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AUTH.NAME AUTHOR AFFILIATION
VAN BRUNT,E.E. Arizona Public Service Co.

RECIP.NAME RECIPIENT AFFILIATION
TEDESCO,R.L. Assistant Director for Licensing

SUBJECT: Forwards revised pages of TMI-2 Lessons Learned Implementation Rept response to NUREG-0737,Item III.D.1.1 re integrity of sys outside containment likely to contain radioactive matl.

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April 2, 1982
ANPP-20612 - JMA/KWG

Mr. R. L. Tedesco
Assistant Director of Licensing
Division of Licensing
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: Palo Verde Nuclear Generating Station (PVNGS) Units 1, 2 and 3
Docket Nos. STN-50-528/529/530
File: 82-056-026; G.1.10; 82-013-040

References: (1) Letter from F. Miraglia, NRC, to E. E. Van Brunt, Jr. dated January 8, 1982, subject: Request for Additional Information (PVNGS LLIR)
(2) Letter from E. E. Van Brunt, Jr. to R. L. Tedesco dated February 11, 1982 (ANPP-20157 - JMA/WFQ) subject: Clarification of Response to Items II.F.1, II.F.2, III.D.1.1 (PVNGS LLIR)

Dear Mr. Tedesco:

The following pages are a revised version of the PVNGS TMI-2 Lessons Learned Implementation Report (LLIR) response to NUREG-0737, Item III.D.1.1 regarding integrity of systems outside containment likely to contain radioactive material.

This revision will be incorporated in a future amendment to the LLIR.

If you have any questions, please contact me.

Very truly yours,

E. E. Van Brunt

E. E. Van Brunt, Jr.
APS Vice President,
Nuclear Projects
ANPP Project Director

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EEVBJr/KWG/av
Attachment
cc: E. Licitra (w/a)
P. L. Hourihan "
R. L. Greenfield "
A. C. Gehr "

STATE OF ARIZONA)
) ss.
COUNTY OF MARICOPA)

I, Edwin E. Van Brunt, Jr., represent that I am Vice President Nuclear Projects of Arizona Public Service Company, that the foregoing document has been signed by me on behalf of Arizona Public Service Company with full authority so to do, that I have read such document and know its contents, and that to the best of my knowledge and belief, the statements made therein are true.

Edwin E. Van Brunt, Jr.

Edwin E. Van Brunt, Jr.

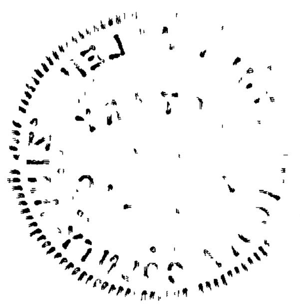
Sworn to before me this 2nd day of April, 1982.

Jean Allen

Notary Public

My Commission expires:

Oct 2, 1984



III.D RADIATION PROTECTION

III.D.1.1 INTEGRITY OF SYSTEMS OUTSIDE CONTAINMENT LIKELY TO CONTAIN RADIOACTIVE MATERIAL FOR PRESSURIZED-WATER REACTORS AND BOILING-WATER REACTORS

Position

Applicants shall implement a program to reduce leakage from systems outside containment that would or could contain highly radioactive fluids during a serious transient or accident to as-low-as-practical levels. This program shall include the following:

(1) Immediate leak reduction

(a) Implement all practical leak reduction measures for all systems that could carry radioactive fluid outside of containment.

(b) Measure actual leakage rates with system in operation and report them to the NRC.

(2) Continuing Leak Reduction -- Establish and implement a program of preventive maintenance to reduce leakage to as-low-as-practical levels. This program shall include periodic integrated leak tests at intervals not to exceed each refueling cycle.

PVNGS Evaluation

1. Design Review

Refer to CESSAR Appendix B, Item III.D.1.1. In addition, a PVNGS design review was performed on the system below to assure that potential radioactive release paths following a serious transient or accident is reduced to as-low-as-reasonably achievable (ALARA) levels.

1 A. Shutdown Cooling System (SCS)

The existing design incorporates all-welded piping. Vent and drain lines throughout the system are capped when not in use. Relief valves on the system relieve to the equipment drain tank (a tank designed to accept radioactive fluids). The leakage from the LPSI pump seals and system valve stems is ALARA. Potential leakage from the SCS into the essential cooling water system (through the shutdown heat exchanger) can be detected during normal operation by installed radiation monitoring.

1 B. Containment Spray Recirculation System (CS)

The existing design incorporates all-welded piping. Vent and drain lines throughout the system are capped when not in use. Relief valves on the system (external to the containment) relieve to the equipment drain tank. The leakage from the CS pump seals and system valve stems is ALARA. Potential leakage during normal operation from the CS into the essential

cooling water system (through the shutdown heat exchanger) can be detected by installed radiation monitoring.

C. CVCS Charging and Letdown System 1

The existing design incorporates all-welded piping. The letdown system is isolated upon CIAS and SIAS. Relief valves on the system relieve to the equipment drain tank.

The leakage from the CVCS charging pumps (positive displacement pumps) and other system equipment is ALARA as they are hard-piped to drains. The nuclear cooling water system is monitored for potential leakage from the CVCS through the letdown heat exchanger during normal operation.

D. Sampling System 1

The existing design of the normal sampling system incorporates "Swagelok" connections, however, the design will be upgraded to all-welded piping for sections which would come into contact with highly radioactive fluids. The system is isolated upon CIAS and SIAS. Relief valves relieve to the equipment drain tank. Leakage from the system is also minimized by the small size of the lines.

The post-accident sampling system will also be constructed of all-welded piping.

E. High-Pressure Injection Recirculation (HPSI)

The design incorporates all-welded piping. Relief valves on the system (external to the containment) relieve to the equipment drain tank. The vent and drain lines throughout the system are capped when not in use. Leakage from the HPSI pump seals and system valve stems is as-low-as reasonably achievable. Miniflow connections to the refueling water tank (RWT) are isolated upon Recirculation Actuation Signal (RAS). Manual cross over valves to the CVCS are normally locked shut.

1 F. Waste Gas System

The waste gas system is isolated from the containment upon CIAS. (The normal vent path from the reactor drain tank (RDT) and the reactor head vent system is isolated.) By design, the introduction of highly radioactive fluids to the system is precluded.

2 As part of the system testing program, each of the above systems is hydrostatically tested to 150% normal operating pressure per the requirements of ANSI B31.1, Summer 1976 Addendum for ANSI B31.1 piping systems, and to 125% normal operating pressure per the requirements of ASME Boiler & Pressure Vessel Code, Section III, 1977 Edition, for ASME piping systems.

Insert A

Insert A to pg III D.1.1 - 4

The PVNGS design was reviewed to confirm that the design and construction of PVNGS systems minimize unplanned releases of radioactivity including the related incidents identified in NRC letter dated October 17, 1979 to all operating nuclear power plants.

The following discussion summarizes that review.

Radioactive liquid atmospheric tanks are provided with overflows with either no isolation valve or a locked-open valve. Overflow lines have loop seals and are routed to appropriate radioactive building sumps.

The sump liquid is routed to the LRS holdup tanks. Overflow lines from the Refueling Water Tank and the LRS Concentrate Monitor Tanks are heat-traced to prevent plugging. Radioactive liquid pressurized tanks with the exception of the volume control tank and reactor drain tank are provided with relief lines routed to the appropriate sumps. A summary of the overflow provisions for the radioactive tanks is provided in Table [LATER]*

Storm drains are located away from areas with a high potential for radioactive spills. No storm drains exist in the immediate vicinity of the Containment, Auxiliary or Radwaste Buildings.

Radioactive pumps are generally located in isolated compartments whose drains are designed to catch all potential leakage. These drains are routed to the appropriate radioactive building sump. In addition, certain pumps whose potential for radioactive leakage is greatest are equipped with drip pans with lines hard-piped to the associated building sump. A summary of the radioactive pumps and their leakage provisions is given in Table [LATER]*

Radioactive valves are located in shielded compartments such as valve galleries equipped with floor drains that are designed to collect all potential valve leakage. These drains are routed to appropriate building sumps.

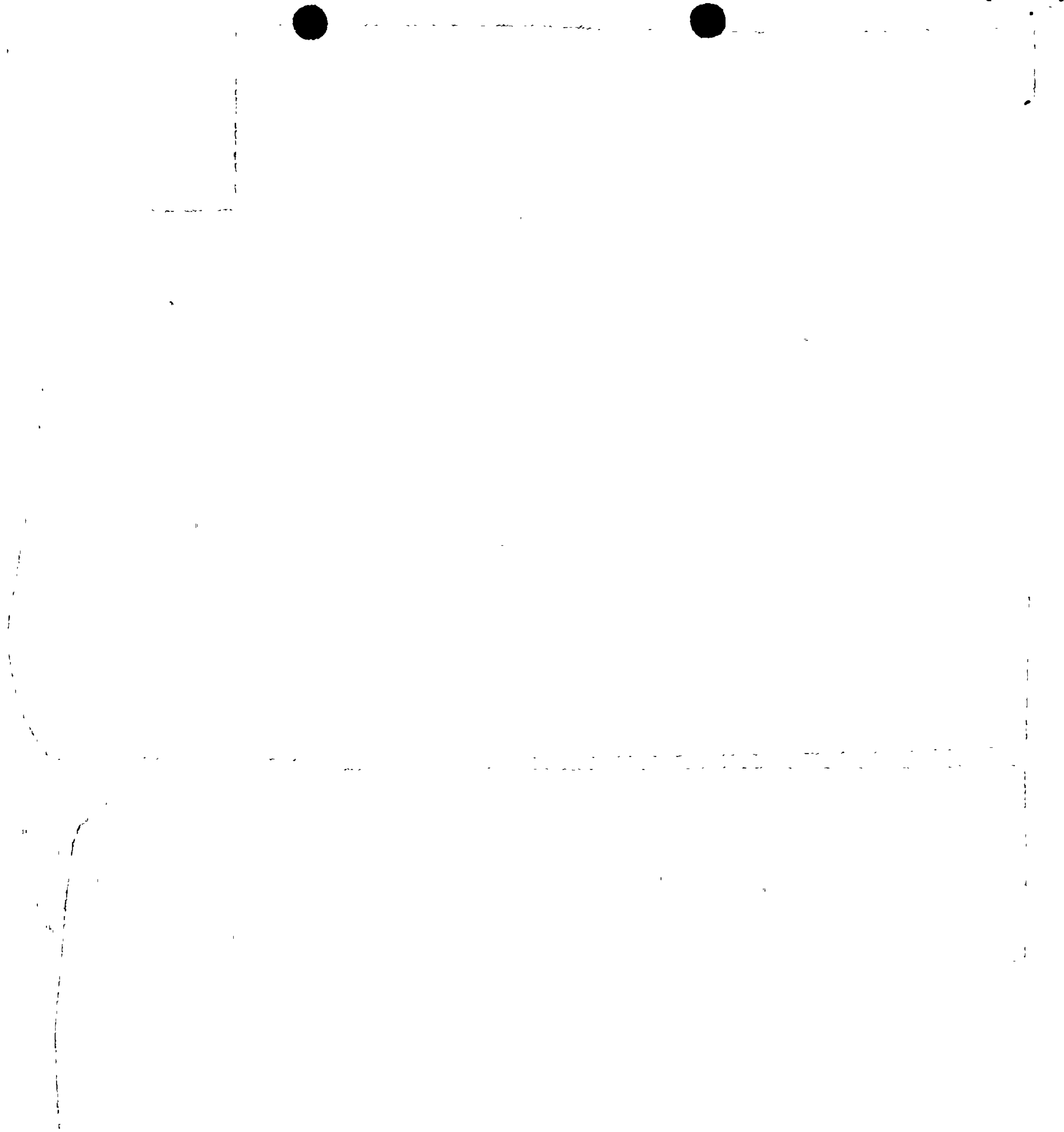
Instrumentation containing radioactive process fluid outside enclosed compartments are located away from normal passageways and are equipped with drip pans to collect potential leakage.

Radioactive tanks located inside the Auxiliary and Radwaste Buildings are located in compartments with curbs to contain tank leakage. These compartments are also equipped with floor drains routed to the appropriate radioactive building sump. Outside liquid radwaste tanks are surrounded by a dike sufficient to hold the contents of a tank rupture. Outside CVCS tanks are concrete tanks with steel liners. The concrete tanks will retain potential liner leakage.

The hot lab, cold lab, decontamination area, and sample station are equipped with floor drains routed to the non-ESF sump.

Based on this discussion the North Anna type event is not expect to occur on PVNGS

* These tables are attached in draft form



2. Leakage Reduction Program

PVNGS will institute a program to maintain leakage rates of systems outside containment to as low as practical which consists of the following:

A. Systems Included in the Program

1. High pressure safety injection system (recirculation portion only).

2. Low pressure safety injection system (shutdown cooling portion only).

3. Reactor coolant sampling system (post-accident sampling piping only).

4. Containment spray system.

5. Radioactive waste gas system (post-accident sampling return piping only).

6. Liquid radwaste system (post-accident sampling return piping only).

INSERT B

Systems excluded from the program: (They will not preclude any option of cooling the reactor core nor will they prevent the use of needed safety systems).

1. Radioactive liquid waste system, except as discussed above.

2. Radioactive waste gas system, except as discussed above. (The system is not required for use post-accident.)

INSERT C

3. Reactor coolant letdown system. (The system is not required to function post-accident. The plant can be 2

Insert B to pg. III D.1.1-5

7. Post-accident containment atmospheric sampling system (hydrogen, monitoring subsystem and post-accident sample piping associated with this function.)

Insert C to pg. III D.1.1-5

(Except for portions required for post accident sampling as described in FSAR section 9.3.2.2.2,.....

brought to a cold shutdown condition without the letdown system. The letdown system is isolated on SIAS and CIAS.)

4. Reactor coolant pump seal bleed-off system. (The system is not required to function outside containment post-accident. The seal bleed-off system is isolated outside containment on CIAS. The system remains isolated post-accident. If seal bleed-off is required post-accident, pressure in the seal bleed-off header will increase and the header relief valve will lift providing a flow path to the reactor drain tank.)

2 5. Charging System. (The charging system under post-accident conditions does not contain radioactive fluid since the letdown system is isolated as discussed in item 3 above. The charging system takes suction from the refueling water tank.)

6. Fuel Pool ~~Cladding~~ Cooling system (FPC). (The FPC is normally isolated from potentially highly contaminated systems by double, locked shut isolation valves.)

C. Program Features

~~Immediate leak reduction measures.~~ The program will consist of periodic monitoring of the systems during operation, and inservice leak testing. Leaks will be identified and corrective maintenance performed.

1. ~~All~~ a Vent and drain lines will be capped to prevent release due to seal leakage.

2. The packing of ~~all~~ valves (except Kerotest which is a packless, stainless steel diaphragm valve) in the scoped liquid systems will be inspected for leakage or evidence of leakage such as boric acid accumulation. Maintenance will be performed on the packing of liquid system valves identified as requiring work.

3. The seals and packing on ~~all~~ pumps in the scoped liquid systems will be inspected for leakage or signs of leakage.

4. Valves, fittings, and compressor seals in the scoped gaseous systems will be checked for leakage. Maintenance will be performed on gas system valves and instrument fittings identified during leak tests as requiring work. INSERT D 2

~~Leakage Measurement~~

~~System leakage will be periodically measured during the operational inservice program for the following systems:~~

~~1. High pressure safety injection system~~
~~2. Low pressure safety injection system~~
~~3. Charging system~~
~~4. Reactor coolant sampling system~~
~~5. Containment spray system~~
~~6. Radioactive waste gas system~~
~~7. Liquid radwaste system~~

~~Records of leakage measurement will be retained in station.~~

Insert D to page III D.1.1-7

5. Systems and subsystems identified in 2A will be leak tested prior to exceeding 5% power and on an interval not to exceed the period between refueling outages. Test records including measured leak rates will be maintained at PVNGS for NRC review. A report including the measured leak rates will be submitted for NRC staff review prior to initial operation above 5% power. Leak rate test techniques will include:

   A. Liquid Systems

      A visual examination will be performed on items 1 through 3 of paragraph 2C above with the system at or near operating pressure. If leakage is identified during these examinations, an integrated leakage rate will be determined by monitoring the applicable sump and tank levels. For sumps and tanks that do not contain a level indicator, the levels will be determined by physical measurement. In addition, the local leak rate tests performed on isolation valves will be utilized for the portion of each system located between the containment and the isolation valves, if practical. These tests will be performed in accordance with written Station Manual procedures.

   B. Gas Systems

      The leakage will be determined by detecting gas leakage at individual valves, fittings, seals, and bolted connections with the system at or near operating pressure. Leakage will be detected by use of acoustic, bubble, or equivalent method (such as a tracer gas method). In addition, the local leak rate tests performed on isolation valves will be utilized for that portion of each system located between the containment and the isolation valves, if practical. These tests will be performed in accordance with written Station Manual procedures.

RADIOACTIVE TANKS OVERFLOW AND LEAKAGE PROTECTION

P&ID	Tank	Atmospheric or Pressure Vessel	Overflow or Relief	Overflow or Relief Line	Tank Location	Curb or Enclosed Compartment	Comments
CHP-001	Volume Control Tank	PV	Relieves to vent gas surge header	N-214-HCDA-3/4"	Auxiliary Bldg 120′ level	Enclosed Compartment	-
CHP-002	Refueling Water Tank	ATM	Overflows to holdup tank sump	N-134-HCDA-6"	Outside of fuel bldg	Concrete w/ steel liner	Overflow line i heat-traced.
CHP-003	Reactor Makeup Water Tank	ATM	Overflows to holdup tank sump	N-381-HCDA-3"	Outside of fuel bldg	Concrete w/ steel liner	
CHP-001	Radwaste Crud Tank	PV	Relieves to non-ESF sump	N-533-GCDA-2"	Auxiliary Bldg 100′ level	4" curb	
CHP-003	Reactor Drain Tank	PV	Vents to gas surge tank	N-281-HCDB-2"	Containment 80′ level	-	
CHP-003	Equipment Drain Tank	PV	Relieves to non-ESF sump	N-347-HCDB-1"	Auxiliary Bldg 40′ level	-	
CHP-003	Holdup Tank	ATM	Overflows to holdup tank sump	N-353-HCDA-3"	Outside of fuel bldg	Concrete w/ steel liner.	
LRP-001	Low TDS Holdup Tank	ATM	Overflows to radwaste bldg sump	N-014-HCDA-6"	Outside of Radwaste Bldg	Enclosed compartment	
LRP-001	High TDS Holdup Tanks	ATM	Overflows to radwaste bldg sump	N-229-HCDA-4"	Outside of Radwaste Bldg	Enclosed compartment	
LRP-001	Chemical Drain Tanks	ATM	Overflows to aux bldg sump via a funnel drain	N-067-HCDA-3" N-206-HCDA-2"	Auxiliary Bldg 51′-6" level	6" curb	

P&ID	Tank	Atmospheric or Pressure Vessel	Overflow or Relief	Overflow or Relief Line	Tank Location	Curb or Enclosed Compartment	Comments
LRP-002	Concentrate Monitor Tanks	ATM	Overflows to radwaste bldg sump	N-195-HCDC-2" N-219-HCDC-1"	Radwaste Bldg 100′ level	6" curb	Overflow lines are heat-traced.
LRP-002	Recycle Monitor Tanks	ATM	Overflows to radwaste bldg sump	N-183-HCDA-3" N-205-HCDA-3"	Outside of Radwaste Bldg	Enclosed compartment	
SRP-001	High Activity Spent Resin Tank	PV	Relieves to radwaste bldg sump	N-027-HCDA-2"	Radwaste Bldg 100′ level	Curb	
SRP-001	Low Activity Spent Resin Tank	PV	Relieves to radwaste bldg sump	N-016-HCDA-2"	Radwaste Bldg 100′ level	Curb	
SRP-002	Waste Feed Tank	ATM	Overflows to radwaste bldg sump via funnel drain	N-204-HCDC-3/4"	Radwaste Bldg 100′ level	Enclosed Compartment	

RADIOACTIVE PUMPS LEAKAGE PROVISIONS

P&ID	Pump	Drip Pan Drain Line	Location	Comments
CHP-001	Crud Pump	N-554-HCDA-1". Drains to non-ESF sump	Auxiliary Bldg 100′ level	None.
CHP-002	Charging Pumps	N-245-HCDB-1" N-246-HCDB-1" N-247-HCDB-1". Drain to recycle drain header.	Aux. Bldg. 100′ level	None.
CHP-002	Boric Acid Makeup Pumps	N-449-XCDA-1/2" N-453-XCDA-1/2" Drain to non-ESF sump.	Aux. Bldg. 70′-0" level	Equipped with a gland seal loop of the process flow.
CHP-003	Reactor Make-up Water Pumps	No drip pan. Drain line off gland seal to holdup tank sump	Aux. Bldg. 70′ level	Equipped with a gland seal loop of the process flow.
CHP-003	Reactor Drain Pumps	N-476-XCDA-1" N-479-XCDA-1" Drain to a funnel drain routed to non-ESF sump	Aux. Bldg. 40′ level	None.
CHP-003	Holdup Pumps	N-482-XCDA-1/2" N-488-XCDA-1/2" Drain to holdup tank sump	Aux. Bldg. 40′ level	Equipped with a gland seal loop of the process flow.
LRP-001	LRS Holdup Pumps	N-031-HCDA-1" N-032-HCDA-1" N-033-HCDA-1" Drain to radwaste bldg sump	Radwaste Bldg 100′ level	None.
LRP-001	Chemical Drain Pumps	N-079-HCDA-1" N-082-HCDA-1" Drain to a funnel drain routed to radwaste bldg sump	Aux. Bldg. 40′-0" level	None.
LRP-002	Concentrate Monitor Tank Pumps	N-117-HCDC-1" N-620-HCDC-1" Drain to radwaste bldg sump	Radwaste Bldg. 100′ level	Drain line is heat-traced.

P&ID	Pump	Drip Pan Drain Line	Location	Comments
LRP-002	Recycle Monitor Pumps	N-186-HCDA-1" Drains to radwaste bldg sump	Radwaste bldg. 100' level	None.
PCP 001	Fuel Pool Cleanup Pumps	No drip pans	Fuel bldg. 100' level	Equipped with a gland seal loop of the process flow which drains to fu building sump.
PCP-001	Fuel Pool	No drip pans	Fuel bldg. 100' level	Equipped with a gland seal loop of the process flow which drains fu building sump.
SRP-001	Resin Transfer/ Dewatering Pump	N- -HCDA-1" Drains to a local stub-up routed to radwase bldg sump	Radwaste bldg. 100' level	None.
SRP-002	Waste Feed Pump	N-068-HCDC-1" Drains to a local stub-up routed to radwaste bldg sump	Radwaste-bldg. 100' level	None.