10 CFR 50.54(f)

A subsidiary of Pinnacle West Capital Corporation

Palo Verde Nuclear Generating Station

Dwight C. Mims
Senior Vice President
Nuclear Regulatory and Oversight

Tel. 623-393-5403
Fax 623-393-6077

Mail Station 7605
P. O. Box 52034
Phoenix, Arizona 85072-2034

102-06627-DCM/MAM/TLC
November 27, 2012

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
11555 Rockville Pike
Rockville, MD 20852

References: 1. NRC Letter, "*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*," dated March 12, 2012

2. NRC Letter, *Endorsement of Nuclear Energy Institute (NEI) 12-07, "Guidelines for Performing Verification Walkdowns of Plant Flood Protection Features"* dated May 31, 2012

Dear Sirs:

Subject: Palo Verde Nuclear Generating Station (PVNGS)
Units 1, 2, and 3
Docket Nos. STN 50-528, 50-529, and 50-530
Flooding Walkdown Report Requested by NRC Letter, "*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*"

On March 12, 2012, the U. S. Nuclear Regulatory Commission (NRC) issued Reference 1 to Arizona Public Service (APS). Enclosure 4 of Reference 1 contains specific Requested Actions, Requested Information, and Required Responses associated with Recommendation 2.3 for flooding. This letter provides APS's Flooding Walkdown Submittal Report in response to Reference 1 for Flooding Recommendation 2.3 for PVNGS.

For Flooding Recommendation 2.3, Enclosure 4 of Reference 1 states that within 180 days of the NRC's endorsement of the walkdown guidance (Reference 2), each addressee will submit its final response for the requested information, including a list of any areas that are unable to be inspected due to inaccessibility and a schedule for when the walkdown will be completed.

A001
NRR

The enclosure to this letter contains the Flooding Walkdown Submittal Report for PVNGS Units 1, 2, and 3, consistent with the flooding walkdown guidance NEI 12-07, "*Guidelines For Performing Verification Walkdowns Of Plant Flood Protection Features,*" as endorsed in Reference 2. There was only one inaccessible item identified during performance of the flooding walkdowns at PVNGS. Waterstops that were installed within the walls of the Auxiliary Building during construction are permanently inaccessible and cannot be inspected. Therefore, this response completes the flooding walkdown information requested in Enclosure 4 of Reference 1.

No commitments are being made to the NRC by this letter.

Should you have any questions concerning the content of this letter, please contact Mark McGhee, Operations Support Manager, Regulatory Affairs, at (623) 393-4972.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on 11/27/2012
(Date)

Sincerely,

D.C. Mims

DCM/MAM/TLC/hsc

Enclosure - Near-Term Task Force Recommendation 2.3 Flooding Walkdown Submittal Report for Palo Verde Nuclear Generating Station Units 1, 2, and 3

cc:

E. J. Leeds,	NRC Director, Office of Nuclear Reactor Regulation
E. E. Collins Jr.	NRC Region IV Regional Administrator
L. K. Gibson	NRC NRR Project Manager
M. A. Brown	NRC Senior Resident Inspector for PVNGS
G. E. Miller	NRR/JLD/JPMB

ENCLOSURE

NEAR-TERM TASK FORCE RECOMMENDATION 2.3 FLOODING WALKDOWN SUBMITTAL REPORT

FOR
PALO VERDE NUCLEAR GENERATING STATION
UNITS 1, 2, AND 3

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1.0 EXECUTIVE SUMMARY

Following the March 2011 accident at the Fukushima Dai-ichi nuclear plant, the Nuclear Regulatory Commission (NRC or Commission) established the Near Term Task Force (NTTF) in response to Commission direction. The NTTF made several recommendations, some of which are related to improving the protection of nuclear power plants against natural phenomena. With recommendation 2.3 (Rec 2.3), the NTTF recommended the NRC require licensees to perform seismic and flooding walkdowns to identify and address vulnerabilities and verify the adequacy of hazard protection features. On March 12, 2012, the NRC issued a letter, pursuant to 10CFR 50.54(f), that requests information from all power reactor licensees related to NTTF recommendations 2.1, 2.3 and 9.3. For the flooding aspect of Rec 2.3, licensees are required to perform flood protection walkdowns to identify and address plant-specific degraded, non-conforming, or unanalyzed conditions, and verify the adequacy of monitoring and maintenance procedures. This report contains the Arizona Public Service Company (APS) response to the request for information related to the flooding aspects of NTTF Rec 2.3, as addressed in enclosure 4 of the NRC letter.

To establish a consistent methodology for performance of the flooding walkdowns, Nuclear Energy Institute (NEI), in conjunction with the industry, developed guidance in NEI 12-07, "Guidelines for Performing Verification Walkdowns of Plant Flood Protection Features." This guidance was endorsed by the NRC on May 31, 2012. The flooding walkdowns at Palo Verde Nuclear Generating Station (PVNGS) were conducted in accordance with the approved guidance and were performed during the period from August 20 through September 5, 2012 while each of the three units was operating in Mode 1. The walkdowns were supplemented by additional plant walkdowns on October 29 and 30, 2012.

The below listed information addresses the requests in the 10 CFR 50.54(f) letter (in italics) followed by a summary of the PVNGS response:

a. *Describe the design basis flood hazard level(s) for all flood-causing mechanisms, including groundwater ingress.*

   The report describes the design flood hazard levels for Local Intense Precipitation, Probable Maximum Flood (PMF) on Streams and Rivers, Potential Dam Failures (Seismically Induced), and Groundwater Intrusion. The report also screened out flood hazards for Probable Maximum Storm Surge and Seiche, Probable Maximum Tsunami Flooding, Ice Effects, and Channel Diversions because these hazards are not credible at PVNGS.

   No discrepancies or contradictions in flood hazard levels were found in design or licensing basis documentation.

b. *Describe protection and mitigation features that are considered in the licensing basis evaluation to protect against external ingress of water into SSCs important to safety.*

   The report describes the site flood protection and mitigation features. These features include the East Wash embankment, East Wash rip-rap, Winters Wash embankment, building exterior walls and basemat, roof drainage systems, 45/85 acre reservoir berms, site drainage system, Diesel Generator Fuel Oil Storage Tank Manholes/Vaults, compacted fill, and site topography. No operator actions were identified that are credited for providing external flood protection and/or mitigation.

c. *Describe any warning systems to detect the presence of water in rooms important to safety.*

There are no credited water level warning systems for external flood protection in the plant's flooding licensing basis. However, there are numerous design features, both safety-related and non-safety related, that will signal the presence of water intrusion in various plant structures.

d. *Discuss the effectiveness of flood protection systems and exterior, incorporated, and temporary flood barriers. Discuss how these systems and barriers were evaluated using the acceptance criteria developed as part of Requested Information Item 1.h.*

The report discusses the effectiveness of the PVNGS flood protection features to perform their credited functions during a variety of site conditions. The evaluations and visual inspections to determine conformance with the flooding licensing basis were performed in accordance with the guidance of NEI 12-07. Flood protection features were evaluated to determine if they were included in a controlled preventative maintenance (PM) activity, surveillance test, or other monitoring program that provides reasonable assurance of continuing functionality. If a feature was not included in a controlled program that assures continuing functionality, this observation was entered into the Corrective Action Program (CAP).

All features were found to be functional. Features found to be non-conforming were entered into the CAP.

e. *Present information related to the implementation of the walkdown process (e.g., details of selection of the walkdown team and procedures,) using the documentation template discussed in Requested Information Item 1.j, including actions taken in response to the peer review.*

PVNGS implemented the walkdown process by following the guidance of NEI 12-07, Revision 0-A, with no exceptions taken. The walkdown team makeup and qualifications are described in the report. The Westinghouse personnel and APS engineers were qualified to perform walkdowns in accordance with the requirements of NEI 12-07.

No actions were required to be taken as a result of the peer review defined in Section 7 of NEI 12-07.

f. *Results of the walkdown including key findings and identified degraded, non-conforming, or unanalyzed conditions. Include a detailed description of the actions taken or planned to address these conditions using the guidance in Regulatory Issues Summary 2005-20, Rev 1, Revision to NRC Inspection Manual Part 9900 Technical Guidance, "Operability Conditions Adverse to Quality or Safety," including entering the condition in the corrective action program.*

The external flooding walkdowns identified conditions related to features that protect Seismic Category I structures from the effects of the Probable Maximum Precipitation (PMP) and PMF as well as groundwater intrusion. Conditions observed included a spoils pile obstructing a wash and non-conforming conditions associated with roof drainage systems on Seismic Category I buildings.

The conditions described above have been addressed to ensure the affected SSCs continue to be functional or operable, as applicable. These observations have been entered into the CAP.

g. *Document any cliff-edge effects identified and the associated basis. Indicate those that were entered into the corrective action program. Also include a detailed description of the actions taken or planned to address these effects.*

An agreement between the industry and the NRC established that cliff edge effects and physical margins do not need to be reported as part of the Walkdown Report. However, during performance of the walkdowns, Available Physical Margins (APM) were collected and documented, as applicable, in the Walkdown Record Forms. These record forms will be maintained onsite for future audits and inspections. Features with small APM have been entered into the CAP.

h. *Describe any other planned or newly installed flood protection systems or flood mitigation measures including flood barriers that further enhance the flood protection. Identify results and any subsequent actions taken in response to the peer review.*

Two changes were determined to be necessary as a result of the flooding walkdowns. Issues with configuration control of site drainage features during ongoing construction of new facilities were identified. Also, the need for Seismic Category I building roof drainage modifications has been identified. Design modifications will be performed as necessary to address these non-conforming conditions. Both of these conditions have actions to address the issues entered into the CAP.

The peer review encompassed the scope discussed in Section 7 of NEI 12-07.

In summary, the required PVNGS flooding protection features were inspected and evaluated and were determined to be capable of providing the level of protection credited in the PVNGS licensing basis. In addition, the site monitoring and maintenance procedures were reviewed and verified to be adequate.

2.0 PURPOSE

This walkdown report was prepared to document the results of the external flood verification walkdown of permanent structures, systems, and components (SSCs), the review of procedures used to monitor and adjust the operation of the plant during an external flood event, and inspection of the plant topography as credited in the current licensing basis (CLB) in accordance with the guidance of Nuclear Energy Institute (NEI) 12-07, Rev. 0-A (Reference 1), "Guidelines for Performing Verification Walkdowns of Plant Flood Protection Features." The walkdown was conducted in response to Enclosure 4 of the letter dated March 12, 2012 from the U.S. Nuclear Regulatory Commission (NRC) requesting information pursuant to Title 10 of the Code of Federal Regulations (CFR), Section 50.54(f) (Reference 2; herein 10 CFR 50.54(f)), which resulted from Recommendation 2.3 of SECY 11-0137 (Reference 3) prepared by the Near-Term Task Force (NTTF) review of insights from the Fukushima Dai-ichi accident. Safety-related SSCs and procedures that are credited in the CLB for protecting the plant from external flood have been identified, inspected, either through physical walkdowns or review of prior inspection documentation, and then compared to the documented acceptance criteria identified for the walkdown.

3.0 BACKGROUND

SSCs important to safety in operating nuclear power plants are designed in accordance with, or meet the intent of, Appendix A to 10 CFR Part 50, General Design Criteria (GDC) 2. GDC 2 states that SSCs important to safety at nuclear power plants must be designed to withstand the effects of natural phenomena such as earthquakes, tornados, hurricanes, floods, tsunami, and seiches without loss of capability to perform their intended safety functions. The design bases for these SSCs are to reflect appropriate consideration of the most severe of the natural phenomena that have been historically reported for the site and surrounding area. The design bases are also to reflect sufficient margin to account for the limited accuracy, quantity, and period of time in which the historical data have been accumulated.

In response to the nuclear fuel damage at Fukushima Dai-ichi due to the earthquake and subsequent tsunami, the NRC requested information pursuant to 10 CFR 50.54(f) (Reference 2). As part of this request, licensees were required to perform walkdowns to verify that plant features credited in the CLB for protection and mitigation from external flood events are available, will perform their intended function, and are properly maintained.

NEI, in conjunction with the industry, prepared NEI 12-07, Rev. 0, as guidance for performing the external flooding walkdowns and completion of the walkdown report. Subsequently, NEI received endorsement of the document by the NRC. NEI then issued NEI 12-07, Rev. 0-A (Reference 1; herein NEI 12-07), incorporating NRC comments. To aid in the clarification of the guidance after the release of Rev. 0-A, the NEI Fukushima Flooding Task Force (FFTF) developed a Flooding Guidance Inquiry Process. The FFTF responses to each inquiry were evaluated by the PVNGS walkdown team and incorporated in the walkdown process, when appropriate.

Section 5.0 provides the direct responses to the NRC requested information items in Reference 2 using the guidance in Appendix D of NEI 12-07.

4.0 REFERENCES

1. NEI 12-07, Nuclear Energy Institute, "Guidelines for Performing Verification Walkdowns of Plant Flood Protection Features," Rev. 0-A, May 2012.
2. ML12053A340, U.S. Nuclear Regulatory Commission, "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," March 12, 2012 (See Enclosure 4 - Recommendation 2.3: Flooding).
3. ML11272A111, SECY-11-0137, U.S. Nuclear Regulatory Commission, "Prioritization of Recommended Actions to be taken in Response to Fukushima Lessons Learned," October 3, 2011.
4. ML073531346, Regulatory Issue Summary (RIS) 2005-20, Revision to NRC Inspection Manual Part 9900 Technical Guidance, "Operability Determinations & Functionality Assessments for Resolution of Degraded or Nonconforming Conditions Adverse to Quality or Safety," Rev. 1.
5. ML12136A479, Inspection Report, U.S. Nuclear Regulatory Commission, "Palo Verde Nuclear Generating Station – NRC Integrated Inspection Report 05000528/2012002, 05000529/2012002, and 05000530/2012002," May 15, 2012.
6. PVNGS Updated Final Safety Analysis Report, Revision 16B; various sections and associated figures as specified throughout including:
    a. Section 2.4, "Hydrologic Engineering."
    b. Section 3.4, "Water Level (Flood) Design."
    c. Section 6.2,6 "Containment Leakage Testing."
    d. Section 9.5.4, "Diesel Generator Fuel-Oil Storage and Transfer System."

5.0 RESPONSE TO NRC REQUESTED INFORMATION

Enclosure 4 of the 10 CFR 50.54(f) March 12, 2012 letter on NTTF recommendations from the Fukushima Dai-ichi Accident contains requests for information related to the results of the CLB external flooding walkdowns. The responses to each NRC information request are based on the guidance of NEI 12-07, Appendix D.

a. Requested Information Item 2.a

Describe the design basis flood hazard level(s) for all flood-causing mechanisms, including groundwater ingress.

The site is located west of Phoenix in a dry, desert region adjacent to the Palo Verde Hills. The terrain has very little topographic relief and slopes gently southward. Palo Verde is considered a "Dry Site" in accordance with the definitions contained within Regulatory Guide 1.102: Flood Protection for Nuclear Power Plants (Revision 1, September 1976; refer to Subsection 2.4.10 and Section 3.4). As defined by the Regulatory Guide, a dry site is a site where the plant is built above the Design Basis Flood Level, and therefore safety-related structures, systems, and components are not affected by external flooding. The grade elevations [mean sea level (msl)] of Seismic Category I Structures are 957.5 ft for Unit 1, 954.5 ft for Unit 2, and 951.5 ft for Unit 3 according to Updated Final Safety Analysis Report (UFSAR) figure 2.4-4.

No discrepancies or contradictions in flood hazard levels were found in design or licensing basis documentation.

The following flood mechanisms were evaluated relative to the requirements of the current licensing basis:

Local Intense Precipitation: The effects of Local Intense Precipitation were evaluated and documented in UFSAR Section 2.4.2.3. UFSAR Table 2.4-6 states the Local Intense Probable Maximum Thunderstorm Precipitation (PMP) to be 15.53 inches after a 6-hour duration. "The calculated maximum water surface elevations due to local PMP storm are 955.5, 952.5, and 949.5 [msl] at Units 1, 2, and 3, respectively. These maximum flood elevations are 2.0 feet below the floor elevations at the respective units."

The key assumptions for the effects of Local Intense Precipitation include *(from UFSAR Section 2.4.2.3):*

1. "The volume of water in the vicinity of the power block area consequent to a 6-hour PMP is based on zero infiltration losses and a complete blockage of the drainage culverts for the storm duration."
2. "For each tributary area around the power block area, an elevation-volume curve is developed. The maximum water surface elevation within each tributary area is determined from the elevation-volume curve assuming no overflow across roads surrounding the tributary area."
3. "The occurrence of snow and ice accumulation coincident with PMP is not considered to be a probable event."

Methodology used in developing the PMP:

The precipitation rate used for the PMP analysis was based on the 1972 National Weather Service report defined in UFSAR Section 2.4.15.5.

As stated in UFSAR Section 2.4.2.3, "areas adjacent to the power block are sloped away at 0.5 to 1%. This results in a minimum drop of 5 to 7 feet at the peripheral drainage system, as compared

to the grade elevation at each unit. The power block areas are divided into smaller tributary areas for purposes of drainage calculations. Runoff from each tributary area is collected in drainage ditches and conveyed to the peripheral drainage system. The peripheral drainage system consists of drainage ditches and culverts along the peripheral access road as shown in [UFSAR] figure 2.4-4. The collector ditches and culverts are designed for the 50-year storm and checked for pondage effects due to a probable maximum flood." There is a preventative maintenance (PM) activity associated with drainage ditches to check their cleanliness and vegetation growth. If the ditches are clear of soil, vegetation, and any obstructions, then pondage effects would be minimized.

Probable Maximum Flood (PMF) on Streams and Rivers: The PMF on streams and rivers was evaluated in accordance with Regulatory Guide 1.59, Rev. 2 (UFSAR Section 2.4.2.2), and documented in the UFSAR Section 2.4.3. The PMF resulted in a water surface elevation of 776 ft from the Gila River, 888 ft from the Centennial Wash, 942 ft from the Hassayampa River, 929.5 ft – 956.4 ft from the Winters Wash and 926.6 ft – 978.8 ft from the East Wash. Wave run-ups for the East and Winters Washes are discussed in UFSAR Section 2.4.3.6. They are based on a sustained overland wind speed of 40 mph. "The maximum water surface elevation was obtained at each cross-section by summing the PMF elevation, the maximum wave height, and runup on the embankment." This resulted in a maximum water surface elevation of 935.1 ft – 962.0 ft from the Winters Wash and 928.4 ft – 982.8 ft from the East Wash according to UFSAR Table 2.4-16, Sheet 2 of 2. Flood protection features (described in Requested Information Item 2.b) are in place to prevent the PMF from inundating the site with water from the Winters Wash and East Wash.

The key assumptions for the PMF on Streams and Rivers include:

1. UFSAR Section 2.4.3.6:

   "A westerly wind with a sustained overland speed of 40 miles per hour was applied to the Winters Wash PMF and both an easterly wind and northerly wind with a sustained overland speed of 40 miles per hour was applied to the East Wash PMF."

   "Streambed profiles for East Wash and Winters Wash are shown on [UFSAR] figures 2.4-15 and 2.4-16. These calculations (wind wave and runup calculations) are based on the assumption that the embankment shown in [UFSAR] figure 2.4-2 has 1 on 3 (rise on run) slope with stone riprap facing East Wash."

   "The maximum water surface elevation was obtained at each cross-section by summing the PMF elevation, the maximum wave height, and runup on the embankment..."

Methodology used in developing the PMF on Streams and Rivers:

As stated in UFSAR Section 2.4.3, "The probable maximum flood (PMF) peak discharge was calculated for each of the streams in the site vicinity. The maximum water surface elevation of peak discharge was then computed for each of the streams." The section continues to state, "The unit hydrograph method of drainage basins greater than 10 square miles in area was used to compute the PMF on Winters Wash." For the smaller realigned East Wash, a different method was used. "The unit hydrograph method for drainage basins less than 10 square miles was used to compute the PMF on the realigned East Wash." The section further discusses that, "The PMF analysis for the Hassayampa River and Centennial Wash was based upon a computed ratio between the 100-year flood and the computed PMF for area drainage basins. For the Gila River at McDowell Damsite and Painted Rock Damsite, the U.S. Army Corps of Engineers (COE) computed the [their] 100-year flood and PMF discharges." Additionally, the section states that, "To be conservative, the PMF computed at Gillespie Dam was used to compute water surface elevations of the point in the Gila River closest to the plant site."

Potential Dam Failures (Seismically Induced): The dam breach/failure flood mechanism was evaluated and documented in UFSAR Section 2.4.4. "The maximum water surface elevation at

the point in the Gila River nearest the plant site would be 900, which is 51 feet below the plant grade for Unit 3."

The key assumptions for the PMF on Streams and Rivers include (from UFSAR Section 2.4.4):

1. "Seismically induced failure of these dams was assumed. The effect of the worst permutation of dam failures on the site was evaluated. This worst case was assumed when sequential, total failure of major dams on the Gila River and its tributaries would occur with simultaneous arrival of the peak discharge at the point in the Gila River nearest the plant site. In this manner a maximum discharge into the Gila River and its flood plain would result."
2. "The assumption was made that Roosevelt Dam on the Salt River, Horseshoe Dam on the Verde River, Coolidge Dam on the Gila River, and Waddell Dam on the Agua Fria River fail instantaneously and completely from seismic shock. The resulting flood waves would demolish Horse Mesa, Mormon Flat, and Stewart Mountain Dams on the Salt River and Bartlett Dam on the Verde River. The flood waves generated by the dam failures on the four rivers would flow down the canyons of the respective rivers to the valleys downstream, would flow through and spread into these valleys, and would reach the point in the Gila River nearest the plant site at the same time. Reservoirs were assumed full at the time of failure."
3. "In addition, a standard project flood (SPF) was assumed to be in progress at the time of the dam failures, with the peak discharge arriving at the point in the Gila River nearest the plant site at the same instant as the maximum peak caused by the dam failures."

Methodology used in developing the Potential Dam Failures:

UFSAR Section 2.4.4.1 states that, "A rational approach to determining effective peak discharge from dam failures was to consider that for each river, all the stored water released from a dam failure will have passed the point of entry to the respective valleys within 24 hours. Accordingly, a dimensionless hydrograph was developed with the 24-hour base length. This is analogous to a unit hydrograph, in that superposition is assumed to calculate the peak discharge resulting from multiple dam failures." UFSAR Section 2.4.4.2 continues by stating:

> "Domino-type failure of all dams was studied with timing such that the peak discharges from each of the four rivers arrive at the point in the Gila River nearest the plant site simultaneously.
>
> Data developed by the U.S. Army Corps of Engineers for the Gila and Salt Rivers were used to calculate diminution of peak discharge from the dam failure flood waves during the time of travel. The Corps of Engineers synthesized a PMF for the Gila and Salt River systems. Routing the PMF hydrograph downstream caused a diminution in peak discharge from approximately 5 to 10%.
>
> Diminution of peak discharge during time of travel of the dam failure waves through the valleys would be greater than during a PMF."

Probable Maximum Storm Surge and Seiche: UFSAR Section 2.4.5 states that "The plant site is near no large bodies of water for which surge or seiche flooding would apply. The potential for flooding surge or seiche does not exist in this area." Therefore, these mechanisms were screened out as not feasible events.

Probable Maximum Tsunami Flooding: UFSAR Section 2.4.6 states that "The site is near no large bodies of water for which tsunami flooding would apply. The potential for flooding by tsunami does not exist in this area." Therefore, the tsunami flood mechanism was screened out as not a feasible event.

Ice Effects: UFSAR Section 2.4.7 states that "There are no historical data to indicate the possibility of site flooding due to ice jams. Ephemeral desert streams in the site area are not subject to ice formation, due to the infrequency of flow and the desert climate." Therefore, ice induced flooding was screened out as not a feasible event.

Channel Diversions: The channel migration/diversion flood mechanism was screened out as not a feasible event as discussed UFSAR Section 2.4.9. The source of cooling water to the plant is treated sewage effluent from the city of Phoenix, and is conveyed to the plant via a 35 mile pipeline. The UFSAR goes on to state in part, "[This] source is subject to possible interruption. However, the essential spray ponds are designed to provide storage of safety-related water necessary for safe shutdown, and the ponds will not be subject to loss of function due to any interruptions in the water source."

Groundwater: The groundwater intrusion flood mechanism was evaluated and documented in UFSAR Section 2.4.13.2.4.D, which states, "Predicted groundwater levels, as shown in figure 2.4-40, from the digital simulation are 915, 909, and 909 feet for Units 1, 2, and 3, respectively. The design groundwater levels of the units are 927, 924, and 921 feet for Units 1, 2, and 3, respectively. Throughout the operating life, therefore, water levels under each unit are predicted to stay below design groundwater levels." UFSAR Section 2.4.13.5 also discusses this point. These elevations correspond to 30 feet below grade level for the respective units and "...are used as the basis for calculating groundwater-induced hydrostatic loadings on subsurface portions of safety-related structures...The groundwater level beneath each unit is predicted to remain well below its respective design groundwater elevation during the [60]-year plant life."

The key assumptions for the groundwater include (from UFSAR Section 2.4.13.2.4.A):

1. "Water was assumed to seep from the bottom of the 80-acre water storage reservoir at the rate of 75 feet per year and be immediately transported down to the aquitard surface."
2. "Inflow to the evaporation pond was assumed to be 954 gallons per minute per unit as the respective units start up in May 1983, May 1984, and May 1986. When the groundwater mound was below the bottom of the evaporation pond (elevation 920 feet above msl), the incoming blowdown was assumed to seep into the ground. When the groundwater mound rose above the bottom of the evaporation pond, an annual evaporation rate of 72 inches was assumed. Evaporation was only considered when water was standing in the evaporation pond."
3. "Leakage through the fine-grained aquitard was allowed to occur in the simulation in the downward direction only."

Methodology used in developing the Design Basis Level Groundwater:

As stated in UFSAR Section 2.4.13.2.4, "Prickett and Lonnquist have developed a digital computer simulation code through a finite difference approach at the Illinois State Water Survey. Many different types of groundwater simulation conditions were presented in their report. The Water Table Condition Code, which was designed to simulate groundwater mound decay and recharge, was used in this study [UFSAR]."

b. Requested Information Item 2.b

Describe protection and mitigation features that are considered in the licensing basis evaluation to protect against external ingress of water into SSCs important to safety.

The flooding licensing basis includes the following features which protect against external flooding events that may occur during any mode of operation. The effect of the PMP event on the power block is that it generates site runoff based on the 6 hour storm duration described in the response

to Requested Information Item 2.a. As described in UFSAR Section 2.4.2.2.2, safety-related structures and equipment are protected by the onsite drainage system which is designed to minimize water pondage in the yard adjacent to plant facilities. "Surface runoff from the power block area will be collected in drainage ditches and discharged into the realigned East Wash in a lower portion of the site. The drainage system and grading plan is [*sic*] designed with sufficient capacity to prevent flooding of Seismic Category I structures and loss of access to these facilities due to PMP." Additionally, protection from the bounding external flood source, which is a PMF in the East Wash produced by 6-hour PMP, was accomplished by rerouting of the wash and construction of an embankment with adequate cross sectional flow area to pass the PMF with 2 feet of freeboard (reference UFSAR 2.4.3.5). The PMF runoff hydrograph for the East Wash (UFSAR figure 2.4-14) indicates that the peak discharge would occur approximately 4 hours into the flood with the discharge returning to zero after approximately 13 hours. A 24-hour PMP would produce the most severe PMF for Winters Wash (UFSAR Section 2.4.3.1). The PMF runoff hydrograph for the Winters Wash (UFSAR figure 2.4-13) indicates that the peak discharge would occur approximately 12 hours into the flood with the discharge returning to zero after approximately 48 hours. Lastly, the buildings were designed with a much greater hydrostatic pressure load from groundwater than the actual projected ground water levels.

The Ultimate Heat Sink (UHS) is provided by the Essential Spray Ponds. These structures provide a two foot freeboard above their overflow weir which would contain a postulated PMP rainfall event (15.5" in 6 hours) and wind-wave action (UFSAR Table 9.2-14) without an uncontrolled release of water to the power block. Their operation during all modes would not be adversely impacted by the PMP (UFSAR Sections 2.4.8.2.1 and 9.2.5).

A review of the Palo Verde Improved Technical Specifications and the Technical Requirements Manual do not prescribe any Mode Dependant requirements on plant equipment, attributable to external flooding protection.

The following are descriptions of flood protection features that are credited in the CLB:

Incorporated or Exterior Passive Features:

East Wash Embankment: The East Wash is located north and east of the site on the owner controlled area. As described in UFSAR Section 2.4.10, the "East Wash has been realigned along the eastern edge of the site to maximize use of the site for other facilities and to limit the extent of the PMF. The normal channel of East Wash has been blocked by an embankment between the two hills on the northern edge of the site. This embankment forces flood flows around the small hill in the northeast corner of the site and cuts off any flow through the old channel. An additional embankment has been constructed along the eastern edge of the site to prevent flooding of the site proper. This change in drainage is illustrated in [UFSAR] figure 2.4-2. Both embankments will be constructed to elevations sufficient to prevent any overtopping by a PMF and associated wave run-up and wind setup [with 2 feet of freeboard (reference UFSAR Section 2.4.3.5)]. The East Wash embankments have been constructed of material excavated from the reservoir and power blocks." Note that this section describes existing site features; UFSAR Section 2.4.3.5 establishes that the East Wash embankment has been modified to pass the PMF with 2 feet of freeboard.

East Wash Rip Rap: UFSAR Section 2.4.10 states that, "The design of erosion protection for East Wash was based on [UFSAR Section 2.4] references 31, 32, and 33. Side slopes of three horizontal to one vertical, estimated angle of repose of riprap material of 40 degrees with the specific weight estimated at 155 pounds per cubic foot were used for analyses." The section goes on to state that, "Details of riprap placement, riprap toes, depth of flow at PMF, and filter blanket

are shown in [UFSAR] figure 2.4-18. The erosion protection is provided to 2 feet above the PMF elevation, including the effects of wind and wave runup."

Winters Wash Embankment: UFSAR Section 2.4.10 discusses that flood protection from the wash is accomplished through site grading, including a maximum of about 10 feet of compacted fill being placed in the cooling tower areas such that Seismic Category I facilities are beyond the extent of a PMF. The ground elevation northwest of Units 1 & 2 (960 ft to 970 ft) is higher than the maximum flood height at the wash and the projected flood levels during a PMF at the closest location to PVNGS (Unit 3) are lower than the power block elevation by approximately 1.2 ft.

Exterior Walls: The NEI Fukushima Flooding Task Force Flooding Guidance Inquiry responses clarified that any exterior wall (above or below grade) protecting space credited as dry in the CLB from groundwater or surface water flooding should be included in the walkdown scope, even if the exterior walls are not explicitly mentioned in the CLB. The inspection applies to portions of the walls below design basis flood and/or groundwater levels. UFSAR Section 3.4.2 states that:

> "Structures that penetrate the maximum groundwater level (given in [UFSAR] paragraph 2.4.13.5) are limited to the containment building and portions of the auxiliary building.
>
> The interior of these structures is made watertight by the 2-foot minimum concrete thickness of the walls and base mat and the use of waterstops in construction joints. Waterstops are provided to minimum levels of 927 feet, 924 feet, and 921 feet msl for Units 1, 2, and 3, respectively. These levels provide adequate margin above the maximum predicted groundwater levels. Auxiliary waterproofing of horizontal and vertical surfaces is not deemed necessary."

Therefore, exterior walls in Seismic Category I buildings that were below the design basis groundwater levels (i.e. Auxiliary and Containment Building walls) were within the scope of the walkdown. The design basis groundwater levels are elevation 927 feet for Unit 1 (grade is 957.5 feet), 924 feet for Unit 2 (grade is 954.5 feet), and 921 feet for Unit 3 (grade is 951.5 feet). Note that the Containment Buildings are inspected as part of the site's Civil System, Structure, and Component Monitoring Program. Additionally, the containment buildings are periodically leak tested. The tests included are: containment integrated leakage rate tests, containment penetration leakage rate tests, and containment isolation valve leakage rate tests (UFSAR Section 6.2.6). Therefore, the walls and basemats of the Containment Buildings have not been included in the scope of the walkdowns.

Basemats: The basemats of Seismic Category I structures at or below the design groundwater elevations are credited for preventing water intrusion into the structures based on UFSAR Section 3.4.2, as stated for exterior walls. This applies to the Auxiliary Buildings, Control Buildings, and Containment Buildings.

Roof Drainage System (including scuppers): UFSAR Section 2.4.2.3 states that, "The roofs of safety-related structures are designed for a live load of 30 pounds per square foot which approximates 6 inches of water accumulation. The roof drains are designed for a 50-year storm with a minimum time of concentration of 5 minutes. Water accumulations over 6 inches will be drained through openings in the parapet walls. Runoff from the plant roof drains will be conveyed away from the critical areas either through ditches or buried pipes." This applies to the roofs of the Auxiliary Buildings, Control Buildings, Diesel Generator Buildings, Fuel Buildings, and the Main Steam Support Structures (MSSS). As discussed in the response to Requested Information Item 2.f, some buildings use scuppers rather than roof drains to remove water from the roof. The evaluation for this condition concluded that the absence of roof drains has no affect on the conveyance of rainwater runoff from the roofs.

45/85 Acre Reservoir Berms: UFSAR Section 2.4.8.2.2 states that, "Makeup water is stored onsite in two independent below-grade impoundments east of the power block area as shown in [UFSAR] figure 2.4-2. They are of approximately 85-acres and 45-acres in surface area." The reservoirs are protected with earthen berms that provide 4 feet of freeboard (compared to normal operating water level) to protect against waves and run-up in the reservoir and water level increase due to the 6-hour PMP, as discussed in UFSAR Sections 2.4.2.2.2 and 2.4.8.2.2. Figure 2.4-23 of the UFSAR illustrates the design details for the reservoir.

Drainage System (i.e., drainage ditches): UFSAR figure 2.4-4 details the site drainage plan for the power block area. UFSAR Section 2.4.2.2.2 states that, "The onsite drainage system is designed to minimize water pondage in the yard adjacent to plant facilities. Surface runoff from the power block area will be collected in drainage ditches and discharged into the realigned East Wash in a lower portion of the site. The drainage system and grading plan is [sic] designed with sufficient capacity to prevent flooding of Seismic Category I structures and loss of access to these facilities due to PMP." UFSAR Section 2.4.2.3 goes on to state that, "The power block areas are divided into smaller tributary areas for purposes of drainage calculations. Runoff from each tributary area is collected in drainage ditches and conveyed to the peripheral drainage system. The peripheral drainage system consists of drainage ditches and culverts along the peripheral access road as shown in [UFSAR] figure 2.4-4." Additionally, UFSAR Section 2.4.10 states that, "A drainage channel designed to carry 50-year flood flows will convey flood waters from the northern portion of the site, west of the peripheral road to a discharge point south of the power block area." Note that this section describes existing site features; the drainage channel has been installed. Also note that drainage culverts are not included in the scope of the walkdown since a complete blockage of the drainage culverts for the storm duration is assumed, as previously discussed.

Compacted Fill: As stated in UFSAR Section 2.4.10, "The ground elevation along the west side of the site will be raised, as indicated on [UFSAR] figure 2.4-4, to limit the extent of PMF on the site. A maximum of about 10 feet of compacted fill will be placed in the cooling tower areas, such that ground between the peripheral road and the power block areas will be above the PMF levels." Note that this section describes existing site features; the compacted fill has been placed in the cooling tower areas. The PMF level to which the west of the site is most susceptible is the Winters Wash wave run-up of 950.3 ft per UFSAR Table 2.4-16, where the site elevations are 960 ft to 970 ft northwest of Units 1 & 2 and 951.5 ft for Unit 3 per UFSAR figure 2.4-4, providing a margin of at least 1.2 ft.

Diesel Generator Fuel Oil Storage Tank Manholes/Vaults: The design of each diesel fuel oil storage tank includes a vault that contains "access to the submersible transfer pump in the tank, connections on the tank, and transfer pump associated valving" according to UFSAR Section 9.5.4.2.1. This section of the UFSAR states that, "The vault is of water-proof design."

Topography: UFSAR Section 2.4.2.3 states that, "Areas adjacent to the power block are sloped away at 0.5 to 1%. This results in a minimum drop of 5 to 7 feet at the peripheral drainage system, as compared to the grade elevation at each unit. The power block areas are divided into smaller tributary areas for purposes of drainage calculations. Runoff from each tributary area is collected in drainage ditches and conveyed to the peripheral drainage system." UFSAR figure 2.4-4 shows the topographic elevation lines for the power block area as well as the site layout.

The site's flood protection design does not include any incorporated or exterior active, temporary passive, or temporary active features. No operator actions are credited for external flood protection.

Technical Specifications, the Technical Requirements Manual, and other plant procedures were reviewed to determine if there are any procedures and/or associated operator actions that are credited for providing external flood protection and/or mitigation. None were identified. Therefore, there are no weather conditions or flood levels that trigger procedures and associated actions.

The adverse weather conditions that were assumed concurrent with flood protection features and associated actions as stated in UFSAR Section 2.4.3.6 are only wind activity coincident with the PMP and PMF. UFSAR Sections 2.3.1.2.2 through 2.3.1.2.5 discuss tornadoes, extreme winds, lightning, and hail, which can develop from thunderstorms. However, these are not stated as concurrent events for the PMP and PMF since the events (tornadoes, hail, and lightning) do not contribute to the site external flood level.

c. Requested Information Item 2.c

Describe any warning systems to detect the presence of water in rooms important to safety.

There are no credited water level warning systems for external flood protection in the plant's flooding licensing basis. However, there are numerous design features, both safety-related and non-safety related, that will signal the presence of water intrusion in various plant structures. Systems that detect internal flooding sources are not part of the scope of the walkdown.

d. Requested Information Item 2.d

Discuss the effectiveness of flood protection systems and exterior, incorporated, and temporary flood barriers. Discuss how these systems and barriers were evaluated using the acceptance criteria developed as part of Requested Information item 1.h.

The scope of the external flood protection and mitigation features walkdown was developed to verify the conformance with the CLB.

Acceptance Criteria:

The feature specific acceptance criteria developed for the walkdown implemented the governing criteria established in Section 6 of NEI 12-07, the guidance of NEI 12-07 Appendix A, the clarifications of the NEI inquiry process, and already established acceptance criteria from site procedures.

Overall Effectiveness:

The external flooding walkdowns identified observations for features that protected Seismic Category I structures from the effects of the PMP and PMF as well as groundwater intrusion. These observations were entered into the site's Corrective Action Program (CAP). Refer to response to Requested information Item 2.f for a discussion of the CAP entries. With a few exceptions, the results of the walkdown indicate that the flood protection features are functional. The exceptions are included in CAP entries discussed in the response to Requested Information Item 2.f. Note that several changes to the plant layout were observed during the walkdown. Based on field observations, the alterations to the topography by the modifications do not adversely affect the run-off assumed in the CLB to the point where it could affect Seismic Category I structures.

Flood protection features were evaluated to determine if each were included in a controlled preventative maintenance (PM), surveillance test, or other monitoring program that provides reasonable assurance of continuing functionality. Typically, flood protection features have a procedure, PM program, or monitoring program to ensure continued functionality, except changes to the site topography, which is controlled by the modification process. Prior to the commencement of the walkdowns, an issue of inadequate flooding and drainage reviews was identified during the modification process and was subsequently entered into the CAP. An additional action has been entered into the CAP to review credited PMP and PMF protection

features inspected during this walkdown. This corrective action item also includes a requirement to perform an effectiveness evaluation on those features that have PM/surveillances, and evaluate the need to create a PM/surveillance for those that do not have one.

Non-Credited Existing Plant Equipment, Structures, and Procedures that might mitigate a PMF:

UFSAR Section 2.4.2.3 assumes that the drainage culverts are blocked for the analysis of site run off (and by extension the catch basins and subsurface drainage that are connected to them). These features could aid in the prevention of ponding that could back up to Seismic Category I structures. Note that the subsurface drainage piping is managed as part of the Industry Initiative on Buried Piping Integrity, as described in NEI 09-14, Guideline For The Management Of Buried Piping Integrity. The condition of this drainage piping has been inspected under the scope of that initiative.

The 45 acre reservoir has an additional berm placed around it that provides an added two feet of freeboard. This is not credited in UFSAR figure 2.4-23 and would provide added protection from overtopping due to the PMP and wave run up.

Various non-credited sump pumps in the sub-grade rooms of the Auxiliary, Control, and Fuel buildings could also mitigate external flooding.

Control room indication and room level alarms are provided to alert operations of internal flooding hazards, but are not credited for external flooding detection. UFSAR, Section 5.4.7.3.C.1 states that, "Room sump level instrumentation is provided in each ECCS [Emergency Core Cooling System] pump room, pipe chase room, SDCHX [Shutdown Cooling Heat Exchanger] room, valve gallery area, and piping penetration room for both train A and train B piping." Similarly, the vital Auxiliary Feedwater (AFW) pump rooms have level detectors. The instrumentation in these areas could detect flooding from external sources.

The vital AFW A & B pump rooms have submarine type doors for (internal) flooding protection that could reasonably be expected to protect from flooding due to external sources.

Plant procedures that prescribe the shiftly and daily operations surveillance checks ensure that vital areas of the plant are routinely subject to operator inspection. Similarly, incidental observations for potential water intrusion within other vital and non-vital areas are made as a consequence of performing normal Auxiliary Operator (AO) rounds and Security department rounds.

Plant procedures provide administrative controls to ensure doors, hatches, and floor plugs are maintained closed, or have appropriate compensatory measures in place for the various applicable plant operating modes. Although the procedures specifically address internal flooding hazards, the required compensatory measures would protect against external flooding hazards, where applicable.

The abnormal operating procedure to respond to acts of nature considers the possibility of occurrence of severe rainstorms and flooding. No procedural guidance directly attributable to external flooding is provided. The procedure itemizes doors, hatches, and plugs that serve as missile barriers that must be closed during a tornado warning. These could reasonably be expected to serve as flooding barriers when closed due to a tornado warning.

e. Requested Information Item 2.e

Present information related to the implementation of the walkdown process (e.g., details of selection of the walkdown team and procedures,) using the documentation template discussed in Requested Information item 1.j, including actions taken in response to the peer review.

NEI 12-07, Revision 0-A was followed. There were no exceptions taken to NEI 12-07. The NEI FFTF developed a Flooding Guidance Inquiry Process to provide clarification on the guidance in NEI 12-07 after the release of Revision 0-A. The responses to the inquiries were incorporated in the walkdown process. Appendix A discusses the PVNGS specific impact of each inquiry.

Section 5.5.2.6 of NEI 12-07 and the last bullet of Appendix A.1.2 of NEI 12-07 allow walkdown record forms to be completed based on the review of other documentation (e.g., PMs, surveillances, etc.) in combination with visually scanning accessible areas to look for any unexpected conditions. PM and surveillance documentation, as well as visual scans during the NEI 12-07 walkdowns, were used to complete the walkdown form for the Diesel Generator Fuel Oil Storage Tank vaults.

The Walkdown team consisted of nine Westinghouse personnel qualified to perform the walkdowns in accordance with the requirements of NEI 12-07 Section 5.3 and Appendix C of that document. The team members were typically accompanied by one or more of six Arizona Public Service qualified, non-participating (observer) engineers assigned to the project and an Auxiliary Operator (not qualified to perform the flooding walkdowns) to assist in immediate operability determinations. The Westinghouse personnel were typically subdivided into teams of three with complementary sets of skills. Each team typically consisted of a mechanical engineer and two Quality Assurance / Quality Control technicians experienced in inspection.

Each team member was trained according to a training program designed to meet the requirements of NEI 12-07 Section 5.3 and Appendix C of that document. The training program was composed of computer-based training (CBT), NANTeL training, experience based training, and classroom training. Information covered in the training program included the 10 CFR 50.54(f) Request for Information letter, NEI 12-07 Rev. 0-A, the Walkdown Procedure, personnel prerequisites and requirements, the Site Current Licensing Basis, and flood protection features inspection.

Westinghouse performed an internal "peer review" by reviewing the PVNGS report with Westinghouse walkdown teams from other plants. In turn, the Westinghouse PVNGS team reviewed the flooding reports from other plants. No actions were required to be taken as a result of the peer review defined in Section 7 of NEI 12-07.

f. Requested Information Item 2.f:

Results of the walkdown including key findings and identified degraded, nonconforming, or unanalyzed conditions. Include a detailed description of the actions taken or planned to address these conditions using the guidance in Regulatory Issues Summary 2005-20, Revision 1, Revision to NRC Inspection Manual Part 9900 Technical Guidance, "Operability Conditions Adverse to Quality or Safety," including entering the condition in the corrective action program.

Observations by the walkdown team were reviewed by qualified plant personnel to determine if the observed condition required entry into the CAP. Each observation that resulted in CAP entry is considered a potential deficiency until a complete design basis review of each CAP entry is performed in accordance with site procedures to justify otherwise. As part of the CAP, an operability determination or functionality assessment was performed for each CAP entry using the guidance of RIS 2005-20 (Reference 4) and site procedures.

It should be noted that NEI 12-07, Section 3.8 states that a "deficiency exists when a flood protection feature is unable to perform its intended flood protection function when subject to the design basis flooding hazard." The functionality assessment or operability determination for the

CAP entries generated for observations concluded that, given the observed condition, either the features can meet their required design function or there was no impact to the operability of Technical Specification equipment. Thus, the initial assessments of those CAP entries indicate no impact on safe operation of the plant.

The following is a summary of items that have been entered into the CAP.

Topography and Onsite Drainage: Various new permanent and (long term) temporary structures have been added to the site without revising the site/power block drainage calculations. In some cases, a drainage analysis may have been performed for the individual change/modification; however, no comprehensive flood analysis has been performed to determine the combined effects of these added structures. A Condition Report Action Item has been assigned to address the issue.

Additionally, the flooding walkdown process documented that, in 2011, the site identified a partial obstruction of the East Wash. During construction of the 45 acre reservoir, a spoils pile was placed in the East Wash. This spoils pile created an obstruction that may have caused water from the PMF to flow onsite. Therefore, the spoils pile was relocated to restore the East Wash to its design configuration.

Several issues were observed regarding the condition of the drainage ditches related to debris in the ditches, erosion, and settlement. The observations were entered into the CAP. These degraded conditions do not affect the flooding level on-site around the power blocks during a PMP.

Roof Drainage System: In October 2011, during plant walk-downs associated with an ongoing project, PVNGS personnel discovered a non-conforming condition related to the roof drainage features of seismic Category I building roofs. The seismic category 1 building roofs are not equipped with both roof drains and scuppers as described in the PVNGS Updated Final Safety Analysis Report (UFSAR). The current as-built configuration includes only scuppers to provide drainage of the roofs of these buildings. During review of this non-conforming condition, an engineering evaluation determined that roof ponding level would exceed the 6" design limit during the probable maximum precipitation (PMP) event and that the building structural integrity was not affected. The Operations Department performed a functional assessment of this condition which concluded that the Seismic Category I buildings remained functional to support the systems, structures and components (SSCs) within the buildings for a PMP event.

The NRC issued a green non-cited violation of 10 CFR 50, Appendix B criterion III, Design Control, for this non-conforming condition (refer to NRC inspection reports 05000528/2012002, 05000529/2012002, 05000530/2012002, dated May 15, 2012). The issue was entered into the Corrective Action Program (CAP) and a design modification is being developed to correct the condition.

During the flooding walkdowns, partially obstructed scuppers on Seismic Category I building roofs were observed. These items were entered into the CAP and appropriate actions have been taken to correct the conditions. The Operations Department performed functional assessments of the affected SSCs which concluded that the buildings remained functional. As an interim measure to prevent recurrence, Operations Department is performing daily inspections on the Auxiliary Building and Fuel Building roofs to verify scupper clearance.

Additionally, it was found on the Units 1 and 3 Control Building roofs that the curb around the Smoke Removal System exhaust duct was lower than the CLB required height. An engineering evaluation was performed to determine the effect on equipment within the structures. The evaluation determined that the condition would not affect the function of class 1E safety related

equipment. The Operations Department performed an Operability Determination for this condition which concluded that the potentially affected SSCs within the buildings remained operable for a PMP event.

On the roof of the Auxiliary Buildings, Control Buildings, and Fuel Buildings of all three (3) units, there are pipe sleeves that protrude about 4 inches off the roof. There are caulked shrouds attached to the pipe sleeves. This configuration meets the design drawing but is inadequate for the 6 inch design flood height of the roof and may allow rain water to seep under the shroud, then over the pipe sleeve into the building as a result of ponding on the roof during a PMP event. A functional assessment determined that this condition will not affect safety related equipment in the affected buildings. A formal evaluation will be performed to calculate the final flooding levels within the buildings and their drainage.

The debris covers were missing or not secured for the roof drains on the Unit 1 MSSS roof. This is a material condition issue that is to be fixed. Additionally, consistent with the original design, the MSSS roofs do not contain any scuppers other than an opening through the parapet wall for the access way to the roof. The original design was based on the capacity of floor drains only. A recent review of facilities performed in response to the non-conforming condition related to roof drainage features led to the discovery that roof drains on the MSSS Building may be inadequate. A functional assessment determined that this condition does not affect the structural integrity of the MSSS building roofs. The roofs will remain functional and the supported SSCs will remain operable in the event of a PMP.

Regarding the accessibility of the credited features, there were no features that had restricted access. Waterstops were the only feature type that was inaccessible for visual inspection. These waterstops were installed at concrete joints located within the Auxiliary Building walls to minimum levels of 927 feet, 924 feet, and 921 feet for Units 1, 2, and 3, respectively, which are about 30 feet or more blow grade. These levels provide adequate margin above the maximum predicted groundwater levels per UFSAR Section 3.4.2. A visual inspection of the Auxiliary Building interior walls for the appearance of active or residual water intrusion was conducted. Additionally, the plant's structural monitoring program periodically inspects the structures. Therefore, there is reasonable assurance that the feature will perform its credited flood protection function.

Walkdown record forms for each credited feature have been completed, including detailed observations and photographs. The walkdown record forms are not submitted to the NRC, but will be retained onsite for NRC audits and inspection.

g. Requested Information Item 2.g

Document any cliff-edge effects identified and the associated basis. Indicate those that were entered into the corrective action program. Also include a detailed description of the actions taken or planned to address these effects.

While endorsing NEI 12-07, the NRC agreed that cliff edge effects and physical margins do not need to be reported to the NRC as part of the Walkdown Report. However, the Appendix B walkdown records, which include the collected Available Physical Margin (APM) information, need to be retained and available for NRC audits and inspections. Therefore, during performance of the walkdowns, APM data were collected and documented, as applicable, in the Walkdown Record Forms. Features with small APM have been entered into the PVNGS CAP.

h. Requested Information Item 2.h

Describe any other planned or newly installed flood protection systems or flood mitigation measures including flood barriers that further enhance the flood protection. Identify results and any subsequent actions taken in response to the peer review.

The CAP entries generated from the observations made during the walkdowns are discussed in the response to Requested Information Item 2.f. The following is description of changes determined to be necessary as a result of the observations. The schedule for completion of these changes has not been determined yet, unless otherwise identified below.

The configuration control issues with respect to site drainage were identified. The site is undergoing construction of several new facilities and structures and the site grading (topography) has undergone significant changes. A number of issues were identified during the walkdowns. Changes to site topography are scheduled to be determined by a flyover and mapping in 2013 to support the flooding hazards reevaluation. Actions to perform the flyover and mapping have been established to support the revaluation process. The spoils pile that was located in the East Wash has been removed. Additionally, rip rap that was identified as missing has been restored.

The need for Seismic Category I building roof scupper modifications has been identified. An engineering work order has been generated as part of the design modification process to address this design inadequacy. Water intrusion into the Smoke Removal System is to be addressed by a modification to the plant. The current condition of scupper blockage is being addressed by corrective maintenance work orders. A corrective action was entered into the CAP to develop a method to prevent scupper obstructions from occurring in the future. As an interim measure to prevent recurrence until the method of prevention is finalized, Operations Department is performing daily inspections on the Auxiliary Building and Fuel Building roofs to verify scupper clearance.

The walkdown team members peer checked the walkdown record forms completed by other team members. Additionally, the walkdown team project lead reviewed all walkdown record forms. An overall evaluation of the walkdown results and the impact on the plant's flood protection was performed by the walkdown team engineers and the station staff. The response to Requested Information Items 2.d and 2.f discuss the overall effectiveness and corrective actions, respectively. There were no actions that resulted in a change to the walkdown process or methodology.

Westinghouse performed an internal peer review by reviewing the PVNGS report with individual Westinghouse walkdown teams from other plants. In turn, the Westinghouse PVNGS team reviewed the flooding reports from other plants. The peer reviews encompassed the scope discussed in Section 7 of NEI 12-07.

APPENDIX A: NEI 12-07 FLOODING GUIDANCE INQUIRIES

The NEI FFTF developed a Flooding Guidance Inquiry Process to provide clarification on the guidance in NEI 12-07 after the release of Revision 0-A. Each inquiry was categorized into one of three levels of NRC review: Not Necessary (no NRC review required), Interpretation (the FFTF provided the FAQ to the NRC for information), and Necessary / Agency Position (the FFTF submitted a position to the NRC for review and endorsement). The following listing details the inquiries that were answered by the FFTF, including the applicable NEI 12-07 section and inquiry category classification, and how the FAQ impacted the PVNGS flooding walkdown process.

1. Section / Cat.: 4 (Scope) / Not Necessary

   Inquiry: Roof leakage and drainage – Should roof leakage/drainage be included in the flooding walkdown scope? The NRC seems to have always been concerned with site drainage for the local intense PMP. Roof drains are part of the building's incorporated plumbing system; runoff from roofs become site drainage once it is discharged from the roof, scuppers, gutter drains, etc. External evidence of leaks is one thing; inspecting roof drainage system could become very involved depending on the type of system.

   Resolution: Unless they are specifically addressed in the flood protection licensing basis, roof drainage systems are not part of the walkdown scope. Roof drainage systems should be included in the walkdown scope to the degree they are discussed in the licensing basis. Runoff from the roof does need to be taken into account as a source of water in the site drainage system.

   PVNGS Impact: The roof drainage systems were included in the scope of the walkdown.

2. Section / Cat.: 4 (Scope) / Not Necessary

   Inquiry: Probable Maximum Hurricane (PMH) damage – Does anyone consider as part of the CLB event the combination of high winds damaging roofs or siding and the subsequent consequences to safety systems resulting from precipitation entering the building? An example would be a non-Class 1 Turbine Building that may house some safety related equipment.

   Resolution: This is not an external flooding event, this issue will be addressed with other external events (e.g., hurricanes and tornadoes) as part of the tier 2 activities.

   PVNGS Impact: Wind damage and resulting consequences to safety systems resulting from precipitation entering the building were not included in the PVNGS NEI 12-07 walkdowns.

3. Section / Cat.: 4 (Scope) / Not Necessary

   Inquiry: CLB Documentation – We are finding situations where the documentation is limited and unclear about what features are credited in the CLB. Site personnel are aware of flood protection or mitigation features that exist in the field but some of these features may not be explicitly documented as credited in the CLB.

   Resolution: Features are included in the walkdown scope if they are credited for flood protection; these features do not need to be specifically described in licensing basis documentation. Some examples:

   - A wall is credited for flood protection. Any penetration seals in that wall up to the level of the design basis flood are in the walkdown scope even though they are not specifically described.
   - If the plant flood licensing basis states a specific flood level or elevation, any feature that is below that elevation and that serves to protect SR equipment from a flood, is within the walkdown scope.
   - If a conduit passes through a credited wall, but the penetration does not include a seal around the conduit, the interface between the conduit and wall should be inspected for general integrity (no obvious cracks, gaps, or spalling)

   PVNGS Impact: The Palo Verde UFSAR does not explicitly discuss building design to protect for groundwater intrusion other than design for hydrostatic loading. However, all exterior subgrade walls/floors below the design groundwater levels and through-wall penetrations in those structures were included in the scope of the PVNGS NEI 12-07 walkdowns.

4. Section / Cat.: 5 (Methodology) / Not Necessary

   Inquiry: Site Topography and Drainage – Is it acceptable to base the assessment of changes to site topography and configuration (i.e., buildings, security barriers, additional pavement, drainage systems, etc.) on field observations. See Section 4.2 of NEI 12-07.

   Resolution: It is not necessary to perform a complete site survey for the walkdowns to assess changes in site topography, compared to that used in the licensing basis flood evaluation. For the 2.3 flooding walkdowns, changes can be assessed primarily through field observations. The 2.1 flooding reevaluations may require updated/new topographic surveys, particularly for the local intense precipitation/site drainage evaluation.

   PVNGS Impact: Changes to topography were assessed using field observations and review of CLB topographical drawings. An updated aerial mapping is planned for PVNGS in 2013 to validate the NEI 12-07 walkdown conclusions and supporting the 2.1 hazards reevaluation project.

5. Section / Cat.: 5 (Methodology) / Not Necessary

   Inquiry: Debris/Blockage in Culvert (or other site drainage feature) – Pipes and other site drainage features should be visually inspected if they are credited in the CLB as providing conveyance for the local-intense PMP. If the systems are assumed blocked in the CLB, inspections are not required.

   Resolution: Yes

   PVNGS Impact: PVNGS assumes total blockage of site drainage culverts during a PMP. They were not included in the scope for the PVNGS NEI 12-07 walkdowns.

6. Section / Cat.: 5 (Methodology) / Not Necessary

   Inquiry: Seal for Penetration Below Grade – Only need to visually inspect the accessible side of the seal.

   Resolution: Yes

   PVNGS Impact: Only the accessible side (the side that can be viewed from the inside of a building) was inspected during the PVNGS NEI 12-07 walkdowns.

7. Section / Cat.: 5 (Methodology) / Not Necessary

   Inquiry: Plant Shut-Down Procedures – There are situations where the site's response to a flooding event is to shut down the plant (specifically for wet sites). There are general procedures that apply regardless of the reason for the shut-down. The only shut-down procedures that need to be evaluated during the flooding walkdowns are 1) those specifically developed for flood mitigation, 2) those potentially challenged by flooding conditions, and 3) those involving time-dependent activities (need to assess against available flood warning time). A temporary pump for cooling water would not be considered a flood protection feature; it would be evaluated as 'equipment' used to implement a flood mitigation procedure. (See Q17 in Appendix B of NEI 12-07.)

   Resolution: Yes. Validate those portions of procedures that are applicable to the flood response.

   PVNGS Impact: None. There are no applicable flood related procedures.

8. Section / Cat.: 5 (Methodology) / Not Necessary

Inquiry: Sources for design information – Is it necessary to pull CLB design specifications and/or drawings for specific flood protection features to verify that field observations match the drawings/specifications? The concern is over the time involved in pulling the drawings and specification for each feature. Peach Bottom has about 1000 individual features, many of which are seals. In that case, all they should need to do is verify that the seal locations are per the CLB drawing and that the type of material is per the CLB spec. This didn't seem to pose a big problem.

An example of one that is creating concern is incorporated pumps. In addition to inspecting the condition and reviewing the maintenance program, should model number, impeller size, etc. be noted to check against CLB drawings/specs for modifications (if this can be done with ordinary visual means). Plant personnel indicated this level of design basis verification would take months to complete and result in not meeting the deadline. As is probably the case with most plants, they have plant processes for modifications and configuration controls. Could they lean on this process in lieu of checking every component? This issue would also apply to other features such as gate valves, check valves, etc.

Resolution: NEI 12-07 states that critical characteristics are to be determined and compared against information obtained during the walkdowns (e.g., nameplate data); it is not sufficient to rely upon the design, modification, and configuration control processes by themselves to ensure that installed SSCs meet their design requirements. On the other hand, it is not necessary to disassemble equipment to check internal configuration. If visually inspecting a feature (e.g., pump) and obtaining critical information (e.g., nameplate data) requires removal of a cover or other components, the licensee can use discretion as to whether this feature is 'inaccessible' per the definition in NEI 12-07, Section 3.6. Note that Section 5.1 and 5.10 of NEI 12-07 contain specific expectations for features determined to be inaccessible.

In the case of seals, it is not necessary to check pressure rating, it is sufficient to visually inspect the seal and determine that it is installed properly, has no obvious degradation, and shows no signs of leakage (see Section 5.6 and example A.1.3 in NEI 12-07).

PVNGS Impact: Flood protection features were inspected using drawings to compare the as-found condition to the as-designed/constructed condition.

There are no credited sump pumps at PVNGS.

9. Section / Cat.: 5.5.2 (Incorporated or Exterior Passive Flood Protection Features) / Not Necessary

   Inquiry: We have a wet site where the SSCs are licensed to flood and the core is protected using mitigating actions. Some of the buildings have safety-related equipment below grade and below groundwater levels. The building's concrete walls keep groundwater from entering the structure but there is no mention of the walls being credited flood or groundwater protection features in the CLB. If the walls and any associated penetration seals are not credited in the CLB as providing protection (against surface water or groundwater flooding), do they need to be included in the walkdown scope?

   On the other hand, if the walls and associated seals are performing a flood protection function, specifically for groundwater ingress, even though the CLB for flooding is silent on it, should a visual observation of the walls be performed?

   Resolution: Any exterior wall (above or below grade) protecting space credited as dry in the CLB from groundwater or surface water flooding should be included in the walkdown scope, even if the exterior walls are not explicitly mentioned in the CLB. The inspection of the walls should also note degrading or nonconforming conditions for associated penetrations, seals, etc., although the penetrations/seals themselves do not need to be listed as separate features, with separate walkdown record forms, unless individually credited in the CLB. The inspection applies to portions of the walls below design basis flood and/or groundwater levels.

   Note that Available Physical Margin should be obtained to the lowest unsealed, unqualified and or inspected sealed penetration above the design basis water level.

   PVNGS Impact: As discussed in item 3 above, walls below the design groundwater level were included in the scope.

10. Section / Cat.: 5.8 (Documentation of Available Physical Margins) / Interpretation

    Inquiry: NEI 12-07 states that interim action should be taken if the Available Physical Margin is determined to be small and the consequences of flooding at the location of concern are significant (loss of safety function). Can credit be taken for safety related or non-safety related, redundant and diverse equipment in determining interim actions?

    Resolution: Evaluations of Available Physical Margin address hypothetical situations that are beyond the current design basis. This is the case because the existence of any physical margin greater than or equal to zero means that the design basis is met and no further action is necessary. Licensees may take conservative, preemptive action when they address situations where the Available Physical Margin is small.

    Since these evaluations assess beyond design basis conditions, it is acceptable for the interim actions to use any available capability to satisfy the safety function that would be lost if the Available Physical Margin was exceeded.

    PVNGS Impact: This inquiry response was considered for any APM results that were entered into the CAP.

11. Section / Cat.: Appendix A (Examples) / Not Necessary

Inquiry: Concerning internal wall inspections (A.1.2) bullets 5, 8 & 10 - is the expectation that we look at:

- All internal walls when the external wall is an external flood protection wall?
- Only those internal walls that are below grade (inaccessible)?
- Only internal walls when there is some sort of issue/deficiency associated with the external wall protective feature?

Resolution:

- Per bullet #2, exterior surfaces of exterior walls (credited for flood protection) should be inspected at and below the maximum analyzed flood height.
- Per bullets # 5 and #8, interior surfaces of the exterior walls (credited for flood protection) should be inspected for signs of in-leakage. For example, the way (SONGS') UFSAR is written, there is no distinction between buried (below-grade) and exposed (above-grade) portions of the wall, so they will be inspecting the entire interior surface. It is conservative to inspect the entire interior surface of the credited exterior wall since there might be an undocumented in-leakage pathway (e.g., unsealed conduit)
- Per bullet #10, buried portions of exterior surfaces of exterior walls are considered inaccessible. The interior surfaces of the exterior walls still need to be inspected if accessible and credited for flood protection.

PVNGS Impact: As discussed in item 3 above, the only walls in scope were walls below the design groundwater level. As similarly discussed in item 6 above for seals, only the accessible side of these walls (the side that can be viewed from the inside of a building) was inspected during the PVNGS NEI 12-07 walkdowns.

12. Section / Cat.: Appendix A (Examples) / Not Necessary

Inquiry: A.1.3 4th bullet - when it says something should have "an absence of corrosion" - everything in south Texas has corrosion if it's exposed to the weather - can we use the term significant or corrosion beyond surface or some qualifier?

Resolution: This is a judgment call; even "significant" is subject to interpretation. If the person performing the inspection is not sure that the corrosion is acceptable, the observation should be entered into the CAP.

PVNGS Impact: Any indication of corrosion that could not be immediately judged as acceptable was recorded as an observation to be entered in the CAP.

13. Section / Cat.: Appendix A (Examples) / Not Necessary

Inquiry: In A.1.2 11th bullet - "PM/surveillance" - suggest adding "/program/plan" to the list. We want to take credit for our "Structures Monitoring Plan" for monitoring buildings as part of Maintenance Rule.

Resolution: It was not the intention of the FFTF to exclude programs or other ways of accomplishing the intent of the inspections as long as they meet the degree of "rigor" described in the guideline. Document the identity of the program or plan you are crediting in the walkdown form.

PVNGS Impact: The PVNGS structural monitoring program was used in conjunction with "PM/surveillance" for this bullet.

14. Section / Cat.: Appendix A (Examples) / Not Necessary

Inquiry: The majority of our features are penetration seals. We are thinking the "critical characteristics" of a seal are that it is filled w/ a material & in good material condition. Do you agree? We did not want to go into material type, thickness, etc.

Resolution: Seal inspection should consist of visual inspection to identify any degradation as compared to the original design, any sign of previous leakage, and that the configuration is consistent with applicable drawings. It is not necessary to physically touch or possibly disturb any seal.

PVNGS Impact: The resolution of this inquiry was considered in the development of the acceptance criteria.

15. Section / Cat.: Appendix B (Walkdown Record Form) / Not Necessary

Inquiry: Could the Walkdown Forms/Sheets be organized in such a way that you wouldn't need all 8 pages for every feature? At STP we have over 500 features, it would be nice if it were organized such that if I am looking at a penetration seal I would only need 4 or 5 sheets. If parts A, B1, C & E were separated from the others & together, then we would need only those for almost 500 of the features.

Resolution: The FFTF talked about doing this and ultimately decided not to in order to avoid additional complexity and questions on whether parts of the form were missing or intentionally left out. If you really want to reduce the size of the form in this way, you could remove sections and then make it absolutely clear in the "comments" in the Part E conclusion section which parts of the form are not included and why.

PVNGS Impact: The format of NEI 12-07 Appendix B for walkdown record forms was followed. No parts were removed. Parts that were not applicable were filled out as such (e.g., entries for Part D, reasonable simulation, were completed as N/A for walls).

16. Section / Cat.:	Appendix D (Walkdown Report) / Not Necessary
Inquiry:	The UFSAR is silent on local intense precipitation (LIP), presumably because the governing flood is riverine. If manual actions are required to protect a SSC from flooding, should the procedure be reviewed against the governing flood and the LIP?
Resolution:	No, the applicable procedures do not need to be reviewed against the governing flood and LIP if LIP is not in the licensing basis. Walkdowns verify plant configuration with respect to the CLB. The new plant flood reevaluations done in response to 2.1 will address LIP as a new hazard.
PVNGS Impact:	None. LIP is considered for the PVNGS UFSAR.