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July 11, 2013

10 CFR 50.4

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555-0001

SUBJECT: Duke Energy Carolinas, LLC (Duke Energy)

McGuire Nuclear Station (MNS), Units 1 and 2
Docket Nos. 50-369 and 50-370
Renewed License Nos. NPF-9 and NPF-17

Response to Request for Additional Information Regarding Overall Integrated Plan in Response to Order EA-12-051, "Reliable Spent Fuel Pool Instrumentation" (TAC Nos. MF 1062 and MF 1063)

REFERENCES:

1. Letter from Duke Energy to NRC, "Overall Integrated Plans in Response to March 12, 2012, Commission Order Modifying Licenses With Regard To Requirements for Reliable Spent Fuel Pool Instrumentation (Order Number EA-12-051)", dated February 28, 2013, Accession No. ML 13086A095
2. Letter from NRC to Duke Energy, "Request for Additional Information" Re: Overall Integrated Plan in Response to Order EA-12-051, "Reliable Spent Fuel Pool Instrumentation" dated June 13, 2013 Accession No. ML 13157A097

In Reference 1, Duke Energy submitted an Overall Integrated Plan (OIP) in response to the March 12, 2012 NRC Order modifying licenses with regard to requirements for reliable Spent Fuel (SFP) Instrumentation (Order Number EA-12-051)

In Reference 2, the NRC transmitted Requests for Additional Information (RAIs) regarding the OIP.

The purpose of this letter is to respond to the Reference 2 RAIs. The attachment to this letter constitutes McGuire's response. The format of the attachment is to restate each RAI question, followed by the appropriate response.

ADD1
NRR

There are no regulatory commitments contained in this letter or its attachment.

If you have any questions or require additional information, please contact George Murphy at (980) 875-5715.

I declare under the penalty of perjury that the foregoing is true and correct.
Executed on July 11, 2013.

Sincerely,

Steven D. Capps

Attachment

xc:

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REQUEST FOR ADDITIONAL INFORMATION

OVERALL INTEGRATED PLAN IN RESPONSE TO

ORDER EA-12-051, "RELIABLE SPENT FUEL POOL INSTRUMENTATION"

DUKE ENERGY

MCGUIRE NUCLEAR STATION, UNITS 1 AND 2

DOCKET NOS. 50-369 AND 50-370

1.0 Introduction

By letter dated February 28, 2013 (Agency wide Documents Access and Management System (ADAMS) Accession No. ML 13086A095), Duke Energy submitted an Overall Integrated Plan (OIP) in response to the March 12, 2012, U.S. Nuclear Regulatory Commission (NRC), Order modifying licenses with regard to requirements for Reliable Spent Fuel Pool (SFP) Instrumentation (Order Number EA-12-051; ADAMS Accession No. ML 12054A679) for McGuire Nuclear Station, Units 1 and 2. The NRC staff endorsed Nuclear Energy Institute (NEI) 12-02 "Industry Guidance for Compliance with NRC Order EA-12-051, to Modify Licenses with Regard to Reliable SFP Instrumentation," Revision 1, dated August 2012 (ADAMS Accession No. ML 12240A307), with exceptions, as documented in Interim Staff Guidance (ISG) 2012-03 "Compliance with Order EA-12-051, Reliable SFP Instrumentation," Revision 0, dated August 29, 2012 (ADAMS Accession No. ML 12221A339).

The NRC staff has reviewed the February 28, 2013, response by the licensee and determined that the following Request for Additional Information (RAI) is needed to complete its Technical Review. If any part of this information is not available by the July 13, 2013, response date for this RAI, please provide the date this information will be submitted.

2.0 Levels of Required Monitoring

The OIP states in part that

- *Level 1 – Level adequate to support operation of the normal fuel pool cooling system. The minimum required level to provide adequate pump suction (769' Elevation).*
- *Level 2 - Level adequate to provide substantial radiation shielding for a person standing on the spent fuel pool operating deck 756' (10±1 feet above the top of the highest point of any fuel rack seated in the SFP). This level provides substantial personnel radiation shielding that would allow implementation of local SFP make-up strategies for a beyond design bases event.*

- *Level 3 – Level where fuel remains covered and actions to implement make-up water addition should no longer be deferred (approximately 746' ±1 foot the highest point of any fuel rack seated in the SFP).*

RAI-1 (Levels of Required Monitoring)

Please provide the following:

a) For level 1, specify how the identified location represents the HIGHER of the two points described in the NEI 12-02 guidance for this level.

b) The OIP states: "If applicable, adjacent hardware stored in the SFP will be evaluated to ensure it cannot adversely interact with SFP level instrumentation." Given the potential for varied dose rates from adjacent hardware stored in the SFP, describe how level 2 will be adjusted to other than the elevation provided in Section 2 above.

c) A clearly labeled sketch depicting the elevation view of the proposed typical mounting arrangement for the portions of instrument channel consisting of permanent measurement channel equipment (e.g., fixed level sensors *and/or* stilling wells, and mounting brackets). Indicate on this sketch the datum values representing Level 1, Level 2, and Level 3 as well as the top of the fuel. Indicate on this sketch the portion of the level sensor measurement range that is sensitive to measurement of the fuel pool level, with respect to the Level 1, Level 2, and Level 3 datum points.

RAI #1 RESPONSE:
INSTRUMENT CHANNEL DESIGN OVERVIEW/BACKGROUND:

The McGuire new wide range Spent Fuel Pool (SFP) level instrumentation will consist of a "primary" and a "back-up" channel. Per NEI 12-02 guidance, neither of these channels requires access to the SFP area during a Beyond Design Bases (BDB) event.
The primary SFP level channel will utilize wave guided radar technology, which has a wave guided pipe and receiving horn located in the SFP area. The wave guided pipe and horn contain no organic materials and are not susceptible to degradation due to exposure to radiation, heat, or steam. The associated primary channel electronics are remotely located from the SFP inside the Seismic Category I Auxiliary Building. This channel has battery back-up capacity and provides remote control room level monitoring capability.
The back-up SFP level channel consists of an analog mechanical pressure gauge that senses SFP head (level) based on a process connection to the SFP transfer tube. The SFP is normally aligned to the fuel transfer canal to support the Standby Shutdown Facility that has provisions for primary system make-up with pump suction supply from the SFP during various Appendix R, security, and Station Black-out (SBO) events. The back-up level instrument read-out is located in an accessible area of the seismic Category I Auxiliary Building. The back-up level instrument requires no electrical cables/power, nor battery back-up.

a) The normal SFP water level is 771.4' Elevation. The SFP cooling pump suction piping submergence is lost when water level decreases below 767.8' Elev. Abnormal procedures secure the SFP cooling pump when water level decreases to 2' below normal. Thus, the NEI 12-02 "Level 1" datum is considered to be 769.4' Elevation.

b) Adjacent SFP hardware stored in the vicinity of the primary SFP level instrumentation will be evaluated with-respect to potential physical seismic interaction and interference with proper operation of the primary level instrumentation. The primary SFP level instrumentation located in the SFP area contains no organic materials which are susceptible to degradation due to exposure to radiation, heat, or steam.

   The back-up SFP level channel is remotely located from the SFP area, thus there are no associated interaction concern(s) with adjacent hardware/tools stored in the SFP.

c) Elevation views depicting the primary and back-up SFP level channel lay-outs, monitoring ranges, and required NEI monitoring levels are provided in FIGURES 1 and 2. The figures depict Unit 1, and are typical for Unit 2.

3.0 Instrumentation Design Features

3.1 Arrangement

The OIP states in part that:

> *In accordance with the guidance in NEI 12-02, the level instruments/channels will be installed in diverse locations and physically arranged in a manner that provides reasonable protection of the level indication function against missiles that may result from damage to the structure over the SFP.*
> *The associated cabling, power supplies and indication each level instrument/channel will be routed separately from each other. Cable routings will be specified to provide reasonable protection from missiles that may result from damage to the structure over the SFP and refuel floor, as applicable. The conduit and cable routing will be determined by the detailed design.*

RAI-2 (Arrangement):

Please provide a clearly labeled sketch or marked-up plant drawing of the plan view of the SFP area, depicting the SFP inside dimensions, the planned locations/placement of the primary and back-up SFP level sensor, and the proposed routing of the cables that will extend from the sensors toward the location of the read-out/display device.

RAI #2 RESPONSE:

A Unit 1 plan view (typical for Unit 2) of the SFP area and primary SFP level channel location is provided in FIGUREs 1 and 3. The wave guided radar pipe is routed slightly above the SFP operating deck, and through a floor core bore penetration down to the sensor electronics located on the 767' Elevation of the Auxiliary Building, and indication/display is provided in the main control room.

Physical layout drawings for cable routing were not readily available, as they are normally identified on cable routing cards. Alternatively, a verbal description of the general cable routing is provided. The primary SFP level channel is provided non-essential AC power from a local area termination cabinet on 767' Elevation of the Auxiliary Building. A local control panel is located adjacent to the sensor electronics located on the 767' Elevation of the Auxiliary building. The local control panel houses a field level indication/display and the battery back-up power supply. A field routed cable connects the control panel to the adjacent sensor electronics. The signal cable is routed from the sensor electronics to the cable spread room and to the indication on the main control board 1/2MC9. All associated channel electronics, and power/signal cabling are located in the Seismic Category I Auxiliary Building, and/or Control Room.

A Unit 1 plan view (typical for Unit 2) of the SFP area and back-up SFP level channel location is provided in FIGURE 4. The back-up SFP level channel is a mechanical pressure gauge and requires no power supply, nor signal cable. The back-up SFP level channel display/read-out is located on the 733' Elevation of the Auxiliary Building in the electrical penetration room.

3.2 Mounting

The OIP states in part that:

> *Permanently installed instruments will be mounted to retain the component design configuration during and following the maximum seismic ground motion considered in the design SFP structure or applicable structure in which the component is located.*
> *If applicable, adjacent hardware stored in the SFP will be evaluated to ensure it cannot adversely interact with SFP level instrumentation.*

RAI-3 (Mounting):

Please provide the following:

a) A clearly labeled sketch or marked-up plant drawing of the plan view of the SFP area, depicting the SFP inside dimensions, the planned locations/ placement of the primary and back-up SFP level sensor, and the proposed routing of the cables that will extend from the sensors toward the location of the read-out/display device.

b) Address how adjacent hardware stored in the SFP will not create adverse interaction with the fixed instrument location(s).

RAI #3 RESPONSE:

a) Refer to FIGURES 3 and 4 provided in response to RAI #2, and the response to RAI #2.

b) Potential physical interaction effects of SFP hardware/tools in the vicinity of the primary SFP level sensor will be evaluated as described in response to RAI #1 b), and are not applicable to the remotely located SFP back-up level channel.
As part of the engineering change process, procedural controls are planned to govern storage of SFP equipment and to avoid the potential for adverse interaction with the primary SFP level channel.

3.3 Qualification

The OIP states in part that:

> *The level instrumentation shall remain functional and maintain required accuracy capability after a Safe shutdown Earthquake, and/or after exposure to any applicable harsh environmental conditions for the equipment location. The level instrumentation and associated cabling will be specified to be reliable at the maximum temperature, humidity, and radiation levels predicted during an extended loss of AC power (ELAP) event at their installed locations.*
> *The instrumentation reliability will be demonstrated by appropriate combination of design, analyses, operating experience, and/or testing as outlined by NEI 12-02.*

RAI-4 (Qualification):

Please provide the following:

a) A description of the specific method or combination of methods you intend to apply to demonstrate the reliability of the permanently installed equipment under Beyond-Design Basis (BDB) ambient temperature, humidity, shock, vibration, and radiation conditions.

b) A description of the testing and/or analyses that will be conducted to provide assurance that the equipment will perform reliably under the worst-case credible design basis loading at the location where the equipment will be mounted. Include a discussion of this seismic reliability demonstration as it applies to a) the level sensor mounted in the SFP area, and b) any control boxes, electronics, or read-out and re-transmitting devices that will be employed to convey the level information from the level sensor to the plant operators or emergency responders.

c) A description of the specific method or combination of methods that will be used to confirm the reliability of the permanently installed equipment during and following seismic conditions to maintain its required accuracy.

RAI #4 RESPONSE:

a) The back-up SFP level channel is a mechanical pressure gauge, and is remotely located from the SFP area. The instrument senses SFP head (level) from a process connection off the fuel transfer tube, and provides a display in the electrical penetration room on 733' Elevation of the Auxiliary Building. As such, it is not exposed to SFP steam or radiation. The mechanical pressure gauge will be seismically mounted and its reliability is based on the successful operating history of similar type analog devices. The gauge design temperature limits will be suitable for the location environment.

The primary SFP level channel instrumentation reliability will be established based on a combination of similarity analyses, testing, and operating experience, as described below.

Temperature

The postulated temperature in the spent fuel pool area that results from a boiling pool is 100°C (212°F). The radar sensor electronics will be located outside of the spent fuel pool room in an area where the temperature will not exceed the radar sensor electronics rated design temperature.

Humidity

The maximum humidity postulated for the spent fuel pool area is 100% relative humidity, saturated steam. The radar sensor electronics will be located outside of the spent fuel pool room in an area away from the steam atmosphere. The waveguide pipe can tolerate condensation formation on the inner wall surface, provided condensate pooling does not occur within the waveguide pipe. Condensate pooling is prevented by installing a weep hole(s) at the low point(s) in the wave guide pipe.

Steam

The ability of the radar wave to propagate through steam has been demonstrated by vendor testing. In addition through air radar has been used in numerous applications that involve measuring the level of boiling liquids. The vendor manual contains a table that provides accuracy correction factors for superimposed gas or vapor including saturated steam at various pressures. Therefore, successful operating experience has demonstrated that the through air radar functions at high levels of steam saturation.

Shock and Vibration

The VEGAPuls 62ER Through Air Radar sensor is similar in form, fit and function to the VEGAPuls 66 that was shock and vibration tested in accordance with MIL-S-901D and MIL-STD-167-1. This shock and vibration testing only applies to the sensor. The waveguide piping is ¾" diameter Schedule 40 piping and is seismically anchored to the floor. Thus the waveguide piping is not considered to be sensitive to shock or vibration.

The power supply panel contains components that are part of the standard VEGA Mobile Remote Display. In addition, the readout portion of the display panel, the PLICSCOM, was installed in the sensor during the shock and vibration testing. The Mobile Remote Display is designed for truck-mounted mobile applications subject to shock and vibration from normal handling, after transportation and setup on the job. Per NEI 12-02, designing instruments for operation in environments where significant shock and vibration loadings are common, such as for portable hand-held devices or transportation applications, is an acceptable measure for verifying that the design is adequate to withstand shock and vibration. This panel is therefore considered to have an acceptable resistance to shock and vibration. There are three components in the AREVA

power control panel that are not included with the VEGA Mobile Remote Display but are similar in construction and are tested for shock and vibration and/or mounted on vibration dampeners. This panel also will be subjected to seismic tests as described below.

The main control room display/indicator will be seismically mounted, and is seismically qualified based on similarity to other control board indicators.

Radiation

The area above and around the pool will be subject to large amounts of radiation in the event water level decreases near the top of the fuel racks. The only parts of the measurement channel in the pool radiation environment are the metallic waveguide and horn, which are not susceptible to the expected levels of radiation. The sensor electronics will be located in an area that does not exceed their $1x10^3$ rad design limit for the required operating time, or the design will provide shielding as required.

b) A seismic shake test will be performed to the requirements of IEEE 344-2004 for elements of the VEGAPuls 62ER Through Air Radar to levels anticipated to envelope most if not all plants in the United States. The equipment to be tested includes the sensor, readout and power control panel, horn end of the waveguide, pool end and sensor end mounting brackets, and waveguide piping. The items will be tested to the Required Response Spectra (RRS) contained in EPRI TR-107330 to account for the potentially high seismic motion that could occur to the cabinet-mounted readout and the power control panel. This RRS will also envelop the seismic ground motion for items mounted to the building structure, pool edge, etc. The main control room display/indicator will be seismically mounted, and is seismically qualified based on similarity to other control board indicators.

The back-up SFP level channel is a mechanical pressure gauge that is considered to be seismically rugged. The pressure gauge will be seismically mounted and its reliability is based on the successful operating history for similar type devices.

c) The seismic testing described in RAI #4 b) includes testing the VEGAPuls 62ER for functionality prior to and post seismic testing, which includes verification of the instrument's accuracy.

The back-up SFP level channel gauge will be seismically mounted and its reliability is established based on successful operating experience that demonstrates it is seismically rugged.

3.4 Independence

The OIP states in part that:

> *The level instruments and any associated cabling (for each Unit SFP) will be physically separated and electrically independent of one another.*

RAI-5 (Independence):

Please provide the following:

a) A description of how the two channels of the proposed level measurement system meet this requirement so that the potential for a common cause event to adversely affect both channels is precluded.

b) Further information on how each level measurement system, consisting of level sensor electronics, cabling, and readout devices will be designed and installed to address independence through the application and selection of independent power sources, the use of physical and spatial separation, independence of signals sent to the location(s) of the readout devices, and the independence of the displays.

RAI #5 RESPONSE:

a) The primary and back-up SFP level channels employ diverse sensing technology. The primary SFP level channel consists of a wave guided radar pipe and horn sensing assembly located on the SFP operating deck. The primary channel includes a remote sensor/transmitter and battery back-up power supply that are located in the 767' Elevation of the Auxiliary Building and provide remote control room level display/indication.

   The back-up SFP level channel is a mechanical pressure gauge that is remotely located from the SFP area and any primary level channel components/cabling. The back-up level channel monitors SFP level via a process connection to the fuel transfer tube. The associated impulse tubing is routed through the reactor building annulus area to the 733' Elevation of the Auxiliary Building, where the read-out/display is located. The back-up level channel does not require electrical power. The back-up level channel is spatially separated and electrically independent from the primary channel.

b) See RAI #5 a) response above.

3.5 Power Supplies

The OIP states in part that:

> *Power supplies (if required) for each SFP instrument/channel shall be electrically separate. If powered, the level instrumentation shall have provisions for emergency back-up power source such as batteries, which are rechargeable or replaceable. The back-up power source(s) must have sufficient capacity to maintain the level indication function until offsite power or other offsite emergency resources provided by FLEX procedures becomes available, consistent with the guidance of NEI 12-02.*

RAI-6 (Power Supply):

If the level measurement channels are to be powered through a battery system (either directly or through an Uninterruptible Power Supply (UPS)), provide the design criteria that will be applied to size the battery in a manner that ensures, with margin, that the channel will be available to run reliably and continuously following the onset of the BDB event for the minimum duration needed, consistent with the plant FLEX Program plans. Include the duration needed to power the SFP Instrument channel until the FLEX mitigation strategy is in place.

RAI #6 RESPONSE:

> The primary SFP level channel dedicated battery capacity is based on ability of the sensor to supply full load (20 mA) for the duration specified in the plant FLEX mitigation strategy with built-in safety margin. The battery capacity will be verified by analyses, and/or test prior to installation. The preliminary estimate of battery capacity is expected to be at approximately 6-7 days. It is estimated that a minimum battery capacity of 72 hours is required to align with the FLEX mitigation plan. If required, battery replacement provisions will be included in the FLEX Phase III strategy to provide continued SFP level monitoring capability.
>
> The back-up SFP level channel is a mechanical pressure gauge that does not require power.

3.6 Accuracy

The OIP states in part that:

a) *The new SFP level instrumentation will be designed to maintain their design accuracy without recalibration following a power interruption or change in power source.*

b) *Accuracy will consider SFP post-event conditions, e.g., saturated water, steam environment, or concentrated borated water, or applicable limiting environmental conditions for the installed location.*

c) *Instrument accuracy will be suitable to allow trained personnel to determine when the actual level exceeds the specified lower level of each indicating range (critical levels 1, 2, 3 as identified by NEI 12-02 guidance) without conflicting or ambiguous indication.*

RAI-7 (Accuracy):

Please provide the following:

a) An estimate of the expected instrument channel accuracy performance under both a) normal SFP level conditions (approximately Level 1 or higher) and b) at the BDB conditions (i.e., radiation, temperature, humidity, post-seismic and post-shock conditions) that would be present if the SFP level were at the Level 2 and Level 3 datum points.

b) A description of the methodology that will be used for determining the maximum allowed deviation from the instrument channel design accuracy that will be employed under normal operating conditions as an acceptance criterion for a calibration procedure to flag to operators and to technicians that the channel requires adjustment to within the normal condition design accuracy.

RAI #7 RESPONSE (Accuracy):

a) The manufacturer reference accuracy for the primary SFP level channel is no greater than ±1 inch based on tests performed by AREVA. This is the design accuracy value that will be specified for the primary SFP level instrument channel. This value is subject to change dependent on the actual performance with the installed waveguide.
The accuracy of the primary SFP level channel is minimally affected by postulated BDB conditions (i.e., radiation, temperature, humidity, post-seismic and post shock conditions). The stainless steel horn antenna and waveguide pipe that is exposed to BDB conditions is unaffected by radiation, temperature and humidity other than a minor effect of condensation forming on the waveguide inner walls that will have a slight slowing effect on the radar pulse velocity. Condensation is prevented from pooling in the waveguide and thus blocking the radar signal by placement of weep holes at low points in the waveguide pipe. A

minor effect on the accuracy is the length of the overall measurement path can change due to temperature related expansion of the waveguide pipe. The waveguide pipe permits the sensor electronics to be located in mild environment conditions so that the effect of elevated temperature on accuracy is also limited. Based on VEGA operating instructions for the VEGAPULS 62ER, a small correction factor is applied to account for the impact of saturated steam at atmospheric pressure on the radar beam velocity. Testing performed by AREVA using saturated steam and saturated steam combined with smoke indicate that the overall effect on the instrument accuracy is minimal. The overall accuracy due to BDB conditions described above is estimated to not exceed ±3 inches.

The back-up SFP level channel is estimated have a total loop uncertainty of ± 7" for normal conditions and ± 14" for BDB conditions.

As part of the engineering change process, the overall level channel uncertainties will be formally documented by an instrument uncertainty calculation performed per Engineering Design Manual (EDM) 102.

b) Operational surveillance procedures will perform periodic channel checks for the primary and back-up SFP level instrumentation to verify proper operation. The channel checks will be accomplished by comparison between the wide-range channel indications, or by comparison to the narrow range SFP level indication and/or known SFP physical level elevation reference markings. The acceptance criteria will consider the respective overall channel uncertainty contributions for accuracy, calibration setting tolerance, resolution, and drift (as applicable). The instrument uncertainty contributions will be considered to have random independent influences.

3.7 Testing

The OIP states in part that:

> *The instrument channel design shall provide for routine testing and calibration. Testing will be consistent with the guidelines of NRC JLD-ISG-2012-03 and NEI 12-02.*

RAI-8 (Testing):

Please provide the following:

a) A description of the capability and provisions the proposed level sensing equipment will have to enable periodic testing and calibration, including how this capability enables the equipment to be tested in-situ.

b) A description of how such testing and calibration will enable the conduct of regular channel checks of each independent channel against the other, and against any other permanently-installed SFP level instrumentation.

c) A description of how functional checks will be performed, and the frequency at which they will be conducted. Describe how calibration tests will be performed, and the frequency at which they will be conducted. Provide a discussion as to how these surveillances will be incorporated into the plant surveillance program.

d) A description of what preventive maintenance tasks are required to be performed during normal operation, and the planned maximum surveillance interval that is necessary to ensure that the channels are fully conditioned to accurately and reliably perform their functions when needed.

RAI #8 RESPONSE:

a) The primary SFP level channel has multi-point testing capability, in-that the radar horn antenna can be rotated away from the SFP water surface and aimed at a movable metal target that is positioned at known distances from the horn. This allows checking for correct readings at various points across the instrument measurement range and validates the functionality of the installed system.

   The back-up SFP level channel design readily supports periodic calibration across its monitoring range. The instrument is to be equipped with a calibration test tee and can be isolated from the process for routine calibrations.

b) Periodic SFP primary and back-up level channel checks to verify proper channel operation will be established as described in RAI #7 b.

c) Periodic channel checks will be established for the primary and back-up SFP level channels to verify proper instrument operation, as described in the response to RAI #7 b). The frequency of the channel checks is expected to be at least monthly (± 25% grace period). This frequency will readily satisfy NEI 12-02 (section 4.3) requirements to verify functionality 60 days prior to a planned refueling outage.

Periodic calibrations can be performed as described in the response to RAI #8 a). Instrument channel calibration frequency will be based on the manufacture recommended frequency, and/or as established based on operating experience within the preventive maintenance program. As part of the periodic calibration surveillance for the primary SFP level channel, further functional verifications will be performed to verify proper operation of the battery backup feature on a simulated loss of normal AC power.

The channel checks will be performed by Operations surveillance procedures, and the instrument calibrations will be performed by Maintenance instrumentation calibration surveillance procedures. Model work orders will be established within the periodic maintenance program to govern the scheduling and performance of the periodic calibrations.

d) Routine preventive maintenance required during normal operation is limited to periodic channel calibration, and/or battery replacement (primary channel only). The preventive maintenance frequency will be established as outlined in the response to RAI #8 c).

3.8 Display

The OIP states in part that:

> *The instrument displays for each SFP level instrument will be provided in the main control room or other accessible location. The displays will be consistent with the guidelines of NRC JLDISG-2012-03 and NEI12-02.*

RAI-9 (Display):

Please provide the following:

a) The specific location for the primary and backup instrument channel display.

b) If the primary or backup display location is other than the main control room, then provide justification for prompt accessibility to displays including primary and alternate route evaluation, habitability at display location(s), and continual resource availability for personnel responsible to promptly read displays, and provisions for communications with decision makers for the various SFP drain down scenarios and external events.

c) The reasons justifying why the locations selected enable the information from these instruments to be considered "promptly accessible" to various drain-down scenarios and external events.

RAI #9 RESPONSE (Display):

a) The primary SFP level channel has a local display on the Auxiliary Building on 767' Elevation, and in the main control room.

The back-up SFP level channel display read-out is in an accessible location in the Auxiliary Building on 733' Elevation. The location is in the electrical penetration room, which is adjacent to the "B" train essential switchgear room.

b) The back-up SFP channel display is located outside of the main control room and remote from the SFP area. The display location is located outside of any locked high radiation areas, and is accessible by operations personnel during a postulated BDB event. The back-up level channel read-out displays are located in Seismic Category I structures, which are protected from potential threats posed by external natural phenomena events, such as flooding, seismic and tornado missiles. Personnel access to the display location relies upon the stairwells which provide access the Auxiliary Feedwater Pump Rooms and Auxiliary Shutdown Panels. During a postulated Extended Loss of AC Power (ELAP) event ambient temperatures at this location would be not be expected to prohibit periodic personnel access to monitor SFP levels. Formal analyses in support of the FLEX strategy will be completed to validate that area room temperatures will support personnel access. The estimated time for personnel to access the back-up channel display is 10-15 minutes, after personnel dispatch. The location of the back-up display is in close proximity to the vital battery and essential switchgear rooms, areas to which Operations personnel would potentially be dispatched as part of the FLEX strategy. Personnel accessing this area would rely on portable hand-held lighting, and hand-held radio communication with the main control room, and/or SFP inventory replenishment personnel. Based on the foregoing discussion, this location is considered to be promptly accessible for the purposes of monitoring SFP level during a postulated BDB event.

c) The primary and back-up SFP level read-out displays are remotely located outside the SFP area and are readily accessible by operational personnel. The primary and back-up SFP level channel read-out displays are located in Seismic Category I structures, which are protected from potential threats posed by external natural phenomena events, such as flooding, seismic and tornado missiles. The primary SFP level display is located within the continuously occupied main control room. The estimated time for personnel to access the back-up SFP level display is 10-15 minutes, after personnel dispatch. The location of the back-up SFP level display is in close proximity to the vital battery and essential switchgear rooms, in which Operations personnel would potentially be dispatched as part of the FLEX strategy.

4.0 Program Features

4.1 Procedures

The OIP states in part that:

> *Station procedures will be developed using guidelines and vendor instructions to address the maintenance, operation and abnormal response issues associated with the SFP level instrumentation. Procedures will be developed to address strategy to ensure SFP water addition is initiated at an appropriate time consistent with implementation of NEI 12-06, Diverse and Flexible Coping Strategies (FLEX) Implementation Guide.*

RAI-10 (Program Features):

Please provide a description of the standards, guidelines and/or criteria that will be used to develop procedures for inspection, maintenance, repair, operation, abnormal response, and administrative controls associated with the SFP level instrumentation, as well as storage and installation of portable instruments.

RAI #10 RESPONSE (Procedures):

The primary and back-up SFP wide-range level instrumentation will be permanently installed plant equipment.

A new Selected Licensee Commitment (SLC) will be established for the primary and back-up SFP level channels. The new SLC will specify the required frequency of performance for periodic channel checks, functional checks, and calibrations, as appropriate. The SLC will outline allowed out of service time-frames consistent with NEI 12-02 requirements. The SLC will specify required remedial actions, in-the-event one or more channels cannot be restored operable within the allowed out of service time-frame. The remedial actions will be consistent with NEI 12-02 requirements. Allowed channel out of service time-frames will be tracked by the Technical Specification Action Item Log (TSAIL) program in accordance with Operations Management Procedure 5-3.

Operational surveillances will be established to periodically verify proper level channel operation, which will consist of periodic primary and back-up SFP level channel checks as described in the response to RAI #7 b). Operations Management Procedure (OMP) 5-3 (Operations Periodic Test Program) governs the requirements for scheduling, reviewing and evaluation of periodic operational tests. The OMP requires unacceptable test results to be documented within the Corrective Action Program (Nuclear Station Directive 208).

Preventive maintenance tasks will be established in accordance with Nuclear Station Directive 411, which governs the Preventive Maintenance program bases, task planning and scheduling, execution, feedback, and change process. The

preventive maintenance tasks will entail periodic level channel calibration, and functional checks, as described in the response to RAI #8 c).

Subsequent to the performance of maintenance activities, post maintenance testing will be performed to ensure the SFP level instrumentation is properly functioning prior to return to service. Work Process Manual 501 and Nuclear Station Directive 408 govern the station requirements for testing.

FLEX Support Guides (FSGs), Emergency and/or Abnormal operating procedures will incorporate use of the primary and back-up SFP level instrumentation for monitoring/maintaining SFP inventory for BDB events, as appropriate.

4.2 Testing and Calibration

The OIP states in part that:

> *Testing and calibration of the instrumentation will be consistent with vendor recommendations or other documented basis. Calibration will be specific to the mounted instrument(s) and the display(s).*
> *Station procedures and preventive maintenance will be developed to perform required instrumentation maintenance, testing, periodic calibrations, and/or functional checks.*
> *Existing station work control processes will be utilized to control maintenance and testing.*

RAI-11 (Testing and Calibration):

Please provide the following:

a) Further information describing the maintenance and testing program the licensee establish and implement to ensure that regular testing and calibration is performed and verified by inspection and audit to demonstrate conformance with design and system readiness requirements. Include a description of your plans for ensuring that necessary channel checks, functional tests, periodic calibration, and maintenance will be conducted for the level measurement system and its supporting equipment.

b) Describe how the guidance in NEI 12-02 Section 4.3 regarding compensatory actions for one or both non-functioning channels will be addressed.

c) Describe what compensatory actions are planned in the event that one of the instrument channels cannot be restored to functional status within 90 days.

RAI #11 RESPONSE:

a) Refer to the responses to RAI #s 7 b), 8 c), 8 d) & 10.

b) A new Selected Licensee Commitment (SLC) will be established to address allowed out service time-frames and required remedial actions (compensatory actions), as outlined in the response to RAI #10.

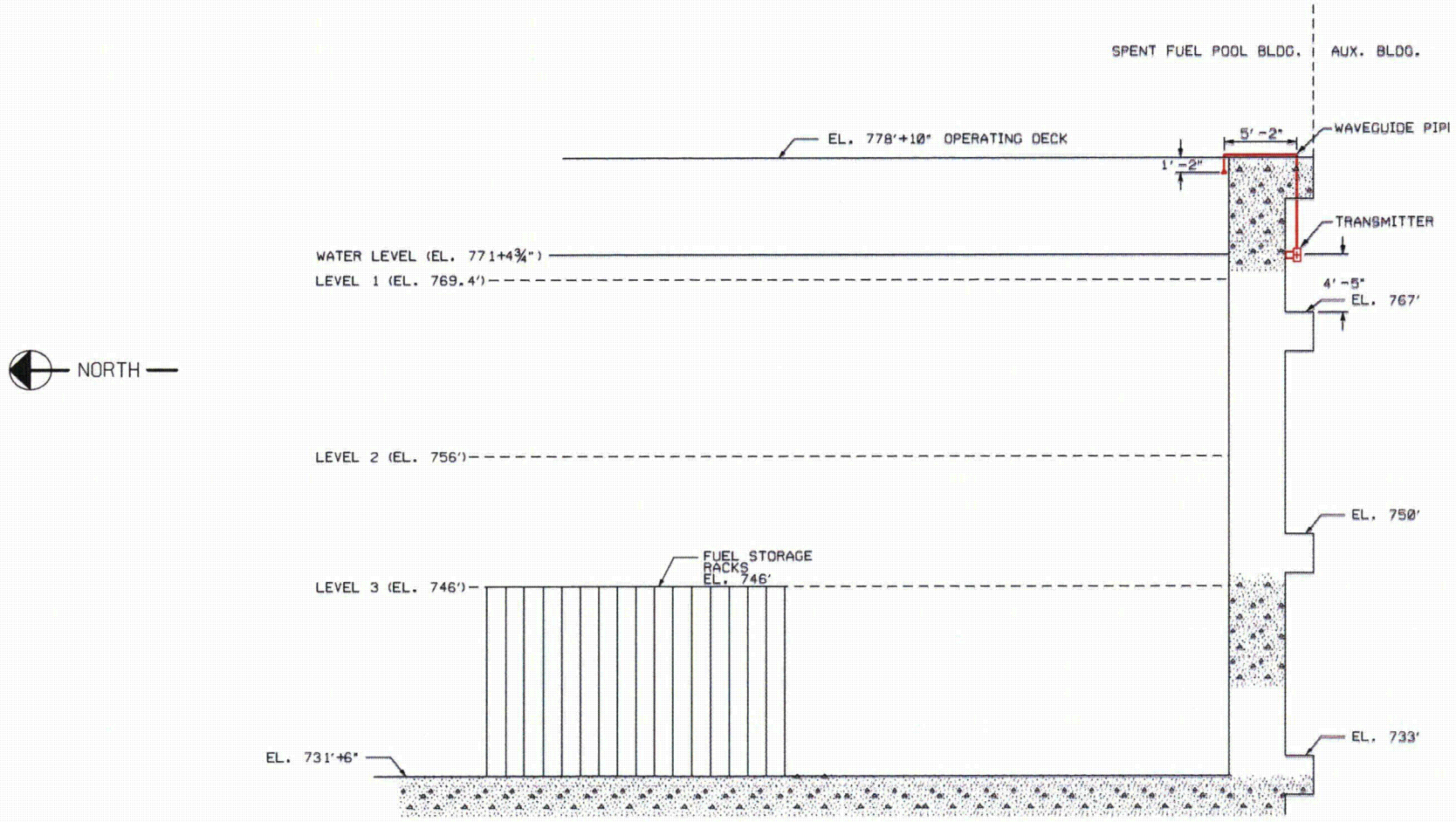
c) Comp actions for single channel and both channels out of service beyond 90 days.
   1. For a single primary or back-up SFP level channel out of service beyond 90 days, the compensatory actions could include one or more of the following:
      - Increased surveillance (channel check) to verify functionality of the remaining operable level channel
      - Implement equipment protective measures.
      - Increased operator visual surveillance of the SFP level and area,
      - Maintain elevated SFP level,
      - Reduce SFP temperatures,
      - Supplemental operations staffing

   2. For both the primary and back-up SFP level channels out of service, the compensatory actions could include one or more of the following:
      - Increased operator visual surveillance of the SFP level and area,
      - Maintain elevated SFP level,
      - Reduce SFP temperatures,
      - Supplemental operations staffing
      - Pre-stage FLEX support equipment (nozzles, hoses, etc) which are relied upon for SFP make-up. Pre-staged equipment would be located within Seismic Category I structures.

FIGURE 1

PRIMARY CHANNEL

(LEVEL RANGE MINIMUM EL. 746' TO APPROX. EL. 775')



LONGITUDINAL SECTION THRU FUEL POOL @ EL 778+10

Figure 2

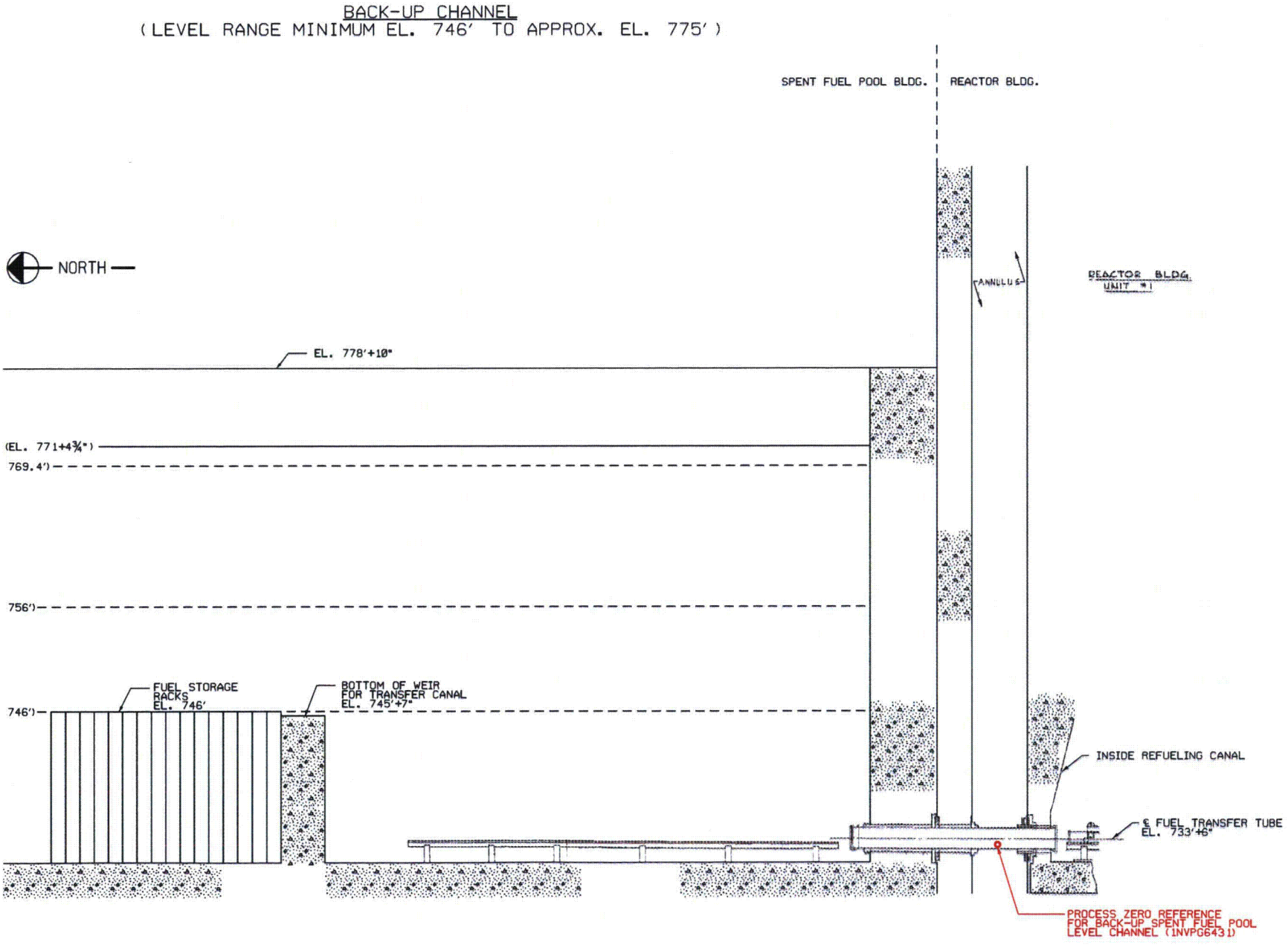

BACK-UP CHANNEL
(LEVEL RANGE MINIMUM EL. 746' TO APPROX. EL. 775')
SPENT FUEL POOL BLDG.
REACTOR BLDG.
NORTH
ANNULUS
REACTOR BLDG. UNIT #1
EL. 778'+10"
(EL. 771+4¾")
769.4')
756')
746')
FUEL STORAGE RACKS EL. 746'
BOTTOM OF WEIR FOR TRANSFER CANAL EL. 745'+7"
INSIDE REFUELING CANAL
℄ FUEL TRANSFER TUBE EL. 733'+6"
PROCESS ZERO REFERENCE FOR BACK-UP SPENT FUEL POOL LEVEL CHANNEL (1NVPG6431)

FIGURE 3 – Primary Level Channel Plan View

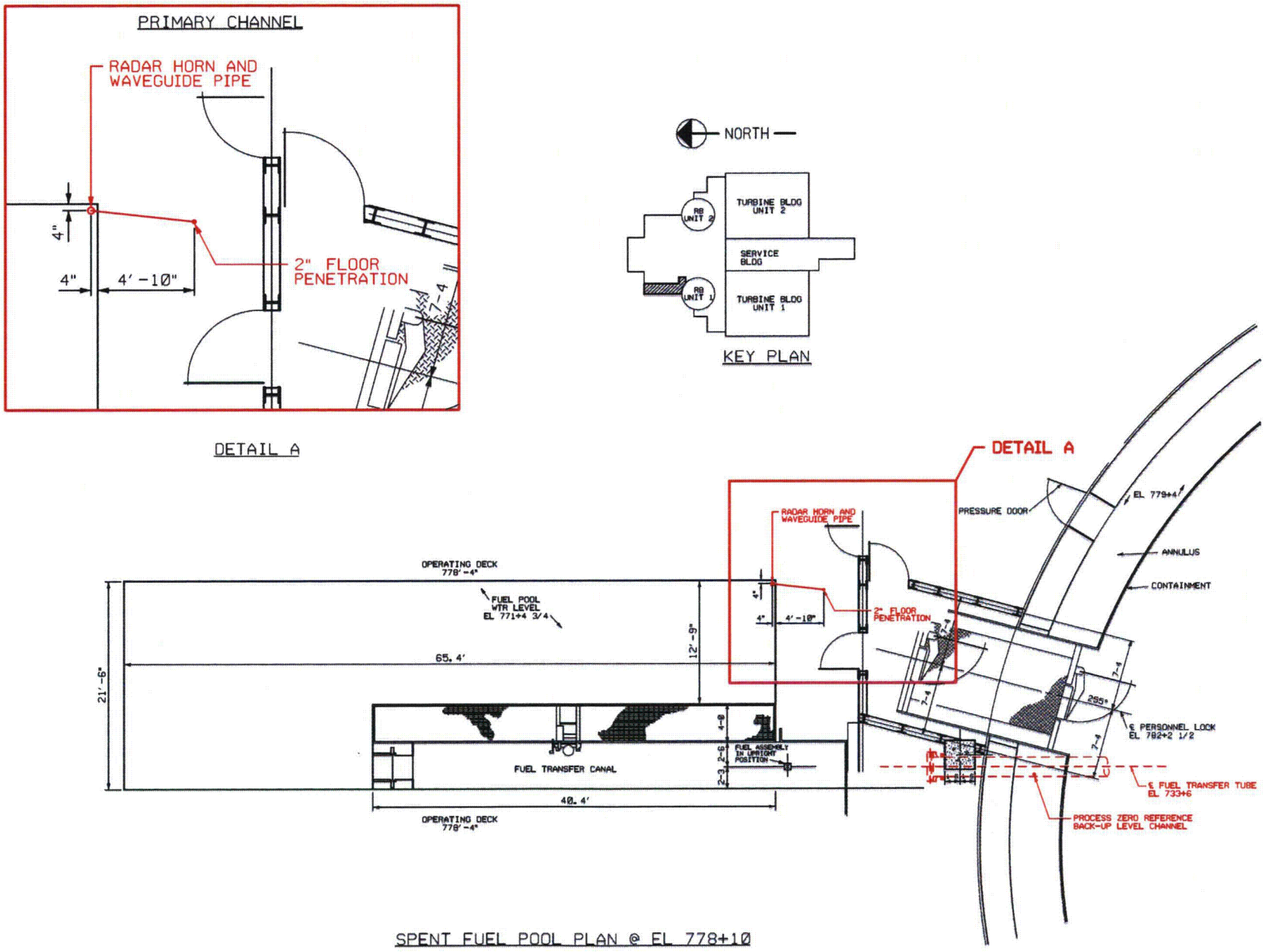


FIGURE 4 – Back-up Level Channel Plan View

BACK-UP SPENT FUEL POOL LEVEL CHANNEL