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Region IV's Tritium and Buried/Underground Piping Background Information

Item 1: *Ground/Subsurface Water Contamination Survey*

Site	(1) **Have there been tritium releases** (spills, leaks, etc.) **other than routine effluent releases, into the public domain** (areas outside OCA)? (If yes, what is the source of the tritium release and the highest groundwater contamination level (pCi/l)?)	(9) **Has the licensee identified onsite radioactive subsurface water contamination?** (If yes, what is the source of the tritium release and the highest groundwater contamination level (pCi/l)?)
Arkansas Nuclear One	**YES**, *In 1975/76, water leaked from the borated storage tank into the* storm drains.	**NO**, subsurface water contamination has not been identified
Callaway	**NO**, There have been 5 breaks in the discharge line. 2 Breaks in the 1988/1989 time frame, 1 break in 1995, 1 in 1998, and one in 2008. None of these were releases into the public domain. (Note: Callaway owns the property from the plant to the river. This includes all property along the cooling tower blowdown line which carries liquid effluent discharges. Some of the property along towards the river is leased for agricultural purposes, usually soybeans and corn.) Logan Creek flows mostly on AmerenUE property downstream of the *break locations, but some portions are not on AmerenUE property.Logan* Creek drains the northeast, east, and southeast sides of the plant plateau and empties into the Missouri River approximately 100' downstream of the current location of the liquid effluent discharge point.	**Yes**. Tritium has been measured in the shallow groundwater in the range of 200 – 400 pCi/L. (LLD is 150 pCi/L) The highest measured tritium levels were 1479 pCi/L in April of 2008, near the power block. Sample data supports the theory of washout as the source of this activity. Since that time, samples have shown much lower activity levels.
Columbia Generating Station	**NO**	**NO**, but DOE has identified tritium from DOE burial site just outside the protected area. Remediation plans are being formulated.
Comanche Peak	**NO**	**YES**, Positive indications for Tritium have been detected in the water production plant, the source determined to be lake water from a supply line. Positive indication was also found in the leachate between primary and secondary liners of a low volume waste pond, indicating a leak in the primary liner, which was subsequently repaired.
Cooper Nuclear Station	**NO**	**YES**. Subsurface water contamination due to washout of radioactive material in off-gas system. (Highest level measured = 1130 pCi/l)
Diablo Canyon	**NO**	**YES**. DCPP collection drains have non-zero tritium values. Testing points to plume condensation as the source of this contamination. The highest level measured was 44,500 pCi/l on 3/6/2008. These drains had relatively static water levels and were pumped to remove the tritium.
Fort Calhoun Station	**NO**	**Yes**, monitoring well adjacent to the auxiliary building has detected approximately 400 pCi/L tritium suspected due to washout. Sr90 has been detected upstream of the plant and multiple experts believe this is background radiation.

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Site	(1) **Have there been tritium releases** (spills, leaks, etc.) **other than routine effluent releases, into the <u>public domain</u>** (areas outside OCA)? (If yes, what is the source of the tritium release and the highest groundwater contamination level (pCi/l)?)	(9) **Has the licensee identified <u>onsite</u> radioactive subsurface water contamination?** (If yes, what is the source of the tritium release and the highest groundwater contamination level (pCi/l)?)
Grand Gulf	<u>**NO.**</u> All spills and leaks have been within the protected area.	<u>**YES**</u>. Sentinel wells located around the power block sample the area of backfill put in place prior to plant construction. These wells show tritium levels just above the LLD value of 500 pCi/L, and are consistent with rainwater samples.. On March 11, 2010, tritium levels of 58,000 pCi/L were reported in the ODCM Outfall 007 sample. This was significantly greater than the January, 2010 sample which reported 1800 pCi/L. This outfall is a storm water sample point for rainfall and surface water, not subsurface water. This sample was taken shortly after a 6" snowfall and subsequent melt. Studies have shown that snow traps more washout than rain. Grand Gulf's data indicates that the majority of the tritium activity in this sample is due to "washout." Followup samples from this outfall have been less than LLD.
Palo Verde	<u>**NO**</u>	<u>**Yes**</u>, Palo Verde has identified subsurface water contamination around building and piping structures associated with non-compacted fill material. Water containing tritium is trapped in these areas by very impermeable compacted fill. This information was reported to the state of Arizona in 2006 at a concentration of approximately 71,000 pCi/l. The most likely source of tritium was attributed to washout during rain events from our early days of operation when we allowed our boric acid concentrator to discharge during rain events. Additionally, condensation leakage from building roof ventilation ducting that washed out during rain events into the surrounding environs may have contributed to the tritium. Concentrations of tritium spiked to a maximum of approximately 500,000 pCi/L. This was following repairs to an underground ventilation tunnel that re-directed the subsurface flow of water in the area. The increase is suspected to be original rain water washout that was trapped beneath the ventilation tunnel that was subsequently flushed from the area when rainwater started to move it towards a monitoring well. Subsequent flushing due to rain events causes spikes but the concentrations are significantly lower. Since the total volume of the trapped water in the area is fairly low and we purge wells prior to sampling, monthly sampling typically will remove most of the contaminated water from this area. Tritium has not been detected in any Palo Verde groundwater samples from any shallow (perched) aquifer or regional aquifer.
River Bend Station	<u>**YES**</u>, In Jan 2008, tritium water leaked from a discharge pipe onsite at RBS, but the water drained into a storm drain which discharged into the East Creek. Approximately 720 gallons was discharged in to the creek.	<u>**YES**</u>, Although the MDA is 2000 pCi/liter, on several different occasions since 1993, the licensee has identified levels from 173 to 325 pCi/liter.

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San Onofre Nuclear Generating Station	YES, From the 2006 survey: On 4 separate occasions in the past, the licensee has had spills in which beta/gamma emitters have been released without monitoring. 1) Unit 1 had overflows of their yard drain, oily water sump, and re-heater pit sump due to rain. This resulted in spills onto their site which eventually made it to the circulating water system and was discharged into the ocean without being monitored. 2) In May 1981, the site discovered that the non-plant side of the seawall sand was contaminated and remediated. 3) In 1982, the licensee removed and replaced a septic tank and determined that the sand beneath the tank was contaminated with gamma emitters. 4) In 1992, the Unit 1 yard drain sump overflowed causing an unmonitored release which was reported to the NRC at the time. The licensee put a plate over the weep to prevent recurrence of this event.	Yes. There have been three sets of on-site ground water samples that have identified detectable plant-related licensed material. All of the on-site ground water sample data has been reported in the year-appropriate Annual Radioactive Effluent Release Report. The following summarizes those data: • In August 2006 during demolition of the Unit 1 containment structure, tritium was identified in the water between the containment sphere enclosure building and the supporting concrete structure. The maximum concentration of tritium was 330,000 pCi/l and a gamma activity of 79.6 pCi/l of ^{137}Cs. The water was extracted and transferred to an ODCM-credited release point for disposal in accordance with the site's effluent control program. • In December 2007, tritium was detected in a new on-site well installed in the Units 2 and 3 Protected Area under the Industry Ground Water Protection Initiative. The highest concentration of tritium detected in the well was in January 2008 at 1600 pCi/l. The concentration of tritium in the well fell below the analytical detection level by September 2008. No gamma activity was detected. The source of the contamination is most likely due to the January 2006 leak in the discharge line from the Unit 2 turbine building sump, an ODCM-credited release point. The Unit 2 turbine building sump discharge piping has been replaced. • In June 2009, tritium was detected in a new on-site well installed in the North Industrial Area (formerly occupied by Unit 1) under the Industry Ground Water Protection Initiative. The highest concentration of tritium detected in July 2009 in that well to date is 1290 pCi/l. No gamma activity has been detected. The investigation into the source of the contamination has not been completed at this time. However, the well is in the area formerly occupied by Unit 1 which has been dismantled and there are no remaining systems that contain radioactive liquids. The second well installed in the North Industrial Area also had detectable tritium in the initial sample after installation in June 2009 - 1060 pCi/l - but has not shown detectable activity since then.
South Texas Project	NO. STP discharges to a 7000 acre reservoir.	YES. The reservoir was constructed with approximately 750 relief wells to protect the structural integrity of the embankment. The reservoir was designed for a water level of 49' mean sea level. The current water level is at 47'. Samples taken in the 1st quarter of 2010 shows tritium levels in the reservoir at 11,300 pCi/L. During the 4th quarter of 2009, while the water level was at 36.3' MSL, tritium levels were 14,000 pCi/L. The relief wells show tritium activity outside of the reservoir with levels at one well located between the two units as high as 15,000 pCi/L. This has decreased and is now at 6,600 pCi/L.
Waterford 3	NO	NO

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Wolf Creek	NO	YES. At Wolf Creek all water used, with the exception of potable water, is obtained from Coffey County Lake. Routine radioactive effluent releases are discharged to the lake. Low levels of tritium were detected in the Essential Service Water Dewatering Wells and in the Dewatering Well located near the Auxiliary Building. The location with the highest level of tritium detected was WEST ESW-W (2,060 +/- 151 pCi/L). The measured tritium level is significantly lower than the tritium levels routinely detected in surface water collected from Coffey County Lake (2009 range was 9,382 to 13,351 pCi/L). Tritium activity was not detected in any of the groundwater samples obtained from the monitoring wells that were drilled in 2008. The source of the H-3 detected in the on-site wells is from lake water that had historically been discharged to the ground and fire protection piping system leakage.

Item 2: Contamination Plume Assessment
(Included for all Region IV sites regardless of whether or not they have identified groundwater contamination)

Site	General description of: Radwaste discharge, Water wells, and Onsite Aquifers	Groundwater Flow Characteristics (include any aquifer specifics identified during hydrogeology review)	Number and location of monitoring wells	Estimated time to reach public drinking water aquifers (if tritium is already offsite, explain and describe levels)
Arkansas Nuclear One	**Radwaste:** The liquid waste discharges to lake. **Aquifers:** Conditions in the vicinity of the plant are generally unsatisfactory for developing good water wells because of the low permeability of the rocks. The principal source of groundwater is sandstone and limestone which are widespread in the region. Groundwater in these rocks is meager or of poor quality in much of the province. Good supplies are available from glacial or alluvial deposits, but they are restricted to valleys adjacent to major streams. The site is separated from the most productive wells (600 feet below land) by clay as well as by the relatively impermeable shales and sandstones. The most consistently productive aquifer in the region is the alluvium along the Arkansas River. The alluvial deposits are not present at the site; the nearest exposure of alluvium is about four miles southeast of the site, below Dardanelle Dam. Groundwater at the site is derived from precipitation on the adjacent hills. Most of the groundwater developed in the vicinity of the site is utilized for rural domestic use. Groundwater discharges into Dardanelle Reservoir about one-half mile southwest of the site. Groundwater is not utilized between the site and the groundwater discharge area. The largest groundwater users within the area are the municipalities of Atkins, 16 miles southeast of the site, and Dardanelle, six miles southeast of the site. Other municipal groundwater users along the Arkansas River between Little Rock and Fort Smith are Morrilton, about 30 miles southeast and Ozark, about 30 miles northwest of the site.	The water table generally conforms to the topography in the vicinity of the site. At the site, the water table slopes about 24 feet per mile southwestward toward Dardanelle Reservoir. The existing southwestward direction of flow at the site could be reversed only by sustained pumping between the site and the hills approximately one mile to the north and east. The emergency cooling pond, located about 1,200 feet northwest of the plant site, is about 500 feet east of an embayment in Dardanelle Reservoir. Any seepage to the northeast, north or northwest will be intercepted by a drainage pipe underlying the clay blanket before it could infiltrate the shale bedrock. The drainage pipe will divert the seepage into the spillway and consequently westward into Dardanelle Reservoir. To the south and southwest the pond is excavated in impermeable clay. Any seepage not being intercepted by the drainage pipe will migrate southwestward toward Dardanelle Reservoir. This is the shortest path with the steepest gradient. Even with a maximum groundwater level at the pond pool elevation of 347 feet, the potential for groundwater to move southeastward toward the plant is precluded by the longer flow path and the much smaller gradient.	Four monitoring wells constructed in the shallow perched groundwater and the shallow saturated zone have been completed to date.	The fractured shale/sandstone aquifer near the site is not used as a source for any public water supply system. Limited use of the aquifer, however, may occur locally by individual users. Further development of the ground water site conceptual model will provide additional information on potential migration pathways . In the unlikely event that radioactive material percolated through the nearly impermeable clay that underlines the site, the contaminated water would flow slowly southwestward toward Dardanelle Reservoir.

Site	General description of: Radwaste discharge, Water wells, and Onsite Aquifers	Groundwater Flow Characteristics (Include any aquifer specifics identified during hydrogeology review)	Number and location of monitoring wells	Estimated time to reach public drinking water aquifers (if tritium is already offsite, explain and describe levels)
Callaway	**Description of Discharges:** All radioactive liquid effluents are discharged through the discharge Monitor Tanks (DMTs) in batch mode and diluted with cooling tower blowdown water to ensure ODCM limits are met. The effluent water is transported by underground stainless steel piping to the discharge line where it is mixed with the dilution flow. The diluted effluent is transported to the discharge point (Missouri River) by a six mile long pipeline. **Aquifer Characteristics:** The Graydon Chert Formation (average thickness of 38 feet) is considered to be the shallow aquifer with a limestone confining layer at the top of the aquitard. Below the shallow aquifer, there is a leaky, confining aquitard (average thickness of 290 feet). Beneath the aquitard is the Cotter-Jefferson City (CJC) aquifer (average thickness of 300 feet). The estimated well yield for the chert aquifer is less than 1 gallon per minute (gpm) and for the CJC aquifer is approximately 5 to 10 gpm. The relatively low estimates of storativity in the CJC aquifer are consistent with mildly fractured bedrock aquifers where the small size of fractures and low degree of interconnectedness limits the amount of water in storage and the amount of water to potentially yield to a well. Alluvial deposits along the Missouri River form an important stream-valley aquifer from the Iowa-Missouri state line to the junction of the Missouri and the Mississippi Rivers. The deposits partly fill an entrenched bedrock valley that ranges from about 2 to 10 miles wide. Based on the regional understanding of the Missouri River alluvial aquifer, it is expected that groundwater elevations within the aquifer would mimic surface water elevations along the Missouri River and the lower reach of Auxvasse Creek.	Groundwater in the Graydon Chert aquifer flows radially outward and downward through the Graydon Chert (approximately 38-ft thick) into the underlying aquitard, then flows vertically downward through the aquitard and enters the CJC aquifer, and then remains in this aquifer as it flows toward the projected discharge locations west toward Auxvasse Creek and southwest toward Mud Creek. Groundwater has the potential to discharge at these locations and would enter the creeks and flow toward the Missouri River. The Missouri River alluvial plain is prone to frequent flooding but there are no public drinking water aquifers in the area.	There are 31 monitoring wells and 11 ponds in the program. In addition to the groundwater monitoring wells, AmerenUE also collects potable well water samples from area residents.	The estimated travel time for groundwater to the closest location along Auxvasse Creek was 3018.4 years. The estimated travel time for a groundwater to the closest location along Mud Creek is 3189.4 years. These were the shortest two travel times estimated for potential groundwater discharge to local streams.

Site	General description of: Radwaste discharge, Water wells, and Onsite Aquifers	Groundwater Flow Characteristics (include any aquifer specifics identified during hydrogeology review)	Number and location of monitoring wells	Estimated time to reach public drinking water aquifers (if tritium is already offsite, explain and describe levels)
Columbia Generating Station	**Radwaste Discharge:** Small amounts of liquid radioactive wastes, processed within the plant and containing traces of radioactive nuclides, are discharged ultimately to the Columbia River via the plant blowdown line. (No liquids were released in 2008.) **Aquifer Characteristics:** In general, groundwater in the surficial sediments occurs unconfined, although locally confined zones exist. An unconfined aquifer overlays local confined zones. There is no groundwater recharge area within the influence of the plant. The 60-ft depth from the land surface to the water table and the arid condition of sediments above the water table make it virtually impossible to detect any recharge from precipitation over this area. The major source of natural recharge to the aquifer is precipitation on Rattlesnake Hills, Yakima Ridge, and Umtanum Ridge	Under the CGS site the unconfined groundwater is moving easterly toward the Columbia River.	600 wells (Hanford Site, from FSAR) 14 onsite groundwater monitoring wells	Studies have shown that the unconfined aquifer formations that can be influenced by CGS activities do not feed into the underlying confined aquifer networks that feed into the wells used for drinking water.
Comanche Peak	**Radwaste:** The plant effluent line enters the Circulating Water System and is discharged into Squaw Creek Reservoir.	The plant is located on an outcropping of the Glen Rose Formation and is surrounded on 3 sides by Squaw Creek Reservoir. Perched (shallow) groundwater flows southwest from the plant to Squaw Creek Reservoir.	Seven wells around the power block, an artesian basin (inside the Protected Area) and three Low Volume Wastewater Pond liner leak detection system monitoring wells	The only source of drinking water is the Twin Mountains formation (Trinity Aquifer), which underlies the Glen Rose Formation, approximately 150 - 200 feet below grade. Estimated time for surface spill to reach the aquifer is 400 years.

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Cooper Nuclear Station	**Radwaste:** The CNS Operating License radioactive liquid discharge release point is made to the Missouri River via the CNS Discharge Canal. The CNS Operating License gaseous effluent discharge release points are the Elevated Release Point, Reactor Building Effluent, Turbine Building Vent, Multi-Purpose Building Vent, Combined Radioactive Waste/Augmented Radioactive Waste Building Vent. CNS is not located in a designated recharge area for any aquifer; however recharge to unconsolidated alluvial deposits does occur. Both the overburden and the underlying rock formation (except for the Nyman Coal) are considered regional aquifers. There are no known wellhead protection areas or EPA-designated sole source aquifers in the immediate vicinity of CNS. There are 7 water wells used on site ranging in depth from approximately 60 -75 ft deep. There are four private water wells located within 1 mile of CNS (but greater than 0.5 miles from CNS). All four wells are up-gradient or cross-gradient to groundwater flow and are not considered significant potential receptors. Local background for river and groundwater tritium is approximately 200-300 pCi/l.	Normally flow is to the Missouri River (west to east)	Currently there are 11 monitoring wells located on the site surrounding the unit. Monitoring Well 4s is down gradient from the turbine generator building and has the highest tritium levels. The licensee plans to drill 4 additional monitoring wells - 2 near Well 4s, 1 near North CST, and 1 near Off-gas building.	Onsite groundwater contamination is not expected to reach drinking water supplies off CNS owner controlled area (per Hydrogeologic Investigation Report, dated December 30, 2009)
Diablo Canyon	**Radwaste:** Discharge is to the condenser outfall which enters the Pacific Ocean. DCPP has water wells (3 with 2 functioning) above the site elevations in the hills east of the site. They are tested routinely. Water moves beneath the plant surface in the shallow zones but is mostly exotic and runs down slope. This subsurface water may or may not be classified as an aquifer but it is none the less sampled.	DCPP hydrology is simple when viewed macroscopically. Water flows off the hills towards the Pacific. There are no public sources nearby, and no drainage to public lands. Two GPI hydro reviews are available and a hydro review for the ISFSI is also available.	DCPP has 4 sample locations along the hydrologic gradient.	N/A. Onsite aquifers do not communicate with offsite aquifers (per discussions with the RPM)

Site	General description of: Radwaste discharge, Water wells, and *Onsite Aquifers*	Groundwater Flow Characteristics (include any aquifer specifics identified *during hydrogeology review)*	Number and location of monitoring wells	Estimated time to reach public drinking water aquifers (If tritium is already *offsite, explain and describe levels)*
Fort Calhoun Station	**Radwaste:** Discharge pipeline exits the turbine building underground to its point of discharge underground in the cooling water discharge tunnel which then discharges to the Missouri River. Ground water is from two sources. The first is the Missouri River Valley, where ample ground water is obtained from the Pleistocene Valley fill and alluvial sand and gravels. The water table ranges from 2 to 17 feet below the surface, and coincides with the elevation of the river in the bottom land adjacent to the river.	The movement of ground water under the uplands is toward and into the Missouri River trench. The occurrence of springs along the base of the bluff confirms the movement of ground water from the hills to the river.	5 shallow/deep monitoring well pairs arranged from south to west of the plant. 3 shallow wells surrounding the plant. 3 more shallow wells are planned to be installed per the groundwater monitoring review recommendations	The hydrologic characteristics of the site and surrounding area and the pattern of the ground water are such that accidental discharge of radioactive fluids into the ground would have no adverse effects on existing or potential ground water users. Such fluids would percolate slowly in the direction of the Missouri River.
Grand Gulf	**Aquifer Characteristics:** The Mississippi River alluvium is the principal aquifer at the site. With the potential for induced recharge from the river, the alluvial aquifer is capable of meeting plant service water requirements. The Catahoula Formation underlies the alluvial and terrace deposits and generally contains ground water under semi-confined conditions. The loess deposits, Vicksburg group, and formations below the Forest Hill Formation are not considered to have water supply potential at the site	In the site area the regional ground water table slopes gently westward, with local gradients dipping toward the major tributary valleys. The gradient steepens toward Hamilton and Gin Lakes. West of the lakes, the ground water table slopes toward the river at a gradient that varies with the prevailing river stage.	65 monitoring wells with 120 additional wells used for observation, pumping, piezometer, dewatering, and collection.	The closest area of concentrated ground water withdrawal is the Port Gibson municipal water system about five mi southeast of the site. Should a spill occur, the contaminants would initially encounter the ground water within the Catahoula Formation which forms a local ridge beneath the site. The concentration of the contaminants at the Mississippi River after the estimated ground water travel time of 12.5 years to the river would be essentially Zero.

Site	General description of: Radwaste discharge, Water wells, and Onsite Aquifers	Groundwater Flow Characteristics (include any aquifer specifics identified during hydrogeology review)	Number and location of monitoring wells	Estimated time to reach public drinking water aquifers (if tritium is already offsite, explain and describe levels)
Palo Verde	**Aquifer Characteristics:** The hydrogeologic profile of the site area is defined by three major sedimentary units, each having distinctly different lithologic and hydrologic characteristics These units are identified as the upper alluvial, middle fine-grained and Lower coarse-grained units. In the site area, the groundwater reservoir consists of an extensive regional aquifer and a local perched water zone comprised of the lower coarse-grained unit, above. This aquifer extends to over 400 square miles and is bounded by the mountain masses that encompass the Lower Hassayampa Centennial area. The primary recharge source to the regional aquifer in the site area is underflow from upper Hassayampa Valley, north of the site area. The general flow direction is north to south. Reversal of flow direction occurs locally where the groundwater levels are depressed due to pumping for irrigation purposes. Infiltration of precipitation, surface runoff, and return flow from irrigation in the vicinity of the site comprise a small portion of the total recharge of the regional aquifer. Discharge from the regional groundwater reservoir occurs as underflow to Arlington Valley (to the south of the site) and pumpage from irrigation wells. **Water Wells:** There are 18 groundwater wells located within 2 miles and another 69 wells located between 2 and 5 miles of the plant site. Among them, 17 of the wells have depths less than 200 feet and draw their water from the perched water zone, while the remaining 70 wells draw their water from the regional confined aquifer below the Palo Verde clay layer.	The general flow direction is north to south. Reversal of flow direction occurs locally where the groundwater levels are depressed due to pumping for irrigation purposes. Contaminated water, if accidentally spilled during plant operation, may seep through the ground surface. For this postulated occurrence, the contaminated water will infiltrate downward through the unsaturated soil and reach the perched water table about 40 feet below the land surface. It will then disperse into the perched groundwater. Further downward movement of water from the base of perched water zone is restricted due to the presence of the Palo Verde clay layer about 200 feet below the ground surface.	Palo Verde has approximately 20 wells that are sampled at least quarterly for radioactivity and other chemical indicator parameters. Palo Verde also monitors water levels in approximately 56 wells continually using transducers.	180 years for tritium. The concentration at the 180 yr point is calculated to be 8.9 E-9 µCi/ml.

Site	General description of: Radwaste discharge, Water wells, and Onsite Aquifers	Groundwater Flow Characteristics (include any aquifer specifics identified during hydrogeology review)	Number and location of monitoring wells	Estimated time to reach public drinking water aquifers (if tritium is already offsite, explain and describe levels)
River Bend Station	**Aquifer Characteristics:** In the vicinity of the site, groundwater is available from Holocene Mississippi River alluvial deposits, Lower Pleistocene and Holocene alluvial deposits which form terraces in the upland areas and Tertiary sands. Three distinct aquifer groupings: Alluvial Aquifer, Upland Terrace Aquifer and Tertiary Aquifers. The Alluvial and Upland Terrace are hydraulically connected and influenced by the Mississippi River. The Tertiary aquifers are all confined zones. The Upland Terrace Aquifer is most likely to receive any residual radioactive contamination from plant operation and is therefore the only aquifer monitored for radioactivity.	Seepage from the postulated spill would move through the Upland Terrace Aquifer and into the Mississippi River Alluvial Aquifer by traveling along the direction of the steepest hydraulic gradient, toward the Mississippi River from the main plant area. Because the Mississippi River Alluvial Aquifer is hydraulically connected to the Mississippi River, the postulated spill would eventually discharge from the groundwater flow system into the surface water flow system through the bank of the river.	25 total, 20 of which are groundwater monitoring wells.	The nearest potable water intake on the Mississippi River is at Bayou Lafourche, LA, which serves the People's Water Service Company in Donaldsonville, LA. Bayou Lafourche is located at River Mile 175.4, about 87 mi (140 km) downstream of the site. During the postulated accident condition, the minimum dilution factor and the associated travel time are estimated to be 1.72×10^{10} and 8.72 yr, respectively.

Site	General description of: Radwaste discharge, Water wells, and Onsite Aquifers	Groundwater Flow Characteristics (include any aquifer specifics identified during hydrogeology review)	Number and location of monitoring wells	Estimated time to reach public drinking water aquifers (if tritium is already offsite, explain and describe levels)
San Onofre Nuclear Generating Station	**Radwaste Discharges:** The liquid radwaste discharge line can be used to releases liquid wastes to either Unit 2 or Unit 3 circulating water monitored discharge system. For SONGS Units 2 &3, in addition to the radwaste discharge line for the controlled release of processed wastes from the coolant radwaste and miscellaneous liquid radwaste tanks, other ODCM-credited liquid release points include the full flow condensate polishing demineralizer sumps and hold-up tank; steam generator blowdown; steam generator blowdown bypass line; the steam generator blowdown processing system neutralization sump; the component cooling water sump; the storage tank area sump; the turbine plant sumps; and the auxiliary building sumps. The North Industrial Area Yard Drain Sump is an ODCM-credited release point that collects surface run-off in the area formerly occupied by Unit 1. **Aquifer Characteristics:** The aquifer beneath the site is an unconfined water table aquifer and is tidally influenced in the PA. The principal water bearing deposit is alluvium consisting of sand, gravel, silt, and clay that reach about 55 feet thick and average about 25 feet thick. The San Mateo Formation consists of deposits of marine sand, gravel, silt, and clay that are also locally water bearing. It is bounded by the Pacific Ocean on the west and elsewhere by semi-permeable marine sedimentary rocks. The valleys are drained westward to the ocean by San Mateo and Christianitos Creeks. There are two groundwater producing units in the San Mateo and San Onofre Basins: the younger alluvial sediments and the poorly consolidated sandstone of the San Mateo formation. The younger alluvium fills the valley bottoms of the San Mateo and San Onofre Creeks, and is not continuous between the basins; whereas, the San Mateo Formation underlies both alluvial plains and forms a continuous aquifer between the basins. Groundwater at SONGS is found within the San Mateo Formation. Groundwater elevations are typically very shallow, less than 10 feet below ground surface.	SONGS is located along the coast of the Pacific Ocean in the San Juan Hydrologic Unit. The site is bounded by the Pacific Ocean to the west and elsewhere by semi-permeable Tertiary marine sedimentary rocks. The valleys are drained west and southwestward to the ocean by the San Onofre Creek. Groundwater conditions at SONGS are controlled by tidal fluctuation and changes in water levels within the San Onofre and San Mateo Creeks. Shallow groundwater movement is downstream through the stream alluvium, and water levels vary seasonally. At the Unit 1 area, the groundwater moves to the southwest. Based on modeling of the simulated groundwater levels for the San Mateo and San Onofre Creeks, the groundwater in the deeper portions of the San Mateo Formation is also moving southwest towards the Pacific Ocean.	Nine wells have been installed within the SONGS OCA under the Ground Water Protection Initiative: 3 of the wells are up-gradient of the Protected Area and Power Block. The remaining wells are located along the site's seaward (western) perimeter: 2 of the wells are in the North Industrial Area (formerly occupied by Unit 1), and the other 4 are in the Units 2 and 3 Protected Area.	Tritium from unplanned, unmonitored releases has not been detected offsite. The study and review of hydrologic and geologic features concluded that it is highly unlikely that any contamination at SONGS would reach a public drinking water aquifer. The California Regional Water Quality Control Board, San Diego Region, stated in its *1994 Basin Plan* "these beneficial uses (municipal, agricultural) do not apply westerly of the easterly boundary of the right-of-way of Interstate Highway 5 and this area is excepted from the sources of drinking water policy..." and identifies the basin containing SONGS to be separate and distinct from adjoining basins

Site	General description of: Radwaste discharge, Water wells, and Onsite Aquifers	Groundwater Flow Characteristics (include any aquifer specifics identified during hydrogeology review)	Number and location of monitoring wells	Estimated time to reach public drinking water aquifers (if tritium is already offsite, explain and describe levels)
South Texas Project	**Radwaste Discharge:** *Made to the site unlined* reservoir. Liquid radwaste discharges originate in the Waste Monitoring Tanks. The piping then returns to the Mechanical/Auxiliary building, where the discharge is combined with the circulating water discharge to the reservoir. The piping from the tanks to the Mech/Aux building are enclosed in a vault where any leakage would be evident from the Mech/Aux building. **Aquifer Characteristics:** There is a shallow *aquifer (approximately 12 ft) and a deep aquifer* onsite (approximately 130 ft) directly above a confined aquifer network that is hydraulically independent. Tritium from the unlined reservoir has been detected in the shallow aquifer that is not used for drinking water, but is used for agricultural purposes.	Discharge of shallow aquifer is mainly into Matagorda Bay and the Colorado River Estuary to the SE of the plant.	18 Groundwater 15 Surface water 2 Drinking water 1 Relief Well Several locations to the SE, ESE, S, SW, SSE, NNE, N, NW, SSW and onsite.	> 100 years
Waterford 3	**Aquifer Characteristics:** The major aquifers in this region are unconsolidated sands that dip southward. In general, these sand deposits are separated and confined by relatively impermeable clays and silts. In order of increasing depth these aquifers are a) The Shallow Aquifers, b) The Gramercy Aquifer, c) The Norco Aquifer and d) The Gonzales-New Orleans Aquifer.	Generally from north to south although the recent hydrological study indicated a break where flow could go from south to north to the river. The licensee will be sinking wells to verify or refute this indication.	Waterford 3 has three wells on the south side of the plant.	According to the FSAR, Operating a nuclear plant at this site will not adversely affect either the local or regional groundwater resources, even in the unlikely event that a radioactive liquid spill should occur.

Site	General description of: Radwaste discharge, Water wells, and Onsite Aquifers	Groundwater Flow Characteristics (Include any aquifer specifics identified during hydrogeology review)	Number and location of monitoring wells	Estimated time to reach public drinking water aquifers (if tritium is already offsite, explain and describe levels)
Wolf Creek	**Radwaste:** The discharge flow path for procedurally allowed effluent releases is typically the circulating water (condenser cooling water) discharge flow path. This path discharges to Coffey County Lake. **Aquifer Characteristics:** Small quantities of ground water are available regionally from three sources within a 50-mile radius of the site. These sources are the alluvial deposits in the river valleys, the near-surface weathered bedrock including shallow soils, and the deep un-weathered bedrock. The alluvial aquifers in the site region yield as much as 100 gallons per minute. Recharge to the alluvial aquifers is derived from precipitation and from ground water in the weathered rock zone where the zone is hydraulically connected to the alluvium. Periods of high river stage may also contribute some short-term recharge. Within a 20-mile radius of the site, the towns of New Strawn, 3 miles west-northwest, and Hartford, 15 miles west-northwest of the plant site, obtain water from alluvial aquifers. Yields from wells in the weathered bedrock range up to 10 gallons per minute. This zone is developed mainly for domestic and livestock purposes. Recharge to the weathered bedrock is from local precipitation, and discharge occurs into alluvial deposits, streams, and wells. Un-weathered bedrock (or deep bedrock) units supply water for domestic and livestock purposes and yield from 1 to 10 gallons per minute to wells. **Wells:** There are three water districts within a 5-mile radius of the site. The City of New Strawn is the smallest district and serves the residents of the New Strawn area. This district obtains ground water from the alluvium along the Neosho River below the John Redmond Reservoir near New Strawn. Rural Water Districts No. 2 and 3 serve numerous residents around the site, encompass a larger geographical area than the City of New Strawn, and both obtain treated surface water from the City of Burlington.	The site hydrology study showed that the first confined water table is approximately 18 feet below the surface. This confining layer of limestone slopes towards the southwest and into Coffey County Lake.	16 arranged in all directions around the plant	From the USAR 2.4.13.3.4 Based upon the RWST contents being released and all the water entering the ground water 10,665 days or ~ 29 years to enter the lake.

Item 3: Monitoring Plans/Procedures for Buried/Underground Piping

Site	Does the site currently have a plan/procedure? (If No, Explain)	Site plan contents (Briefly explain licensee's plan/procedure to assess, repair, and mitigate issues related to the degradation of buried/underground piping)	What regulatory commitments have been made by the licensee regarding buried/underground piping? (See Item 5 for add'l specifics)
Arkansas Nuclear One	**YES**	Licensee is implementing corporate procedures to assess/inspect buried piping/tanks. In general, inspections should be performed at the segments that have the highest risk ranking, but no risk ranking was provided by the licensee (at this time). The licensee plans to use classic non-destructive examinations or by excavation to the segment surface. When a buried segment is uncovered, the coating should be inspected. The results should be documented and include relevant photographs or video. When a buried segment is uncovered (OD) or entered internally (ID) for any reason, as a minimum it should be visually inspected for evidence of corrosion or damage. The licensee notes that particular attention should be paid to the joints, especially welds, as they often are more susceptible to degradation than the base metal.	**NONE.** Following the initiatives of NEI-09-14
Callaway	**YES**	Callaway's Buried Pipe Program is EDP-ZZ-01011. This procedure is undergoing revision and Rev 1 is expected for release mid May 2010. Revision 1 will incorporate "recommended practices" defined in EPRI Technical Report – 1016456, "Recommendations for an Effective Buried Pipe Program". In 2010, Callaway will work with a vendor to develop a buried pipe database which will house all information relevant to buried pipe systems, including inspection data. By December 2010, Callaway will have a prioritized list or ranking of buried piping systems/segments based on consequence and likelihood of failure. From this prioritized list, an Inspection Plan will be developed for the assessment of structural and leakage integrity of buried piping systems. By December 2013, a formal Asset Management Plan will be developed and will include not only inspection plans, but planned maintenance activities, plans for repair, and plans for replacement. The STARS plants (Callaway, Palo Verde, Diablo Canyon, SONGS, Wolf Creek, STP, Comanche Peak) have collaborated to create a Buried Pipe Team to ensure all plants within the alliance meet the goals set forth in the Industry Initiative for Buried Piping.	Callaway does not have any formal station commitments for buried pipe testing/ inspection.
Columbia Generating Station	**YES**	The licensee has a Buried Piping Integrity Program. This procedure details: the piping to be inspected, the roles of all affected organizations, the inspection frequency, guideline of ultrasonic thickness techniques, and other inspection methods. This procedure is effective 2008 and is currently in revision to meet current NEI-09-14.	**NONE.** Following the Initiatives of NEI-09-14

Site	Does the site currently have a plan/procedure? (If No, Explain)	Site plan contents (Briefly explain licensee's plan/procedure to assess, repair, and mitigate issues related to the degradation of buried/underground piping)	What regulatory commitments have been made by the licensee regarding buried/underground piping? (See Item 5 for add'l specifics)
Comanche Peak	**YES**	The CPNPP buried piping program is developed based on EPRI guideline 1016456 and NEI-09-14. Its elements consist of identification and scoping buried piping, risk ranking them, performing opportunistic inspections and developing future inspection plans utilizing proven technology that are identified by EPRI. Any repair or replacement identified by inspection will be performed using existing procedures. The STARS plants (Callaway, Palo Verde, Diablo Canyon, SONGS, Wolf Creek, STP, Comanche Peak) have collaborated to create a Buried Pipe Team to ensure all plants within the alliance meet the goals set forth in the Industry Initiative for Buried Piping.	**NONE.** Following the initiatives of NEI-09-14
Cooper Nuclear Station	**NO**. The licensee has a procedure for ground water monitoring. The procedure for Buried/Underground Piping inspection and monitoring is under development.	CNS currently has a ground water monitoring program to identify potential degradation of buried/underground piping. The CNS program for buried/underground piping is under development in order to meet CNS License Renewal commitments and industry initiative (NEI 09-14). The program will include a risk ranking of all buried/underground piping based on the likelihood of failure and the consequences of failure. The risk ranking will be used in the selection of components for inspection. The CNS preventative/mitigative strategy includes the maintenance and improvement of the cathodic protection system.	CNS has a commitment to implement a Buried Piping and Tanks Inspection Program as part of License Renewal due January 18, 2014.
Diablo Canyon	**YES**	The licensee has a Fluid Leak Management Program procedure with the intent is to ensure external leakage from plant systems is classified, prioritized, and managed or corrected in a timely manner. The program contains provisions to monitor inactive and low level active leaks until such time the leak either becomes active or increases in severity to a level necessitating repair. The program provides guidance for a proactive approach toward preventing leaks. Below-grade piping is neither included specifically nor excluded specifically from the procedure. Additional site procedures specifically address the monitoring of piping installed below grade elevation. Some Additional Information The quantity and extent of important-to-safety and safety-related system piping installed below grade elevation at DCPP is quite limited compared to that of other nuclear plants. The integrity of these DCPP systems has long been assessed and maintained via: 1) the site procedures 2) corrosion-resistant design (e.g., diesel fuel piping installed in leak-detected chases), and 3) redundancy in flow paths allowing for the replacement of leaking components without loss of system function (e.g., fire protection). These measures have proven adequate in the past; however, a much more rigorous approach is soon to appear.	The License Renewal submittal dated November 23, 2009, DCL-09-079, contains the following commitment: "Implement the Buried Piping and Tanks Inspection program as described in LRA Section B2.1.18 during the 10 years prior to the period of extended operation." PG&E, has committed to the development of a program toward the management of potential degradation in below-grade piping in accordance with the NSIAC Industry Initiative on Buried Piping," NEI 09-14. This new program, when fully implemented, will provide an integrated and efficient treatment of aging effects in below-grade piping over the long-term. It is anticipated that present DCPP procedures will undergo some revision on the way to an integrated program.

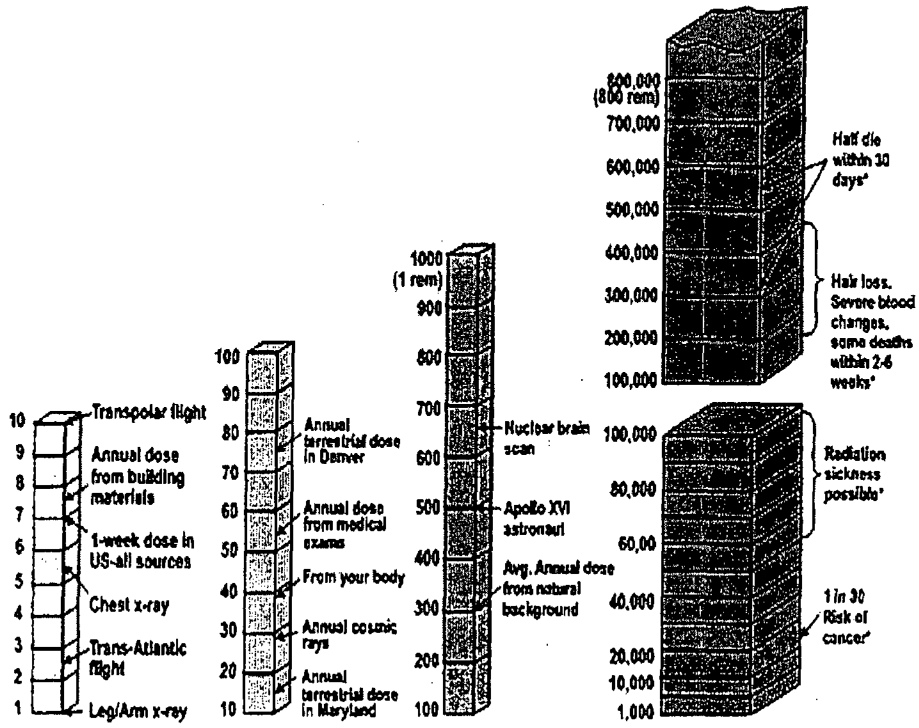
Site	*Does the site currently have a plan/procedure? (If No, Explain)*	Site plan contents (Briefly explain licensee's plan/procedure to assess, repair, and mitigate issues related to the degradation of buried/underground piping)	What regulatory commitments have been made by the licensee regarding buried/underground piping? *(See Item 5 for add'l specifics)*
Fort Calhoun Station	**YES**	The licensee has a Buried Piping and Components Program with the objective to: Identify all susceptible buried piping and components, Examine piping components with NDE techniques, Evaluate component examinations to determine magnitude of degradation, Establish pipe section and/or components replacement criteria based on the amount of allowable wall thinning when degraded pipe sections and/or components are found, and Reduce system degradation through the use of upgraded materials, local design changes, or enhanced coating techniques.	**NONE.** Following the initiatives of NEI-09-14 No commitment for buried piping for license renewal. Procedures do state that if piping is uncovered during excavations, then the piping should be inspected.
Grand Gulf	**YES**	*Licensee is implementing corporate procedures to assess/inspect buried piping/tanks.* *In general, inspections should be performed at the segments that have* the highest risk ranking, but no risk ranking was provided by the licensee (at this time). The licensee plans to use classic non-destructive *examinations or by excavation to the segment surface. When a buried* segment is uncovered, the coating should be inspected. The results should be documented and include relevant photographs or video. When *a buried segment is uncovered (OD) or entered internally (ID)* for any reason, as a minimum it should be visually inspected for evidence of corrosion or damage. The licensee notes that particular attention should be paid to the joints, *especially welds, as they often are more susceptible* to degradation than the base metal.	**NONE.** Following the initiatives of NEI-09-14
Palo Verde	**NO**. *Per NEI 09-14*, a new program procedure for buried piping is due to be issued by *June 30, 2010. The intent of* this procedure is to also address tanks that are within the scope of 10 CFR *Part 54 (License* Renewal). A draft copy of this procedure was provided to the *NRC License Renewal* Inspection Team during the first quarter of 2010.	The STARS plants (Callaway, Palo Verde, Diablo Canyon, SONGS, Wolf Creek, STP, Comanche Peak) have collaborated to create a Buried Pipe *Team to ensure all plants within the alliance meet the goals set forth in* the Industry Initiative for Buried Piping.	**NONE.** Following the initiatives of NEI-09-14 The Buried Piping and Tanks Inspection program is a new program that will be implemented prior *to the period of extended of operation. Within the* ten year period prior to entering the period of extended operation, an opportunistic or planned *inspection will be performed. Upon entering the* period of extended operation a planned inspection within ten years will be required unless *an opportunistic inspection has occurred within* this ten year period. Industry and plant-specific operating experience will be evaluated in the *development and implementation of this program.*

Site	Does the site currently have a plan/procedure? (If No, Explain)	Site plan contents (Briefly explain licensee's plan/procedure to assess, repair, and mitigate issues related to the degradation of buried/underground piping)	What regulatory commitments have been made by the licensee regarding buried/underground piping? (See Item 5 for add'l specifics)
River Bend Station	**<u>YES</u>**	Licensee is implementing corporate procedures to assess/inspect buried piping/tanks. In general, inspections should be performed at the segments that have the highest risk ranking, but no risk ranking was provided by the licensee (at this time). The licensee plans to use classic non-destructive examinations or by excavation to the segment surface. When a buried segment is uncovered, the coating should be inspected. The results should be documented and include relevant photographs or video. When a buried segment is uncovered (OD) or entered internally (ID) for any reason, as a minimum it should be visually inspected for evidence of corrosion or damage. The licensee notes that particular attention should be paid to the joints, especially welds, as they often are more susceptible to degradation than the base metal.	**<u>NONE.</u>** Following the initiatives of NEI-09-14
San Onofre Nuclear Generating Station	**<u>YES</u>**	SONGS Buried Piping Program document follows the EPRI *Recommendations for an Effective Program to Control the Degradation of Buried Pipe* (1016456), December 2008 and NEI 09-14, Guideline for the Management of Buried Piping Integrity for management of buried piping. In addition, SONGS is participating in the STARS Alliance effort to improve the consistency of the SONGS' program document with other STARS Alliance Plants and to ensure the establishment of a Buried Piping Program Document by June 30, 2010. Additional tasks to comply with the NEI Buried Piping Initiative include: risk ranking, inspection plan development, formal piping inspections, and lifecycle management.	There are no NRC mandated commitments from SCE to the NRC for the Buried Piping Program. The NRC has not formally issued any regulations regarding management of non-safety-related buried piping to date. EPRI, NEI, and INPO have been providing updates to the NRC on the industry's initiatives for buried piping programs.
South Texas Project	**<u>YES.</u>**	Procedure was effective on 12/17/09. The process will identify all buried piping systems and then rank those systems with the potential for degradation. Ranking will be done based on configuration, pipe material, coatings, environment (both internal and external), age, corrosion control, and ASME class. The program will then select and schedule direct or indirect inspections. Methods used will be dependent on accessibility, pipe location, type of ground cover, proximity of other pipe systems, and other underground structures. Results of the inspections will be dispositioned based on risk assessment of the piping system. Monitoring of repairs will be performed to ensure the type of repair is adequate and will mitigate further degradation of the system. The risk ranking of the systems will be recalculated periodically. High risk systems are scheduled to be inspected beginning in 2011.	**<u>NONE.</u>** The procedure states that the program is comparable to the program described in NUREG-1801, Section XI.M28 and Section XI.M34.

Site	Does the site currently have a plan/procedure? (If No, Explain)	Site plan contents (Briefly explain licensee's plan/procedure to assess, repair, and mitigate issues related to the degradation of buried/underground piping)	What regulatory commitments have been made by the licensee regarding buried/underground piping? (See Item 5 for add'l specifics)
Waterford 3	<u>**YES**</u>, The buried piping program is described in fleet procedures EN-DC-343 and CEP-BPT-100. These procedures include activities such as identification and risk ranking of buried pipe. WF3 has started the process outlined in these procedures.	Licensee has procedures in place to assess/inspect buried piping/tanks In general, inspections should be performed at the segments that have the highest risk ranking, but no risk ranking was provided by the licensee (at this time). The licensee plans to use classic non-destructive examinations or by excavation to the segment surface. When a buried segment is uncovered, the coating should be inspected. The results should be documented and include relevant photographs or video. When a buried segment is uncovered (OD) or entered internally (ID) for any reason, as a minimum it should be visually inspected for evidence of corrosion or damage. The licensee notes that particular attention should be paid to the joints, especially welds, as they often are more susceptible to degradation than the base metal.	<u>**NONE.**</u> Following the initiatives of NEI-09-14
Wolf Creek		The STARS plants (Callaway, Palo Verde, Diablo Canyon, SONGS, Wolf Creek, STP, Comanche Peak) have collaborated to create a Buried Pipe Team to ensure all plants within the alliance meet the goals set forth in the Industry Initiative for Buried Piping. The documents are in development.	<u>**NONE.**</u> Following the initiatives of NEI-09-14

(b)(5)

Radiation Doses in Perspective
(in millirem)



* Doses received over short time period (hours to days) at high dose rates are "acute" doses.

Item 5: Regulations Addressing Design and Testing of Buried Piping and Monitoring Radioactivity Releases

Several **regulatory requirements and commitments** exist that could be utilized as part of the inspection process to focus licensee resources on obtaining a better understanding of the current condition of structures, systems, and components (SSCs) and implement appropriate aging management corrective actions. In particular:

10 CFR Part 50 Appendix A - General Design Criterion established requirements for controlling radioactivity.

Criterion 60 – Control of Releases of Radioactive Materials to the Environment: Requires that the nuclear power unit designs include means to control suitably the release of radioactive materials in effluents and to handle radwaste produced.

Criterion 61--Fuel storage and handling and radioactivity control: The fuel storage and handling, radwaste, and other systems containing radioactivity be designed to assure adequate safety. These systems shall be designed with a capability to permit appropriate periodic inspection and testing of components important to safety,

Criterion 64--Monitoring radioactivity releases: Means shall be provided for monitoring the containment atmosphere, loss-of-coolant accident fluids, effluent discharge paths, and the plant environs for radioactivity that may be released.

Requirement - 10 CFR 50.55a Codes and standards: **(g)** Establishes requirements for in-service testing of components, including piping. **(g)(4)** requires testing, including leak testing, in accordance with ASME Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," To the extent that SSCs are bounded by 10 CFR 50, Appendix B, testing and maintenance requirements may be necessary to monitor piping for degradation to include a CST, RWST, SW and SFPs. **Footnote 9 to 50.55a** Guidance for quality group classifications of components which are to be included in the SARs pursuant to **§ 50.34(a) and (b)** may be found in RG 1.26, "Quality Group Classifications and Standards for Radiological-Waste-Containing Components of Nuclear Power Plants," and in Section 3.2.2 of NUREG-0800, "Standard Review Plan for Review of Safety Analysis Reports for Nuclear Power Plants."

Requirement - 10 CFR 50.34a Design objectives: Requires equipment to control releases of radioactive material in effluent from nuclear power reactors. In the case of an application filed on or after January 1971, the application shall also identify the design objectives to be employed, for keeping levels of radioactive material in effluents to unrestricted areas ALARA. Each application for an operating license shall include a description of the equipment and procedures for the control of gaseous and liquid effluents and for the maintenance and use of equipment installed in radwaste systems.

50.71

Requirement - Technical Specifications: TS 5.4.1.a, "Procedures," requires that written procedures be established, implemented, and maintained covering the activities specified in Regulatory Guide 1.33, Appendix A, Section 7, Procedures for Control of Radioactivity (For limiting materials released to environment and limiting personnel exposure) for Liquid Radioactive Waste Systems (Sampling, Monitoring, and Discharging to Effluents) Radiation Protection Procedures: (Radiation Surveys and Contamination Control)

Requirement - Radiation Protection Concerns Addressed in 10 CFR 20 Part 20:
10 CFR 20.1501 Subpart F--Surveys and Monitoring (a) Each licensee shall make or cause to be made, surveys that-- (1) May be necessary for the licensee to comply with the regulations in this part; and (2) Are reasonable under the circumstances to evaluate-- (i) The magnitude and extent of radiation levels; and (ii) Concentrations or quantities of radioactive material; and (iii) The potential radiological hazards.

10 CFR 20.1301 Dose limits for individual members of the public.

(b) A licensee shall show compliance with the annual dose limit in § 20.1301 by--
(1) Demonstrating by measurement or calculation that the total effective dose equivalent to the
individual likely to receive the highest dose from the licensed operation does not exceed the annual dose limit;

10 CFR 20.2002 Method for obtaining approval of proposed disposal procedures; Requires that no licensee dispose of licensed material except by specified methods approved by the Commission

10 CFR 20.2007 Compliance with environmental and health protection regulations states, nothing in this subpart relieves the licensee from complying with other applicable Federal, State, and local regulations governing any other toxic or hazardous properties of materials that may be disposed of under this subpart.

In the near future 10 CFR 20.1406 will require reactors to minimize onsite contamination and the introduction of radwaste: Revised 10 CFR 20.1406 is waiting a review by the Commission and is a direct result of the groundwater revelations of 2006. It requires existing licensees to operate facilities in a manner that minimizes the introduction of radwaste into the site, including the **subsurface contamination,**

Commitment - Safety Analysis Reports: RG 1.143 describes a method acceptable for complying with regulations regarding radwaste management systems, including guidance for classification and QA measures. Position C.1.1 and Table 1 of the RG 1.143 describe codes and industry standards applicable to the design and fabrication of radwaste management systems. In addition, RG 1.143 describes positions with regard to the design and fabrication of these systems that are supplemental to those established by the codes and standards cited. RG 1.143 does not explicitly specify classifications for radwaste management system components in terms of the quality groups (A-D) described in RG 1.26. Radwaste management SSCs should be designed to control leakage and facilitate access, operation, inspection, testing, and maintenance in order to maintain radiation exposures to operating and maintenance personnel ALARA. RG 8.8 provides guidelines acceptable to the NRC staff on this subject.

Commitment - NEI 07-07 Groundwater Protection Initiative (TI 2515/173): Objective 1.2 committed licensees to evaluate all SSCs that contain or could contain licensed material which there is a credible mechanism to reach groundwater, and evaluate work practices which there is a credible mechanism for the licensed material to reach groundwater. SSCs of interest include: RWST, SFP & leak detection systems; outdoor tanks and storage of contaminated equipment; buried piping; retention ponds or basins or reservoirs and lines carrying steam.

If yes, how frequently is the sampling performed?

Are there vacuum breakers, pressure relief valves or similar type valves on the discharge piping? If so, how are these valves monitored for leakage? No. However U3 discharge line can be lined up with the blowdown processing system, which does have a vacuum breaker. If this system were to fail the physical location of this system allows gravity to drain the leak into the circ water system.

5. What surface bodies of water do you have onsite (Protected Area and Owner Controlled), including cooling tower basins, impoundments, cooling reservoirs, spray ponds, retention ponds, lakes, sanitary/sewage systems, etc.?

   Onsite sewage treatment system which discharges to the circulating water system. This is a clean system.

   Are these bodies of water lined ponds? If so, with what?
   There is a retention pond that is lined and a reservoir for fire water that has an asphalt base.

   What is the highest level of residual contamination in each of those systems?
   None

6. Does the licensee have groundwater monitoring wells onsite?
   No. Unit 1 is undergoing decommissioning and to date no beta/gamma activity has been detected.

   How many wells and where are they located (e.g., distributed around/throughout the site, in a particular region of the site and/or near particular buildings/structures, etc.)?

7. At what frequency does the licensee sample/analyze the wells?

   N/A

8. What radionuclides does the licensee monitor?

   See the latest annual environmental report for this information.

Gamma emitters?	MDA
Tritium?	MDA
Gross Beta?	MDA
Other?	MDA

9. Has the licensee identified onsite radioactive groundwater contamination?
   No.

   If yes, when was it identified? Corrective action document No.

How large of an area?

Has the contamination moved outside the restricted area or the owner controlled area?

10. If the licensee does NOT have an onsite radioactive groundwater monitoring program does the licensee plan to implement a program and how extensive?
No.

Does the licensee plan to take other measures to assure they can identify radioactive groundwater contamination?
No.

11. Does the licensee have a surveillance program to periodically walkdown outside areas around the site to look at potential leaks and spills?

Engineers walkdown their systems down onsite, and Health Physics department routinely surveys beaches and outside the OCA.

12. Does the licensee perform other onsite monitoring (e.g. soil sampling) to identify unexpected radioactive releases? Yes.

13. As discussed in IE Bulletin No. 80-10, what clean systems have become contaminated?

In 1991-92 timeframe, the sewage treatment system became contaminated, was decontaminated and remediated.

The laundry system was also a clean system around the 80-10 Bulletin time, but has since been modified to discharge its water into the blowdown processing system sump.

What are the levels of residual contamination in those systems?

Sewage treatment system - None

Laundry system - operating within the design criteria.

14. Does the licensee have any history of radioactive spills and/or leaks outside of buildings? Yes, they have been remediated.

If so, have they been documented in accordance with 10CFR 50.75g?

If not, why?

No residual contamination.

Region IV Radioactive Waste Related Questions

Site: Waterford-3 **Date:** 3/7/06 **Person Contacted:** Greg Scott
Licensing
(504) 739-6703

John Amato
Chemistry

1. Have there been tritium releases "spills, leaks, etc." other than routine effluent releases from the plant into the public domain "areas outside the licensee OCA". No

   If yes, describe it.

2. Where does the liquid waste discharge? [NRC noted that there is difference between effluent and liquid waste] To circ water block in the Turbine building

3. Does licensee radioactive (any) discharge lines traverse non licensee owned areas? No

4. If the licensee has discharge piping that carry radioactive liquids, does the licensee perform monitoring along the pathway to identify leakage? No

   If yes, how frequently is the sampling performed? NA

   Are there vacuum breakers, pressure relief valves, or other type of valves on discharge piping? No

   If so, how many are monitored for leakage? NA

5. What surface bodies of water does the licensee have on site? "PA and OCA"

   Cooling Tower Basin Yes

   Impoundments No

   Cooling Reservoirs No

   Spray Ponds No

   Retention Ponds Yes

   Lakes No

   Sanitary Sewage Systems Yes

   Are these bodies of water lined? Yes
   If so, with what? Concrete and fiberglass.
   What is the highest level of residual contaminants of each one of those systems?
   There is no contamination in any of the listed bodies of water.

6. Does the licensee have ground water monitoring wells on site? No

   How many wells and where are they located? N/A

7. What frequency does the licensee sample the wells? N/A

8. What nuclides do the licensee monitor? [Gamma, tritium, MDA] ODCM Nuclides

9. Has the licensee identified onsite radioactive ground water contamination? No
   If yes, how large of an area? NA
   Has contamination moved outside of the OCA? NA
   Is there a CR written on this event? NA

10. If the licensee does not have an onsite radioactive ground water program, does the licensee plan to implement one and how extensive? No plans

    Does the licensee plan to take other measures to ensure that they can identify radioactive ground water contamination? No plans

11. Does the licensee have a surveillance program to periodically walk down the outside area around the site to look at potential leaks and spills? No

12. Does the licensee perform other onsite monitoring "soils ???" to identify ??? radioactive releases? No

13. As discussed in IEB 80-010, what clean systems have become contaminated (including tritium)? What are the levels of residual contamination in those systems. (liquid and sludge) Two Dry Cooling Tower Sumps have Tritium around 5E-6 uCi/cc. Turbine Building Industrial Waste Sump tritium 2E-5 uCi/cc. One Auxiliary Component Cooling Water Basin 5E-6 uCi/cc, the other basin is clean.

14. Does the licensee have a history of spills or leaks outside of the building? If so, have they documented per 10CFR50.75g? If not, why not? Spent Fuel pool overflow. Spills are documented in Waterford-3 Corrective Action program as Condition Reports.

Site: Wolf Creek **Date:** 3/8/06 **Person Contacted:** Bill Muilenburg
(620)364-8831x4511

The NRC has requested the following information from WCNOC:

1. Has there been any Tritium spills or leaks other than effluents? If yes describe.

   No. Wolf Creek discharges radioactive liquid effluents in accordance with regulations and station procedures to Coffey County Lake (Wolf Creek Generating Station's cooling lake). As a result of these discharges Coffey County Lake has tritium levels in the range of ~9,000 pCi/L - ~16,000 pCi/L. Coffey County Lake is the water source for all water used at Wolf Creek other than potable water, including Circulation Water, Service Water, Essential Service Water, Component Cooling Water and Fire Protection water systems. Therefore, all water used in or discharged from these systems does contain tritium. Any leaks or discharges from these systems are expected to contain the same levels of tritium as the lake, see note below.

2. Where is the liquid waste discharge at WCNOC? The discharge flow path for procedurally allowed effluent releases is typically the circulating water (condenser cooling water) discharge flow path. This path discharges to Coffey County Lake.

3. If the licensee has discharge lines that carry radioactive liquid. Does the licensee discharge lines traverse any non-licensee areas? No

   Does the licensee have monitoring? Yes

   If yes how frequently? Each radioactive effluent release point contains a process liquid radiation monitor with automatic isolation capabilities. These monitors are continuously in service during the discharge process. They sample a small amount (3 to 5 gpm) of bypass effluent to ensure release limits are not exceeded.

4. Are there any vacuum breaker, pressure release or similar devices on discharge lines? If so how are they monitored for releases? None installed.

5. What surface bodies of water are there on site? (i.e. Lake, sanitary sewage)

   Wolf Creek uses a 5,090-acre lake, Coffey County Lake, for cooling. A 9.43-acre non-discharging sewage lagoon is used for domestic waste. There is a 31acre lime sludge pond used as a settling basin for discharges of regenerate wastewater.

Are they open bodies of water or are they lined? These bodies of water are open and not lined.

Of the bodies of water what is the highest level of contamination (Tritium in the lake)?
Tritium in Coffey County Lake varies from ~9,000 pCi/L to ~16,000 pCi/L.

What is there potential source? Permitted liquid radioactive waste discharges.

6. Does the licensee have ground water monitoring wells on site? There are no specifically designed ground water monitoring wells on site. There are several de-watering well casings used for de-watering access pits for piping inspections.

   How many wells and where are they located?
   Wolf Creek is in the process of determining the number of, and locations for, ground water monitoring wells.

7. What frequencies do the licensee sample or analyze the wells? Wolf Creek plans to sample these wells quarterly.

8. What radionuclides does the licensee monitor? See Table 2-1.
   What are the MDA levels of the nuclides? See table 2-1.
   What is the licensee looking for? See table 2-1

TABLE 2-1
RADIOACTIVE LIQUID WASTE SAMPLING AND ANALYSIS PROGRAM

LIQUID RELEASE TYPE	SAMPLE FREQUENCY	PRINCIPAL GAMMA EMITTERS	I-131	DISSOLVED/ ENTRAINED GASES (GAMMA)	GROSS ALPHA AND H-3	Sr-89, Sr-90	Fe-55
1. Batch Tanks (2)							Q Composite(4)
a. THB07A&B	P	P(3)	P	M	M Composite(4)	Q Composite(4)	
LLD (1)		5E-7	1E-6	1E-5	1E-7 for Alpha 1E-5 for H-3	5E-8	1E-6
b. THF04A&B	P	P(3)	P	M	M Composite(4)	Q Composite(4)	Q Composite(4)
LLD (1)		5E-7	1E-6	1E-5	1E-7 for Alpha 1E-5 for H-3	5E-8	1E-6
2. Continuous Releases (5)							
a. Steam Generator Blowdown	Daily (6)	W(3) Composite(4)	W Composite(4)	M	M Composite(4)	Q Composite(4)	Q Composite(4)
LLD(1)		5E-7	1E-6	1E-5	1E-7 for Alpha 1E-5 for H-3	5E-8	1E-6
b. Turbine Building Sump	Daily (6)	W(3) Composite(4)	W Composite(4)	M	M Composite(4)	Q Composite(4)	Q Composite(4)
LLD(1)		5E-7	1E-6	1E-5	1E-7 for Alpha 1E-5 for H-3	5E-8	1E-6
c. Waste Water Treatment	Daily (6)	W(3) Composite(4)	W Composite(4)	M	M Composite(4)	Q Composite(4)	Q Composite(4)
LLD(1)		5E-7	1E-6	1E-5	1E-7 for Alpha 1E-5 for H-3	5E-8	1E-6
d. Lime Sludge Pond	Daily (6)	W(3) Composite(4)	W Composite(4)	M	M Composite(4)	Q Composite(4)	Q Composite(4)
LLD (1)		5E-7	1E-6	1E-5	1E-7 for Alpha 1E-5 for H-3	5E-8	1E-6

LLD = (mCi/mL)

9. Has the licensee on site identified any radioactive ground water contamination? No, as indicated in question 8 Wolf Creek does not currently monitor on site for ground water contamination. Off site ground water and drinking water are routinely monitored as part

of the Radiological Environmental Monitoring Program. No off site radioactive contamination of ground water has been detected.

If so when? N/A
Did the licensee document in the corrective action database? N/A
How large was the spill? N/A

10. If the licensee does not have an onsite radioactive ground water program, does the licensee plan on implementing one or do you take other measures to identify? Wolf Creek is currently working on a procedure and locations to perform onsite de-watering well sampling.

11. Does the licensee have surveillance programs that walk down the outer areas of site to look for potential leaks and spills? Yes, Environmental Management performs a bi-monthly site surveillance inspection and Operations perform daily inspections by Site Operators.

12. Does the licensee perform other onsite monitoring such as soil sampling to identify unexpected radioactive releases? Yes, Health Physics performs soil and water samples prior to releasing from the RCA yard area.

13. As described in IE Bulletin 80-10 what clean systems have become contaminated? The secondary side of WCGS with the exception of the potable water system is tritiated. However, no direct contamination of clean systems has occurred at WCGS.

14. Does the licensee have a history of radioactive spills or leaks (i.e. 5075g) documentation?

    Wolf Creek did detect spent fuel pool liner leakage via the leak detection and collection system. There have been a total of 3 leaks found, and repaired, in the spent fuel pool. One in the late 1980's, one in 1999, and one in 2001. All three were located by back-pressuring the leak chase system, and repaired. In all three cases, the leakage was contained within the building systems. Since that time no further leaks have been detected. There are no known leaks or spills that have occurred outside of plant structures. There have been leaks/spills that have occurred inside structures designed to contain and control the leaks or spills to inside the structure.

NOTE: During activities such as flushing of fire protection lines or draining of the described systems, that have water from the lake in them, the tritiated water is discharged to the ground or storm sewer systems. Because of Wolf Creek's topography these discharges all return to the lake. No additional tritium is added to the environment as a result of these evolutions.