condition. Each R/O module has four modules: pre-treatment, R/O, demineralizer, and concentrate feed. Once the effluent is processed by the R/O module, it is transferred to a monitoring tank where the effluent is sampled, analyzed, and released, once found to be within NRC regulatory limits.

The LWMS design provided in DCD Tier 2, Table 11.2-6, "Equipment List in the LWMS (Sheets 1 ~~and 2~~ thru 3)," includes the following nominal tank ~~and sump volumes~~ Need to be deleted.:

- two 68,137 liter (L) (18,000 gallon (gal)) floor drain tanks
- two 68,137 L (18,000 gal) equipment waste tanks
- two 34,069 L (9,000 gal) chemical waste tanks
- two 102,206 L (27,000 gal) monitor~~ing~~ tanks
- one 1,703 L (450 gal) acid storage tank
- one 189 L (50 gal) acid batch tank
- one 1,703 L (450 gal) caustic storage tank
- one 1,741 L (460 gal) seal water storage tank
- one 189 L (50 gal) caustic batch tank
- one 416 L (110 gal) chemical additive tank
- two 22,712 L (6,000 gal) detergent waste tanks

DCD Tier 2, Table 11.2-6, contains information for pump capacities in the LWMS and also includes "miscellaneous" information that provides some design information on the detergent waste filter, the seal water heat exchanger, and the R/O package.

Operation and monitoring of the LWMS is performed from the radwaste control room with provisions for local monitors. The LWMS operates on a batch basis with manual start and automatic stops. Parameters such as tank levels, processing flow rates, differential pressures across filters, and ion exchange columns, are indicated, alarmed, or both, to provide information on operational and equipment performance. High-level alarms associated with the liquid tanks are activated in the main control room (MCR). DCD Tier 2, Table 11.2-8, "Radioactive Atmospheric Tank Overflow Protection," contains a summary of indications, level annunciations, and overflows for the LWMS. Two liquid radwaste discharge radiation detector and dual isolation valves are installed on the sole discharge line from the LWMS to monitor and control liquid effluent discharges to the environment.

The SG blowdown radiation monitor measures the radiation level in the SG blowdown water after it is treated and before it is returned to the condensate storage tank. A sample from the SG blowdown mixed-bed demineralizers is monitored for radiation. In the event of primary-to-secondary system leakage due to an SG tube leak with radiation monitored above a predetermined setpoint, an alarm is automatically initiated for operator actions in the MCR, and the valve through which treated liquid is sent to the discharge header is automatically turned off. A detailed description of the SG blowdown system can be found in Section 10.4.8 of this SER.

Design features are also provided in the LWMS to control and maintain personnel doses ALARA. Filters such as the activated carbon filter and ion exchange columns are remotely handled to eliminate direct contact and reduce potential exposures. Components that require inspections, such as tanks, are located in cubicles with access doors to allow quick ingress and egress. Components that require maintenance, such as pumps, are located in low-radiation corridors outside the equipment cubicles. Tanks, equipment, and pumps used for storing and processing radwaste are located in controlled areas and are shielded, based on design-basis source term inventories.

The COL licensee will conduct LWMS preoperational inspections and testing to ensure that all subsystems are operationally ready and meet their design bases and performance specifications and that all automatic control functions are fully operational, including the automatic termination and isolation of radioactive releases upon the detection of a high-radiation signal from the liquid effluent radiation monitor. The COL licensee will develop administrative procedures governing the operation of all subsystems, control the treatment of various process and waste streams, and prevent accidental discharges into the environment.

In assessing the radiological impacts from radioactive liquid effluent releases, the DCD provides the text and tables in DCD Section 11.2 to present information supporting the development of the liquid source term, as well as compliance with the ECLs of 10 CFR Part 20, Appendix B, Table 2, Column 2, and 10 CFR 20.1301(e), insofar as it requires meeting the U.S. Environmental Protection Agency (EPA) environmental radiation protection standards of 40 CFR Part 190, "Environmental Radiation Protection Standards for Nuclear Power Operations," and the numerical design objectives of 10 CFR Part 50, Appendix I. The results show that expected annual liquid effluents released during normal operation, including AOOs, in unrestricted areas and doses to members of the public comply with the NRC regulations and conform to NRC guidance. As discussed in SE Section 11.2, the results also demonstrate compliance with the ALARA requirements of 10 CFR Part 50, Appendix I, and SRP acceptance criteria for the postulated failure of a liquid tank containing radioactivity.

ITAAC: The ITAAC associated with DCD Tier 2, Section 11.2, appear in DCD Tier 1, Section 2.7.6.1, "Liquid Waste Management System," and Table 2.7.6.1-2, "Liquid Waste Management System ITAAC." Table 2.11.3-2, "Containment Isolation System ITAAC," describes the ITAAC associated with the LWMS equipment, components, and piping and that comprise a portion of the containment isolation system. DCD Tier 2, Section 14.3.2.7, "ITAAC for Plant Systems," summarizes how the applicant developed ITAAC for DCD Tier 1, Section 2.7.6.1.

TS: Information pertinent to TS is associated with the LWMS in DCD Tier 2, Section 11.2.3.2, "Radioactive Effluent Releases due to Liquid Containing Tank Failures," Section 11.2.3.3, "Offsite Dose Calculation Manual," and Chapter 16, "Technical Specifications," TS 5.5.1, "Offsite Dose Calculation Manual (ODCM)," TS 5.5.4 "Radioactive Effluents Controls Program," TS 3.4.15, "RCS Specific Activity," and TS 5.5.12, "Explosive Gas and Storage Tank Radioactivity Monitoring Program."

Need to be deleted.

10 CFR 20.1406: There is information pertinent to 10 CFR 20.1406 in DCD Tier 2, Sections 11.2.1.2, "Design Criteria"; ~~11.2.1.4, "Method of Treatment"; and~~ 11.2.1.6, "Mobile or Temporary Equipment."

; and 11.2.2.4. "Design Features for Minimization of Contanmination"

COL Information or Action Items: See Section 11.2.5 below.

Technical Report(s): There are no technical reports associated with this area of review.

verify the function of a monitor in a pass/fail criterion. An electronic test signal will still be used to produce the signal needed to test the monitors for indication and alarm functionality. The staff finds this response to be acceptable because the applicant has included text in DCD Section 11.5 to state that the RMS has a radiation check source available to verify system availability automatically and is present in the system to verify the monitor's operation. The staff confirmed that the proposed changes have been incorporated in DCD Revision 1, dated March 10, 2017. Therefore, the staff considers RAI 218-8183, Question 11.02-4, to be resolved and closed.

11.2.4.10 Technical Specifications

The review of DCD Tier 2, Chapter 16, shows that there are no TS directly associated with liquid waste storage and processing. However, DCD Tier 2, Chapter 16, TS 5.5.1 and TS 5.5.4, provide directions in managing releases of radioactive effluents and the control and handling of concentrated wastes for disposal. The proposed TS requirements of DCD Tier 2, Chapter 16, TS 5.5.12, restrict the amount of radioactivity in tanks located outdoors to ensure the concentration limits do not exceed those in 10 CFR Part 20, Appendix B, Table 2, Column 2, in the event of a release to an unrestricted area.

DCD Tier 2, Chapter 16, TS 5.6.1, "Annual Radiological Environmental Operating Report," and TS 5.6.2, "Radioactive Effluent Release Report," specify annual reporting requirements in describing the results of the radiological monitoring program and provide summaries of the quantities of radioactive liquid effluents released to the environment. As stated in TS 5.5.1, COL licensee-initiated changes to the ODCM must be justified by calculation, and changes will maintain levels of radioactivity in effluents in compliance with the requirements of 10 CFR 20.1302; 40 CFR Part 190; 10 CFR 50.36a; and 10 CFR Part 50, Appendix I. TS would also require the radioactive effluent controls program, which is contained in the ODCM, to include instrumentation to monitor and control liquid effluent discharges; meet limits on effluent concentrations released to unrestricted areas; monitor, sample, and analyze liquid effluents before and during releases; set limitations on annual and quarterly dose commitments to a member of the public; and assess cumulative doses from radioactive liquid effluents.

The staff deemed these proposed TS requirements acceptable, and the applicant will address the implementation of such programs in a plant- and site-specific ODCM under COL Information Item 11.2(1), as described in DCD Tier 2, Table 1.8-2. Section 11.5 of this report contains the staff's evaluation of the applicant's proposed ODCM.

11.2.5 Combined License Information Items

Table 11.2-2 lists COL information item numbers and descriptions related to the LWMS from DCD Tier 2, Table 1.8-2:

SE Table 11.2-2 APR1400 COL Information Items

ITEM NO.	DESCRIPTION	SECTION
COL 11.2(1)	The COL applicant is to prepare the site-specific ODCM in accordance with NEI 07--09A. typo	11.2.1.2 11.2.3.3

ITEM NO.	DESCRIPTION	SECTION
COL 11.2(2)	The COL applicant is to prepare operational procedures and programs related to operations, inspection, calibration, and maintenance of the contamination control program.	11.2.1.2 11.2.2.1.2 11.2.2.4
COL 11.2(3)	The COL applicant is to determine whether contaminated laundry is sent to an offsite facility for cleaning or for disposal.	11.2.1.3
COL 11.2(4)	The COL applicant is to prepare and provide the P&IDs.	11.2.1.4
COL 11.2(5)	The COL applicant is to perform a site-specific cost-benefit analysis following the guidance in the regulatory requirements of NRC RG 1.110.	11.2.1.5
COL 11.2(6)	The COL applicant is to provide reasonable assurance that the mobile or temporary equipment and interconnections to plant systems conform with the regulatory requirements and guidance of 10 CFR 50.34a, 10 CFR 20.1406, NRC RG 1.143, NRC RG 4.21, and ANSI/ANS 40.37. The COL applicant is to ensure that the implementation of mobile and temporary equipment meets the requirements of NUREG-0800 Sections 12.3 and 12.4 and that any impacts to the radiation zone maps are evaluated.	11.2.1.6
COL 11.2(7)	The COL applicant is to develop a plant-wide NRC RG 4.21 Program following the guidance in NEI 08-08A for contamination control.	11.2.2.4~~4~~ typo.
COL 11.2(8)	The COL applicant is to maintain the complete documentation of system design, construction, design modifications, field changes, and operations and make them available for decommissioning planning and implementation.	11.2.2.4
COL 11.2(9)	The COL applicant is to develop the procedure for the collection and shipment of mixed wastes, if and when they are generated, for offsite treatment. The generation of mixed liquid wastes is minimized by process control and the controlled use of hazardous chemicals.	11.2.2.11.3
COL 11.2(10)	The COL applicant is to develop the interface design and provide the site-specific information for the LWMS effluent discharge, including radioactive release points, effluent temperature, the design (type, shape, and size) of flow orifices, and the sampling requirements following the guidance of NRC RG 1.21 and RG 4.15 and the standards incorporated therein by reference.	11.2.2.1.4 11.2.2.3.1 11.2.3.1

and control releases of radioactive gases generated during plant operation and maintenance. For process streams containing radioactivity, treatment methods include the use of HEPA and charcoal filters, gas decay tanks filled with activated charcoal, and detectors monitoring radiation and radioactivity levels. Fission product gases (e.g., krypton and xenon) are dynamically absorbed by activated charcoal media in decay tanks, allowing for their radioactive decay before being discharged to the environment through a plant vent stack. For process streams that contain hydrogen and oxygen, in addition to radioactive materials, the treatment methods inclu[illegible]entation to control hydrogen and [illegible]mpressors. The purpose of this system [illegible]sive gas mixtures. Airborne radioa[illegible] building's ventilation exhaust system, using HEPA and charcoal filters. The sources of radioactivity for such systems include process leakage, steam discharges, and work being [illegible] controlled work areas where open systems are being mainta[illegible]

GWMS covers the gaseous radwaste system (GRS) and the building ventilation system. Processing system for treating offgas from CVCS is GRS. 'GWMS' in this SER, which is marked by a square, should be changed to 'GRS'. (Typical)

According to Note 4 in DCD Tier 2 Table 3.2−1 and Section 11.3.1.3.c, the compound building that house the GRS equipment are designed to radwaste safety class RW−IIa in accordance with RG 1.143.

11.3.2 Summary of Application

DCD Tier 1: The applicant provided a system description in DCD Tier 1, Section 2.7.6.2, "Gaseous Waste Management System," summarized here, in part, as follows.

The GWMS is located in the compound building and is a nonsafety-related system ~~with nonseismic components~~. The portions of the compound building that house the principal GWMS equipment are designed to seismic Category II.

Need to be deleted.

The GWMS is designed to monitor, control, collect, process, handle, store, and dispose of gaseous radioactive waste generated as the result of normal operation, including AOOs. Charcoal beds provide for the delay and decay of radioactive gases before release into the environment. Gaseous waste streams are monitored for both hydrogen and oxygen content to prevent a flammable mixture. The nitrogen ~~waste gas~~ is operated at a higher pressure. Treated waste gas is verified with radiation monitors before release to the environment. Upon detection of radiation levels above a setpoint, the radiation mon[illegible] GWMS discharge valve.

gas to purge or dilute hydrogen and oxygen content in gaseous waste streams

The gaseous effluent waste is processed through the dryer and the charcoal bed absorbers and is sent to the plant stack for release to the environment.

DCD Tier 2, Section 11.3, "Gaseous Waste Management System," contains detailed descriptions of the design and operating features of the GWMS.

DCD Tier 2: The applicant has provided a system description in DCD Tier 2, Section 11.3, summarized here, in part, as follows.

In DCD Tier 2, Section 11.3, the applicant described the design of the GWMS and its functions in monitoring, controlling, collecting, processing, handling, storing, and disposing of gaseous radioactive waste generated as the result of normal operation and AOOs. The GWMS collects gas mixtures containing hydrogen and oxygen, noble gas fission products, and radioiodines and radioactive particulates, among others. The GWMS is a nonsafety-related system and serves no safety functions with the exception of containment penetration isolation valves and piping. The discharge isolation valve closes on a low ventilation system exhaust flow rate and when the radiation monitor setpoint is exceeded. A failure of the GWMS does not compromise safety-related systems or components and does not prevent the safe shutdown of the plant. The compound building, which houses the GWMS, is designed to seismic Category II

Refer to comment above

requirements evaluated in SE Section 3.2. DCD Table 11.3-9, "Gaseous Radwaste System Failure Activity release and Doses" describes the failure scenarios considered for the GWMS.

In DCD Tier 2, Section 3.2, the applicant described the seismic and quality group classification and corresponding codes and standards that apply to the design of the GWMS components and piping and structures housing the system. The GWMS is housed in a reinforced concrete structure to provide adequate shielding and minimize radiation exposures to personnel during operation and maintenance. SE Section 12.4 provides the staff's evaluation of these personnel radiation exposures.

DCD Tier 2, Figure 11.3-1, "Gaseous Radwaste System Flow Diagram," presents the process design of the GWMS, and Figure 11.3-2, "Gaseous Effluent Release Points and Exhaust," presents the design operating parameters, such as flow rates, temperatures, and pressures, for the major gaseous waste streams. DCD Tier 2, Table 11.3-4, "GRS Major Equipment Design Information," lists system components and information characterizing volumetric capacities and processing flow rates for major components. DCD Tier 2, Figure 12.3-13, "Radiation Zones (Normal) Compound Building El. 100'-0," and Figure 12.3-14, "Radiation Zones (Normal) Compound Building El. 120'-0," present the general arrangement of the compound where the major components of the GWMS are located.

building

Figure 12.3−10 and 12.3−12 also present the location of the major GRS components. And Figure 12.3−14 does not present the location of the GRS components.

In DCD Tier 2, Section 9.4, "Heating, Ventilation, presents design information on ventilation systems servicing buildings where radioactive systems are located, as well as systems used to collect gases vented from tanks and vessels. SE Section 9.4 contains the staff's evaluation of these ventilation systems. DCD Tier 2, Section 11.3.3, describes design information on the vent stack and release points. DCD Tier 2, Figure 9.4.3-1, "Compound Building HVAC System Flow Diagram," shows the detailed flow diagram of the HVAC system depicting the installed airborne radioactivity monitors and release to the environment through the plant vent stack.

7

The GWMS consists of processing equipment, associated monitoring instrumentation, and control components. The GWMS treats waste gas in two ways. The first method reduces the volume of potentially explosive mixtures of hydrogen and oxygen by means of dilution with nitrogen. Moisture in the waste gas is removed in the waste gas dryer skid, which protects the charcoal adsorbed beds, and is returned to the LWMS for processing. Because a buildup of explosive mixtures of hydrogen and oxygen is possible, the GWMS must be designed either to withstand the effects of a hydrogen explosion or to have design features that preclude the buildup of explosive gas mixtures in accordance with the guidance in SRP Section 11.3. The APR1400 is designed to preclude the generation and accumulation of explosive gas mixtures.

The major components of the GWMS include the following:

- one header drain tank
- two waste gas dryers
- one standby chiller
- two charcoal guard beds
- four charcoal delay beds
- one HEPA filter

- RG 1.33, as it relates to QA for the operation of the GWMS provisions for the sampling and monitoring of radioactive materials in process and effluent streams and control of radioactive effluent releases to the environment

- RG 4.21, as it relates to minimizing both the contamination of equipment, plant facilities, and the environment and the generation of radioactive waste during plant operation

- BTP 11-5, "Postulated Radioactive Releases Due to a Waste Gas System Leak or Failure," as it relates to the assessment of radiological impacts associated with the failure of a GWMS component

- NUREG-0017 (Revision 1), as it relates to the methodology to calculate gaseous and liquid effluent releases

- NUREG-1301, as it relates to ODCM guidance for PWR plants

- NUREG/CR-4653, "GASPAR II—Technical Reference and User Guide," as it relates to the methodology to calculate gaseous effluent doses

- IE Bulletin 80-10, as it relates to methods and procedures used in avoiding the cross-contamination of nonradioactive systems and unmonitored and uncontrolled releases of radioactivity

- ANSI/ANS-18.1-1999, as it relates to the methodology for determining the source term for normal reactor operations, including AOOs

11.3.4 Technical Evaluation

The staff reviewed the GWMS using the guidance and acceptance criteria of SRP Section 11.3.

11.3.4.1 Design Considerations

11.3.4.1.1 GWMS System Description Source Term

The GWMS is designed to monitor, control, collect, process, handle, store, release to ventilation exhaust, and dispose of gaseous radioactive waste generated as a result of normal operations and AOOs. The GWMS is made up of the GRS and the building ventilation. The GRS handles and processes the radioactive effluent off-gases from the CVCS tank vents, the gas stripper off-gases containing radioactive noble gases, halogens, hydrogen, and oxygen from reactor operation, and nitrogen, which is used as a cover gas for the tanks in the ~~GRS~~ CVCS

Noble gases and halogens are removed from the gaseous radwaste by absorption from the gaseous stream for decay in the charcoal delay beds before release to the environment. The treated gases are passed through the compound building HVAC ventilation exhaust for release to the environment. When operating under normal conditions, the charcoal delay beds will provide a 45-day delay for xenon and 3.5-day delay for krypton. The waste gas dryer is used to control the inlet gas moisture and temperature to maintain normal conditions for the charcoal delay beds.

The primary sources to the gas surge header are the gas stripper, equipment drain tank (EDT), volume control tank (VCT), and reactor drain tank (RDT) in the CVCS. The gases consist primarily of hydrogen, with small amounts of nitrogen, oxygen, and trace amounts of other

fission gases. The removal of gases is performed in the VCT, from depressurization, and in the gas stripper.

The GRS consists of one header drain tank; two waste gas dryers; one standby chiller; two charcoal guard beds; four charcoal delay beds; one HEPA filter; and the associated piping, valves, and instrumentation for the system.

The header drain tank collects condensed liquid from the gas surge header in the AB and in the GRS inlet piping in the compound building. The header drain tank is also used to collect condensate from waste gas dryer operations.

Downstream of the gas surge header, two 100-percent capacity trains comprising one waste gas dryer and one charcoal guard bed are used to reduce the gas moisture and protect the main charcoal delay beds. The waste gas dryer cools the waste gas before entering the guard beds. The GRS chiller provides the cooling water when the plant chilled water is unavailable. Humidity sensors are placed downstream of the waste gas dryer and charcoal guard beds to monitor for moisture and to provide alarms for operator actions if above a preset moisture content. With two trains of guard beds, only one is in operation at a time. While one is operating, the other is in standby or regeneration mode. Humidity sensors are installed upstream and downstream of the guard beds to further protect the integrity of the charcoal delay bed.

9,525 (Editorial change)

The four charcoal delay beds are normally operating in series. The leading delay beds can be isolated for regeneration or replacement. Nitrogen is available to dry the charcoal delay bed in the event of excess moisture contamination. Each charcoal delay bed can have nitrogen introduced to flush or dry it. The charcoal delay beds contain a total of ~~9.525~~ kilograms (kg) (21,000 pounds) of charcoal. The charcoal delay beds also contain provisions for replacement in scenarios where there is a wetting of the delay bed. During replacement, the delay bed will be isolated and bypassed to allow for continued operation while the charcoal is replaced.

During the staff's review of the charcoal delay beds, the staff noted the lack of information pertaining to maintaining the integrity of the charcoal delay beds. The staff issued RAI 205-8230, Question 11.03-5, on September 8, 2015, (ADAMS Accession No. ML15295A504) requesting information pertaining to (1) monitoring potential fire conditions in the charcoal delay beds, (2) addressing potential leaks of the chilled water system, (3) detecting potential blockages within the charcoal beds, and (4) describing the flow paths that interact with the charcoal delay beds. This information was requested so that the staff could evaluate the ability of the charcoal delay beds to treat the waste gas effluent.

In its response to RAI 205-8230, Question 11.03-5 dated December 3, 2015 (ADAMS Accession No. ML15337A512), the applicant described how fires in the charcoal delay beds are prevented by maintaining temperatures below those needed for the self-ignition of charcoal. The applicant also described the use of inlet temperature sensors that can monitor temperature conditions and stated that the beds can be isolated in the event of a fire. To maintain charcoal beds, the applicant described the use of guard beds to protect charcoal delay beds from moisture, and the use of moisture instruments upstream and downstream of the guard beds to ensure that the gas flowing through the charcoal delay beds is dry. In the event of chilled water leakage, the applicant stated that the moisture instrumentation at the guard beds inlet will automatically isolate the entire train. In its revised response to RAI 205-8230, Question 11.03-5 dated April 25, 2016 (ADAMS Accession No. ML16116A388), the applicant updated the response to include DCD Section 11.3 text revisions and revised DCD Figure 11.3-1 to incorporate the discussions of the original RAI response. The staff finds this response

acceptable and confirmed that the proposed changes have been incorporated in DCD Revision 1, dated March 10, 2017. Therefore, the staff considers RAI 205-8230, Question 11.03-5, to be resolved and closed.

All components of the GRS are located in shielded cubicles. After passing through the charcoal delay bed, the waste gas then flows through a HEPA filter where the particulates, including charcoal bed fines, are removed and then vented to the compound building HVAC system.

Before discharge to the environment, the radioactivity of the processed gaseous waste is monitored by a radiation monitor in the compound building ventilation exhaust, where the discharge flow is automatically isolated by alarm interlock, if the preset limit is exceeded. The limit is triggered by a radiation monitor that closes the effluent discharge valve. The GRS is also designed to alarm operators when there is insufficient flow to discharge the gaseous waste effluent. The staff reviewed the GWMS to determine whether it complies with the requirements of GDC 60, GDC 61, and 10 CFR 50.34a. GDC 60 requires that the GWMS be designed to control releases of gaseous radioactive effluents, and GDC 61 stipulates that the GWMS is designed to ensure adequate safety under normal operations and AOOs. Under the requirements of 10 CFR 50.34a, the applicant must provide sufficient design information to demonstrate that the design objectives of equipment necessary to treat and control releases of radioactive effluents into the environment have been met. The applicant adequately describes the system's components needed to control gaseous effluent releases through the use of charcoal delay beds to delay the release of noble gases, the HEPA filter to capture the effluent particulates in the gaseous waste stream, and gas dryers and guard beds to maintain the integrity of the waste treatment systems. The applicant also describes the use of radiation monitors to isolate gaseous effluent releases above a predetermined setpoint to maintain them below the release limits in 10 CFR Part 20, Appendix B, Table 2, Column 1; 10 CFR Part 50, Appendix I; and 40 CFR Part 190.

11.3.4.1.2 Waste Monitoring and Discharge

typo

The staff reviewed the GWMS to determine whether it complies with GDC 3, "Fire Protection," which requires that the design of SSCs important to safety, including the gaseous waste handling and treatment systems, be adequately designed to prevent the occurrence of a~~a~~ fire or explosion or to withstand the effects of an explosion. The applicant has stated that the gaseous streams in the GRS are monitored for both hydrogen and oxygen content, so that a flammable mixture does not occur. The explosive mixtures of hydrogen and oxygen concentrations are monitored by two gas analyzers. The results of the gas analyzers are confirmed by periodic sampling and analysis. An explosive mixture in the GRS is prevented by maintaining an oxygen or hydrogen concentration of less than 4 percent by volume by dilution with nitrogen. The applicant references and follows the criteria established in ANSI/ANS 55.4.

In review of the charcoal guard and delay beds, the staff issued a question about compliance with NFPA 804. Within NFPA 804, Section 8.4.9.4, it states that fixed water spray systems shall be provided for charcoal adsorber beds containing more than 45.5kg (100 lbs) of charcoal. DCD Section 11.3.2 describes the charcoal delay beds as having 9525 kg (21000 lb) of charcoal. In review of DCD Section 11.3.2, the staff could not find reference to the description of a spray system for the charcoal delay beds. Since the applicant has specified compliance with NFPA 804 in DCD Table 9.5.1-2 (37 of 70), item 4, the staff issued RAI 538-8720, Question 11.03-12, on February 06, 2017, (ADAMS Accession No. ML17037D278) to request information about how the applicant plans to remain compliant with NFPA 804 given the lack of a spray system for these charcoal delay beds. In its response to RAI 538-8720, Question 11.03-12

dated March 17, 2017 (ADAMS Accession No. ML17076A138), the applicant stated that the applicant plans on using nitrogen injection to control the amounts of hydrogen and oxygen concentrations below flammability limits. As is described in Section 9.5 of this SER, nitrogen has been approved as a means to limit and extinguish fire events for charcoal beds. The staff has found the response acceptable since the ability to prevent and extinguish a fire has been described by the applicant for the charcoal adsorber beds in the GWMS. The staff is tracking changes to the DCD in response to **RAI 538-8720, Question 11.03-12**, **as Confirmatory Item 11.3-1**.

The staff concludes that the measures proposed by the applicant are adequate to prevent the occurrence of an explosion in accordance with GDC 3.

11.3.4.1.3 General Design Criteria 60 and 61 and 10 CFR 50.34a

In assessing compliance with GDC 60 and 61, the staff reviewed the QA provisions and RG 1.143 guidance specified by the applicant in the DCD. The applicant stated that the GRS will conform to regulatory position C.7 of RG 1.143 and RG 1.33, which specify the QA guidance to follow. DCD Table 3.2-1 also identifies the seismic category, quality group, and safety class for components of the GRS. The QA program is stated to be designed in accordance with ANSI/ANS-55.6, which is in agreement with RG 1.143, position C.7. In determining the design for radwaste systems, the applicant provided DCD Table 11.3-11 to reflect the guidance specified in RG 1.143 to meet the values for A_1 and A_2 in 10 CFR Part 71, Appendix A. The staff's confirmatory calculations of the data provided by the applicant were initially unable to confirm the results provided. The calculations involved using the source terms in DCD Table 11.3-11 and the table of fractions in 10 CFR Part 71, Appendix A, to determine the radwaste classifications for each SSC. The staff's calculations determined that the applicant's analysis was using a value of 0 in place of values that were not listed in 10 CFR Part 71, Appendix A, Table 1. In the text preceding Table 1 in 10 CFR Part 71, Appendix A, states that "For individual radionuclides whose identities are known, but which are not listed in Table A-1, the A_1 and A_2 values contained in Table A-3 may be used. Otherwise, the licensee shall obtain prior Commission approval of the A_1 and A_2 values for radionuclides not listed in Table A-1, before shipping the material." The staff's confirmatory calculations used the values specified by 10 CFR Part 71, Appendix A, Table 3, when determining the A_1 and A_2 values. The staff issued RAI 171-8143, Question 11.03-4, on August 25, 2015, (ADAMS Accession No. ML15237A478) to request that the applicant evaluate the use of the values specified in its analysis in determining the A_1 and A_2 values used to determine radwaste system classifications.

In its response to RAI 171-8143, Question 11.03-4 dated December 14, 2015 (ADAMS Accession No. ML15348A337), the applicant described the method used to determine the RG 1.143 system classifications, and in its revised response to RAI 171-8143, Question 11.03-4 dated May 2, 2016 (ADAMS Accession No. ML16123A521), the applicant further updated the values in the analysis, since there was an error noted for Xe-135m, and also updated the result specified in DCD Table 11.3-11. In its responses, the applicant determined that the radwaste system classification for the charcoal delay was RW-IIa, which is now consistent with the staff's results. The staff determined that all of the components described in DCD Table 11.3-11 should be classified as RW-IIa, using the guidance in RG 1.143. Since the staff can confirm the results presented by the applicant, it finds the applicant's response acceptable. The staff confirmed that the proposed changes have been incorporated in DCD Revision 1, dated March 10, 2017. Therefore, the staff considers RAI 171-8143, Question 11.03-4, to be resolved and closed.

In its review of the tanks that contain liquid, gaseous, or solid wastes that are vented to the rooms in which they are located, the staff determined that more information was required to describe the methods used to direct tank gases to the ventilation system. The staff issued RAI 538-8720, Question 11.03-11, on February 06, 2017, (ADAMS Accession No. ML17037D278) requesting additional details in the DCD to clarify the methods implemented to direct tank gases to the ventilation system and additional details on ensuring liquids are prevent from entering the ventilation system. In its response to RAI 538-8720, Question 11.03-11 dated March 23, 2017 (ADAMS Accession No. ML17082A422), the applicant described that the vent for each tank is located near each cubical vent to minimize the transport of gases. In addition, the applicant provided details on which tank vents were directed to floor drains so that water overflow would be directed to the appropriate drains before venting. The applicant also described that the low activity spent resin tank, is used only during resin transfer, and is not normally open during normal operations. The staff determined that the response provided by the applicant is acceptable because the applicant provided the details to the staff about how tank gases were directed to the ventilation system. The staff is tracking changes to the DCD in response to **RAI 538-8720, Question 11.03-11, as Confirmatory Item 11.3-2**.

In its review of the GWMS P&IDs, the staff had questions on the valve used to terminate discharge to the environment. The staff's review of DCD Figure 11.3-1, "Gaseous Radwaste System Flow Diagram," identified a single isolation valve, valve 008, to limit gaseous releases to the environment on a high radiation signal or low ventilation flow. The staff issued RAI 538-8720, Question 11.03-13, dated February 6, 2017, (ADAMS Accession No. ML17037D278) requesting information on how the system would limit releases in excess of requirements found in 10 CFR 20 Appendix B, and 10 CFR 50 Appendix I. In its response to RAI 538-8720, Question 11.03-13 dated March 17, 2017 (ADAMS Accession No. ML17076A138), the applicant responded and specified that there is another isolation valve that can be closed remotely at the radwaste control room in the event valve 008 does not close on receipt of a close signal. The applicant also specified that valves 1013 and 1014, which are located before and after valve 008, can be manually closed. The staff has reviewed the response and determined that the response is acceptable since the applicant has specified other valves that operations can use to control releases to the environment. The staff is tracking changes to the DCD in response to **RAI 538-8720, Question 11.03-12, as Confirmatory Item 11.3-3**.

11.3.4.2 10 CFR Part 50, Appendix I, Gaseous Effluent Doses

The staff reviewed the GWMS to determine whether it complies with the requirements of 10 CFR Part 50, Appendix I. The applicant calculates releases using the GASPAR II computer code, approved for use by the NRC. Using the data in the applicant-provided tables and GASPAR II input and output files, the staff performed confirmatory calculations of the effluent releases stated in the DCD. In performing the calculations, the staff observed the use of two separate X/Q values in the analysis. The applicant states that the X/Q value used at the food receptor location would be half of the X/Q referenced for the exclusion area boundary (EAB). The EAB X/Q has a reference to DCD Table 2.0-1. Upon inspection of DCD Section 2.3.5 and DCD Table 2.0-1, the staff found only one referenced X/Q value and determined that the assumption provided by the applicant was not acceptable. The staff issued RAI 147-7933, Question 11.03-2, on August 10, 2015, (ADAMS Accession No. ML15226A659) to request that the applicant further justify the use of an X/Q value not referenced in DCD Section 2.3.5, and a detailed explanation of parameters being used to support the GASPAR II calculation in the form of a calculation package for staff review. In its response to RAI 147-7933, Question 11.03-2 dated September 25, 2015 (ADAMS Accession No. ML15269A019), the applicant provided additional information to confirm the correct use of the X/Q value in DCD Section 11.3, the food

PATHWAY	APPLICANT RESULTS	NRC RESULTS	DESIGN OBJECTIVES
Skin	0.056 mSv (5.6 mrem)	0.056 mSv (5.6 mrem)	0.15 mSv (15 mrem)
Max Organ (Child Bone)	0.145 mSv (14.5 mrem)	0.148 mSv (14.8 mrem)	0.15 mSv (15 mrem)

The staff's calculations confirmed that the applicant's effluent release doses are below the design objectives for 10 CFR Part 50, Appendix I. The staff finds its results and those of the applicant acceptable because of the conservative use of nonsite-specific data for the analysis. The results are found to be below the limits in 10 CFR Part 50, Appendix I, and are acceptable. The applicant includes COL Information Item 11.2(13), for a COL applicant to calculate these doses to a member of the public using the guidance of RG 1.109 and RG 1.113. An applicant following the COL item will use site-specific parameters to develop gaseous effluent releases based on any specific site. This COL is consistent with staff guidance in the SRP, and the staff finds this COL information item acceptable, since a COL applicant will develop a site-specific dose analysis that is in compliance with 10 CFR Part 50, Appendix I.

11.3.4.3 Site-Specific Cost-Benefit Analysis

DCD Tier 2, Section 11.3.1.6, "Site-Specific Cost-Benefit Analysis," describes the GWMS design for use at any site with flexibility to incorporate site-specific requirements with minor modifications, such as technology preference, degree of automated operation, and radioactive waste storage. RG 1.110 describes an acceptable method of performing a CBA to demonstrate that the GWMS design includes all items of reasonably demonstrated technology for reducing to ALARA levels each reactor's cumulative population doses from releases of radioactive materials. The applicant states the CBA for the APR1400 design demonstrates that the addition of items of reasonably demonstrated technology will not provide a more favorable cost benefit but does not include a CBA in DCD Tier 2, Section 11.3.1.6. The COL applicant will provide the site-specific CBA to demonstrate compliance with the requirements of 10 CFR Part 50, Appendix I, Sections II.A and II.D under COL Information Item 11.3(2). Because the CBA requires site-specific information, which is outside the scope of the requested DC, the staff finds the inclusion of COL Information Item 11.3(2) acceptable.

11.3.4.4 10 CFR Part 20, Appendix B, Gaseous Effluent Concentration Limits

The staff reviewed the information provided by the applicant to support compliance with 10 CFR 20.1302. This is a review of the ECLs calculated by the applicant in using the source term developed in Section 11.1 and the ECL values found in 10 CFR Part 20, Appendix B, where the staff finds that the applicant's determined value would be less than 1.

The applicant initially provided DCD Table 11.3-6, "Design Basis Gaseous Effluent Concentrations at the Site Boundary," to demonstrate compliance with the annual average gaseous release concentrations identified in Note 4 of 10 CFR Part 20, Appendix B, Table 2, Column 1, "unity rule" concentration limit. The applicant's tabulation included site concentrations that encompassed gaseous effluent releases from a proposed APR1400 unit. The staff notes that the gaseous effluent site concentrations are below the limits in 10 CFR Part 20, Appendix B, Table 2, Column 1, and the unity calculation described in Note 4.

ITEM NO.	DESCRIPTION	SECTION
COL 11.3(6)	The COL applicant is to prepare the site process control program and the site radiological environmental monitoring program.	11.3.2.2.2
COL 11.3(7)	The COL applicant is also to perform the dose calculation using the total gaseous effluents from the site for comparison with the requirements of 40 CFR 190.	11.3.3.1
COL 11.3(8)	The COL applicant is to perform an analysis using site-specific meteorological data to demonstrate that the potential airborne concentration resulting from GRS failure meets the requirements of 10 CFR 20, Appendix B, Table 2.	11.3.3.2
COL 11.3(9)	The COL applicant is to prepare an ODCM following the guidance in NEI 07--09A template.	11.3.3.3

typo

The staff finds the above list to be complete. Also, the list adequately describes actions necessary for the COL applicant. No additional COL information items were identified that need to be included in DCD Tier 2, Table 1.8-2, for the GWMS.

11.3.6 Conclusions

The staff concludes that the GWMS, as a permanently installed system, includes the equipment necessary to collect, process, hold for decay, and control releases of radioactive materials in gaseous effluents generated as a result of normal operation, including AOOs. The applicant provided sufficient design information to demonstrate that it has met the requirements of 10 CFR 50.34a; 10 CFR 50.36a; 10 CFR Part 20; 10 CFR Part 50; GDC 3, GDC 60, GDC 61, and GDC 64; 40 CFR Part 190; and NRC guidance and SRP Section 11.3 acceptance criteria. This conclusion is based on the following:

- The APR1400 design demonstrates compliance with 10 CFR 50.34a, as it relates to the inclusion of sufficient design information and system design features necessary for collecting, processing, holding for radioactive decay, controlling, and monitoring safe discharges of gaseous wastes. The design conforms to the guidelines of SRP Section 11.3.

- The APR1400 design demonstrates compliance with 10 CFR Part 50, Appendix A, GDC 3, as it relates to sufficient information and design features necessary for processing and recombining radiolytic decomposition gases and instrumentation in controlling and monitoring potentially explosive gas mixtures in gaseous waste processing equipment.

- The APR1400 design meets the requirements of 10 CFR Part 50, Appendix A, GDC 60, with respect to controlling releases of gaseous effluents by monitoring GWMS discharges through the plant vent stack. GWMS releases are monitored by a radiation monitor, which will generate a signal to terminate gaseous releases before discharge concentrations exceed a predetermined radiation monitor setpoint. The COL applicant is required to determine the operational setpoint for its GWMS radiation monitor in a plant- and site-specific ODCM under COL Information Item 11.5(2), as described in DCD Tier 2, Table 1.8-2. As part of this commitment, the COL applicant is required to

The SWMS process flow diagrams are presented in DCD Tier 2, Figure 11.4-1, and "Solid Radwaste System Flow Diagram."

In DCD Tier 2, Section 11.4.3, "Radioactive Effluent Releases," the applicant stated any liquids and gases generated from the operation of the SWMS are processed by the LWMS (described in DCD Tier 2, Section 11.2) and the plant ventilation system (described in DCD Tier 2, Section 9.4). Any liquids and gases from operating the SWMS are routed to the LWMS and GWMS for treatment. As a result, the radiological impacts associated with the expected liquid and gaseous effluents generated during the operation of the plant, including those from SWMS, are addressed in DCD Tier 2, Sections 11.2 and 11.3 for the LWMS and GWMS, respectively. SE Sections 11.2 and 11.3 present the staff's evaluation of liquid and gaseous effluent releases and doses, respectively.

The SWMS design criteria in DCD Tier 2, Section 11.4.1.2, provide the means to package radwaste for compliance with 10 CFR Part 61, "Licensing Requirements for Land Disposal of Radioactive Waste," and the applicable parts of 10 CFR Part 60, "Disposal of High-Level Radioactive Wastes in Geologic Repositories," and 10 CFR Part 63, "Disposal of High-Level Radioactive Wastes in a Geologic Repository at Yucca Mountain, Nevada"; to collect, process, package, and store radioactive waste for compliance with 10 CFR Part 20; to contain radioactive waste for compliance with 49 CFR Part 171, "General Information, Regulations, and Definitions"; and process and package radioactive waste for transportation and disposal for compliance with 49 CFR Part 173, "Shippers—General Requirements for Shipments and Packagings," Subpart I, "Class 7 (Radioactive) Materials"; using the acceptance criteria of SRP Section 11.4 and NRC guidance.

ITAAC: The ITAAC associated with DCD Tier 2, Section 11.4, are given in DCD Tier 1, Section 2.7.6.3, "Solid Waste Management System," and Table 2.7.6.3-2, "Solid Waste Management System ITAAC." DCD Tier 2, Section 14.3.2.7, "ITAAC for Plant Systems," summarizes how ITAAC were developed for DCD Tier 1, Section 2.7.6.3.

TS: There is information pertinent to TS associated with the SWMS in DCD Tier 2, Section 11.4.~~3.2~~ 4.4, "Process Control Program," and DCD Tier 2, Chapter 16, Section 5.5.1.

10 CFR 20.1406: There is information pertinent to 10 CFR 20.1406 in DCD Tier 2, ~~Sections 11.4.1.4, "Method of Treatment," and 11.4.2.5, "Operation and Personnel Doses."~~ Sections 11.4.1.7, "Mobile Equipment,"; 11.4.2.2.5, "Interim Radwaste Storage Facility (IRSF),"; 11.4.2.4, "Operation and Personnel Doses," and 11.4.2.5, "Design Features for Minimization of Contamination."

COL Information or Action Items: See Section 11.4.5 below.

Technical Report(s): There are no technical reports associated with this area of review.

Topical Report(s): There are no topical reports asso

APR1400 Interface Issues Identified in the DCD: T
associated with this area of review.

Site Interface Requirements Identified in the DCD: There are no site interface requirements associated with this area of review.

Cross-Cutting Requirements (TMI, USI/GSI, Op Ex): There is a cross-cutting issue for this area of review described in NUREG-0933, "Resolution of Generic Safety Issues," Section 2, "Task Action Plan Items" (NUREG-0933, Main Report Item C-17, "Interim Acceptance Criteria for Solidification Agents for Radioactive Solid Wastes").

GRS is not expected to be replaced. If it is replaced, it will be processed in accordance with the PCP provided by the COL applicant in COL Information Item COL 11.4(5). The applicant stated that the DAW subsystem starts at the collection point of DAW and ends at the temporary waste storage area.

The R/O concentrate subsystem dries the concentrate waste from the R/O membrane separation process. The dried concentrate waste is packaged in a 200-L (55-gal) drum or HIC. The applicant stated th DCD Table 11.4−1 does not include the information that compares the concentrate discharge 60−day storage time to the criteria in ANSI/ANS−55.1.

The temporary waste storage subsystem is located in the compound building and provides an area to store higher activity packaged wastes. The temporary waste storage area is sized to accommodate the number of drums and HICs generated in a 6-month period of normal operation. DCD Table 11.4-1 contains information on the expected and maximum shipped volumes for offsite storage. DCD Table 11.4-1 summarizes the expected waste generation and compares the 60-day storage time to the 30-day storage criteria in ANSI/ANS-55.1, "Solid Radioactive Waste Processing System for Light-Water-Cooled Reactor Plants." The temporary waste storage area has an overhead crane with direct access to an adjacent truck bay to allow for direct loading of packaged waste. In its review of the generated waste being stored in the temporary storage area, the staff questioned how the applicant determined its 6-month storage capacity using DCD Table 11.4-1. As a result, the staff issued RAI 242-8276, Question 11.04-3, on October 14, 2015, (ADAMS Accession No. ML15296A011) asking the applicant to provide references to plant drawings and the available surface area to store waste.

The staff also requested that the applicant provide information to supplement the expected generation and maximum generation rates for DAW to compare the expected generation rates to the available storage area. In its response to RAI 242-8276, Question 11.04-3 dated January 28, 2016 (ADAMS Accession No. ML16028A058), the applicant referred to a plant drawing for the temporary storage area, in DCD Figure 1.2-27, "General Arrangement Compound Building EL 100'-0," and also described the high-activity and low-activity storage areas, as well as the expected volumes to be contained in these spaces. The staff reviewed the planned storage areas and confirmed that the building can contain the volumes of waste generated during operations. The applicant also updated DCD Table 11.4-1 to include the expected generation rates for DAW and included a footnote to discuss how the volume of waste generated was being compressed and packaged with the assumed ratios and reduction factors. The staff verified this information through confirmatory calculations using the expected waste storage drum base areas, and the staff determined that the expected surface areas are contained within the temporary waste storage area.

In its revised response to RAI 242-8276, Question 11.04-3 dated April 16, 2016 (ADAMS Accession No. ML16107A010), the applicant proposed additional DCD changes. The applicant included the description within the RAI text that describes the development of the waste generation rates. The staff finds this response acceptable. The staff confirmed that the proposed changes have been incorporated in DCD Revision 1, dated March 10, 2017. Therefore, the staff considers RAI 242-8276, Question 11.04-3, to be resolved and closed. The applicant also included COL Item 11.4(6), which requires a COL applicant to describe how it will handle waste that is generated in excess of the shipment amounts.

In DCD Section 11.4.2 and in the footnote to DCD Table 11.4-1, the applicant stated that charcoal used in the GRS is not expected to be replaced. However, in the cases where

charcoal waste is generated, the COL applicant will process it in accordance with the PCP developed by the COL applicant (COL Information Item 11.4(5)).

Included as COL Information Item 11.4(8), a COL applicant is responsible for providing the information on a sitewide interim radwaste storage facility (IRSF), if additional storage space is warranted by the COL applicant.

The exhaust air from the spent resin dewatering system is processed by the compound building HVAC system before release to the environment.

11.4.4.1.2 Mobile Equipment

The APR1400 design's spent resin dewatering system is designed as a modular and mobile system. The mobile design allows for replacement when the equipment is broken or a new technology is available. The mobile system is cited to have an exhaust fan and HEPA filter, in accordance with BTP 11-3. The exhaust air is discharged to the compound building HVAC system, which then allows it to be processed by the GRS. The applicant specified that a COL applicant is to provide reasonable assurance that provisions meet ANSI/ANS-40.37, "Mobile Low-Level Radioactive Waste Processing Systems," and also requires that a COL applicant conform to the regulatory requirements of 10 CFR 50.34a, 10 CFR 20.1406, and RG 1.143 (COL Information Item 11.4(3)).

11.4.4.1.3 General Design Criteria 60 and 61 and 10 CFR 50.34a

GDC 60 requires the nuclear power unit design to include provisions to handle radioactive wastes produced during normal reactor operations, including AOOs. GDC 61 requires that the fuel storage and handling, radioactive waste, and other systems that may contain radioactivity be designed to ensure adequate safety under normal and postulated accident conditions.

The requirements of GDC 60 and 61 are met by the use of the regulatory positions in RG 1.143 as they relate to the seismic design, quality group classification of components used in the SWMS and structures housing the systems, provisions used to control leakage, and definitions of discharge paths, beginning with interfaces with plant primary systems and terminating at the point of controlled discharges.

The staff reviewed the QA provisions and RG 1.143 requirements specified by the applicant in the DCD. The applicant stated that the SWMS will conform to regulatory position C.7 of RG 1.143 and RG 1.33, which specifies the QA guidance to follow. DCD Table 3.2-1 also identifies the seismic category, quality group, and safety class for components of the SWMS. The QA program is stated to be designed in accordance with ANSI/ANS-55.6, which is in agreement with RG 1.143, position C.7. In determining the design guidance for radwaste systems, the applicant provided DCD Table 11.4-3, to reflect the guidance specified in RG 1.143 to meet the A_1 and A_2 values in 10 CFR Part 70, Appendix A. The staff's confirmatory calculations of the data provided by the applicant were unable to verify the results provided. The staff's analysis determined that the applicant's analysis was using a value of 0 in place of values that were not listed in 10 CFR Part 70, Appendix A, Table 1. In the text preceding Table 1, it states: "For individual radionuclides whose identities are known, but which are not listed in Table A-1, the A_1 and A_2 values contained in Table A-3 may be used. Otherwise, the licensee shall obtain prior Commission approval of the A_1 and A_2 values for radionuclides not listed in Table A-1, before shipping the material." The staff's confirmatory calculations used the values specified by Table 3 in Appendix A when determining the A_1 and A_2 values. The staff issued RAI 157-8149, Question 11.04-1, on August 18, 2015, (ADAMS Accession No. ML15230A390) to request that the applicant evaluate the use of the values specified in determining the A_1 and A_2 values to determine radwaste system classifications. In its response to RAI 157-8149, Question 11.04-1 dated September 17, 2015 (ADAMS Accession No.

ITEM NO.	DESCRIPTION	SECTION
	20.1406, NRC RG 1.143, IE Bulletin 80-10, and NRC RG 4.21. The COL applicant is to ensure that the implementation of mobile and temporary equipment meets the requirements of NUREG-0800 Sections 12.3 and 12.4 and that any impacts to the radiation zone maps are evaluated. The COL applicant is to prepare a plan to develop and use operating procedures and portable radiation monitoring instruments, so that regulatory requirements and guidance are followed.	
COL 11.4(4)	The COL applicant is to provide P&IDs.	11.4.2
COL 11.4(5)	The COL applicant is to prepare the site process control program, which is consistent with the guidance of NEI 07-10A, and the site radiological environmental monitoring program.	11.4.2 11.4.2.5 11.4.4
COL 11.4(6)	The COL applicant is to determine the number of shipment. If the generated waste exceeds the shipment amounts, the COL applicant is to provide details for how the extra generated waste that exceeds the shipment amounts will be handled.	11.4.2
COL 11.4(7)	The COL applicant is responsible for the collection, temporary storage, and shipment of mixed waste for offsite treatment and disposal.	11.4.2.2.44 typo
COL 11.4(8)	The COL applicant is responsible for the provision of a site-wide IRSF for interim storage of radioactive wastes. The COL applicant is to provide reasonable assurance that the design and operation of such a facility meets the regulations and guidance specified in NUREG-0800, Section 12.3 and 12.4, including 10 CFR 20.1101, 10 CFR 20.1406, RG 4.21 and RG 8.8.	11.4.2.22.5 typo
COL 11.4(9)	The COL applicant is to provide a mobile crane to retrieve a waste package that becomes stuck in the lifted condition or that is dropped.	11.4.2.3
COL 11.4(10)	The COL applicant is also to provide operational procedures to properly ship low-level wastes to external sites in accordance with the NRC and U.S. Department of Transportation (DOT) regulations.	11.4.2.33 typo
COL 11.4(11)	The COL applicant is to prepare the operational procedures and maintenance programs for the SWMS as related to leak detection and contamination control.	11.4.2.5
COL 11.4(12)	The COL applicant is to develop plant-wide RG 4.21 life-cycle planning for minimization of contamination program following the	11.4.2.5

ITEM NO.	DESCRIPTION	SECTION
	guidance in NEI 08-08A, in which the SWMS procedures and programs are to be integrated.	
COL 11.4(13)	The COL applicant is to maintain the complete documentation of system design, construction, design modifications, field changes, and operations.	11.4.2.5

The staff finds the above listing to be complete. Also, the list adequately describes actions necessary for the COL applicant. No additional COL information items were identified that need to be included in DCD Tier 2, Table 1.8-2, for the SWMS.

11.4.6 Conclusions

The staff concludes that the SWMS, as a permanently installed system, includes the equipment necessary to collect, hold, process, package, and store wet and dry solid wastes and control releases of radioactive materials associated with the operation of the SWMS. The applicant provided sufficient design information to demonstrate that it has met the requirements of 10 CFR 50.34a; GDC 60, GDC 61, and GDC 63 of 10 CFR Part 50, Appendix A; and NRC guidance and acceptance criteria. This conclusion is based on the following:

- The APR1400 design demonstrates compliance with 10 CFR 50.34a, as it relates to the inclusion of sufficient design information and system design features that are necessary for collecting, holding, processing, handling, packaging, and safely storing wet and dry solid radioactive wastes. The design conforms to the guidelines of BTP 11-3 and SRP Section 11.4, Appendix 11.4-A. The APR1400 demonstrates compliance with the requirements of GDC 61 by meeting the guidelines of RG 1.143 in providing sufficient wet and solid waste processing capacities and storage space to ensure adequate safety under normal operation, AOOs, and postulated accident conditions.

- The design of the APR1400 implements a plant-specific PCP, as an operational program, described in DCD Tier 2, Sections 11.4.3 and 13.4, for processing LLRW. The PCP addresses plant-specific operating procedures and acceptance criteria as they relate to the treatment and processing of radioactive wastes such that waste products generated by the SWMS will meet the classification and characterization definitions in 10 CFR 61.55 and 10 CFR 61.56, respectively. The implementation of a PCP is specified under COL Information Item 11.4(5), as described in DCD Tier 2, Table 1.8-2.

- The design of the APR1400 radioactive waste storage area in the compound building includes provisions for ~~60 days~~ 6 months of onsite storage of processed solid and wet wastes, exclusive of dry wastes classified as Class A wastes under 10 CFR 61.55. The approach to LLRW management presumes that LLRW will be disposed of by shipment to an authorized recipient under 10 CFR 20.2001(a)(1). Under that approach, the COL applicant should demonstrate the means included in the design to process dry solid and wet wastes so that these wastes meet the classification and characterization definitions in 10 CFR 61.55 and 10 CFR 61.56, respectively. The need for LLRW storage space beyond that of the design capacity of the radioactive waste storage areas is the responsibility of the COL applicant under the implementation of a plant-specific waste management plan and updated PCP.

COL 11.5(3)	The COL applicant is to provide site-specific procedures that conform with the numerical guides of 10 CFR 50.34a and 10 CFR Part 50, Appendix I.	11.5
COL 11.5(4)	The COL applicant is to prepare an offsite dose calculation manual (ODCM) that contains a description of the methodology and parameters for the calculation of the offsite doses for the gaseous and liquid effluents.	11.5.1.2 Table 11.5-2
COL 11.5(5)	The COL applicant is to provide analytical procedures and sensitivity for selected radio-analytical methods and types of sampling media for site-specific applications.	11.5.1.2
COL 11.5(6)	The COL applicant is also to develop operational procedures in accordance with NRC RG 1.33 and NRC RG 4.15.	11.5.1.2
COL 11.5(7)	The COL applicant is to develop a radiological and environmental monitoring program (REMP) in accordance with NUREG-1301 and NUREG-0133, and NRC RG 4.1, which describes the scope of the program, taking into account local and land use census data in identifying all potential radiation exposure pathways, associated radioactive materials present in liquid and gaseous effluent, and direct external radiation from SSCs.	11.5.1.2 11.5.2.4
COL 11.5(8)	The COL applicant is to develop detailed locations, tubing installations, and provide the sampling method including the sampling frequency and time to acquire representative sampling.	11.5.1.2
COL 11.5(9)	The COL applicant is to determine the monitor type, safety class, measuring range, and installed location of the RE-165 and RERE-166.	11.5.2.3.5~~5~~ typo Table 11.5-2
COL 11.5(10)	The COL applicant is to provide operational procedures and maintenance programs related to leak detection and contamination control.	11.3.3.1 11.5.2.4

As previously evaluated, the staff concludes that the above list of COL information items is complete and adequately describes the actions necessary for the COL applicant.

11.5.6 Conclusions

The staff concludes, using the information presented in the application, that the applicant has demonstrated compliance with NRC regulations and guidance and provided sufficient information in describing the provisions to avoid unmonitored and uncontrolled radioactive releases to the environment. The relevant regulation is contained in 10 CFR 20.1406 and the NRC guidance is contained in RG 4.21, RG 1.143, SRP Section 11.5, and IE Bulletin 80-10.

For the **confirmatory items tracked under RAI 131~~131~~-8087, Question 11.05-1; and RAI 132~~132~~-8088, Question 11.05-2~~2~~,** the staff will confirm that these items are incorporated in the next revision of the DCD.

typo