ATTACHMENT TO RBG-47308

RIVER BEND STATION

Flooding Walkdown Report

Entergy

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Engineering Report Cover Sheet

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ENGINEERING REPORT

RIVER BEND NUCLEAR STATION FLOODING WALKDOWN SUBMITTAL REPORT FOR RESOLUTION OF FUKUSHIMA NEAR TERM TASK FORCE RECOMMENDATION 2.3: FLOODING

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1.0 SCOPE AND OBJECTIVE

This report was developed to provide information requested by the United States Nuclear Regulatory Commission (NRC) pursuant to Title 10 of the Code of Federal Regulations, Section 50.54(f) on March 12, 2012 for River Bend Nuclear Station Unit 1. In response to the NRC request, Entergy performed walkdowns to verify that plant features credited in the current licensing basis (CLB) for protection and mitigation from external flood events are available, functional, and properly maintained. The walkdowns were performed to verify that structures, systems, and components (SSCs), portable flood mitigation equipment, and the procedures needed to install and or operate them during a flood are acceptable and capable of performing their design function as credited in the current licensing basis (CLB).

This report presents the findings of the flooding walkdown inspections completed at River Bend Nuclear Station. The walkdowns were completed in accordance with the United States Nuclear Regulatory Commission (NRC) endorsed guidance of NEI 12-07, Rev. 0A, Guidelines for Performing Verification of Plant Flood Protection Features, dated May 31, 2012 and Entergy Nuclear procedure EN-DC-170 that was developed to provide instructions for implementation of the NRC endorsed guidelines. The walkdowns completed at River Bend Station (RBS) were performed to verify that the structures, systems, and components (SSCs) credited for flood protection are capable of performing their design function as described in the CLB. The walkdowns were also used to verify that plant modifications implemented since original construction, such as changes to topography, do not adversely affect flooding protection.

This report identifies the flooding hazards that comprise the CLB and the protection and mitigation features that are credited with preventing the ingress of external water into SSCs important to safety at RBS. The effectiveness of the flood protection features is evaluated against a set of acceptance criteria. Results of the walkdowns, including key findings, available physical margin, and any identified degraded, or nonconforming conditions are addressed and a description of the actions taken or planned to address these conditions is provided.

2.0 DESIGN BASIS FLOOD HAZARD LEVEL

Sections 2.4 and 3.4 of the RBS Updated Final Safety Analysis Report (UFSAR) describe the design basis flood and flood protection features provided at RBS for protection against an external flood.

2.1 Flood Hazards Identified

2.1.1 General Site Information

The RBS site includes two general levels of terrace. The alluvial floodplain on the east side of the river varies from 3,000 to 4,000 ft wide, and is at about 35 ft msl. The upper terrace has an average elevation of over 100 ft msl. The station buildings and all safety-related equipment are located on the upper terrace. The original ground grade in this area was about 110 ft msl. The finished ground grade is at nominal elevation 95 ft msl. Grade varies from 97 ft msl maximum to 90 ft msl minimum. The site is drained by Grants Bayou on the east and Alligator Bayou on the west. Numerous unnamed intermittent streams cross the site and drain to either Grants or Alligator Bayou. Grants Bayou enters Alligator Bayou to the south of the site. It then flows south into Thompson Creek, which enters the Mississippi River approximately 7 mi downstream of the RBS embayment. All safety-related equipment is contained in Seismic Category I Buildings. Equipment in buildings not sealed from floodwater entry is at a minimum elevation of 98 ft msl.

2.1.2 Mississippi River Flood

The largest flood flow calculated for the Mississippi River in the site region is the Project Design Flood (PDF). The flood estimation was performed by the Army Corps of Engineers. The anticipated flow distribution to the Mississippi River floodway system during a PDF utilizing upstream reservoir storage would provide a reduction in peak flow. The estimated flood level at the site for this flow is 54.5 ft msl, about 40 ft below plant grade. The PDF is confined between the manmade levee on the west bank of the river and the eastern edge of the river floodplain.

2.1.3 Local Streams

A flood on Grants Bayou (and its tributary, West Creek) is potentially more severe than flooding of other area streams. The water levels in Grants Bayou and West Creek were computed through the use of the HEC-2 Water Surface Profiles computer program developed by the Army Corps of Engineers. Two flood conditions were analyzed for the local streams. These include the PMF, and a 25-yr flood with safe shutdown earthquake (SSE) conditions. Based on this analysis, plant area flooding would not occur. It is unlikely that an operational basis earthquake (OBE) would fail site area slopes. Specifically, the Donaldsonville earthquake of 1930 is used as the basis for determining OBE and SSE seismic intensities. It is unlikely that an SSE, with a conservatively assumed maximum ground motion of 0.1 g, would cause bank caving. However, this has been assumed for the flood analysis. Since the channel conditions for the 1/2 PMF + OBE would be the same as for the PMF, it is seen that the PMF would produce higher water levels. Therefore, the ½ PMF + OBE can be eliminated from further discussion.

2.1.4 Coincident Wind Wave Activity

Plant grade and any safety-related equipment are well above any wind-wave water level. Plant safety is not jeopardized by even the most extreme conditions of Mississippi River flooding.

2.1.5 Potential Dam Failures

The effect of the failure of dams located in the Mississippi River Basin from both flood and seismic action has been considered. Plant grade is about 95 ft msl, and safety-related equipment is positioned at a minimum elevation of 98 ft msl or is located in buildings protected from floodwater entry. The normal river water level at the site is about 20.4 ft msl, and the highest recorded water level since installation of numerous upstream river control structures is about 52.1 ft msl. Considering the distance of dams from the site (greater than 100 river miles), the elevation of the site with respect to surrounding topography and the river floodplain, and the broad expanse of tributary and river floodplain available to overbank flows, it is extremely unlikely that a flood wave or flood flows generated by a dam failure or series of failures anywhere in the basin could affect safety-related equipment at the site. To support this assessment, all safety-related equipment is more than 35 ft above the PMF peak level, which is well above any potential effect from dam failures. There are no dams or similar water control structures on the local streams.

2.1.6 Probable Maximum Precipitation (PMP)

The maximum postulated flood level of 96 ft msl at RBS is due to the probable maximum precipitation (PMP) event. An analysis of plant drainage was performed to determine whether safety-related equipment could be flooded during an occurrence of the PMP. The following discussion pertains to flooding in the immediate plant area. Normally, the plant area is drained by directing runoff into the subsurface drain system, drainage ditches, and culverts. All local runoff is conveyed to West Creek or East Creek. There are no areas which could produce ponding of runoff to an elevation greater than 96 ft msl near plant buildings during a PMP event. Overland runoff can enter West Creek by overtopping West Plant Road or by overflowing a drainage ditch and exceeding 94 ft msl; it can enter East Creek by overtopping the cooling tower access road at about 92.5 ft msl.

Flooding of Category I structures through conduit penetrations connected to manholes is of no concern at RBS. There are no Category I manholes at RBS. All through wall electrical penetrations of Category I structures in direct contact with ground below the design basis flood level (DBFL) are encapsulated in watertight electrical duct banks.

2.1.7 Probable Maximum Surge and Seiche Flooding

RBS is not subject to surge or seiche flooding.

2.1.8 Probable Maximum Tsunami Flooding

Tsunamis principally occur following undersea earthquakes, although landslides, bottom slumping, and volcanic eruptions have been quoted as generators in certain cases. The site is 262 river miles from the Gulf of Mexico, and there is no danger of flooding due to geoseismic activity in the Gulf.

2.1.9 Ice Effects

Water temperatures of the Mississippi River near St. Francisville range from 34°F to 88°F, and ice does not form in the river near the site. There is no record of an ice jam causing flooding near the site. The plant area is about 50 ft above the river levee and is not endangered by the unlikely occurrence of ice jam flooding.

2.1.10 Cooling Water Canals

The only canal at the station is associated with the cooling water system. This is the cold water flume that connects the individual Circulating Water System mechanical-draft cooling tower basins. Failure of the flume does not jeopardize plant safety. The plant is equipped with a standby cooling tower, and safety-related equipment is a minimum of 3 ft above grade, well above any potential onsite flood level due to flume failure.

2.1.11 Channel Diversions

The U.S. Army Corps of Engineers maintains the Mississippi River in its present channel by means of an extensive program. It is considered extremely unlikely for the current course of the Mississippi River to be jeopardized by sudden natural diversion processes.

2.1.12 Roof Drainage

Precipitation that falls on the roofs of onsite buildings is collected in gutters along the roof edge and discharged via downspouts to the plant yard adjacent to the buildings. Overflow from the roof gutters spills directly onto the plant yard. All building roofs except for some small areas are sloped, and no potential exists for significant ponding of rainfall on the roofs. With the exception of the Standby Cooling Tower Pumphouse and the Diesel Generator building roof at elevation 126'-0" msl, there are no parapet walls which exist on plant buildings which would encourage rainfall ponding. In the case of the Standby Cooling Tower Pumphouse, a 2'-4" maximum height parapet wall exists at the edge of the roof. The Diesel Generator Building roof at elevation 126'-0" msl is bounded on the west side by a continuous wall. Both roof structures are adequately designed to support the maximum potential height of ponded rainwater.

2.1.13 Design Basis Groundwater Level

It has been demonstrated that plant buildings can withstand the pressure and buoyancy effects of a 70 ft msl groundwater level. This is about 13 ft above normal groundwater. The safety related tunnels adjacent to the Unit 2 excavation have been shown to be able to withstand the pressure and buoyancy effects from a ponding level in the excavation of 80 ft msl. In addition, the design basis levels for

Unit 2 excavation ponding and groundwater will not be exceeded during the most severe postulated meteorology and seismic events.

The normal groundwater elevation at the site is +57 ft msl, as determined from piezometric measurements. The maximum groundwater elevation is 70.0 ft msl, which occurs coincident with the Design Basis Flood at the site. This temporary rise in the groundwater level is the result of infiltration during surface flood conditions.

2.2 Assumptions

2.2.1 The Grants Bayou PMF was conservatively assumed to coincide with the PDF of the Mississippi River. The peak river stage elevation is 54.5 ft msl, as determined by the Army Corps of Engineers. This was used as the starting elevation for Grants Bayou backwater profile calculations.

2.2.2 The flow for Grants Bayou above West Creek was conservatively assumed to exist undiminished upstream.

2.2.3 The local streams are spanned by railroad and road bridges with piers located adjacent to and in the stream bed. These streams are subject to debris accumulation. For these reasons, each bridge crossing downstream of the station was assumed to be 50 percent clogged at the occurrence of the PMF and 1/2 PMF + OBE, and 100 percent clogged for the 25-yr flood + SSE.

2.2.4 Three West Creek crossings were built to facilitate station construction. One is located upstream of the West Creek drop structure. The other two are located along the Fabriform-lined portion of West Creek at Warehouse #2 and at the paint shop (upstream from the Warehouse #2 crossing). The paint shop crossing was removed prior to plant operation. For both the PMF and 25-yr flood + SSE, 100 percent culvert clogging is assumed at these crossings.

2.2.5 Flow through bridges or embankment conveyances upstream of the station were conservatively assumed to enter the study area undiminished in magnitude. Backwater calculations were performed on West Creek flows assuming creek conditions as they will exist during plant operation.

2.2.6 Combinations of extreme local flooding and seismic events were also investigated. An OBE combined with a 1/2 PMF and SSE combined with a 25-yr flood were assumed to occur. Neither occurrence would produce water levels higher than the PMF.

2.2.7 The SSE was assumed to:

1. Fail all local slopes to a maximum inclination of 20H:1V and fully clog all bridges downstream of the plant.
2. Leave bridges upstream of the plant intact, allowing floodwater to enter the site undiminished.

2.2.8 The OBE at RBS is conservatively assumed to have a maximum ground motion of 0.05 g. Therefore, it can be inferred that an OBE would not cause bank caving at RBS. It is unlikely that an SSE, with a conservatively assumed maximum ground motion of 0.1 g, would cause bank caving. However, this has been assumed for the flood analysis.

2.2.9 No credit was taken for the plant area subsurface drainage system during plant area PMP runoff and flood level analysis.

2.2.10 In order to calculate the amount of rainfall and runoff which could collect in the Unit 2 excavation, the following assumptions were made:

1. The storm drain system within the berm is clogged and provides no conveyance of runoff to West Creek or East Creek.
2. Rainfall occurring within the 700,000 sq ft top area of the excavation contributes directly to ponding.
3. Rainfall occurring within the berm but exterior to the excavation is converted to runoff prior to adding to the ponded volume in the excavation. This covers an area of about 450,000 sq ft.

2.2.11 For the analysis of Unit 2 excavation ponding, it was assumed that a 72 hr PMP storm is preceded by a 72 hr 1/2 PMP storm. In accordance with Regulatory Guide 1.59, Rev. 2, it was assumed that 72 hrs separated the two storms. Additionally, it was conservatively assumed that 2 ft of ponding (to 65 ft msl) would exist in the excavation prior to the 1/2 PMP antecedent storm. Two analyses of ponding were performed. Case 1 assumed no seepage from the excavation during the 9-day storm period, which allowed for a computation of the maximum ponding level in the excavation. The results of this study were compared to the 80 ft msl criterion for maximum ponding in the excavation. Case 2 assumed seepage from the excavation would occur, which would allow for a computation of the maximum groundwater level under plant buildings. The results of this study were compared to the 70 ft msl criterion for the maximum groundwater level beneath plant buildings.

2.2.12 In the estimation of PDF flow reduction due to reservoir storage, storms used to construct the PDF were assumed to be generally located near the downstream portions of the major tributaries where the maximum effectiveness of reservoir storage capability would not be obtained. It is assumed that reservoir storage provides a reduction in peak flow during the PDF and Probable Maximum Flood (PMF). It is assumed that flow diversion upstream of the site during the PMF would increase from the determined PDF confined discharge value. Hence, the main stem confined discharge at the site would increase.

2.3 Methodology

2.3.1 Mississippi River Flood

The largest flood flow calculated for the Mississippi River in the site region is the PDF. The flood estimation was performed by the U.S. Army Corps of Engineers. The PDF has an estimated frequency of occurrence of greater than 100 yr, but no more exact frequency determination is available. The occurrence of a greater flood would be very rare, and could be estimated only by using very improbable intensities of rainfall, runoff, and storm sequences. The PDF is based on tributary and main stem floods predicted by the U.S. Weather Bureau as "maximum possible" and by the Mississippi River Commission as "maximum probable".

The Army Corps considers the PMF to be the most severe flood "reasonably possible" at a particular location. A PMF for the Lower Mississippi River has not been defined because there are no recent criteria available for such a determination on a basin of this size and complexity. Considering the above flood descriptions, it is concluded that the PDF could be considered to be of the same order of magnitude as a PMF.

2.3.2 Coincident Wind Wave Activity

An estimated PMF level of 60 ft msl was combined with the 2-yr extreme wind speed to determine the maximum water level at the site due to river flooding. Based on Regulatory Guide 1.59, Rev 2, a wind speed of 50 mph was selected. Standard methods were used to determine the wave height, period, and runup.

2.3.3 Probable Maximum Precipitation

The following discussion pertains to precipitation in local drainage basins which produces the design basis flooding condition for the plant. PMP values for the Grants Bayou basin and sub-basins were based on data contained in Hydrometeorological Reports No. 51 and 52. All-season PMP values for a variety of storm durations and drainage area sizes are based on a nationwide analysis of storm characteristics such as dew points, land contours, and historical rainfall.

Based on drainage characteristics of the basins, rainfall durations and storm distributions were selected. The basins analyzed to determine the impact of extreme local flooding on plant safety include: Grants Bayou, 15.6 sq mi; Grants Bayou above confluence with West Creek, 8.4 sq mi; and West Creek, 1.0 sq mi. Storm durations were selected such that the shortest time interval in the rainfall distribution corresponded to the unit rainfall duration (the time of runoff-producing rainfall) as calculated for each sub-basin.

A storm duration of 24 hr was selected for the entire Grants Bayou basin while durations of 12 and 6 hr were applied to Grants Bayou above West Creek and West Creek, respectively.

PMP storm values were distributed in accordance with NRC Regulatory Guide 1.59, Rev. 2, and standard procedures.

2.3.4 Maximum Ground Water Table

Published reports by the United States Geological Survey and the Louisiana Department of Public Works provided information on the groundwater resources in the site area. Newsletters from the Capital-Area Groundwater Conservation Commission, Baton Rouge, LA, also were a source of information.

2.4 Non Conformance

No differences or contradictions in flood hazard levels were found in design or licensing basis documentation at RBS.

3.0 EXTERNAL FLOOD PROTECTION AND MITIGATION FEATURES

3.1 Flooding Licensing Basis

The maximum postulated flood level at RBS would be caused by an occurrence of the PMP in the immediate plant area. This event would result in standing water at 96 ft msl. As a result the DBFL for the site is set at 96 ft msl. All flood protection features, as detailed in Section 3.3 below, are designed to protect all safety related equipment from flooding during a PMP event. These flood protection features are required to be operable during all plant modes of operation.

3.2 Flood Duration

All-season PMP values for a variety of storm durations and drainage area sizes are based on a nationwide analysis of storm characteristics such as dew points, land contours, and historical rainfall. Based on drainage characteristics of the basins, rainfall durations and storm distributions were selected. The basins that were analyzed to determine the impact of extreme local flooding on plant safety include: Grants Bayou, 15.6 sq mi; Grants Bayou above confluence with West Creek, 8.4 sq mi; and West Creek, 1.0 sq mi. Storm durations were selected such that the shortest time interval in the rainfall distribution corresponded to the unit rainfall duration (the time of runoff-producing rainfall) as calculated for each sub-basin. A storm duration of 24 hrs was selected for the entire Grants Bayou basin while durations of 12 and 6 hrs were applied to Grants Bayou above West Creek and West Creek, respectively.

For the analysis of Unit 2 excavation ponding, it was assumed that a 72 hr PMP storm is preceded by a 72 hr 1/2 PMP storm. In accordance with Regulatory Guide 1.59, Rev. 2, it was assumed that 72 hrs separated the two storms.

3.3 Flood Protection Features

External flood protection is provided for safety-related systems and components for all postulated flood levels and conditions by one of the following methods:

1. Housing them in Seismic Category I structures designed to withstand the flood loads
2. Locating them above the maximum postulated flood level
3. Locating them in watertight cubicles (of a structure) designed to withstand external flood loads.

When exposed to earth, the structural components of Seismic Category I structures are designed using:

1. Wall thicknesses below flood levels of not less than 2 ft
2. Waterstops at construction joints below flood level.

Waterproofing of foundations and exterior walls of Seismic Category I structures below grade is accomplished principally by the use of synthetic rubber waterstops at expansion and construction joints.

All penetrations, doors, and equipment hatches through the exterior walls of the Seismic Category I structures below DBFL have watertight seals and are designed to withstand the hydrostatic head of water that they would be exposed to during a flood.

The access openings to the structures housing safety-related components are either located above the DBFL or are required to be closed to prevent any adverse effect from flooding of the structures. If local seepage occurs through the walls, it is controlled by sumps and sump pumps. The operation of the plant, therefore, is not affected by flood conditions.

No permanent plant dewatering system is provided for RBS.

The Seismic Category I structures are designed and analyzed for the maximum hydrostatic head and the buoyant forces due to the Probable Maximum Flood, using the applicable loads and load combinations. A safety factor of 1.1 is used in designing these structures against flotation.

The most critical postulated flood condition results in standing water at 96 ft msl, which would be caused by an occurrence of the PMP in the immediate plant area. The dynamic effect resulting from wave forces at this low level of ponding (1 to 1.5 ft at the plant buildings) is considered negligible. Therefore, the hydrodynamic loads due to floods are not considered in the design of Seismic Category I structures.

During most storms, a portion of runoff in the eastern area of the site would enter the storm drain system and flow to East Creek. For rainfall intensity greater than the storm drain capacity, water would pond in the plant area, overflow a portion of the cooling tower access road, and flow directly to East Creek.

Storm runoff in the construction parking area, immediately north of the plant, would drain to a paved ditch along the east, south, and west embankments. A box culvert provides conveyance of runoff from this ditch to West Creek. The culvert is located beneath the intersection of the plant ring road and the West Plant Access Road, at the northwest corner of the immediate plant area. If this culvert became clogged, runoff would overflow the ditch and move west to West Creek and south to the excavation and Unit 1.

Storm runoff in the area of the Unit 2 excavation would be partially intercepted by the storm drain system (flowing to West Creek), and partially collect in the excavation.

At the former location of Unit 2, a berm and elevated roads direct overland runoff away from the excavation. Along the north side of the excavation, the berm consists of packed

earth with a 12 ft top width and 2H:1V side slopes. The top elevation is 98 ft msl, about 4 ft above grade. The berm extends around the northwest corner of the excavation and connects to an elevated section of West Plant Road at 98 ft msl. This portion of the berm will direct runoff from the area north of the excavation to West Creek.

At the south side of the excavation, South Plant Road has been elevated to 96 ft msl and acts as the berm. Runoff from the area south of the excavation will be conveyed by a drainage ditch to West Creek or East Creek, and ponding above 96 ft msl could not occur. A berm and elevated road section at top el 96 ft msl connects the plant buildings with South Plant Road at the southeast corner of the excavation. Overland runoff in this area will move toward East Creek.

3.4 Procedures

3.4.1 Abnormal Operating Procedure

RBS currently has numerous Abnormal Operating Procedures (AOPs) which provide actions to be taken in the event of a plant abnormal event. The AOPs provide action to verify the G-Tunnel west wall doors (Doors leading out to the Unit 2 Excavation area) are closed during a severe weather event. The actions specified in this procedure are not credited in the CLB and failure to complete the actions would not prevent safe shutdown of the plant.

3.4.2 Preventive Maintenance

The existing plant preventive maintenance (PM) system provides the requirements for the inspection of all flood protection doors installed at RBS. The inspection interval of the doors and inspection requirements detailed in the PM for each door were reviewed. Based on this review, some doors were observed to have inactive or retired PMs. All doors with retired PMs were entered into the RBS Corrective Action Program for evaluation. The current conditions of the doors were evaluated during the inspection and found to be acceptable and pose no operability issues.

3.5 Adverse Weather

The purpose of the Severe Weather Operation Procedures is to provide preparation and protection instructions before, during, and after hurricanes, tornadoes and severe thunderstorms. In accordance with the CLB and review of RBS Severe Weather Operation Procedure, temporary active or passive flood protection measures are not required to be installed for protection of safety-related SSCs during flooding conditions at RBS.

Based on the CLB, several flood protection doors are assumed to remain closed during a PMP event; however no discussion is found in the licensing basis requiring personnel to close these doors. Severe Weather Operation Procedures at RBS provide instructions to verify if G-Tunnel west wall doors are closed before a severe weather event. Per review of the design basis documents of these doors, the doors are normally closed, and do not require personnel to travel outside in a severe weather condition to perform this action. This procedure does not provide any time period requirement in verifying the closure of these doors.

4.0 INTERNAL WARNING SYSTEMS

4.1 Room Water Level Warning Systems

No interior water level warning systems or alarms are credited for external flood protection in the RBS current licensing basis.

5.0 EFFECTIVENESS OF FLOOD PROTECTION SYSTEMS

5.1 Acceptance Criteria

The flood protection features credited in the CLB for River Bend Nuclear Station are: all walls and foundation mats of Category I structures below the DBFL; all piping penetrations, electrical penetrations, door openings, hatches and miscellaneous openings and their seals below the DBFL; and the general topography of the site (including the Unit 2 excavation and berm, the West Creek, the East Creek and their related culverts, and miscellaneous drainage ditches). These flood protection features were visually inspected in accordance with the acceptance criteria described in Section 6 of NEI 12-07 and Section 9.4 of Entergy Procedure EN-DC-170. The flood protection features were considered acceptable if no conditions adverse to quality were identified during the walkdown. Listed below are considerations that were to be taken into account for the walkdown.

1. Perform document review of all CLB credited flood protection and mitigation features to verify their design is in accordance with the licensing basis as specified in section 3.0 above. This document review includes review of all related concrete structural drawings, piping/electrical penetration drawings, penetration design parameter (including seal details) tabulation drawings, structural design specifications, concrete design and installation specifications, penetration seal specifications, and related concrete design calculations of specific locations.

2. Unit II Excavation berm shall consist of packed earth with a 12 ft top width and 2H:1V side slopes. The top elevation shall be 98 ft; about 4 ft above grade. The berm shall extend around the Northwest corner of the excavation and connect to an elevated section of the West Plant Road at 98 ft. This portion of the berm is to direct runoff from the area north of the Unit II Excavation to the West Creek.

3. No adverse impact to Unit 2 Excavation volume and maximum flooding due to the following new plant modifications in the Unit II Excavation:

    a. Independent Spent Fuel Storage Installation (ISFSI)
    b. Service Water Tanks and Berm
    c. Security Owner Control Area Fence (SOCA) Modification

4. Unit II Excavation shall be visually inspected to confirm general topography and layout with CLB and design documents.

5. Perform a visual inspection of credited wall seals/sleeves for indications of degradation that would allow flood waters to penetrate into the flood protected area(s). Conditions that were recorded include (but are not limited to) indication of water seepage through seal, indication of seal/sleeve aging or degradation, damage, undocumented openings or holes (such as those due to abandoned through wall components), etc.

6. The credited side(s) (surface) of each wall must be inspected. If the side of the wall that is credited for flood protection is examined and found to be acceptable, the other side of the wall does not need to be examined.

7. Visible through wall penetrations/openings (including door, piping, electrical and other miscellaneous openings) should be sealed and contain no visible potential water seepage pathways. Penetration sleeves, link seals, piping, and conduits should be free from surface corrosion.

8. Seal material should be free from water stains and surfaces surrounding the seal should be free from water induced rust discoloration.

9. Concrete structures should be free from water stains/efflorescence emanating from their surfaces.

10. Concrete structures should be free from adverse concrete spalling indications and cracks greater than 0.04 inches in width.

11. All concrete construction joints, expansion joints, and shake spaces should be free from water seepage indications, visible potential water seepage pathways, and should contain no visible signs of degradation.

12. No apparent degradation in structural members that challenges their ability to withstand flooding loads.

13. Flood protection feature is included in the Site's Preventive Maintenance (PM) Program and the PM for the specific feature is adequate and active.

14. Inspection of Owner Controlled Area (OCA) shall reveal no major topographic changes that will adversely affect site drainage or CLB DBFL of 96 ft msl. All major modifications within the OCA should have no adverse effect on site drainage or CLB DBFL of 96 ft msl. Special review shall be given to the following major modifications:

    a. Installation of Generation Support Building (GSB)

    b. Newly Installed GSB Parking Lot

    c. ISFSI Installation

    d. SOCA Modification

    e. Service Water System/Cooling Tower

All observations which were not immediately able to be judged as acceptable on the walkdowns were entered into the RBS Corrective Action Program to allow for a more detailed evaluation to be completed.

5.2 Discussion

5.2.1 Overall Effectiveness

The flooding walkdowns at RBS inspected all exterior walls, roofs, and foundation mats of Category I structures at and below the DBFL of 96 ft msl. This inspection also included all piping penetrations, electrical penetrations, miscellaneous openings, doors, equipment hatches, construction joints, and shake spaces associated with the walls, roof, and foundation mats. The visual inspections revealed that all features are capable of performing their flood protection function. Visual inspections of the site topography, site drainage pathways, berms, ditches, culverts, and creeks were also conducted.

Based on review of RBS site layout drawings it was determined that numerous new structures with the potential to adversely impact the current site drainage system and DBFL have been installed on site. These structures include the Generation Support Building (GSB), the Independent Spent Fuel Storage Installation (ISFSI), the Security Owner Control Area (SOCA), the newly installed GSB parking lot and the Service Water System/Cooling Tower. Review of the design basis documents and field walkdown of these structures shows that the impact to the site drainage system has been evaluated and found to be within acceptable limits. Hence, there is no adverse impact to the site drainage system and thus no change to the DBFL.

Based on engineering document review, the walkdowns completed at RBS, and the results of the operability determinations associated with the CRs entered into the Corrective Action Program; it is determined that RBS has sufficient protection available at the site to ensure the safe operation of the plant in the event of an external flood. All walls and penetrations located below the DBFL of 96 ft msl were walked down to ensure no cracks or openings were present which would allow water to leak into the structure.

The PMP flooding event is the event which controls plant flood design. Based on calculations and analysis completed at the site, the maximum PMP water surface elevation for the site will not be greater than 96 ft msl. The flood protection features installed at the site were designed to ensure sufficient margin is present between the top of the water surface elevation and the top of all seals and flood protection barriers. This design was confirmed via engineering document review and walkdowns.

During the walkdowns, observed conditions that did not meet the acceptance criteria discussed in Section 5.1 above were entered into the Corrective Action Program at RBS. The operability reviews for the CRs of these observations determined the flooding features to be operable. Hence, in the event of a design basis external flood event, all safety related SSCs at RBS are adequately protected as credited in the CLB.

5.2.2 Other SSCs and Procedures

Entergy Corporate procedures associated with Maintenance Rule walkdowns at RBS provide the guidance and requirements for conducting a structural condition monitoring program to meet the requirements of 10CFR 50.65, the Maintenance Rule. At RBS, the Maintenance Rule walkdowns associated 10CFR 50.65 are conducted a minimum of every five (5) years and are completed in accordance with the procedures. This program provides a systematic approach for evaluation of plant systems/structures which provides a reasonable assurance that the structures are capable of fulfilling their intended 10CFR 50.65 functions. The program consists of periodic reviews of the condition of the plant structures via periodic inspections, routine walkdowns, surveillance tests, and ongoing review of the effect of the condition of plant structures on significant plant equipment. The program consists of defining and performing periodic structural evaluations which ensures the timely identification, assessment, and repair of degraded structural elements. Concrete structures and penetration seals are inspected for cracking, spalling, erosion, corrosion of reinforcing bars, settlement, deformation, leaching, discoloration, groundwater leakage, rust stains, exposed rebar, rust bleeding, and other surface irregularities. All flood barriers and seal structures were determined to be within the scope of the Maintenance Rule and are therefore examined in accordance with these procedures. Maintaining the structures and materials monitored under these procedures provides a reasonable assurance that those structures that fall under the program will be able to perform their intended function.

Even though not credited in the CLB, the Auxiliary Building, Control Building, Diesel Generator Building, Fuel Building and safety related tunnels are all equipped with floor drainage systems. Water entering these structures would flow across sloped floors, drainage conduits or open culverts and enter the floor drainage systems to be collected in sumps at the bottom floor elevations. However, no credit is taken in the licensing basis for the lowering of water levels by the operation of the floor drainage system. The floor drainage system would control the incidental effect of water seepage into the buildings at RBS, hence preventing water from pooling inside structures.

6.0 IMPLEMENTATION OF WALKDOWNS

6.1 NEI-12-07 Guidance

The verification walkdowns were performed in accordance with the NRC endorsed guidance of NEI 12-07, Rev. 0A, "Guidelines for Performing Verification Walkdowns of Plant Flood Protection Features" dated May 31, 2012, and Entergy Nuclear procedure EN-DC-170 that was developed to provide instructions for implementation of the NRC endorsed guidelines. Additional guidance for implementation was also obtained from the Flooding Walkdown Frequently Asked Questions (FAQs) and NRC responses, which are based on discussions between NEI and the NRC.

The basis for establishing the walkdown scope and the flood protection features included the preparation of a walkdown list in accordance with the guidance provided in Section 4 of NEI 12-07. As part of this preparation, the CLB was reviewed to determine the flood protection features and actions that are necessary to prevent an external flooding event

at the site from adversely impacting safety-related SSCs. In addition to the identification of passive and active flood protection features, existing site and Entergy Corporate procedures were reviewed to determine if any procedures were necessary to ensure existing flood protection features would be functional in the event of a flood at the site.

Walkdown packages were prepared in accordance with the guidance provided in Section 5.2 and walkdown team personnel were selected based on the requirements provided in Section 5.3 of NEI 12-07.

Prior to each walkdown, a pre-job brief was conducted. All walkdown results were documented in accordance with the recommendations of Section 7 of NEI 12-07 on the Flooding Walkdown Record Form provided in Attachment 9.3 of EN-DC-170. The walkdown record form provided in Attachment 9.3 is consistent with the record form template provided in Appendix B of NEI 12-07.

6.2 Team Organization

Consistent with Section 5.3 of NEI 12-07, the walkdown team consisted of at least two trained individuals with a complementary set of skills. The walkdown team consisted of at least two degreed engineers (or equivalent) who had familiarity with the site. The walkdown team was supplemented as required by plant maintenance and/or operations personnel.

6.3 Training Approach

Consistent with Section 5.3 of NEI 12-07 and Section 4.1 of EN-DC-170, personnel selected to perform walkdown inspection activities were experienced and knowledgeable of the site CLB. Personnel were also trained to perform the visual inspections and met the knowledge requirements specified in EN-DC-170 and Appendix C of NEI 12-07. Team members associated with the flooding walkdowns also satisfactorily completed the NANTEL Generic Verification Walkdowns of Plant Flood Protection Features lesson and were knowledgeable of the 50.54(f) letter dated March 12, 2012.

Plant maintenance and/or operations personnel who supplemented the walkdown teams were not required to be qualified to the aforementioned requirements.

7.0 WALKDOWN RESULTS

A total of 23 walkdown packages were associated with the walkdowns completed at RBS, with several packages containing multiple features. The features and attributes are broken down into flood protection type (incorporated passive, temporary passive, incorporated active, and temporary active) as shown in the table below.

Table #1: Summary – Features Included in the Walkdown Scope

Flood Protection Type	Total Number of Features	Total Number of Attributes
Passive – Incorporated	35	207
Passive – Temporary	0	0
Active – Incorporated	1	7
Active – Temporary	0	0

7.1 Deficiencies

There were some observed conditions of features that did not meet the NEI 12-07 acceptance criteria. These conditions were entered into the Corrective Action Program; however, none of these observations were determined to be deficiencies as defined in NEI 12-07. The operability determinations for these conditions concluded that the feature could perform its intended flood protection function when subject to its design basis flooding hazard. However, as a proactive measure, work orders were created as necessary to repair the conditions that did not meet the NEI 12-07 acceptance criteria.

7.2 Observations

Observations during the walkdowns that did not meet the NEI 12-07 acceptance criteria were documented in the Corrective Action Program (CAP). The features were determined to be operable and none of the observations were determined to be deficiencies. All observations entered into the Corrective Action Program as a result of the flooding walkdowns have been dispositioned as of the writing of this report.

7.3 Corrective Actions

There were no observations identified that required actions to address a deficiency. Since the CAP has determined that there are no deficiencies, there are no planned actions pending related to deficiencies.

7.4 Flood Protections Features not Inspected

Portions of the east wall of the Diesel Generator Building were inaccessible because the rooms housing the diesel tanks are filled with sand. The associated attributes (pipe penetrations) along this wall were also inaccessible. Inspection of the accessible areas revealed no adverse condition. Hence, based on the inspection of the accessible areas and engineering document review showing the concrete wall as the flood barrier in this area, the entire Diesel Generator Building east wall was evaluated to be acceptable.

Most of the foundation mat and walls of the Standby Cooling Tower were inaccessible due to the foundation mat and walls being beneath the water cells. Based on design engineering document review and evaluation of all inaccessible features, it was determined that all features inaccessible due to being submerged below water are watertight, hence, acceptable for flood protection. Non submerged areas were also evaluated based on design engineering document review and found to be acceptable for flood protection.

Most of the Reactor Building walls and foundation mat were inaccessible due to the features being located beneath the suppression pool or within the drywell. Based on design engineering document review and evaluation of all inaccessible features, it was determined that all features inaccessible due to being submerged below water are watertight, hence, acceptable for flood protection. The foundation mat of the Reactor Building within the drywell was evaluated to be acceptable based on its thickness of approximately 10 ft.

8.0 AVAILABLE PHYSICAL MARGIN

As indicated in Section 3.12 of NEI 12-07, Rev. 0A, the NRC is no longer expecting the Recommendation 2.3: Flooding Walkdowns to include an evaluation of the cliff-edge effects at the site. The available physical margin (APM) has been determined and documented on the walkdown record forms. The APMs provided on the walkdown record forms will allow flood hazard reevaluations completed in response to Recommendation 2.1: Flooding to be completed.

9.0 NEW FLOOD PROTECTION SYSTEMS

No new flood protection enhancements or mitigation measures were determined to be necessary based on the flooding walkdowns, and therefore additional enhancements or measures are not planned.

10.0 REFERENCES

10.1 NRC Letter to Licensees, dated March 12, 2012, "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 Daiichi Accident."

10.2 NEI 12-07 Rev. 0-A Guidelines for Performing Verification Walkdowns of Plant Flood Protection Features, NEI, dated May 2012.

10.3 River Bend Nuclear Station Updated Final Safety Analysis Report, Revision 22.

10.4 EN-DC-170, Revision 000, "Fukushima Near Term Task Force Recommendation 2.3 Flooding Walkdown Procedure"

11.0 ATTACHMENTS

None