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INL Reactor Technology Complex Out-of-Service Buried Piping Hazards

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Abstract

Idaho National Laboratory (INL) Reactor Technology Complex (RTC) buried piping and components are being characterized to determine if they should be managed as hazardous waste and subject to the Hazardous Waste Management Act /Resource Conservation and Recovery Act (RCRA). RTC buried piping and components involve both active piping and components from currently operating nuclear facilities, such as the Advanced Test Reactor (ATR), and inactive lines from RTC facilities undergoing Decontamination and Decommissioning (D&D) activities, including the Materials Test Reactor (ETR) and the Engineering Test Reactor (ETR). The issue exists as to the proper methods to analyze and control hazards associated with D&D activities on facilities collocated with existing operating nuclear facilities, or future collocated facilities being considered with the resurgent nuclear industry.

A qualitative hazard assessment was developed to evaluate the potential hazards associated with characterization activities, and any potential effects on the safety basis of the collocated RTC operating nuclear facilities. The hazard assessment clearly demonstrated the low hazards associated with the activities based on form and dispersiblity of the radioactive material in the piping and components. The hazard assessment developed unique controls to isolate active RTC piping and components from inactive components, and demonstrated that existing safety management programs were adequate for protection of the worker.

1. INTRODUCTION

INL RTC inactive piping and components are undergoing RCRA Voluntary Consent Order (VCO) remediation activities. RTC systems undergoing VCO action include the RTC hot waste management system, designated as the VCO TRA-004 system. Characterization of the system began with the assumption that the radioactive material inventory was less than the hazard category (HC) 3 (LTHC 3) thresholds identified in DOE-STD-1207-92 (Reference 1). During initial characterization activities, it was determined that the residual material in one inactive line (2” HDA-661) could potentially exceed the HC 3 thresholds; therefore, a potential inadequacy in

the safety analysis (PISA) was declared. An unreviewed safety question (USQ) (Reference 2) resulted as reported in occurrence report NE-ID-BEA-RTC-2006-008 (Reference 3). A HC 3 or greater Nuclear Facility/Activity for the RTC VCO activities was also declared in the occurrence report.

An existing nuclear facility/activity safety basis does not exist for the VCO TRA-004 system. However, further characterization activities are required to confirm amount of material in the VCO TRA-004 system piping and components and determine the proper hazard category and level of safety basis documentation for further VCO activities. If further characterization determines that VCO TRA-004 system components are greater than or equal to HC 3, appropriate safety basis documentation will be required before further remediation activities begin. Characterization activities have been discontinued for HC 3 and non-categorized components until interim controls have been approved by Department of Energy Idaho Operations Office (DOE-ID) and implemented. VCO TRA-004 system piping and components with existing sample data that have been determined without question to be less than HC 3 and that are isolated are excluded from the RTC Inactive Piping Undergoing VCO Action Nuclear Facility/Activity, and remediation on those components continue.

In accordance with INL safety analysis process requirements, an Evaluation of the Safety of the Situation (ESS) (Reference 4) resulted from the PISA and subsequent USQ. The ESS will support a Justification for Continued Operations (JCO) to allow continued characterization activities for final hazard categorization of the VCO TRA-004 system. The ESS evaluates the potential hazards associated with the VCO TRA-004 system characterization activities of the VCO TRA-004 system inactive piping or components that have been initially categorized as HC 3 or greater, or cannot be categorized with existing sample data.

2. VCO SYSTEM ACTIVITY/DESCRIPTION

2.1.1 VCO TRA-004 System

VCO TRA-004 system piping and components are shown in Figure 1 and Figure 2. HC 3 or not categorized piping and components define the HC 3 or greater nuclear facility/activity boundary for the RTC VCO activities evaluated in the ESS. Piping and components shown in Figure 1 and Figure 2 as less than HC 3 that are isolated are excluded from the RTC Inactive Piping Undergoing VCO Action Nuclear Facility/Activity.

As shown in Figure 1 and Figure 2, the VCO TRA-004 system includes a variety of lines that were used to transfer radioactive waste from RTC facilities to the TRA-613 pump vaults and subsequently, to either the TRA-713 hot waste storage tanks then to the tank truck loading dock (TRA-761) or discharged to TRA-712 retention basin as warm waste if it met the warm waste criteria. The VCO TRA-004 system includes the two TRA-613 pump vaults, the three TRA-713 hot waste storage tanks, and associated piping and ancillary equipment. The following section summarizes the VCO TRA-004 system, isolation boundaries, system lines and components, and isolation valves.

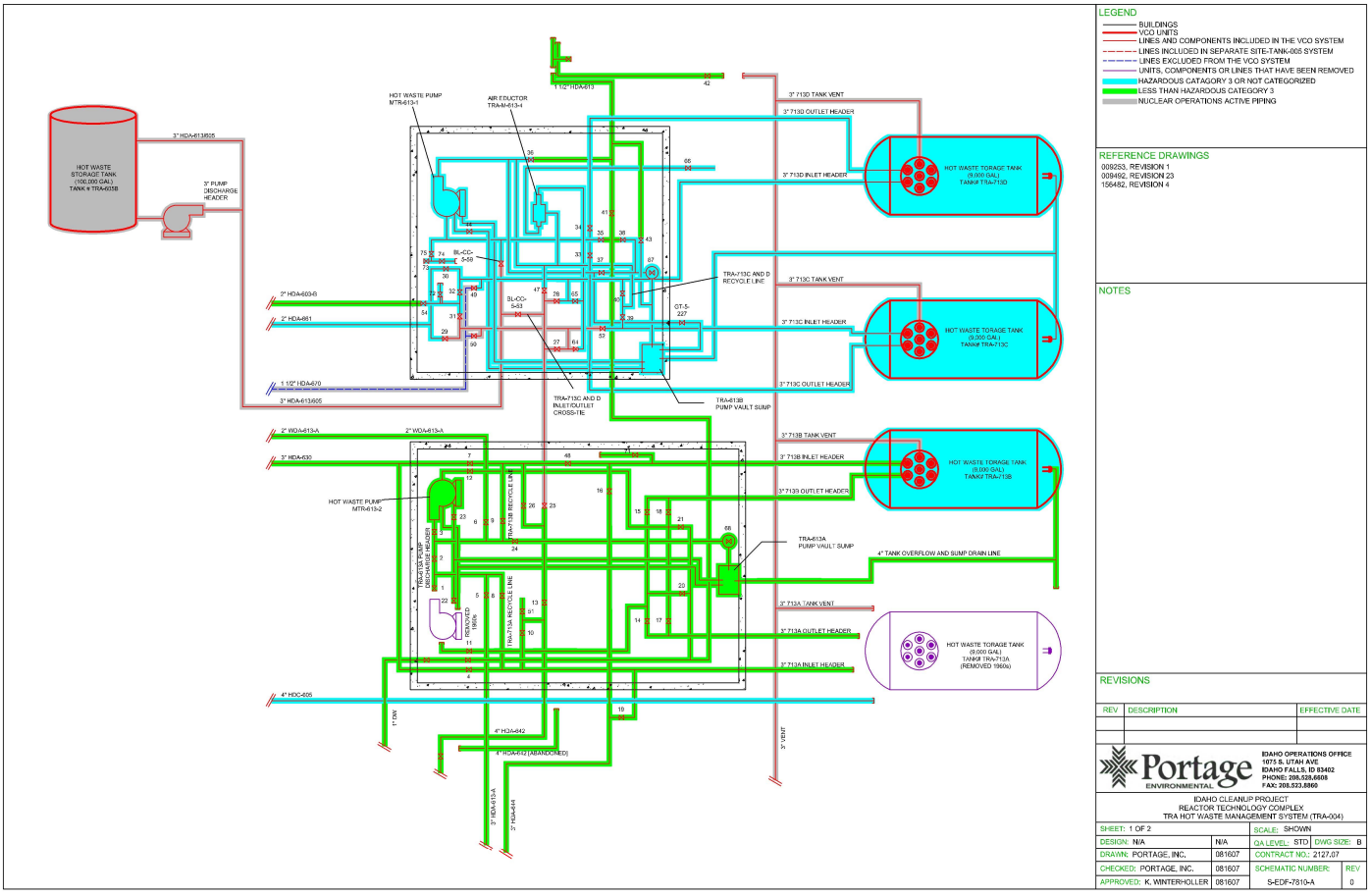

Figure 1. VCO TRA-004 Piping Diagram A.

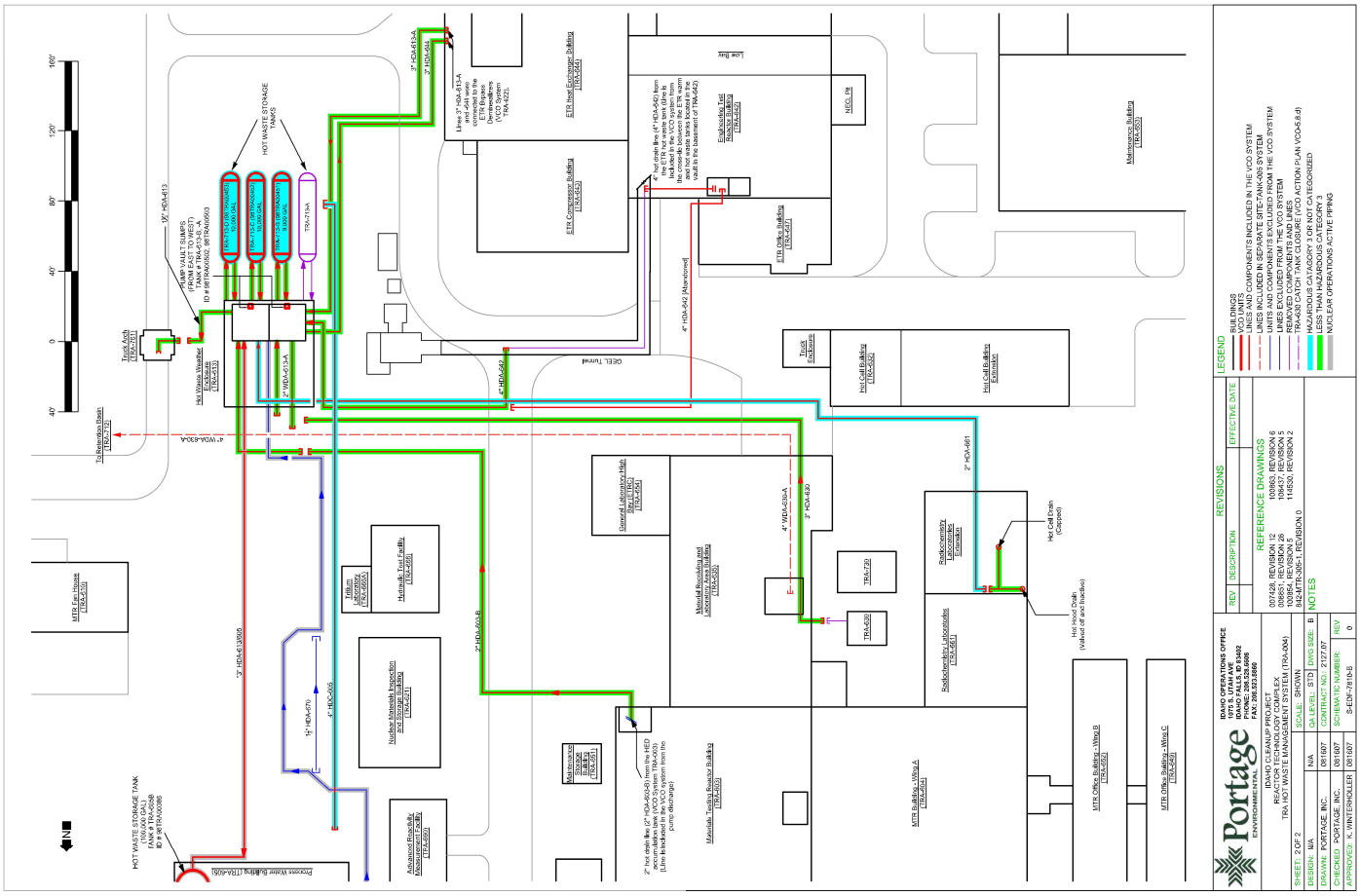

Figure 2. VCO TRA-004 Piping Diagram B.

The VCO TRA-004 project is currently characterizing TRA-004 components as part of RCRA closure plan preparation. Information gathered will aid in preparation of the RCRA closure plan, hazard categorization for closure activities, and for waste stream planning projections during RCRA closure. The portions of TRA-004 that are categorized as HC 3 or not categorized for lack of data do not have complete characterization. The data available is limited and not sufficient for making RCRA closure planning decisions or for waste stream disposition. Therefore, the VCO TRA-004 project needs to continue characterization activities on the inactive portions of the system under the ESS/JCO.

As shown in Figure 1 and Figure 2, various portions of the system are categorized as "Other," HC 3, and not categorized due to lack of data. An "Other" facility is defined as any facility other than a HC 1, 2, or 3 facility or a radiological facility (Reference 5). Items categorized as "Other" have sufficient data for hazard categorization and, if isolated from the HC 3 and the not categorized piping and components, are excluded from the nuclear facility evaluation, with the exception of discussing their isolation. Items categorized as HC 3 or not categorized are the subject of the ESS and need additional activities performed to obtain complete characterization.

The inactive VCO TRA-004 system components are either physically isolated (cut, capped, plugged, blind flanged, etc.) or isolated by closed and administratively locked valves. Active lines associated with VCO TRA-004 system, 3" HDA-605/613 and 1-1/2" HDA-670, are available to transfer waste from the ATR to TRA-605 and runs through the TRA-613B pump vault (neither line has been routinely used since the 1990s and would only be used under exceptional circumstances under the direct authorization of ATR management). These lines are isolated from other piping in the pump vaults by closed and locked Valves #25, 28, 29, 31, 47, 49, 52, 64 and BL-CC-5-59. These active lines are not evaluated in the ESS but were discussed only to demonstrate that they have been isolated from the lines being evaluated. The 3" intravault piping is physically isolated by blind flange on the TRA-613A vault side of Valve #25. This physical isolation separates the line from the LTHC 3 piping in the TRA-613A vault. Therefore, Valve # 25 is not administratively controlled because the blind flange serves as an isolation boundary. A jumper cross-tie will be installed between 1 ½" HDA-670 and 3" HDA-613/605 piping to the north of TRA-613. After the installation of this cross-tie, no operational piping will remain in the TRA-613 vaults. At that time valves (28, 29, 31, 47, 49, 52, 64, and BL-CC-5-59) will no longer be required as isolation boundaries.

Refer to Table 1 below for a summary of VCO TRA-004 system components, isolation boundaries, isolation valve numbers, and hazard categorization results.

Table 1. TRA-613/TRA-713 Isolation Boundaries.

Isolation Boundary	Line/Component	Isolation Valve Numbers or Physical Isolation Location	Hazard Categorization Results
TRA-613A Influent/Effluent/Intravault Piping and TRA-613B Tank			
Inactive/Active	3“ HDA-630	Blind Flange on Valve 25	Other
Inactive/Active	2“ WDA-613-A	Blind Flange on Valve 25	Other
Inactive/Active	4“ HDA-642	Blind Flange on Valve 25	Other
Inactive/Active	3“ HDA-613-A	Blind Flange on Valve 25	Other
Inactive/Active	3“ HDA-644	Blind Flange on Valve 25	Other
Inactive/Active	Intravault piping for TRA-613A	Blind Flange on Valve 25	Other
Inactive/Inactive Other/ HC 3	TRA-713B hot waste storage tank	3” Influent line cut/plugged 3” Effluent line cut/plugged	HC 3
Inactive – Isolated	4“ HDC-605	Isolated (plugged/capped) at both ends	Not Categorized
TRA-613B Influent/Effluent/Intra-Intervault Piping, TRA-713C and TRA-713D Tanks			
Inactive/Inactive Other/Not Categorized	1-1/2” HDA-613	35, 36, 38 and 43	Other
Inactive/Active and Inactive/Inactive Other/Not Categorized	2” HDA-603-B	31 and 32	Other
Inactive/Active and Inactive/Inactive HC 3 /Not Categorized	2” HDA-661	29 and 30	HC 3
Inactive/Active and Inactive/Inactive Other/Not Categorized and HC 3/Not Categorized	Inter/intra vault piping for TRA-613B	Blind Flange on Valve 25, Adminstratively locked and controlled closed Valves 28, 29, 31, 35, 38, 47, 49, 52, 64 and BL-CC-5-59	Not Categorized
Inactive/Inactive Not Categorized/ HC 3	TRA-713C hot waste storage tank	39 and 52 (inlet) 33 (outlet)	HC 3
Inactive/Inactive Not Categorized/ HC 3	TRA-713D hot waste storage tank	28, 30, 32, 40, 49, and 65 (inlet) 34 (outlet)	HC 3

2.1.2 VCO TRA-004 System Characterization Activities

VCO TRA-004 system characterization is being performed to support RCRA closure planning. Characterization may include collection of liquid, solid, and/or sludge samples, remote radiation readings, video, and Quality Assurance (QA) inspection and testing (e.g., ultrasonic thickness). Sample volume will vary depending on media collected and radiation levels. The amount of liquid removed during sampling ranges approximately from a few milliliters to several gallons and the amount of solids/sludge removed ranges approximately from a few milligrams to several kilograms depending on the radiation field. These amounts of sample material removed are a fraction of the total inventory in the lines and the disturbance of the radioactive or hazardous material in the lines is considered minimal. Liquid samples are typically collected using peristaltic pumps, syringes, or composite liquid waste sampler (COLIWASA) samplers. Solid/sludge samples are usually collected using spoons, scoops, scrapers, or similar methods to transfer the sample from the pipe/component to the sample container.

Access to inactive piping and components will occur in order to collect samples. This may include hot tapping inactive piping, cutting inactive piping, disconnecting flanges, and similar methods of access. Upon completion of characterization activities, inactive piping will be left in a suitable condition, which may include blind flanges, mechanical pipe plugs, pipe caps, reconnecting the piping and maintaining the closed/locked valve, or other similar methods to maintain isolation. In general, it is desirable during characterization to provide physical isolation between sections of the system when inactive piping is accessed for sampling.

3. VCO TRA-004 SYSTEM HAZARD ANALYSIS

3.1.1 Methodology

The hazard analysis methodology used in the ESS conforms to NS-18104 (Reference 6) for a HC 3 activity and includes the following:

1. Hazard Identification (Section 3.1.2)
2. Hazard Categorization (Section 3.1.3)
3. Hazard Evaluation (Section 3.1.4
4. Hazard Evaluation Results (Section 3.1.5)
5. Derived Hazard Controls (Section 3.1.6)

3.1.2 Hazard Identification

Hazard identification involved determining the following for the VCO TRA-004 system characterization:

1. The radioactive and hazardous material inventory (i.e., the type and amount of radioactive and hazardous material that is potentially releasable), form, and location.

2. Potential energy sources and initiating events that could directly result in injury to workers or affect the inventory of radioactive and hazardous materials.

3.1.2.1 VCO TRA-004 System Radioactive Material Inventory

The wastes transferred through VCO TRA-004 system lines were contaminated liquids. Available sample results have identified radioactive material in the liquid and/or sludge remaining in the lines that exceed the HC-3 threshold quantities in DOE-STD-1027-92 (Reference 6).

3.1.2.2 Hazardous Materials

The TRA-713 hot waste storage tanks (TRA-713B, TRA-713C, and TRA-713D and line 2" HDA-661 contain hazardous materials. Hazardous materials may include cadmium, chromium, lead, mercury, and may include volatile organic compounds (VOCs), and semivolatile organic compounds (SVOCs).

3.1.2.3 Energy Sources and Initiating Events

Routine and non-routine hazards, energy sources, and initiating events that can result in an uncontrolled release of radioactive or hazardous material during VCO TRA-004 system characterization activities were identified. Routine hazards include standard industrial hazards (SIHs) or insignificant hazards.

3.1.3 Hazard Categorization

Hazard categorization per the guidance provided in DOE-STD-1027-92 was performed for VCO TRA-004 system piping and components. The hazard categorization results for VCO TRA-004 system piping and components are summarized in Table 1.

3.1.3.1 Technical Basis for VCO TRA-004 System Piping/Component Segmentation

As stated in DOE-STD-1027-92,

"…the standard permits the concept of facility segmentation provided the hazardous material in one segment could not interact with hazardous materials in other segments. For example, independence of HVAC and piping must exist in order to demonstrate independence for facility segmentation purposes. This independence must be demonstrated and places the "burden of proof" on the analyst."

Table 2 Hazard Screening for VCO TRA-004 System Characterization Activities.

Generic Hazard Type	Present During Characterization Activities	Explanation
Standard Industrial Hazard	Yes	The characterization activities present no unique SIH hazards not found in similar characterization activities in other facilities/activities. A Job Safety Analysis is performed for the characterization work order.
Radioactive material	Yes	Inventory of radioactive material for VCO TRA-004 systems as shown in Table 1 exceed the sum of ratios for HC 3. Disturbing residue may result in spill or airborne release.
Radiation	Yes	Radioactive material in inactive piping presents a radiation and contamination hazard to workers.
Chemical material/energy	Yes	Chemical hazards in inactive piping have been identified.
Fissile Material/Nuclear criticality	No	Based on laboratory validation reports and other supporting documentation, the total amount of fissionable material is under 5 grams which is much less than the DOE-STD-1027-92 minimum criticality limits of 450 grams for Pu-239, 500 grams for U-233, and 700 grams for U-235.
Field and low-level fixed X-ray equipment	No	X-Ray equipment will not be used for characterization activities.
Toxic materials	Yes	The quantities of all toxic substances used for characterization activities are considered SIHs covered by the Industrial Safety and Hygiene Program.
Flammable/combustible material	Yes	The quantities of all flammable/combustible substances used for characterization activities are fire related hazards in the presence of an ignition source.
Explosive materials	No	There will be no explosive materials used during characterization activities.
Lasers	No	Lasers will not be used for characterization activities.
Electrical	No	There are no high-energy electrical sources used for characterization activities. Electrical hazards from powered tools are considered low-energy SIH.
Kinetic energy	Yes	Powered vehicles or equipment (forklifts) may be used for characterization activities. Hot tapping piping, cutting piping, disconnecting flanges, and similar methods of access may require use of power tools.
Pressure	No	No high-pressure systems will be used for characterization activities.
High temperature/High Thermal Energy	No	No high-temperature systems will be used for characterization activities.
Low Temperatures/Low Thermal Energy	No	Cryogenic materials will not be used for characterization activities
Gravity-Mass/Potential Energy	Yes	Falling objects, falls from elevations greater than 6 ft (such as from scaffolding), and hoisting and rigging hazards may impact characterization activities.
Biohazards	No	No evidence of biohazards other than those expected in high deserts, such as hantavirus and snake or insect bites.
Natural Phenomenon	Yes	Earthquakes, high winds, range fires, and cold temperatures/snow may result in sample or piping spills during characterization activities.

The physical basis for segmentation with respect to the VCO TRA-004 system is the physical isolation of those pipes and components. Isolation features preclude transfer of hazardous material between inactive and active piping and components that are excluded from the scope of the ESS and the VCO TRA-004 system piping and components that are included in the scope during characterization activities, either during normal operations or during common severe phenomenon. Isolation features include:

- Physical isolation between piping and components, including piping that has been cut and physically separated from other piping and components and plugged or capped at both ends

- Isolation by administratively closed and locked valves that will be maintained when working at system boundaries.

To protect the assumption that the closed and locked valves provide the required isolation, safety analysis commitments were identified and discussed further in Section 3.1.6. The safety analysis commitments ensure that VCO TRA-004 system piping and components that are excluded from the scope of the ESS are isolated from inactive piping and components that have been categorized as HC 3, or that have not been characterized, by at least one closed and administratively locked valve at each inactive system interface. Table 1 lists the VCO TRA-004 system line and component segments, and specifically identifies the isolation boundary and isolation valve or component (i.e. capped/plugged line).

3.1.4 Hazard Evaluation

A qualitative hazard evaluation was performed for the hazards that can result in an uncontrolled release of radioactive or hazardous material and affect the off-site public, collocated workers, facility workers, or the environment. Table 3 provides summary information on the hazard, hazardous event, cause, likelihood, and consequence categories, risk bin, and preventative and mitigative features (i.e., design and administrative). Hazardous events listed in 3 are based on a What-if Analysis performed in support of the ESS.

Standard industrial hazards are hazards that are routinely encountered in general industry and construction, and for which national consensus codes and/or standards exist, such as Occupational Safety and Health Administration (OSHA) to guide safe design and operation. In accordance with the guidelines in DOE-STD-1027-92 (Reference 1) and DOE-STD-3009-94 (Reference 7), no special analysis is required for these occupational hazards unless they are possible initiators or contributors for an accident involving an uncontrolled release of radioactive or hazardous material in which case they are included in the hazard analysis. A safety analysis commitment was made to implement an Industrial Safety Program for VCO TRA-004 system characterization activities.

Table 3. Hazard Evaluation Summary for VCO TRA-004 System Characterization Activities.

Hazard	Hazardous Event	Cause	Likelihood, Consequence, and Risk Without Controls			Preventive and Mitigative Features	
			Likelihood Category[a]	Consequence Category	Risk Bin[b]	Design	Administrative
1. Radioactive Material	Release of radioactive material during characterization activities.	Human error or equipment failure while performing characterization activities results in disturbing piping or component radioactive material.	Anticipated (A)	Off-Site Public: N Collocated Workers: N Facility Workers: L Environment: N	7 7 11	None identified	Radiation Protection Program Conduct of Operations Program Work Control Program Maintenance Program
	Direct radiation exposure in excess of planned exposures received during characterization activities.	Human error or equipment failure while performing characterization activities results in disturbing piping or component radioactive material.	Anticipated (A)	Off-Site Public: N Collocated Workers: N Facility Workers: L Environment: N	7 7 11	None identified	Radiation Protection Program Conduct of Operations Program Work Control Program Maintenance Program
	Release of radioactive material and/or Direct Radiation exposure received due to interaction of active process piping radioactive materials with inactive RTC piping during characterization activities.	Human error or isolation valve failure results in radioactive material being released from active process piping lines into inactive piping lines while performing characterization activities.	Anticipated (A)	Off-Site Public: N Collocated Workers: N Facility Workers: L Environment: N	7 7 11	*RTC Piping Valve Isolation*	RTC Piping Isolation Valve Administrative Locks Radiation Protection Program Conduct of Operations Program Work Control Program

Table 3. Hazard Evaluation Summary for VCO TRA-004 System Characterization Activities.

Hazard	Hazardous Event	Cause	Likelihood, Consequence, and Risk Without Controls			Preventive and Mitigative Features	
			Likelihood Category[a]	Consequence Category	Risk Bin[b]	Design	Administrative
2. Hazardous Material	Release of hazardous material during characterization activities.	Human error or equipment failure while performing characterization activities results in disturbing piping or component hazardous material.	Anticipated (A)	Off-Site Public: N Collocated Workers: N Facility Workers: L Environment: N	7 7 11	None Identified	Industrial Safety and Industrial Hygiene Program Conduct of Operations Program Work Control Program Maintenance Program
3. Flammable/ Combustible Materials	Fire in vicinity of characterization activities results in release of radioactive or hazardous material.	Presence of ignition source and combustible/flammable materials during characterization activities results in fire and impact to piping or component radioactive or hazardous material.	Anticipated (A)	Off-Site Public: N Collocated Workers: N Facility Workers: L Environment: N	7 7 11	None identified	Fire Protection Program Conduct of Operations Program Work Control Program Radiation Protection Program Industrial Safety and Industrial Hygiene Program
4. Gravity-Mass	Radioactive or hazardous material release due to falling equipment or debris resulting in disturbance of radioactive or hazardous material.	Human error or equipment failure results in falling equipment or debris and impact to piping or components disturbing radioactive or hazardous material.	Anticipated (A)	Off-Site Public: N Collocated Workers: N Facility Workers: L Environment: N	7 7 11	None identified	Radiation Protection Program Conduct of Operations Program Work Control Program Maintenance Program Industrial Safety and Industrial Hygiene Program

Table 3. Hazard Evaluation Summary for VCO TRA-004 System Characterization Activities.

Hazard	Hazardous Event	Cause	Likelihood, Consequence, and Risk Without Controls			Preventive and Mitigative Features	
			Likelihood Category[a]	Consequence Category	Risk Bin[b]	Design	Administrative
5. Kinetic Energy	Release of piping or component radioactive or hazardous material during characterization activities.	Human error or equipment failure results in impact to piping or component radioactive or hazardous material from energized equipment or moving vehicles.	Anticipated (A)	Off-Site Public: N Collocated Workers: N Facility Workers: L Environment: N	7 7 11	None identified	Radiation Protection Program Conduct of Operations Program Work Control Program Maintenance Program Industrial Safety and Industrial Hygiene Program
6. Natural Phenomena	Release of piping or component radioactive or hazardous material during characterization activities.	Earthquake (seismic event), high winds, range fires, cold temperatures/snow results in release of piping or component radioactive or hazardous material.	Unlikely (U)	Off-Site Public: N Collocated Workers: N Facility Workers: L Environment: N	4 4 8	None identified	None required

a. The likelihood categories are listed and described in Table 3-3 of NS-18104 (Reference 6): A – Anticipated, U – Unlikely, EU – Extremely Unlikely, BEU – Beyond Extremely Unlikely. Consequence categories are listed and described in Table 3-4 of NS-18104 (Reference 6): N – negligible, L – low, M – moderate, and H – high.

b. Risk bin numbers are described in Figures 3-2, 3-3, and 3-4 of NS-18104 (Reference 6).

3.1.5 Hazard Evaluation Results

As shown in Table 3, the primary hazard event involves the release of radioactive or hazardous material and/or direct radiation exposure in excess of planned exposures or hazardous material exposure during characterization activities resulting from the disturbance of radioactive or hazardous material due to impacts from moving or falling equipment caused by equipment failure or human error. These events are conservatively estimated to be in the Anticipated frequency range.

Due to the quantity and form of the radioactive and hazardous material in the piping and components, the likely result would be a localized radioactive or hazardous material release at the location of the characterization activity.

Due to the quantity and form of the radioactive and hazardous material in the piping and components, and the limited amount of force/impact disturbing the radioactive/hazardous material in the piping and components, the consequences to the public and collocated workers are quantitatively evaluated to be in the Negligible category. Therefore, as indicated in Figures 3-2 and 3-3 of NS-18104 for events with an Anticipated frequency category and a Negligible consequence category, no safety-class or safety-significant controls are required for protection of the public or collocated worker.

The expected consequences due to a localized release of radioactive or hazardous material and/or direct radiation exposure in excess of planned exposures during characterization activities to the facility workers are qualitatively evaluated to be in the Low consequence category for both radioactive and hazardous material exposures.

Based on the Risk Matrix in Figure 3-4 of NS-18104, the Risk Bin results for the facility worker shown in Table 3 indicate that no safety-significant controls are required for protection of the facility worker. Figure 3-4 of NS-18104 indicates that for events with an Anticipated frequency category and a Low consequence category, safety analysis commitments should be identified to manage facility worker risk. The results of the hazard summary from Table 3 indicate that the facility worker risk associated with VCO TRA-004 system activities can be managed through the identified safety analysis commitments. The safety analysis commitments shown in Table 3 are largely commitments to existing safety management programs. The safety analysis commitments are discussed in more detail below and the combined effect of these safety analysis commitments is to reduce the risk to the facility worker.

3.1.6 Derived Hazard Controls

3.1.6.1 Safety Analysis Commitments

3.1.6.1.1 Design Commitments

TRA-004 Piping Valve Isolation

The following design features were identified as important to worker safety in the Hazard Evaluation and shall be implemented:

- VCO TRA-004 system inactive piping and components that are included in the scope of the ESS shall be isolated from the piping and components that are excluded from the scope of the ESS by at least one administratively closed and administratively locked valve at each system interface.

3.1.6.1.2 Administrative Commitments

RTC Piping Isolation Valve Administrative Locks

The following administrative features were identified as important to worker safety in the Hazard Evaluation and shall be implemented:

- Lockout/Tagout procedures shall be used when working on inactive VCO TRA-004 system piping or components that interface with active piping or components that are excluded from the scope of the ESS.

- Administrative locks shall be used when working on all other inactive VCO TRA-004 system piping or components that interface with piping or components that are excluded from the scope of the ESS.

Commitments were made to implement the following Safety Management Programs:

- Radiation Protection Program
- Industrial Safety and Industrial Hygiene Program
- Maintenance/Work Control Program
- Conduct of Operations Program
- Fire Protection Program
- Emergency Response Program

4. CONCLUSION

The piping and components shown in Figure 1 and Figure 2 define the HC 3 or greater nuclear facility/activity boundary for the RTC VCO activities. Based on the hazard analysis performed for the characterization activities involving VCO TRA-004 system piping and components, characterization activities may safely continue with the implemented safety analysis commitments identified in the ESS. There are no restrictions on VCO activities for VCO TRA-004 system components that are categorized as less than HC 3. The primary hazard event associated with VCO action on inactive RTC piping and components involves the release of radioactive or hazardous material during characterization activities. This occurs by disturbing the radioactive or hazardous material as a result of impacts from moving or falling equipment caused by equipment failure or human error during characterization activities, or by fires or natural phenomenon events.

Due to the quantity and form of the radioactive or hazardous material in the piping and components, there are negligible expected consequences to the public or collocated workers and low expected consequences to immediate workers. As a result, there are no safety-class or safety-significant controls required for protection of the public, collocated worker, or immediate worker.

5. REFERENCES

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