix A, GDC 2, "Design bases for protection against natural phenomena," states:

> Structures, systems, and components important to safety shall be designed to withstand the effects of natural phenomena such as earthquakes, tornadoes, hurricanes, floods, tsunami, and seiches without loss of capability to perform their safety functions. The design bases for these structures, systems, and components shall reflect: (1) Appropriate consideration of the most severe of the natural phenomena that have been historically reported for the site and surrounding area, with sufficient margin for the limited accuracy, quantity, and period of time in which the historical data have been accumulated, (2) appropriate combinations of the effects of normal and accident conditions with the effects of the natural phenomena and (3) the importance of the safety functions to be performed.

10 CFR 50, Appendix B, “Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants,” states, in part:

> Nuclear power plants and fuel reprocessing plants include structures, systems, and components that prevent or mitigate the consequences of postulated accidents that could cause undue risk to the health and safety of the public. This appendix establishes quality assurance requirements for the design, manufacture, construction, and operation of those structures, systems, and components. The pertinent requirements of this appendix apply to all activities affecting the safety-related functions of those structures, systems, and components; these activities include designing, purchasing, fabricating, handling, shipping, storing, cleaning, erecting, installing, inspecting, testing, operating, maintaining, repairing, refueling, and modifying.
>
> As used in this appendix, “quality assurance” comprises all those planned and systematic actions necessary to provide adequate confidence that a structure, system, or component will perform satisfactorily in service.

These criteria were satisfied in the construction of the PNPP site. The controlling flood and associated water levels impacting the PNPP site are a result of the surface drainage capabilities during the LIP event. The safety-related structures of the plant are located within the LIP domain, which is shown in Figure 2-1 below. As described in the current PNPP USAR, the floors at plant grade are nominally set at elevation (EL) 620 feet (ft) 6 inches U.S. Geological Survey (USGS).

The PNPP USAR presents elevations using a USGS datum that is equivalent to the National Geodetic Vertical Datum of 1929 (NGVD 29). A plant-specific datum for PNPP, referred to as Perry Local Datum (PLD), was established to provide NGVD 29 data corrected to local monument markers. For reference, conversion for the North American Vertical Datum of 1988 (NAVD 88), for the International Great Lakes Datum of 1985 (IGLD 85), and for PLD are provided in Table 2-1 below.

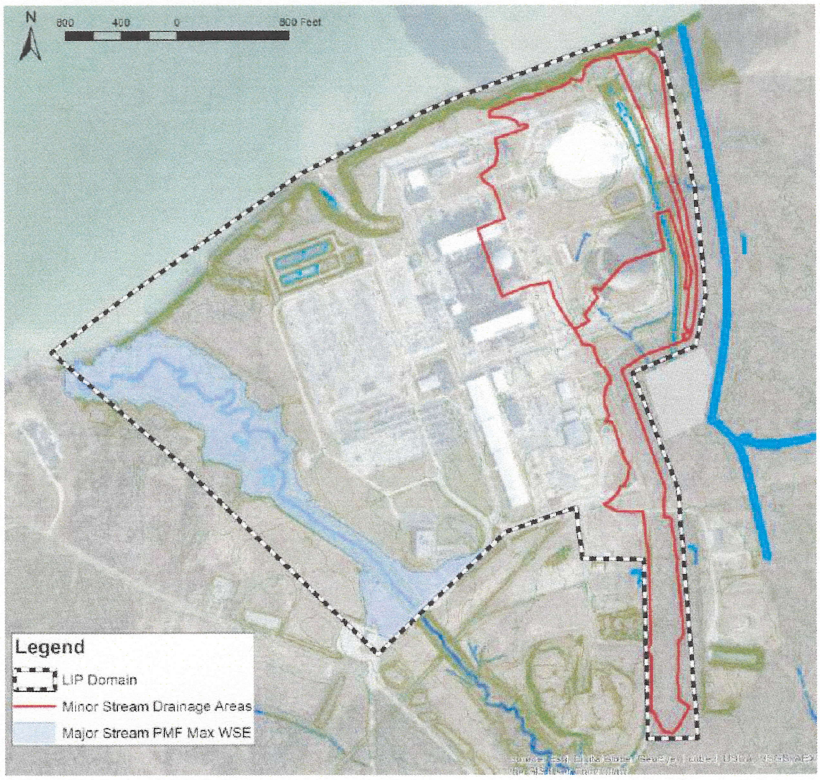
Table 2-1: General Datum Conversions

Datum Conversions (feet)			
NGVD 29	NAVD 88	IGLD 85	PLD
0.00	-0.72	-0.94	+0.21

Station structures are passively protected against water levels up to EL 620 ft 6 inches, the nominal elevation of the building floors. The below-grade portions of the structures are provided with sealed penetrations and a watertight membrane.

Plant flooding by LIP was prevented, in part, by the design of the storm drain system. In case of complete blockage of the storm drain system, the plant site was graded so that overland drainage will occur away from the plant site buildings and will not allow the accumulated storm water to exceed EL 620 ft 6 inches.

Figure 2-1: LIP Domain



Based on the higher water levels from the reconstituted analyses, use of the existing storm drain system to control the maximum water elevation during external flood hazard events is necessary to protect the site SSCs that provide a safety-related function. Because this system has already been constructed as a non-safety related system, the system was not designed, fabricated, erected, or initially tested consistent with SSCs that provide a safety-related function. It also does not fall under the scope of quality assurance program (QAP) controls. Although aspects of the QAP can be retroactively enforced, the full pedigree of the system cannot be established. Therefore, an exemption to the requirements of 10 CFR 50, Appendix B, is required.

Energy Harbor Nuclear Corp. is requesting an exemption to credit the existing non-safety related storm drain system as performing a mitigative function for safety-related SSCs during external flood hazard events.

3.0 PROPOSED EXEMPTION

As described in the PNPP USAR, Section 2.4.2.3, the site is drained by the three separate storm drainage systems, collectively referred to here as the storm drain system. The entire site area is subdivided into discrete subbasins, each having storm water inlets referred to as catch basins. Storm water flows overland for no more than 300 ft before it reaches a catch basin.

Sizing of storm drainage pipes is based upon basic hydraulic theory employing entrance, exit, and friction losses. Tailwater conditions were assumed to exist at each pipe based on the previous downstream pipe's headwater calculation. The final outlet of each storm drainage subsystem was assumed to have no downstream tailwater restrictions.

In the case of complete blockage of the storm drain system, the plant site has been graded so that overland drainage will occur away from the plant site buildings and will not allow the accumulated storm water to exceed EL 620 ft 6 inches. Therefore, water ponding at EL 620 ft 5 inches will have no adverse effect upon safety-related SSCs.

Based on the reconstituted analyses, WSEs will exceed EL 620 ft 6 inches at various site locations and reliance on the non-safety related storm drain system as being functional during the probable maximum precipitation (PMP) event, cool season PMP, and the standard project storm (SPS) is necessary. This includes all three "subsystems" (East, West, and South) of the storm drain system. The storm drain subsystems include concrete catch basins with cast iron grating, galvanized corrugated metal pipe, polyvinyl chloride (PVC) piping and concrete headwalls. The storm drain system is representatively modeled within the reconstituted analyses, accounting for the geometry, material, and layout of the piping network including the inlets. The reconstituted analysis considers all catch basins as being 50 percent blocked and the catch basin perimeter is reduced by 25 percent, accounting for debris accumulation and metal grating. Piping is analyzed with a 10 percent pipe capacity reduction, accounting for debris accumulation. In 2016, the site conducted cleaning and inspection of the storm drain system to ensure the field conditions of the system were within the bounds of the reconstituted analyses. A maintenance plan was established to conduct routine cleaning and inspection of the system. The maintenance plan is to be revised, as needed, to ensure the system conditions remain bounded by the analyses.

Regulatory Guide 1.59, "Design Basis Floods for Nuclear Power Plants," Revision 2, incorporates American National Standards Institute (ANSI) Standard N170-1976, "Standards for Determining Design Basis Flooding at Power Reactor Sites," as Appendix A to the regulatory guide. ANSI N170-1976 is considered acceptable by the NRC staff with the exception of erosion rates to earthfill or rockfill dams.

Section 5.8, "Plantsite Drainage," of ANSI N170-1976 is the governing section for the determination of the effects of local PMP on the plant site. ANSI N170-1976, Section 5.8.1.3, "Grades and Drains," also provides guidance with respect to the design of "drainage facilities." According to the standard, "drainage facilities" shall be provided such that during the local PMP the runoff is carried away without causing flooding at the safety-related facilities. Although the PNPP site is prone to flooding during the LIP event, the plant storm drain system does not cause the flood but assists in limiting the maximum WSE at the power block. The three subsystems are all generally designed with the headwaters starting near the power block, and flow is conveyed away from the plant site to nearby waterways. The ANSI standard requires site drainage be carried away as approved by appropriate local jurisdiction. For the PNPP site drainage, including the plant storm drain system, appropriate National Pollutant Discharge Elimination System permitting through the Ohio Environmental Protection Agency is in

place allowing the site to discharge into the Northwest Impoundment, Major Stream, and Remnant Minor Stream.

There are no external flooding hazards associated with a seismic event (that is, dam failure or tsunamis); therefore, seismic qualification of the storm drain system for the purposes of flood protection is not required. The pipes within the storm drain system are generally buried 4 ft to 5 ft below grade and experience an external pressure from the weight of soil [110 pounds per cubic feet (lbs/cf)] of approximately 3 pounds per square inch (psi) during normal operating conditions. The system typically operates as a gravity system with negligible internal pressures. Therefore, during normal operation, the pipe experiences a differential pressure of 3 pounds per square inch differential (psid) (3 psi external minus 0 psi internal).

During extreme weather conditions, such as the PMP, the storm drain system will surcharge and develop internal pressures. The maximum internal pressures developed within the pipes based on the static head difference between the elevation of floodwaters at the site (approximately EL 622 ft) and the outfall discharge elevation at the streams (approximately EL 606 ft) during the LIP event is estimated as 7 psi. This is a conservative internal pressure value as tailwater conditions, pipe frictional losses, and surcharge conditions at interim structures are not considered. Therefore, during the LIP event, the pipe experiences a differential pressure (7 psi internal minus 3 psi external) of 4 psid. The minimal psid change in the system from normal operating conditions (3 psid) and those present during the PMP (4 psid) represents a negligible change in differential pressure across the pipe wall. The full range of pressures that the system experiences remains insignificant when compared to the yield strength of the pipe. The chance of system failure during the LIP event is therefore remote.

Failure in underground storm drain systems are typically due to material degradation. As the material degrades, openings in the pipes can allow soil or pipe bedding material to enter the pipe. Water intrusion into the openings can transport the soil and bedding material into the pipe and eventually to nearby waterways. As this condition continues, voids around the pipe can develop and eventually lead to sink holes and pipe failure. As stated previously, a PM task is to be developed to ensure the pipes are clean as well as inspected. A properly structured PM can identify and correct pipe degradation before failure conditions exist.

The storm drain system is passive and functional during the PMP event. A PM task is to be established to ensure that the system is maintained as available. The system is expected to remain in service as there is not a reasonable cause of failure for the system during external flood hazard events; a seismic event is not postulated coincident to an external flooding event. The storm drain system is not subjected to internal working pressures of consequence during normal operation or during the extreme weather event. Therefore, taking credit for the non-safety related storm drain system as performing a flood mitigation function for safety-related SSCs during external flood hazard events is reasonable.

For the non-safety related plant storm drain system, full application of 10 CFR 50, Appendix B, requirements to categorize it as safety-related would be cost prohibitive

and would not provide an appreciable change in assurance that it would perform as intended. Because this system does not fall under specific QAP controls, an exemption in accordance with 10 CFR 50.12 is applicable. The proposed exemption is from 10 CFR 50, Appendix B, requirements to allow PNPP to credit the existing plant storm drain system, a non-safety related system, as providing adequate assurance or confidence that safety-related SSCs will satisfactorily perform their safety functions during external flood hazard events.

4.0 JUSTIFICATION OF EXEMPTION

10 CFR 50.12, "Specific exemptions," states that the NRC may grant exemptions from the requirements of the regulations of this part provided three conditions are met. They are:

(1) The exemptions are authorized by law,
(2) The exemptions will not present an undue risk to the public health and safety, and
(3) The exemptions are consistent with the common defense and security.

Energy Harbor Nuclear Corp. has evaluated the requested exemption for PNPP against the criteria of 10 CFR 50.12 and determined the criteria are satisfied as described below.

1. <u>This exemption is authorized by law.</u>

   The requested exemption is authorized by law in that no law precludes the activities covered by this exemption request. Granting of the request does not result in a violation of the Atomic Energy Act of 1954, as amended.

2. <u>This exemption will not present an undue risk to the health and safety of the public.</u>

   The underlying purpose of 10 CFR 50, Appendix A, requiring structures, systems, and components (SSCs) important to safety to be designed, fabricated, erected, and tested to quality standards commensurate with the importance of the safety functions to be performed, is to ensure the SSCs will satisfactorily perform their safety functions, and thereby protect the health and safety of the public. The underlying purpose of 10 CFR 50, Appendix B, is to ensure quality assurance requirements are applied to these SSCs to provide adequate confidence that the SSCs will perform satisfactorily in service. In the case of the reconstituted design basis external flood hazard events, use of the non-safety related plant storm drain system to mitigate flood levels and help prevent intrusion of water into these SSCs is necessary. For non-precipitation external flood hazard events, there is no need to rely on this non-safety related system for flood protection. The system has been demonstrated to have the capacity to prevent floodwaters from entering safety-related buildings, ensuring safety-related SSCs perform their safety

functions. The underlying purpose of 10 CFR 50, Appendix B, is still achieved.

The requested exemption does not create any new accident precursors. The probability and consequences of postulated accidents are not increased, and an acceptable level of external flood hazard protection is maintained. Therefore, there is no undue risk to public health and safety.

3. The exemption is consistent with the common defense and security.

   The requested exemption credits the existing non-safety related plant storm drain system to perform a flood mitigative function for SSCs during external flood hazard events. This exemption has no relation to security issues. The common defense and security are not impacted by this exemption.

In addition to the three conditions discussed above, 10 CFR 50.12(a)(2) states that the NRC will not consider granting an exemption unless special circumstances are present.

Under 10 CFR 50.12(a)(2)(ii), special circumstances are present whenever the application of the regulation in the particular circumstances would not serve the underlying purpose of the rule or is not necessary to achieve the underlying purpose of the rule. The non-safety related storm drain system has the capacity to prevent floodwaters from entering safety-related buildings, ensuring safety-related SSCs perform their safety functions. To categorize the storm drain system as safety-related would not provide an appreciable change in assurance of SSCs performance. Therefore, the underlying purpose of the rule is achieved with the non-safety related storm drain system.

5.0 ENVIRONMENTAL CONSIDERATION

Energy Harbor Nuclear Corp. is requesting an exemption from certain requirements of 10 CFR 50, Appendix B, for the Perry Nuclear Power Plant, Unit No. 1 (PNPP). Specifically, Energy Harbor Nuclear Corp. is requesting to credit the plant storm drain system, a non-safety related system, as performing a flood mitigation function for safety-related structures, systems, and components (SSCs) during external flood hazard events. The following information is provided in support of an environmental assessment and finding of no significant impact for the proposed exemption.

Energy Harbor Nuclear Corp. has determined that the exemption involves no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite; that there is no significant increase in individual or cumulative public or occupational radiation exposure; that there is no construction impact; and there is no significant increase in the potential for or consequences from a radiological accident. Accordingly, the proposed exemption meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(25). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of this proposed exemption request.