DOE/EA-2082

Environmental Assessment

for the

Disposal of Greater-Than-Class C (GTCC) Low-Level Radioactive Waste and GTCC-Like Waste at Waste Control Specialists, Andrews County, Texas

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ACRONYMS AND ABBREVIATIONS

ACHP	Advisory Council on Historic Preservation
ALARA	as low as reasonably achievable
CEQ	Council on Environmental Quality
CFR	*Code of Federal Regulations*
CISF	consolidated interim storage facility
CWF	Compact Waste Facility
DOE	U.S. Department of Energy
EA	environmental assessment
FWF	Federal Waste Facility
Final EIS	*Final Environmental Impact Statement for the Disposal of Greater-Than-Class C (GTCC) Low-Level Radioactive Waste and GTCC-Like Waste (DOE/EIS-0375)*
GTCC LLW	Greater-than-Class C low-level radioactive waste
HEPA	high-efficiency particulate air
LANL	Los Alamos National Laboratory
LCF	latent cancer fatality
LLRWPA	*Low-Level Radioactive Waste Policy Act of 1980,* amended by the *Low-Level Radioactive Waste Policy Amendments Act of 1985*
LLW	low-level radioactive waste
MCC	modular concrete canisters
mrem	millirem
mrem/hr	millirem per hour
NEF	National Enrichment Facility
NEPA	*National Environmental Policy Act of 1969*
NHPA	*National Historic Preservation Act*
NRC	U.S. Nuclear Regulatory Commission
NRHP	*National Register of Historic Places*
RCRA	*Resource Conservation and Recovery Act*
TAC	*Texas Administrative Code*
TLLRWDCC	Texas Low-Level Radioactive Waste Disposal Compact Commission
TCEQ	Texas Commission on Environmental Quality
TRCA	Texas Radiation Control Act
TRU	transuranic
WCS	Waste Control Specialists, LLC
WIPP	Waste Isolation Pilot Plant

1. INTRODUCTION

1.1 BACKGROUND

Section 3(b)(1)(D) of the *Low-Level Radioactive Waste Policy Act*, as amended by the *Low-Level Radioactive Waste Policy Amendments Act of 1985*, (Public Law 99-240) (LLRWPA) assigned the responsibility for the disposal of greater-than-Class C (GTCC) low-level radioactive waste (LLW) to the federal government. The U.S. Department of Energy (DOE) is the federal agency responsible for disposing of GTCC LLW. GTCC LLW is LLW that has radionuclide concentrations exceeding the limits for Class C LLW established in Title 10, Part 61, of the *Code of Federal Regulations* (10 CFR Part 61), "Licensing Requirements for Land Disposal of Radioactive Waste." GTCC LLW is generated by activities licensed by the U.S. Nuclear Regulatory Commission (NRC) or Agreement States.[1] The LLRWPA specifies in section 3(b)(2) that GTCC LLW for which the Federal government is responsible under section 3(b)(1)(D) is to be disposed of in a facility licensed by NRC and determined by the NRC to be adequate to protect the public health and safety (discussed further in Section 1.4.2). GTCC-like waste refers to DOE-owned or generated LLW and non-defense transuranic (TRU) waste that is without a disposal path and has characteristics sufficiently similar to those of GTCC LLW such that a common disposal approach has been proposed. "GTCC-like" is not intended to and does not create a new DOE classification of radioactive waste.

In February 2016, DOE issued the *Final Environmental Impact Statement for the Disposal of Greater-Than-Class C (GTCC) Low-Level Radioactive Waste and GTCC-Like Waste* (DOE/EIS-0375) (Final EIS; DOE 2016). The Final EIS evaluated the potential environmental impacts associated with the proposed development, operation, and long-term management of a disposal facility or facilities for GTCC LLW and DOE's inventory of GTCC-like waste. The inventory evaluated in the Final EIS is about 12,000 cubic meters (420,000 cubic feet) of GTCC LLW and GTCC-like waste and contains about 160 million curies of radioactivity. About three-fourths of this volume is GTCC LLW, with GTCC-like waste making up the remaining one-fourth of the volume. The preferred alternative for disposal of GTCC LLW and GTCC-like waste in the Final EIS is generic commercial facilities and/or the Waste Isolation Pilot Plant (WIPP) in New Mexico. There was no preference among the three land disposal technologies at the generic commercial facilities (i.e., intermediate-depth borehole, enhanced near-surface trench, and above-grade vault facilities).

In November 2017, DOE submitted the *Alternatives for the Disposal of Greater-Than-Class C Low-Level Radioactive Waste and Greater-Than-Class C-Like Waste Report to Congress*, as required by Section 631 of the Energy Policy Act of 2005 (DOE 2017). This Report to Congress provides an overview of the disposal alternatives for GTCC LLW and GTCC-like waste that were analyzed in the Final EIS. The Report to Congress noted that full waste emplacement operations at WIPP are not expected until the 2021 timeframe; therefore, DOE is primarily considering disposal in generic commercial facilities.

[1] Agreement States are states that have entered into agreements with the NRC that give the states the authority to license and inspect byproduct, source, or special nuclear materials used or possessed within their borders (Atomic Energy Act of 1954, as amended).

Though the Final EIS analyzed generic commercial facilities, it did not analyze a specific commercial facility because, while there was interest from vendors, no vendors provided specific information on disposal locations and methods. DOE had indicated in Section 12 of the Final EIS that should a specific commercial facility or facilities for disposal of GTCC LLW and GTCC-like waste be identified, DOE would conduct site-specific NEPA reviews, as appropriate. Therefore, DOE is preparing this *Environmental Assessment for the Disposal of Greater-Than-Class C (GTCC) Low-Level Radioactive Waste and GTCC-Like Waste at Waste Control Specialists* (DOE/EA-2082), which provides a site-specific analysis of the potential environmental impacts of disposing the GTCC LLW and GTCC-like waste at Waste Control Specialists, LLC (WCS) in Andrews, Texas. This site-specific EA is not a decision document. DOE will issue a Record of Decision on GTCC LLW and GTCC-like waste disposal after this EA has been issued.

1.2 PURPOSE AND NEED FOR AGENCY ACTION

At this time, there is no disposal capability for GTCC LLW or GTCC-like waste. In accordance with the LLRWPA, DOE is developing a path forward for the disposal of GTCC LLW that adequately protects the public health and safety. Although GTCC-like waste is not subject to the requirements in the LLRWPA governing disposal of GTCC LLW, DOE proposes to dispose of GTCC-like waste in the same manner as GTCC LLW. The purpose and need for agency action is to meet the federal government's legislative responsibility for disposal of GTCC LLW as provided in the LLRWPA and to provide for disposal of GTCC-like waste for which there is currently no identified disposal path.

1.3 NATIONAL ENVIRONMENTAL POLICY ACT

The Council on Environmental Quality (CEQ) addresses tiering documents associated with the *National Environmental Policy Act of 1969* (42 U.S.C. § 4321) (NEPA). Tiering allows an agency to avoid duplication through incorporating by reference the general discussions and relevant specific discussions from an environmental impact statement of broader scope into a NEPA document of lesser scope or vice versa. As an example, a broad-scope document (programmatic) would be followed by a site-specific or project-specific document. Without duplication of the analysis prepared for the previous document, the tiering process results in documents of greater use and meaning to the public as the plan or program develops. This site-specific EA is tiering from the Final EIS and hereby incorporates it by reference. Additional guidance on tiering is contained in the *Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations* (CEQ 1986).

On August 31, 2018, DOE transmitted a draft of this EA to the State of Texas for review in accordance with DOE's NEPA implementing procedures at 10 CFR 1021.301(d). After a 30-day review, Texas Commission on Environmental Quality (TCEQ) submitted comments on the Draft EA to DOE. DOE worked with TCEQ to ensure that all of its comments have been addressed.

1.4 WASTE CONTROL SPECIALISTS INFORMATION AND DOCUMENTS

1.4.1 Description of Current Waste Control Specialists Facilities and Operations

WCS operates a commercial 1,338-acre facility located on a 14,900-acre site in western Andrews County, Texas. WCS holds a license with the Texas Commission on Environmental Quality (TCEQ) to dispose of Class A, B, and C LLW and mixed LLW. The WCS site is located in one of the four regions of the United States evaluated in the Final EIS. The WCS site contains two major facilities for the disposal of LLW. These facilities are shown in Figure 1-1 and briefly described below.

Figure 1-1. Aerial Image of the Existing Waste Control Specialists Low-Level Radioactive Waste Disposal Facilities, Andrews County, Texas

As part of a previous WCS licensing process, TCEQ prepared the *Draft Environmental and Safety Analysis of a Proposed Low-Level Radioactive Waste Disposal Facility in Andrews County, Texas*

(TCEQ 2008) (Environmental and Safety Analysis Report) as supporting documentation for the licensing action to develop, operate, and close the two separate, but adjacent, facilities referenced below for the disposal of LLW at the WCS site in Andrews County, Texas. The licensing action authorized the two adjacent facilities under one license for near-surface land disposal of Class A, B, and C LLW. The Environmental and Safety Analysis Report was prepared in response to WCS' *Application for License to Authorize Near-Surface Land Disposal of Low-Level Radioactive Waste* (WCS License Application; WCS 2007a–n).

1.4.1.1 Compact Waste Facility

Operational since 2012, the WCS Compact Waste Facility (CWF) is owned and licensed by the State of Texas and operated by WCS. The Texas Low-Level Radioactive Waste Disposal Compact Commission (TLLRWDCC) was formed in accordance with the provisions of the LLRWPA to address the disposal of LLW generated in member states. The member states of the TLLRWDCC are Texas and Vermont. The WCS CWF is also available for the 34 states that do not have access to a compact disposal facility. Out-of-compact generators must submit an import petition to the TLLRWDCC for approval prior to shipping. The State of Texas also limits total non-compact waste disposed at the CWF to 30 percent of the licensed capacity. The current WCS CWF has a licensed capacity of 9,000,000 cubic feet and 3,890,000 curies.

1.4.1.2 Federal Waste Facility

The WCS Federal Waste Facility (FWF) was designed, permitted, and constructed for disposal of "federal facility waste" [2] that is the responsibility of the federal government under the LLRWPA. The WCS FWF opened on June 6, 2013, and has a current licensed capacity of up to 26,000,000 cubic feet and 5,600,000 curies. The FWF footprint that has been evaluated as part of the current license is approximately 80 acres. The design and license allow the disposal facility to be developed in phases consistent with the need to dispose of the volume of LLW received. Additional phases of the disposal facility will be constructed as needed and within the licensed capacity requirements.

All hazardous and radioactive waste at the WCS FWF is encapsulated in a robust liner and cover system, featuring a seven-foot-thick liner system that includes a one-foot-thick layer of reinforced concrete and a geo-synthetic layer that is compliant with the *Resource Conservation and Recovery Act* (RCRA, 42 U.S.C. § 6901 et seq.). In addition, all of the waste is buried within the highly impermeable red-bed clay formation that extends hundreds of feet beneath the deepest layer of waste.

WCS is also authorized to dispose of and accept mixed waste, as defined in Section 401.221, "Mixed Waste," of the Texas Health and Safety Code. Mixed waste is a combination of hazardous waste and LLW. Hazardous waste is regulated under Chapter 361, "Solid Waste Disposal Act," of the Texas Health and Safety Code and RCRA. In order to accept mixed waste at the WCS FWF, TCEQ issued a hazardous waste disposal permit in accordance with Title 30 of the *Texas Administrative Code*, Chapter 335 (30 TAC 335), "Industrial Solid Waste and Municipal Hazardous Waste." Mixed waste accepted for disposal is limited to federal facility waste, as

[2] "Federal facility waste" means LLW that is the responsibility of the federal government under the LLRWPA, but which excludes GTCC LLW (30 TAC 336.2[60]).

defined in Section 401.2005(4), "Definitions," of the Texas Health and Safety Code. Both GTCC LLW and GTCC-like waste can include mixed waste.

1.4.2 Regulatory Framework

In 2003, the Texas legislature amended the *Texas Radiation Control Act* (TRCA), which would ultimately provide a disposal facility for Class A, B, and C LLW generated within the commercial sector and for certain waste owned or generated by the federal government. Under the amended statute, the State of Texas would own the disposal facility and take title to commercial waste disposed of in the Texas CWF. Additionally, the Texas statute and TCEQ regulations required WCS to submit to TCEQ an agreement between DOE and the State of Texas, under which the federal government would take title to waste owned or generated by the federal government and disposed of in the FWF and agree to take perpetual ownership of the FWF at the time of decommissioning.

The current TCEQ regulations preclude disposal of GTCC LLW at the FWF. However it should be noted that on July 21, 2014, WCS submitted to TCEQ a petition for rulemaking, proposing certain changes to the regulations that could allow for the disposal for GTCC LLW, GTCC-like waste, and TRU waste (WCS 2014). On January 30, 2015, TCEQ sent a letter to the NRC requesting clarification regarding TCEQ's jurisdiction and authority to license and regulate the disposal of such waste at the WCS site in Andrews County, Texas (TCEQ 2015). On August 13, 2015, the NRC staff briefed the NRC Commissioners and stakeholders from TCEQ, DOE, other industry, and public interest groups, including WCS, on its review of the TCEQ request. The NRC staff's recommendation to the Commissioners was that the NRC would allow the State of Texas to license and regulate the disposal of GTCC LLW, and that NRC staff pursue a rulemaking to address TRU waste disposal in 10 CFR Part 61 (NRC 2015). On December 22, 2015, the Commission directed the NRC staff to develop a regulatory basis for disposal of GTCC LLW and TRU waste through means other than a deep geologic disposal, including near surface disposal, within six months of the completion of the final rule for 10 CFR Part 61. The Commission also directed the NRC staff to conduct a public workshop during the development of the regulatory basis to receive input from stakeholders. On September 8, 2017, the Commission revised its earlier directions regarding the development of the GTCC LLW and TRU waste regulatory basis, and directed the staff to develop the regulatory basis six months after the publication of the supplemental proposed rule for the 10 CFR Part 61 rulemaking. The NRC conducted public meetings in the spring of 2018 to identify the various technical issues that should be considered in the development of a regulatory basis for the disposal of GTCC LLW and transuranic waste (Volume 83 of the *Federal Register*, page 6475). To date, the NRC has not issued the supplemental proposed rule for the 10 CFR Part 61 rulemaking nor the GTCC LLW regulatory basis.

2. PROPOSED ACTION AND NO ACTION ALTERNATIVE

2.1 PROPOSED ACTION

DOE proposes to dispose of the entire GTCC LLW and GTCC-like waste inventory detailed in the Final EIS in the WCS FWF located in Andrews County, Texas.

2.1.1 Disposal

The WCS FWF has a current licensed capacity of up to 5,600,000 curies and 26,000,000 cubic feet. LLW with high surface dose rates must be placed inside modular concrete canisters (MCCs) and grouted. The canisters serve as enhanced waste packages and may either be cylindrical or rectangular. Either canister could potentially be used for disposing of GTCC LLW and GTCC-like waste. Waste that is placed in an MCC is grouted, rendering the final waste form resistant to human intrusion and impeding the environmental transport of radionuclides. The weight of a grouted MCC is approximately 100,000 pounds. WCS fabricates MCCs on site and has the capability to increase the density of the concrete as needed, thus providing for greater shielding of radioactive sources. Additionally, a steel insert may also be placed inside the MCCs to further protect workers responsible for waste-handling operations. After waste is placed and grouted inside an MCC, the canister is disposed of at depths up to 120 feet below grade at the WCS FWF. These MCCs are designed to stack on top of each other up to seven high. As part of the phased development and operations, the WCS FWF has an engineered cover system that is approximately 25 feet to 45 feet thick and is designed to prevent infiltration of precipitation until final closure.

Representatives at WCS have indicated that no additional construction activities or operational changes would be required to receive and dispose of the entire inventory of GTCC LLW and GTCC-like waste at the WCS FWF beyond its currently licensed design and operating conditions, which include the development of the facility in phases. WCS currently has the capability and capacity to accommodate the entire GTCC LLW and GTCC-like waste inventory identified and evaluated in the Final EIS (WCS 2018a). The Final EIS inventory represents the amount of GTCC LLW and GTCC-like waste that has been generated from currently operating facilities and has been projected to be generated from existing facilities or is projected from proposed future actions or planned facilities not yet in operation (DOE 2016, Appendix B). The current curie limit is a license condition and not a performance-based limitation and could be addressed in a license amendment associated with the acceptance and disposal of GTCC LLW and GTCC-like waste.

2.1.2 Closure

Closure associated with the Proposed Action would be consistent with the WCS license requirements. Closure could consist of any one or combination of the following activities: closure, dismantlement, decontamination, decommissioning, reclamation, disposal, aquifer restoration, stabilization, monitoring, or post-closure observation and maintenance. Post-closure activities could include carrying out an environmental monitoring program at the disposal site, periodic surveillance, minor custodial care, and other requirements as determined under the license. The specifics of closure are generally designed to provide stability of the site, minimize the potential for release of radioactivity, and protect from an inadvertent intrusion of the closed facility.

In the *Application for License to Authorize Near-Surface Land Disposal of Low-Level Radioactive Waste* (WCS License Application) evaluated in the TCEQ Environmental and Safety Analysis Report (TCEQ 2008), WCS identified the following four periods associated with closure:

1. **Site Closure and Stabilization Period –** A period that begins at the end of the WCS CWF and FWF operational period. During this period, the site is stabilized for post-closure care. Activities during the site closure and stabilization period include site modification to improve drainage and minimize erosion; decontamination of surface facilities; demolition of structures and facilities no longer necessary; and installation of monitoring devices. The duration of the site closure and stabilization period is estimated to last one to two years.

2. **Post-Closure Observation and Maintenance Period –** An observation period that begins after site closure and lasts until the licenses and/or permits for disposal facilities are transferred from the operator to the permanent custodian (state or federal governmental entity). This observation period for the FWF will be 30 years. Post-closure monitoring shall include quarterly samplings of all oil and gas wells and radon evaluations at former air monitoring sites. Annual fauna samples are also taken.

3. **Institutional Control Period** – Institutional controls begin when the license is transferred from the operator to the permanent government custodial agency as provided in 30 TAC 336.734, "Institutional Requirements." Institutional controls are designed to physically control access to the disposal facility. There are three types of controls:

    a. Proprietary institutional controls, which are put in place by the property owner, such as deed restrictions;

    b. Governmental institutional controls, which are based on a government's or police powers, such as zoning, water well use restrictions, and building permit requirements; and

    c. Physical controls, such as fences, markers, earthen covers, and radiological monitoring and maintenance for those controls. Active maintenance may also be required to maintain institutional controls and containment structures. Physical controls must be used in combination with ownership in fee simple title. At the end of the prescribed period of institutional control, the license will be terminated by the state agency in charge of oversight for the facility. The NRC specifies that the institutional control period will normally last 100 years. However, the institutional control period could last longer if radionuclides with long half-lives are disposed of at the facility and if active or surveillance-type maintenance is required for a longer period to protect the public and inadvertent intruders from radiation at the site or the site cannot be released for unrestricted use.

4. **Post-Closure Period** – The period of primary interest in the performance assessment process. A minimum period of 1,000 years after closure or the period where peak dose occurs, whichever is longer, is required as the period of analysis to capture the peak dose from the more mobile, long-lived radionuclides and to demonstrate that the performance objective in 30

TAC 336.724, "Protection of General Population from Releases of Radioactivity," is met.[3] During this post-closure period, physical access controls to the disposal site are assumed to be lost and site surveillance ended.

2.1.3 Transportation to the Waste Control Specialists Federal Waste Facility

The entire inventory of GTCC LLW and GTCC-like waste would be transported to the WCS FWF from the sites identified in the Final EIS. The potential impacts of transporting the waste are discussed in Chapter 3 of this document. The analysis assumes that the total quantity of GTCC LLW and GTCC-like waste and the number of shipments required over the time frame of the Proposed Action is consistent with that evaluated in the Final EIS.

2.2 NO ACTION ALTERNATIVE

The No Action Alternative for the current inventory of GTCC LLW and GTCC-like waste is the same as that presented in the Final EIS. In summary, under the No Action Alternative, current practices for storing GTCC LLW and GTCC-like waste would continue in accordance with current requirements (e.g., NRC, State, and DOE). The GTCC LLW generated by the operation of commercial nuclear reactors (mainly activated metals) would continue to be stored on site at the various nuclear reactor sites that generated this waste or at other reactors owned by the same utility. Sealed sources would also remain at generator or other licensee sites. DOE's Office of Global Material Security/Off-Site Source Recovery Project would continue to recover disused or unwanted sealed sources that present a national security or public health and safety threat. The third category of waste, "Other Waste," would also remain stored and managed at the generator or other interim storage sites. In a similar manner, all stored and projected GTCC-like waste would remain at current DOE storage and generator locations (these wastes currently are being stored at several DOE sites). See the Final EIS (DOE 2016) for additional information on the No Action Alternative relative the current GTCC LLW and GTCC-like waste. Potential impacts associated with the No Action Alternative are described in Section 3.5 of the Final EIS.

Under the No Action Alternative, the WCS FWF would continue operation consistent with existing and future permitted license activities that do not include the disposal of any GTCC LLW or GTCC-like waste. The TCEQ Environmental and Safety Analysis Report (TCEQ 2008) presents the potential environmental impacts associated with continued operation of the WCS FWF.

[3] Concentrations of radioactive material that may be released to the general environment in groundwater, surface water, air, soil, plants, or animals shall not result in an annual dose above background exceeding an equivalent of 25 millirems to the whole body, 75 millirems to the thyroid, or 25 millirems to any other organ of any member of the public. Effort shall be made to maintain releases of radioactivity in effluents to the general environment as low as is reasonably achievable (30 TAC 336.724).

3. AFFECTED ENVIRONMENT AND POTENTIAL CONSEQUENCES

Sections 1.1 and 1.4 of this site-specific EA discuss the most recent and relevant documents that contain information relevant to the Proposed Action including from the Final EIS. Section 1.4 introduces the WCS License Application (WCS 2007a–n) and TCEQ Environmental and Safety Analysis Report (TCEQ 2008), which include disposal analyses of Class A, B, and C LLW at the WCS site near Andrews, Texas. Consistent with DOE and CEQ NEPA regulations, implementing procedures, and guidance, this site-specific EA utilizes existing analyses from these documents to avoid duplication of effort and reduce paperwork. By tiering from the Final EIS, this site-specific EA provides a comparative analysis of the Proposed Action and is able to "eliminate repetitive discussions…and to focus on the actual issues ripe for decision" (40 CFR 1508.28). The following bullets provide a summary of the analytical approach being used to assess potential environmental consequences in each of the affected resource areas.

- The information associated with each affected resource area in this site-specific EA is summarized and referenced from the documents prepared for the WCS FWF and CWF facilities (TCEQ 2008) and the recent submittal of the *WCS Consolidated Interim Spent Fuel Storage Facility Environmental Report* (CISF Environmental Report) (WCS 2018b).

- The evaluation in this site-specific EA compares the WCS FWF site with similar disposal alternatives in the same geographical area that were analyzed in the Final EIS.

- The Final EIS evaluated transportation, handling, and disposal of the entire inventory of GTCC LLW and GTCC-like waste to existing disposal facilities near the WCS FWF. Therefore, that information is representative of transportation to the WCS FWF.

This site-specific EA evaluates the same resource areas that were evaluated in the Final EIS. The evaluation in this chapter incorporates the premise stated in Section 2.1.1 that no additional construction activities or operational changes to current licensed facilities are needed in order to receive and dispose of GTCC LLW and GTCC-like waste at the WCS FWF. The following resource-specific discussions present the relevant information consistent with the application of the graded approach. This approach focuses discussion on items that are important to the NEPA evaluation of the Proposed Action. Resource areas and the potential for environmental impacts are discussed commensurate with their potential for significance.

The potential impacts of the No Action Alternative are addressed in Section 2.2.

3.1 CLIMATE AND AIR QUALITY

3.1.1 Affected Environment

3.1.1.1 Climate

Meteorological variables such as precipitation, temperature, humidity, and wind and information about potential storm activity are used to assess effects of climate on performance of a waste disposal site and evaluate potential environmental impacts. Meteorological data were collected and compiled as part of the environmental review and licensing process for the existing WCS LLW disposal facilities (TCEQ 2008). Onsite meteorological data (January 2000 to December 2005)

and longer-term regional data sets from National Weather Service meteorology stations were used to describe the climate of the WCS site (TCEQ 2008; WCS 2007a, Appendix 2.3.1). These 2008 data were reviewed and determined to still be representative of the climate of the region. Regional climatological records included information from Hobbs and Jal, New Mexico, and Andrews and Midland, Texas. These sites are 20 to 64 miles from the WCS site.

3.1.1.1.1 Precipitation

Approximately 70 percent of annual precipitation occurs from June through November, with most rains falling during brief but frequent intense thunderstorms. The average annual rainfall at the WCS site from January 2000 through December 2005 was 15.8 inches; similar to the long-term regional records. The average annual snowfall for the region ranges from 3.4 to 5.1 inches (WCS 2007a).

3.1.1.1.2 Temperature and Humidity

The WCS site climate is characterized by warm summer temperatures and cold winter temperatures. The average daily maximum temperature recorded on site from 2000 through 2005 exceeded 100 degrees Fahrenheit in June through August. The average daily minimum temperature recorded on site from 2000 through 2005 was below freezing from November through March. Relative humidity values range from 30 percent in April to 84 percent in October (WCS 2007a, Table 25).

3.1.1.1.3 Wind

The wind at the WCS site blows primarily from the south. Winds from the south, south-southeast, and south-southwest directions account for 28.5 percent of the wind data. Average wind speeds are fairly consistent year-round. The strongest average winds measured at WCS from 2000 to 2005 were from the southerly direction with speeds from 8 to 11.5 miles per hour (mph) (WCS 2007a).

3.1.1.1.4 Natural Hazards and Storm Activity

Sand or dust storms typically occur in the winter or early spring caused by strong westerly winds. Dust storms, when visibility is less than 0.5 mile, last for six hours or less. Tornado records from the National Oceanic and Atmospheric Administration indicate that for Andrews County, Texas, two tornadoes, recorded in 1962 and 1982, were categorized as F2 (wind speed from 113 to 157 mph), nine were categorized as F1 (wind speed from 73 to 112 mph), and 13 were categorized as F0 (wind speed from 40 to 72 mph). Meteorology data evaluated for the licensing and environmental review of the WCS CWF indicate that Andrews County experiences about one flooding event per year, 3.2 high-wind occurrences per year, and 6.2 occurrences of hail per year. Because storm events can be localized, the actual frequency of occurrences at specific locations within the county, such as the WCS site, is often less than that indicated by county-wide records (WCS 2007a).

3.1.1.2 Air Quality

Both Andrews County, Texas and Lea County, New Mexico (the closest county in the adjacent state) are in attainment for all criteria air pollutants defined in the National Ambient Air Quality Standards (e.g., nitrogen dioxide, sulfur dioxide, lead, carbon monoxide, particulate matter, and ozone). Operations of the WCS CWF generate small amounts of particulate matter (fugitive dust from vehicles and landfill excavation) and criteria pollutants from fuel combustion (vehicles, heavy equipment, and boilers).

The Final EIS describes the affected environment at several federal facilities, including the Los Alamos National Laboratory (LANL) and WIPP, approximately 300 and 80 miles from the WCS site, respectively. The air quality environments of these locations in southwestern United States are similar to that of the WCS site, with all three locations in attainment for all criteria pollutants. Section 8.1.1.3 of the Final EIS describes the air quality environment for LANL; Section 4.2.1.2 describes the air quality environment for WIPP.

3.1.2 Potential Consequences

3.1.2.1 Climate

The Proposed Action would have no direct impacts on the regional climate. Section 5.3.1.2 of the Final EIS includes a qualitative discussion regarding global climate impacts. These impacts would be similar for the WCS disposal proposal discussed in this site-specific EA.

3.1.2.2 Air Quality

The Final EIS evaluated potential criteria pollutants impacts from the construction and operation of an enhanced near-surface disposal vault, which is similar to the WCS FWF, for five semi-arid and arid environments. The analysis for near-surface disposal at WIPP would be more representative of the WCS LLW disposal facility (DOE 2016, Section 8.2.1). Emissions were estimated to be a small fraction (less than 0.1 percent or smaller) of county-wide emissions. The integration of GTCC LLW and GTCC-like waste into the existing FWF would not require any additional construction activity beyond that already planned and would not change the existing operations at the WCS site. Therefore, the Proposed Action would not be expected to increase the emission of any criteria air pollutants in the vicinity of the WCS site.

3.1.3 Mitigation Measures

Existing best management practices for the WCS LLW facilities, listed below, would continue during implementation of the Proposed Action:

- Continue operation of the existing WCS meteorological monitoring stations and air quality monitoring program to provide real-time and long-term onsite data. These data can be used for monitoring ongoing operations, emergency management, and input to performance assessment models.

- Continue operational control of fugitive dust from access roads, in the WCS FWF, and on stored excavated material stockpiles with water or other soil surfactants as appropriate (WCS 2007b, Appendix 5.5).

No additional mitigation measures beyond those mentioned above for the WCS LLW facilities are required for climate and air quality.

3.1.4 Unavoidable Adverse Impacts

Because the Proposed Action would not be impacted by the regional climate nor would the Proposed Action impact air quality, there would be no unavoidable adverse impacts to or on this resource area.

3.2 GEOLOGY AND SOILS

3.2.1 Affected Environment

The WCS site is located in western Texas and lies within the southern portion of the High Plains section of the North American Great Plains physiographic province. The site is situated on the southwestern edge of the Southern High Plains. The Southern High Plains is an elevated area of undulating plains with low relief encompassing a large area of western Texas and eastern New Mexico. This area is generally defined to the west by the Pecos River Valley and the Mescalero Ridge. However, in the vicinity of the WCS FWF, the Mescalero Ridge is not well defined. To the north and east, the Southern High Plains is bounded by cap-rock escarpments resulting from head-ward erosion of the Canadian, Red, Brazos, and Colorado rivers. To the south, the Southern High Plains transitions into the Edwards Plateau, without a well-defined boundary. The topographic expression at the WCS site is mostly subdued, with long, gentle slopes (TCEQ 2008, p. 177). Across the site, elevations range from approximately 3,415 feet to 3,500 feet above mean sea level.

The regional and local geology and description of soils were compiled as part of the Environmental and Safety Analysis Report (TCEQ 2008, Section 6.3) and the CISF Environmental Report (WCS 2018b). Figure 3-1 presents a cross-sectional view of the WCS FWF, from north to south.

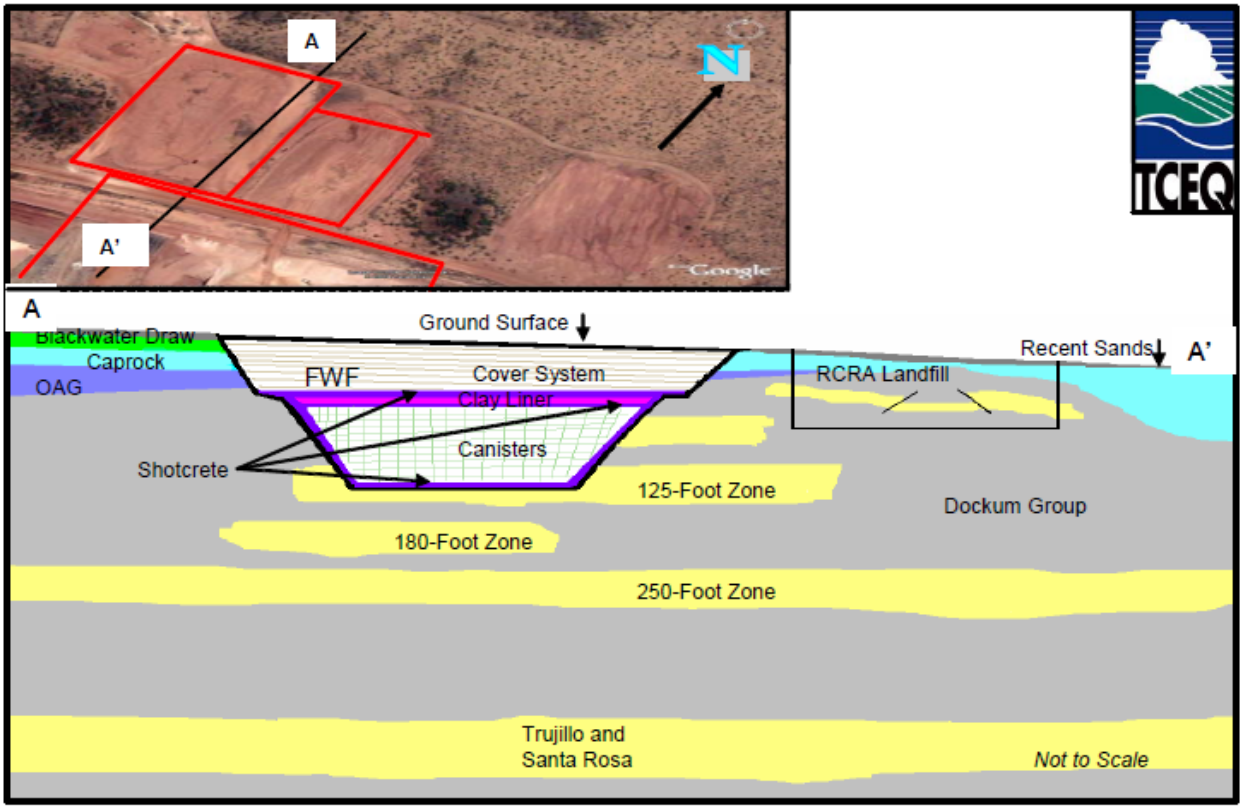
The WCS site is situated over the north-central portion of the prominent structural feature in the Permian Basin known as the Central Basin Platform. The Central Basin Platform is an area of moderate, low-intensity seismic activity. Some of the seismic activity in southeastern New Mexico and west Texas is possibly induced by oil and gas production, secondary recovery, or waste injection although segregating induced from natural seismic activity is difficult. The largest earthquake in the vicinity, about 19 miles from the WCS site, was the Rattlesnake Canyon earthquake in 1992 with a magnitude of 5 (WCS 2007c). A site-specific probabilistic seismic hazard analysis of the WCS site was completed in 2004 to estimate the levels of ground motions that could be exceeded at a specified annual frequency (or return period) at the site, incorporate the site-specific effects of the near-surface geology on ground motions, and develop seismic design parameters for the site (WCS 2007l). The seismic hazard at the WCS site was estimated to be low with a 2,500-year return period peak horizontal acceleration on soft rock of only 0.04*g*; where *g* is the acceleration due to gravity of 9.8 meters per second per second. The analysis stated that the

absence of late-Quaternary faulting and the low-to-moderate rate of background seismicity, even that associated with petroleum recovery activities, results in low seismic hazard at the WCS site.

No subsidence features related to salt dissolution (karst formations) have been identified within the facilities area or the immediate vicinity of the site (WCS 2007c). The nearest active subsidence features to the WCS site are the San Simon Swale, the San Simon Sink, the Wink Sinks, and a sink northwest of Jal, New Mexico (WCS 2007c, Figure 2.5.6).

3.2.2 Potential Consequences

Construction at the WCS FWF occurs in phases, as stated in Section 1.4.1.2 of this site-specific EA, and will comply with the current WCS facility license conditions for the planned volume of the disposal area. Since no new construction or operational changes beyond those identified in the current license would be needed to receive and dispose of GTCC LLW and GTCC-like waste at the WCS FWF (see Section 2.1.1 and the introduction to this chapter), there would be no additional potential consequences to geology or soils. Although seismic activity could potentially affect the engineered barriers, potential seismic hazards have been integrated into the existing WCS facility design (WCS 2007g, 2007m), which would not be impacted by the proposed disposal of GTCC LLW and GTCC-like waste.



Source: TCEQ 2008, Figure EA-4.

Figure 3-1. Conceptual Cross Section of the Waste Control Specialists Federal Waste Facility and Stratigraphy

3.2.3 Mitigation Measure

Because the Proposed Action would not impact geology and soils, there are no mitigation measures identified for this resource area.

3.2.4 Unavoidable Adverse Impacts

Because the Proposed Action would not impact geology and soils, there would be no unavoidable adverse impacts to or on this resource area.

3.3 WATER RESOURCES

3.3.1 Affected Environment

3.3.1.1 Surface Water

The WCS site region has a semi-arid climate, with low precipitation rates and minimal surface water. There are no permanent and only occasionally ephemeral sources of surface water (e.g., playas) on or in the vicinity of the site. Ephemeral surface water includes several natural playas located to the northeast and east of the existing facilities (WCS 2007n, Figure 1) that hold surface water following heavy or sustained rainfall events. The largest playa basin lies approximately 2,500 feet to the northeast, with an overall basin relief of about 20 feet (TCEQ 2008). In general, the playas retain surface water for less than two weeks with retention time depending on magnitude of the rainfall event, size of the playa basin, and the infiltration potential of the basin soil materials (WCS 2007c). The manmade surface water features identified within five miles of the site include Baker Spring, various stock tanks, and ponds. There are no coastal high-hazard areas or wetlands present on the facility area or within five miles of the facility area.

3.3.1.2 Groundwater

The Trujillo and Santa Rosa formations are considered to be part of the larger Dockum Group, designated a minor aquifer by the Texas Water Development Board (TWDB 2018). The WCS license includes design and operational aspects that are intended to be protective of water resources (TCEQ 2008, Sections 2 and 3). Groundwater at the WCS site is monitored in several transmissive zones: the Ogallala-Antlers-Gatuna unit, the 125-foot zone (dry), the 180-foot zone, and the 225-foot zone (Figure 3-1). The 225-foot zone of the Dockum Group is considered the uppermost regulated groundwater zone at WCS. The WCS site uses approximately 42,000 gallons per year of offsite potable water purchased from the City of Eunice, which represents about 0.03 percent of water consumption by the City of Eunice (TCEQ 2008, Section 5.13).

3.3.2 Potential Consequences

Expansion of the WCS FWF occurs in phases as disposal capacity is needed, as stated in Section 1.4.1.2 of this site-specific EA, and would comply with the current WCS facility license conditions affecting water resources. Since no construction or operational changes would be required to implement the Proposed Action, there would be no impact to water resources.

3.3.3 Mitigation Measures

There are current and planned measures that are part of the license for the WCS facility to protect water resources (WCS 2017j). No new measures would be required as a direct result of the Proposed Action.

3.3.4 Unavoidable Adverse Impacts

Because the Proposed Action would not impact water resources, there would be no unavoidable adverse impacts to or on this resource area.

3.4 HUMAN HEALTH

3.4.1 Affected Environment

The near-term operational and longer-term potential impacts related to the health of workers, nearby personnel, and future occupants of the WCS general area after closure and loss of institutional controls have been extensively evaluated for WCS facilities including the CWF, FWF, and nearby operations as a part of the TCEQ licensing process. The TCEQ licensing process parallels the requirements of the NRC for licensing of other similar radioactive waste disposal sites.

Besides the TCEQ licensing process, the Final EIS reports similar evaluations for other similar sites. The Final EIS evaluates the potential human health impacts that could result from the disposal of the entire inventory of GTCC LLW and GTCC-like waste at any of eight alternative sites (seven federal DOE sites and a generic commercial facility in each of the four regions of the United States). One of the generic commercial facilities modeled in the Final EIS was in the western United States, was an enhanced above-grade disposal vault, and had arid conditions that can be used as a surrogate for WCS FWF (Kirk & Jacobi 2015).

The radiological baselines for the WCS site are described in detail in WCS (2007c, Appendix 11.1.1, Section 8.1.4). The radiological baselines described therein are based on a background sampling program completed in 1996 and include radioactivity concentrations in biota, soil, vegetation, air, groundwater, and surface water—all found to be consistent with the natural background radiation. Additional baseline monitoring was conducted after 1996 and prior to WCS licensing. Ambient gamma radiation exposures were also measured and found to be consistent with natural background radiation.

3.4.1.1 Worker Dose – Normal Operations

Radiation safety programs are a part of the TCEQ Radioactive Material License No. R04100 (TCEQ 2016). WCS has committed to maintaining doses to the workforce as low as reasonably achievable (ALARA) (WCS 2007d, Appendix 8.0-4). WCS (2007e, Appendix 5.5.2-1) includes a discussion of WCS' management commitment to ALARA and WCS' administrative control limits for radiation exposure presented in procedure LL-RSP-100, "Radiation Safety Program."

WCS License Condition 120 requires annual dose monitoring reports. In 2017, the WCS Radiation Safety Department monitored 115 employees at the WCS site for occupational exposure. The

collective dose for those workers was 5.2 person-rem. The highest dose for any worker in 2017 was 333 mrem (WCS 2018c). Similarly, the collective worker dose was 4.9 person-rem, with a maximum worker dose of 318 mrem in 2016 (WCS 2017b).

The actual experience at WCS for 2016 and 2017 is similar to the worker dose exposures projected in the Final EIS, in which the annual collective worker dose estimates for the disposal facility were mainly from handling the wastes. The annual collective worker doses were estimated to be 4.2 person-rem for the trench disposal method and 5.2 person-rem for the vault disposal method. These doses correspond to a potential annual risk of a latent cancer fatality (LCF) of 0.003. It was expected that the maximum dose to any individual worker would not exceed the DOE administrative control level of 2 rem per year. No fatalities were expected to occur during waste disposal operations, and about two lost work days per year were projected due to occupational injuries and illnesses (DOE 2016, page 9-80 – 9-81 and Table 5.3.4-2).

The potential radiological impacts to members of the general offsite public from routine operations associated with LLW disposal are those associated with chronic exposure to very low levels of radiation via the air pathway. Potential radiation doses to members of the public are expected to be very low due to the strict procedures and protocols that are implemented to avoid airborne releases (WCS 2007c, Section 5.1.2.2). Potential long-term impacts are provided below in Section 3.4.1.3, "Performance Assessment."

3.4.1.2 Worker and Offsite Public Dose – Accident Scenarios

The 2007 WCS Environmental Report (WCS 2007c, Appendix 11.1.1) evaluated several hypothetical operational accidents involving LLW, including a waste container breach and an explosion or fire at the WCS FWF. Containers could be breached by various mechanisms, including dropping, collision, crushing, container defect, or spills. These mechanisms for breaching or rupturing a container could occur during vehicle transport or handling on site during a number of operational activities. The estimated doses from these hypothetical accidents to an onsite worker are well below the annual occupational dose limit of five rem, stipulated in 30 TAC 336.305, "Occupational Dose Limits for Adults." The estimated dose to the offsite receptor is below the annual dose limit of 100 mrem for a member of the public, as stipulated in 30 TAC 336.313, "Dose Limits for Individual Members of the Public."

3.4.1.3 2008 WCS Performance Assessment

The WCS long-term human health models for Class A, B, and C LLW disposal conducted for the TCEQ licensing process (TCEQ 2008) and the information contained in the Final EIS made similar waste assumptions consistent with the NRC standards and practices presented in the LLW disposal rules (10 CFR Part 61). In both cases, the keys to isolation of the waste from the public and limiting the potential for human radiological exposure are the inherent geological features of the site in limiting the infiltration of water into the waste, dissolving the waste, and transporting the waste via water to points where it might be consumed by individuals. Engineered features, such as waste packaging and disposal site design, liners, and a closure cap limit the potential for water to come into contact and subsequently interact with waste and transport radionuclides from the disposal site. These features, however, may not be fully functional after institutional controls are lost. At the WCS FWF, the site geology provides an effective barrier to the transport of

radionuclides to the underlying groundwater even after institutional controls are no longer effective. Unless there is intrusion into the waste, the principal remaining pathway for the transfer of the radionuclides to the accessible environment is the gradual diffusion upward through the unsaturated media to the atmosphere or downward to the underlying groundwater. The diffusion process is very slow compared to transport via a groundwater pathway.

The 2008 WCS performance assessment for Class A, B, and C LLW disposal assumed that the site would not be monitored post-closure; therefore, there would not be any worker doses during that period. Although airborne releases could occur by the upward diffusion of radionuclides through the overlying cover system, it is expected that wind dispersion of any released radionuclides would result in low potential dose at the site boundary.

During the period of institutional controls, the highest doses to the public are expected to be those associated with the migration of radionuclides to the surface via upward diffusion through the unsaturated clays and their subsequent inhalation by the general public.

After the institutional control period, nearby or adjacent residents could continue to be exposed by inhalation of gases or particulates that have diffused upward from the LLW disposal facilities to the atmosphere. In addition, the WCS licensing performance assessment considered several onsite intruder exposure scenarios, including a ranch worker, an oil field worker, a recreational hunter, a dry-land farmer, and an onsite resident. For these scenarios, potential exposure pathways include inhalation of outdoor gas-phase radionuclides emanating from the closed facilities, inhalation of particulates due to resuspension of surface soil above the facilities, incidental ingestion of surface soil, external dose from surface and near-surface soil, and exposure to oil well drill cuttings in a mud pit.

3.4.2 Potential Consequences

3.4.2.1 Impacts on Human Health During Operations

3.4.2.1.1 Worker Dose – Normal Operations

Since no operational changes to the current license are needed to receive and dispose of GTCC LLW and GTCC-like waste at the WCS FWF (see Sections 2.1.1 and the introduction to this chapter), no additional potential consequences to workers were identified. The expected worker doses from normal operations would be consistent with those reported in Section 3.4.1.1. The WCS radiation safety programs required by the WCS TCEQ license would continue with the addition of GTCC LLW and GTCC-like waste. WCS waste-handling operations are primarily remote, which limits the potential exposure to workers. These practices would continue with the addition of GTCC LLW and GTCC-like waste packages. ALARA goals would limit exposures to individual workers. Worker doses are primarily driven by radiation levels at a distance from the waste package, which also must be within regulatory limits. There would be no additional impacts expected for members of the general public under normal operations and, as described in Section 3.4.1.1, the expected offsite impacts would remain very low.

3.4.2.1.2 Workers and Offsite Public Dose – Accidents and Intentional Destructive Acts

The Final EIS evaluates potential impacts from accidents involving the release of radioactive materials to offsite locations, which would be dependent on the local meteorology and location of nearby individuals. While meteorology and locations of nearby individuals are very much site-dependent, the radiation doses and LCF risks to an individual near the WCS site would generally be expected to be comparable to those predicted for use of the federal sites in the Final EIS. The highest dose to an individual for the various federal sites evaluated in the Final EIS ranges from 2.4 to 16 rem (0.001 to 0.009 LCF). This individual is assumed to be located 330 feet from an accident involving a fire to a standard waste box (due to the distances to the site boundaries, the individual is expected to be a noninvolved worker). The doses to the impacted population in the downwind sector from such an accident were estimated to range from 0.47 to 160 person-rem (0.0003 to 0.1 LCF).

Although WCS will comply with all appropriate health and safety procedures and requirements during disposal of GTCC LLW and GTCC-like waste, it is possible that accidents may occur, resulting in a worker injury and potentially the offsite release of radioactive materials. Since GTCC LLW and GTCC-like waste disposal operations at the WCS FWF would follow the same general processes as under the current operations, the Proposed Action would not introduce any new, unique accident scenarios to the facility beyond those considered in the TCEQ license process.

DOE evaluated the consequences of scenarios involving intentional destructive acts, such as sabotage or terrorism events, associated with the disposal of GTCC LLW and GTCC-like waste in the Final EIS. Potential intentional destructive act scenarios involving the GTCC LLW and GTCC-like waste could occur during transportation of the waste to the disposal facility, while the waste containers are being handled at the disposal facility (unloading, temporary storage, and emplacement), or after emplacement. The details of the analyses and the range of potential consequences of various scenarios are presented in Section 5.3.4.4 of the Final EIS (DOE 2016).

3.4.2.2 Modified WCS Performance Assessment and Potential Consequences

As mentioned in Section 3.4.1.3, the TCEQ licensing process included a performance assessment to evaluate the potential long-term impacts from disposing Class A, B, and C LLW at the WCS site (TCEQ 2008). Since that time, WCS has modified the performance assessment to also evaluate the potential radiological impacts related to the disposal of GTCC LLW and GTCC-like waste in the WCS FWF. This performance assessment has not yet been submitted to TCEQ as a formal request for review and license amendment. WCS used the same GTCC LLW and GTCC-like waste inventories presented in the Final EIS (Kirk & Jacobi 2015) in the modified performance assessment. Additionally, the updated performance assessment used the same probabilistic conceptual model and radiological exposure scenarios that were used to support the major amendment to Radioactive Material License No. R04100, which was approved by TCEQ, authorizing disposal of large quantities of depleted uranium and removing the disposal limits for certain radionuclides (technetium-99, carbon-14, and iodine-129). Since the site is in a semi-arid environment, most of the transport of radionuclides to the environment is expected to be through

upward diffusion of volatile radionuclides, including helium-3, carbon-14, argon-39, krypton-85, iodine-129, and radon-222, to the surface rather than via groundwater. The volatile radionuclides could diffuse in the air and water in the soil. The diffusion pathway of greatest interest to dose is from the waste layers upward to the ground surface, so that pathway received extra attention in the WCS modeling.

Additionally, WCS evaluated thermal loading considerations of disposal of GTCC LLW and GTCC-like waste in the WCS FWF relative to the facility license requirements. Waste packages are disposed of inside of grout-filled, reinforced concrete canisters and each concrete canister is separated from other canisters by a layer of sand. The additional material (concrete, grout, and sand) occupies approximately four times the airspace of the original waste being disposed. This extra material prevents any localized heating from "hot spots" impacting surrounding waste. Additionally, the licensing process would include an evaluation of the waste acceptance criteria, disposal configurations, and geometries to ensure no adverse impacts due to thermal loading and that all requirements would be in place for the safe disposal of the GTCC LLW and GTCC-like waste. Based on these factors, the disposal of GTCC LLW and GTCC-like waste with the other LLW permitted for disposal would not cause any long-term issues with individual cell performance and, therefore, would not impact the long-term performance of the facility.

The peak dose for most receptors is dominated by upward diffusion of technetium-99. The WCS model assumed that the source inventory is equally spread over the entire waste inventory. If the GTCC LLW and GTCC-like waste are disposed of in the lower levels of the cell, this upward diffusion would be further stunted. Note that a canister placed on the bottom layer of the WCS FWF would be more than 100 feet below the surface. With the recently approved expansion for LLW operations, which allows seven layers of waste canisters, the bottom two layers will be greater than 100 feet below the surface. The WCS analysis does not take credit for the reduced solubility and transport of the technetium-99 through the grout or for iron components in the reinforced concrete that create a chemically reducing condition that further slows the migration of the technetium-99. In addition, the rates of upward diffusion processes are postulated to be a conservative estimate because the upper layers are very porous and dry, which creates a capillary barrier that further decreases upward diffusion.

The model results that address the potential impacts from the Proposed Action are presented in Table 3-1. The results indicate an increase in potential peak dose impacts to the nearest permanent resident; however, the expected doses would remain several orders of magnitude below the regulatory limit. Because of the geologic conditions at the site, as well as the license mitigation measures, releases would not be expected to show up until well after most of the radionuclides had decayed away. Only very long-live radionuclides would be expected to remain.

The results of the 2015 performance assessment for the WCS FWF for disposal of all GTCC LLW and GTCC-like waste reported in the Final EIS meet the performance objectives in 30 TAC 336 (Kirk & Jacobi 2015).

Table 3-1. Waste Control Specialists' Model Results for GTCC LLW and GTCC-Like Waste Inventory—Effective Dose after Loss of Institutional Control

	Modeled Receptors (mrem per year)					
	Nearest Permanent Resident	**Ranch Worker**	**Oil Field Worker**	**Recreational Hunter**	**Dry-Land Farmer**	**Onsite Resident**
Regulatory Limit[a,b]	25	(b)	(b)	(b)	(b)	(b)
Base-Case Expected LLW Inventory in WCS FWF[c]	8.7×10^{-9} @ 1,000 y	2.3×10^{-4} @ 100,000 y	0.014 @ 600 y	6.6×10^{-5} @ 100,000 y	0.0028 @ 100,000 y	0.16 @ 100,000 y
All GTCC + LLW Inventory[d]	6.8×10^{-7} @ 1000 y	0.043 @ 100,000 y	0.1 @ 600 y	0.012 @ 100,000 y	0.52 @ 100,000 y	26 @ 100,000 y

FWF = Federal Waste Facility; LLW = low-level radioactive waste; y = year

[a] Regulatory limits are from 30 TAC 336.723, "Performance Objectives," and 336.724, "Protection of General Population from Releases of Radioactivity."

[b] The regulatory limits only apply for periods under institutional controls. After loss of institutional controls, TCEQ guidance suggests a 500 mrem/yr dose criterion for an onsite inadvertent intruder.

[c] Base case is the expected Class A, B, and C LLW inventory in the WCS FWF.

[d] GTCC Case: All GTCC LLW and GTCC-like waste from the Final EIS plus the base case expected LLW inventory.

Source: Kirk & Jacobi 2015.

3.4.3 Mitigation Measures

There are current and planned measures to address the health and safety of workers and the offsite public that are part of the current licensing process for the WCS facility (WCS 2007j). No new measures would be required as a direct result of the Proposed Action. The current and planned measures could include design, operational, and monitoring activities to prevent and provide early detection of releases of radionuclides and chemical constituents before they leave the disposal site boundary (see Sections 2.1.1 and 2.1.2 of this document).

3.4.4 Unavoidable Adverse Impacts

LLW that is currently disposed of in the WCS FWF under the existing TCEQ license has the potential for short- and long-term impacts to health and safety. Because of the geologic conditions at the site, as well as the license mitigation measures, releases would not be expected until well after most of the radionuclides had decayed away. Only very long-live radionuclides would be expected to remain (see Section 3.4.2 above). Transport of radionuclides from the waste to the surface or underlying groundwater would still be limited by diffusion through the unsaturated soils.

The implementation of the Proposed Action has the potential to increase the potential unavoidable adverse impacts, as reported in Table 3-1.

3.5 ECOLOGY

3.5.1 Affected Environment

The terrain in western Texas and adjacent areas of New Mexico surrounding the WCS LLW disposal facilities is gently rolling with shallow washes. The regional semi-arid climate with low annual seasonal rainfall and hot summer temperatures and cold winter temperatures (Section 3.1.1.1) supports vegetation of predominately grasses with scattered shrubs.

Three ecological surveys were conducted on the WCS site and surrounding area prior to development of the WCS LLW disposal facilities (WCS 2007f, Appendix 2.9.1, Attachments 1A, 1, and 2). These surveys describe and document the major plant, animal, and aquatic resources on the WCS site and surrounding vicinity. These resources are briefly discussed in the following sections with a description of the current ecological resources within the WCS LLW disposal facilities where GTCC LLW and GTCC-like waste would be disposed.

The Final EIS provides a detailed description of the ecology of the affected environment for WIPP, approximately 80 miles west-southwest of the WCS site. The environment described in the Final EIS is similar to that in western Texas.

3.5.1.1 Terrestrial Ecology

The vegetation on the WCS LLW facility prior to development was predominately grasses with some forbs and shrubs. The most abundant grasses were black grama (*Bouteloua eriopoda*), blue grama (*Bouteloua gracilis*), slim tridens (*Tridens muticus*), purple threeawn (*Aristida purpurea*), and sand dropseed (*Sporobolus cryptandrus*) (Ortega et al. 1997, as cited in WCS 2007f). The most common shrub was sand shinnery oak (*Quercus harvardii*), some soapweed (*Yucca* sp.), and honey mesquite (*Prosopis glandulosa*).

During development of the WCS LLW facilities, vegetation was cleared from the FWF footprint, and no additional vegetation removal is required for the Proposed Action. Supporting facilities, such as stormwater retention and evaporation ponds, were also constructed during the initial site development. The WCS operations and administration buildings and other WCS disposal facilities surround the FWF. Vegetation was also removed from the footprint of these facilities during construction of the WCS site. The immediate area surrounding the LLW facilities is crossed by numerous access and service roads, railroad tracks, and surface water runoff diversion canals.

A variety of wildlife were observed or positively identified from signs during the three ecological surveys. Mourning doves (*Zenaida macroura*) were the most abundant bird species. Other common birds observed include scaled quail (*Callipepla squamata*), Chihuahuan raven (*Corvus cryptoleucus*), roadrunner (*Geococcyx californicus*), American kestrel (*Falco sparverius*), brown-headed cowbird (*Molothrus ater*), and savannah sparrow (*Passerculus sandwichensis*). Observed mammals include black-tailed jackrabbit (*Lepus californicus*), coyote (*Canis latrans*), gophers, mule deer (*Odocoileus hemionus*), Ord's kangaroo rat (*Dipodomys ordii*), silky pocket mouse (*Perognathus flavus*), deer mouse (*Peromyscus maniculatus*), northern grasshopper mouse (*Onychomys leucogaster*), southern plains woodrat (*Neotoma micropus*), and plains harvest mouse (*Reithrodontomys montanus*). Reptiles observed in the study area include whiptail lizards (*Cnemidophorus* sp.), southern prairie lizard (*Sceloporus undulatus consubrinus*), and dunes

sagebrush lizard (*Sceloporus arenicolus*). Habitat for these species has been mostly removed on the WCS site. Vertical structures, such as buildings and poles, provide perching locations for bird species such as mourning doves, ravens, and raptors.

3.5.1.2 Aquatic Ecology

There are no permanent natural surface waters within the WCS site. Wetlands do not occur on the WCS site (TCEQ 2008). Occasional ephemeral water sources form in depressions (e.g., playas) or roadside ditches following heavy precipitation events. As described in Section 3.3.1.1, several playas occur northeast and east of the WCS site. These ephemeral water sources occasionally support breeding populations of amphibians such as the Texas toad (*Bufo speciosus*) and spadefoot toad (*Scaphiopus multiplicatus*) and invertebrates adapted to ephemeral water sources (WCS 2007f). Playas may also provide temporary water sources for terrestrial wildlife. Stormwater retention and evaporation ponds have been constructed within the existing WCS site and also provide a water source for wildlife in this semi-arid environment.

3.5.1.3 Recreationally Important and Threatened or Endangered Species

Mule deer, collared peccary (*Tayassu tajacu*), mourning doves, and scaled quail have been observed in the area and are managed as game species for recreational hunting. Species listed as either threatened or endangered by the federal government or State of Texas or being considered for federal listing are shown in Table 3-2. The two most likely species to be found on or near the WCS facilities are the Texas horned lizard (*Phrynosoma cornutum*) and the dunes sagebrush lizard. The Texas horned lizard is listed as threatened by the State of Texas and was observed on the WCS site during the ecological surveys in 1996 and 2006 (WCS 2007c, Appendix 11.1.1). The dunes sagebrush lizard was a federal candidate species, but the U.S. Fish and Wildlife Service decided in 2012 that a federal listing was not warranted. Favorable habitat includes open sandy blowouts near shinnery oak (WCS 2018b), which occur in the vicinity of the WCS site in isolated patches.

Table 3-2. Federal and State Threatened or Endangered Species

Common Name	Scientific Name	Federal Status	State Status	Comments
Texas horned lizard	*Phrynosoma cornutum*	(a)	Threatened	(a)
Dunes sagebrush lizard	*Sceloperus arenicolus*	(a)	(a)	Federal listing not warranted[b]
Peregrine falcon	*Falco peregrinus anatum*	(a)	Threatened	Potential migrant
Bald eagle	*Haliaeetus leucocephalus*	(a)	Threatened	Potential migrant
Lesser prairie-chicken	*Tympanuchus pallidicinctus*	(a)	(a)	Federal candidate
Northern aplomado Falcon	*Falco femoralis septentrionalis*	Endangered	Endangered	(a)

[a] Not applicable.

[b] https://www.gpo.gov/fdsys/pkg/FR-2012-06-19/html/2012-14818.htm

The lesser prairie-chicken, a federal candidate species, has not been found in the vicinity of the WCS site. Although the site is within the southern range of the species, surveys conducted in 2004 at the WCS site detected no individuals (WCS 2007f, Appendix 2.9.1). The northern aplomado falcon, a federally listed species, is an unlikely resident at the WCS site. The area is located on

the northern edge of the falcon's range and existing industrial development on site and in the surrounding vicinity diminishes the potential habitat value.

3.5.2 Potential Consequences

The acceptance of GTCC LLW and GTCC-like waste for disposal at the WCS FWF would occur in the existing developed facilities (Figure 1-1). Therefore, no impacts to ecological resources are expected. Vegetation has already been cleared from the WCS FWF and other existing support facilities. Some additional vegetated areas may be temporarily covered by stockpiles of excavated soil from the FWF during waste emplacement. However, any minor impacts would occur under current operation of the FWF and would not be specifically caused by disposal of the additional GTCC LLW and GTCC-like waste.

Impacts to recreationally important species are not expected because vegetation within areas to be used for GTCC LLW and GTCC-like waste disposal has already been removed. DOE has determined that the Proposed Action would have no effect on the federally and State-listed northern aplomado falcon. This determination is based on the fact that the falcon is unlikely to occur in the vicinity based on current and historical ranges (USFWS 2014), and all activities related to the Proposed Action would occur within existing WCS facilities where vegetation had been already removed. In addition, no changes to existing operations or modifications to facilities are expected for GTCC LLW and GTCC-like waste acceptance that would potentially affect the northern aplomado falcon or other protected species. DOE has also determined that the Proposed Action would not affect the three State-listed threatened species (see Table 3-2) because all project activities would occur within the existing facilities where habitat for these species does not exist.

Section 5.3.5 of the Final EIS addresses potential environmental impacts to ecological resources for disposal of GTCC LLW and GTCC-like waste. The majority of the discussion describes potential impacts resulting from construction activities, which, as described above, would not be relevant for the Proposed Action in this site-specific EA. Additionally, the Final EIS evaluates the potential for impacts to ecological resources from exposure to radionuclide contamination. Section 5.3.5.2.7 of the Final EIS states that the depth of disposal and cover materials associated with the disposal facilities is expected to prevent or minimize the exposure of wildlife to radionuclides.

3.5.3 Mitigation Measures

The existing WCS facilities have been designed to prevent potential landfill intrusion by burrowing animals, such as ground squirrels (*Ictidomys mexicanus, Xerospermophilus spilosoma*), pocket gophers, and ants, and deep-rooted native plants known to occur in the area (WCS 2007f, Appendix 2.9.1; 2007g, Appendix 3.0-1; 2007h, Appendix 7.1.1-1). The landfill design includes a biointrusion barrier in the multi-layer cover system. No additional mitigation would be required for disposal of GTCC LLW and GTCC-like waste.

3.5.4 Unavoidable Adverse Impacts

Because the Proposed Action would not impact ecological resources, there would be no unavoidable adverse impacts to or on this resource area.

3.6 SOCIOECONOMICS

Section 5.2.6 of the Final EIS describes the methods used for the socioeconomic analysis for the various disposal alternatives. Socioeconomic data for each site alternative describe a region of influence surrounding the site, which was made up of multiple counties. The region of influence was used to assess the impacts of site activities on employment, unemployment, income, population, housing, community fiscal conditions, public services (including the local transportation network), and community service employment. The region of influence at each site was based on the residential locations of workers directly related to site activities, and it encompassed the area in which these workers spend their wages and salaries.

Several socioeconomic analyses have been conducted for different WCS license applications. The most recent analysis was conducted in 2015 for the CISF Environmental Report (WCS 2018b, Appendix A) and best represents the current socioeconomic environment surrounding the WSC site. The region of influence for this analysis was defined as a 30-mile radius around the WCS site.

3.6.1 Affected Environment

The primary labor markets for the WCS site are Andrews County, Texas, and Lea County, New Mexico. WCS onsite staffing was 184 employees in 2015, with approximately 20 additional corporate employees (WCS 2018b, Appendix A). Approximately 50 percent of the employees live in Texas and 50 percent in New Mexico. Most employees in Texas live in the city of Andrews, which has a population of about 14,000 people. The city of Andrews is located about 30 miles east-southeast of the WCS site and is the county seat of Andrews County. The city of Andrews has been in a period of large economic activity, triggered by major industry investments, which have brought in hundreds of high-paying jobs and additional construction activity. There are no population centers in Andrews County closer to the WCS facility. The surrounding area is very rural and semi-arid, with commerce in livestock production, agriculture (cotton, sorghum), and substantial oil and gas production, which represents most of the county's wealth and income. Andrews County covers 1,500 square miles, and in 2010, its population density was 9.9 persons per square mile. Based on population projections from 2020 to 2070 by the Texas Water Development Board for Texas Counties, Andrews County is projected to grow by 107.3 percent, or an average annual growth rate of approximately 1.4 percent (WCS 2018b, Appendix A).

The WCS employees that live in New Mexico are evenly split between the cities of Hobbs and Eunice in Lea County. The current socioeconomic conditions for Lea County are similar in most respects to Andrews County. Lea County is relatively large, covering 4,390 square miles in southeastern New Mexico. The county population density is 14.7 persons per square mile. The population in Lea County is projected to grow by 71 percent between 2010 and 2040, or an average annual growth rate of approximately 1.8 percent (WCS 2018b, Appendix A). Agriculture (ranching and farming) and oil and gas production are major components of the economy, with a growing manufacturing sector (WCS 2018b, Section 3.10). The city of Hobbs has a population of 34,122 people and is approximately 20 miles northwest of the WSC site. The city of Eunice has a population of 2,922 people and is approximately six miles west of the WCS site.

In addition to the direct and indirect economic benefits through employee salaries (2016 annual payroll of approximately $16 million) and secondary job growth, the WCS facilities provide revenue to both Andrews County and the State of Texas (WCS 2018d). Both Andrews County and the State of Texas receive five percent of the gross sales of all radioactive waste disposal activities. WCS makes quarterly payments to the State of Texas and Andrews County. The five-percent gross receipts fee, deposited into the State's General Revenue fund, was suspended from September 1, 2017, to August 31, 2019 by an amendment to the Texas Health and Safety Code (TCEQ 2017). Andrews County has received approximately $8.1 million in fee revenues for four years of disposal operations (through September 30, 2016). The State of Texas has received approximately $43.5 million of disposal fees since operations began at the WCS site (WCS 2018d).

3.6.2 Potential Consequences

WCS does not expect to hire any additional employees for the disposal of GTCC LLW and GTCC-like waste at the WCS FWF. Therefore, the Proposed Action would not impact the local economies or government services in Andrews County or Lea County. The acceptance and disposal of GTCC LLW and GTCC-like waste would add a new waste stream in the FWF. The revenues expected over the WCS FWF lifetime are not expected to change significantly as a result of acceptance and disposal of GTCC LLW and GTCC-like waste.

Section 5.3.6 of the Final EIS presents the common socioeconomic impacts associated with the various disposal alternatives. The evaluation covers the alternatives for disposal at federal sites; however, impacts for a generic commercial facility were not evaluated because of the site-specific data needs for the analysis.

3.6.3 Mitigation Measures

There are no mitigation measures needed for this resource area.

3.6.4 Unavoidable Adverse Impacts

Because the Proposed Action would not negatively impact socioeconomics, there would be no unavoidable adverse impacts to or on this resource area.

3.7 ENVIRONMENTAL JUSTICE

The Final EIS explains that the analysis of the impacts of a GTCC LLW and GTCC-like waste disposal facility on environmental justice issues follows guidelines described in *Environmental Justice Guidance under the National Environmental Policy Act* (CEQ 1997). The analysis method has three parts: (1) the geographic distribution of low-income and minority populations in the affected area; (2) an assessment of whether the impacts from construction and operations would be high and adverse; and (3) if the impacts would be high and adverse, a determination of whether these impacts would disproportionately affect minority and low-income populations. Section 5.2.7 of the Final EIS provides a detailed analysis of environmental justice concerns.

3.7.1 Affected Environment

Race/ethnicity and poverty data for the four counties (Lea County, New Mexico, and Andrews, Gaines, and Winkler counties, Texas) within a 30-mile radius[4] of the WCS site indicate that the proportion of racial and ethnic minorities and percent of households below poverty level in the population are comparable to the same demographic variables for the states of Texas and New Mexico (TCEQ 2008). Racial and ethnic minorities (defined as non-white groups) constitute 44.6 percent of the total population in the four counties located within the region of interest. This is lower than the Texas state average of 55.3 percent and the New Mexico state average 47.6 percent. In Lea County, 17.3 percent of households live below the poverty level, compared to the state average of 14.5 percent. In Texas, 13.9 percent of the households in Andrews County, 17.3 percent in Gaines County, and 14.4 percent in Winkler County live below the poverty level, compared to the state average of 12.0 percent. These data indicate that racial/ethnicity and low-income populations in the vicinity of the WCS site are not disproportionally greater than those across the larger region of New Mexico and Texas. A similar socioeconomic analysis prepared for the NRC also identified no minority or low-income populations exceeding 50 percent of the relevant block group or more than 20 percentage points greater than the state or county percentages within a four-mile radius of the WCS site (WCS 2018b, Appendix A).

3.7.2 Potential Consequences

Because the region does not contain disproportionate minority and low-income populations, no disproportionately high, and adverse impacts to minority or low-income populations would occur.

Section 5.3.7 of the Final EIS discusses the common environmental justice impacts associated with the various disposal alternatives. The evaluation covers the alternatives for disposal at federal sites; however, impacts for a generic commercial facility were not evaluated because of the site-specific data needs for the analysis.

3.7.3 Mitigation Measures

No specific mitigation measures have been identified because the disposal of GTCC LLW and GTCC-like waste at the WCS FWF would not disproportionately impact minority or low-income populations.

3.7.4 Unavoidable Adverse Impacts

Because the Proposed Action would not impact minority or low-income populations, there would be no unavoidable adverse impacts to or on this resource area.

[4] The Final EIS uses a 50-mile radius; however, the TCEQ environmental and safety analysis (TCEQ 2008) uses a 30-mile radius. Since potential impacts at the WCS site primarily would be more localized, this inconsistency does not affect the analysis.

3.8 LAND USE

Land use is a classification of parcels of land relative to the presence of human activities (e.g., industry, agriculture, and recreation) and natural areas. Section 5.2.8 of the Final EIS provides a detailed overview of the considerations and data used to describe land use at the various alternative sites.

3.8.1 Affected Environment

Land use on the WCS site prior to the construction of the LLW facilities was rangeland used for grazing livestock and wildlife habitat. Oil and gas production occurred in the surrounding area. Current land use at the WCS LLW disposal site is industrial and is similar to other land uses within approximately one mile, including the Lea County landfill, a uranium enrichment production plant, and an aggregate quarry in New Mexico. The WCS site includes the FWF, CWF, other disposal areas, stormwater retention and evaporation ponds, excavated material storage piles, multiple access and service roads, and buildings to support workers and operations (Figure 1-1). The FWF, where the GTCC LLW and GTCC-like waste would be disposed of, has been cleared of vegetation and is partially excavated for acceptance of Class A, B, and C LLW.

3.8.2 Potential Consequences

The disposal of GTCC LLW and GTCC-like waste in the WCS FWF would not change any existing land use or impose any additional limits or restrictions on future land uses surrounding the facility.

3.8.3 Mitigation Measures

The development of the existing WCS facilities for RCRA waste and Class A, B, and C LLW required a long-term commitment of land use from mostly rangeland to industrial waste site. TCEQ (2008, Section 8) and WCS (2007i, Appendix 6.1.1-1; 2007j, Appendix 6.1.2-1) discuss the long-term management of the site, including land ownership, site closure, decommissioning, post-closure monitoring, and institutional control. Integrating GTCC LLW and GTCC-like waste into the WCS FWF would not change or require the addition of any mitigation measures in the existing site closure and post-closure plans for managing the long-term land use and access at the WCS site.

3.8.4 Unavoidable Adverse Impacts

Because the Proposed Action would not impact land use, there would be no unavoidable adverse impacts to or on this resource area.

3.9 TRANSPORTATION

GTCC LLW and GTCC-like waste would be transported to the WCS site via truck or rail for disposal. Sections 5.2.9 and 5.3.9 of the Final EIS provide an analysis of potential transportation impacts. The analysis includes an estimate of both radiological and non-radiological impacts associated with the shipment of GTCC LLW and GTCC-like waste during disposal facility operations from their points of origin to the disposal sites. One of the sites evaluated in the Final

EIS, WIPP, is approximately 80 miles west-southwest of the WCS site and therefore provides a good analog for the evaluation of potential impacts associated with transportation of GTCC LLW and GTCC-like waste to the WCS site.

3.9.1 General Approach and Assumptions

The Final EIS evaluates potential impacts for transportation under routine and accident conditions. Radiological impacts during routine conditions are a result of human exposure to the low levels of radiation near the shipment. The regulatory limit established in 49 CFR 173.441, "Radiation Level Limitations," and 10 CFR 71.47, "External Radiation Standards for All Packages," to protect the public is 10 millirem per hour (mrem/hr) at six feet from the outer lateral sides of the transport vehicle. This dose rate corresponds roughly to 14 mrem/hr at three feet. As discussed in the Final EIS, a DOE complex-wide radionuclide profile of similar waste was used to estimate the dose rate of GTCC LLW and GTCC-like waste shipments (Appendix C, Section C.9.4.4). The external dose rate for contact-handled shipments was set to 0.5 and 1.0 mrem/hr at three feet for truck and rail shipments, respectively. For shipments of remote-handled waste, the external dose rate was set to 2.5 and 5.0 mrem/hr for truck and rail shipments, respectively. About 94 percent of all shipments would be composed of remote-handled waste. The assignment of dose rates was based on shipments of similar types of waste. Dose rates for individual rail shipments are approximately double those for truck shipments because rail shipments are assumed to have twice the number of waste packages as those on a corresponding truck shipment. Impacts from accidents, should they occur, are dependent on the amount of radioactive material in a shipment and on the fraction that is released if an accident occurs.

3.9.2 Potential Consequences

This site-specific EA assumes that the transportation impacts projected for transport to the WIPP site in Section 4.3.9 of the Final EIS are representative of the transportation impacts to the WCS site because of the relative proximity between the WIPP and WCS sites.

As identified in Section 4.3.9.1 of the Final EIS, a total of 33,700 truck shipments or about 11,800 rail shipments would be required to transfer the GTCC LLW and GTCC-like waste to the WIPP site, which would be the same number of shipments expected to the WCS site. This could result in two non-radiological fatalities from accidents for truck transport or one accident fatality for the rail option. The collective population dose for truck transport to the WIPP (or WCS) site is estimated at 68 person-rem (42 with rail option) and could result in an LCF risk of up to 0.1 (0.03 with rail option), which includes an accident risk of up to 5×10^{-2} LCF. The worker doses for truck transport are estimated at 180 person-rem (54 person-rem with rail option) and could result in an LCF risk of 0.1 (0.03 with rail option). The values for truck transport are larger by a factor of 1.6 to 3.3 than the corresponding values for rail transportation because a larger number of truck shipments would be required. Table 4.3.9-1 in the Final EIS presents the estimated collective population transportation risks for shipments to the WIPP site. These risks are provided separately and collectively for each of the different waste types.

3.9.3 Mitigation Measures

There were no mitigation measures identified specific to the Proposed Action. The transportation of GTCC LLW and GTCC-like waste to the WCS FWF would follow all applicable transportation safety regulations.

3.9.4 Unavoidable Adverse Impacts

While the transportation of GTCC LLW and GTCC-like waste to the WCS FWF would follow all applicable transportation safety regulations to minimize potential impacts, there would be a small potential for unavoidable adverse health and safety impacts, as identified in Section 3.9.2 of this site-specific EA, associated with the national transportation program.

3.10 CULTURAL RESOURCES

The Final EIS evaluation of cultural resources includes archaeological and historic architectural sites and structures, as well as places from the past having important public and scientific uses and may include definite locations (sites or places) of traditional cultural or religious importance to specified social or cultural groups, such as American Indian tribes ("traditional cultural properties"). Cultural resources can be either manmade or natural physical features associated with human activity and, in most cases, are unique, fragile, and non-renewable. Cultural resources that meet the eligibility criteria for listing on the National Register of Historic Places (NRHP) are termed "historic properties" under the *National Historic Preservation Act* (16 U.S.C. § 470; NHPA).

NHPA is a comprehensive law that creates a framework for managing cultural resources in the United States. It expands the NRHP; establishes State Historic Preservation Offices, Tribal Historic Preservation Offices, and the Advisory Council on Historic Preservation (ACHP); and provides a number of mandates for federal agencies. Section 106 of the NHPA directs all federal agencies to take into account the effects of their undertakings (actions and authorizations) on historic properties included in or eligible for listing in the NRHP. Section 106 of NHPA is implemented by the ACHP regulations at 36 CFR Part 800, "Protection of Historic Properties." Section 106 regulations permit agencies to integrate compliance with the NEPA process.

Sections 5.2.10 and 5.3.10 of the Final EIS describe the evaluation applied to the alternative sites in the EIS. The evaluation covers the alternatives for disposal at federal sites; however, impacts for a generic commercial facility were not evaluated because of the site-specific data needs for the analysis.

3.10.1 Affected Environment

An archaeological survey was conducted at the WCS site (150 acres) in 1994 prior to the expansion of the facility (WCS 2007k). The survey found no archaeological resources and concluded that the location was not well suited for the presence and preservation of archaeological resources. In 2006, a review was conducted of site records for archaeological projects within 6.2 miles of the then proposed WCS LLW project site. Eighteen known archaeological sites, including seven sites that are eligible for the NRHP, were found during the review. The closest sites were between 1.8 and 2.5 miles from the proposed facility. Although some of the sites may lie within the viewshed

of the now existing WCS FWF, it was concluded that the facility would be unlikely to have an adverse effect on the sites. In addition, both the New Mexico State Historic Preservation Officer and the Texas Historical Commission provided stamps of approval that the WCS LLW facility would be unlikely to have negative impacts on historic, architectural, cultural, or archaeological resources (WCS 2007k, Appendix 2.2.1, Attachments 2 and 3; 2007c, Appendix 11.1.1, Section 2.6; TCEQ 2008, Section 5.1).

3.10.2 Potential Consequences

DOE has determined that acceptance and disposal of GTCC LLW and GTCC-like waste at the WCS FWF would not impact historic, architectural, cultural, or archaeological resources. This determination is based on the fact that disposal of GTCC LLW and GTCC-like waste would occur entirely within the existing WCS FWF footprint and would not involve any additional land disturbance or construction, and that both the New Mexico State Historic Preservation Officer and the Texas Historical Commission had previously concluded that the WCS facility would be unlikely to have negative impacts on historic, architectural, cultural, or archaeological resources.

3.10.3 Mitigation Measures

To minimize any potential impact to historic and cultural resources, WCS put in place accidental discovery procedures (TCEQ 2008, Section 5.1). In the unlikely event that human remains or other significant archaeological resources were uncovered during excavation of the WCS FWF for waste disposal, all work would cease and an archaeological reviewer at the Texas Historical Commission would be notified to assess the site before work proceeded.

3.10.4 Unavoidable Adverse Impacts

Because the Proposed Action would not impact historic, architectural, cultural, or archaeological resources, there would be no unavoidable adverse impacts to or on this resource area.

3.11 WASTE MANAGEMENT

3.11.1 Affected Environment

The current WCS LLW disposal operations have the potential to generate various waste types, including sanitary waste and radioactive and non-radioactive solid wastes.

Sanitary wastes generated at the WCS site include the effluents from facility drinking water fountains, water closets, lavatories, mop sinks, and other similar fixtures.

Solid radioactive wastes may be generated at the WCS site as a result of cask contamination surveillance and decontamination activities. These wastes generally consist of paper or cloth swipes, paper towels, protective clothing, and other job-control wastes contaminated with low levels of radioactivity. Expended high-efficiency particulate air (HEPA) filters from the facility ventilation system, along with job-control waste associated with filter change-out, also may contribute to the generation of solid radioactive waste. Job-control waste generated during filter change-out is collected and monitored along with other LLW.

Solid radioactive wastes would be collected in containers and temporarily stored in the transfer facility. Small volumes of solid radioactive wastes are anticipated. These wastes would be disposed of in the WCS FWF as LLW.

Non-radioactive solid wastes are expected to be generated as a result of routine maintenance, operations, and administrative support functions at the WCS FWF. Prior to releasing solid materials for unrestricted release, radiological surveys would be conducted to ensure that any potential levels of radioactivity are below applicable limits.

Non-radiological solid waste would be disposed of at a solid waste municipal landfill. Hazardous or mixed waste is not expected to be generated from the disposal of GTCC LLW and GTCC-like waste in the WCS FWF.

3.11.2 Potential Consequences

The Final EIS projects annual radioactive and non-radioactive waste generation rates during operation of a GTCC LLW and GTCC-like disposal facility. These rates were applied to both the federal and commercial disposal sites. The water used to wash down the truck after it delivered the GTCC LLW or GTCC-like waste to the disposal facility could be contaminated (albeit unlikely). The Final EIS analysis conservatively assumes that the wash-down water would be considered liquid LLW until determined otherwise. As outlined in Appendix D, Table D-16, of the Final EIS, the projected annual volume of wash-down water was 780,000 gallons of water that would require survey and possible treatment (e.g., evaporation) before disposal as solid LLW. The analysis also projected an additional 16 cubic yards per year of solid LLW, including HEPA filters. Projected annual non-radioactive waste generation included 320,000 gallons per year of sanitary waste and 120 cubic yards per year of solid non-hazardous waste, such as domestic trash and office waste.

Because the WCS FWF is currently operating and has waste management procedures in place for the disposal of LLW, operation of the existing WCS FWF for GTCC LLW and GTCC-like waste disposal is expected to have a negligible impact on waste generation and waste management infrastructure at the WCS site and is not expected to result in a substantial increase in waste generation.

3.11.3 Mitigation Measures

There are no mitigation measures needed for this resource area.

3.11.4 Unavoidable Adverse Impacts

Because the Proposed Action would not substantively change the amount of waste handled or disposed at the WCS FWF, there would be no unavoidable adverse impacts to or on this resource area.

4. CUMULATIVE IMPACTS

4.1 INTRODUCTION

CEQ defines a cumulative impact as an impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such actions (40 CFR 1508.7, "Cumulative Impact"). This chapter of the site-specific EA provides the analytical approach and results for the cumulative impacts analysis that considers the Proposed Action.

4.2 ANALYTICAL APPROACH

As documented in this site-specific EA, there have been several NEPA-related documents prepared in recent years that address cumulative impacts in the region, including the WCS FWF. As discussed previously, the Proposed Action would not involve any construction or operational changes beyond those already identified in the current license for the WCS FWF. As a result, Chapter 3 of this document identifies no or very small potential environmental consequences resulting from the Proposed Action that would incrementally contribute to these previously analyzed cumulative impacts. Therefore, the past, present, and reasonably foreseeable future actions that have been previously identified and evaluated in existing documents are representative of the cumulative impacts related to the Proposed Action. The following sections provide an overview of the cumulative impacts evaluations and a summary of the evaluations.

The most recent and relevant document that presents cumulative impacts, excluding the Proposed Action, in the region surrounding the WCS FWF is Revision 1 of the CISF Environmental Report[5] (WCS 2017a). WCS submitted this report to the NRC, consistent with the requirements of NUREG-1748. The analysis of cumulative effects in the CISF Environmental Report is based on an assessment of information presented in previous documents prepared for licensing actions for facilities that could contribute to cumulative impacts or provide analysis relevant to those actions. These documents include:

- *Draft Environmental and Safety Analysis of a Proposed Low-Level Radioactive Waste Disposal Facility in Andrews County, Texas* (TCEQ 2008)
- *Environmental Impact Statement for the Proposed National Enrichment Facility (NEF) in Lea County, New Mexico* (NRC 2005)
- *Final Environmental Impact Statement for the Construction and Operation of an Independent Spent Fuel Storage Installation on the Reservation of the Skull Valley Band of the Goshute Indians and Related Transportation Facility in Toole County, Utah* (NRC 2001)

The CISF Environmental Report evaluates the cumulative effects that would occur when the proposed action to license, construct, and operate a CISF for storing 40,000 metric tons of spent nuclear fuel for the next 60 years is added to the past, present, and reasonably foreseeable

[5] Revision 1 of the CISF Environmental Report (WCS 2017a) includes an analysis of cumulative impacts. It should be noted that Revision 2 of the same report (WCS 2018b) does not include an analysis of cumulative impacts.

developments that may occur at other nearby facilities within a 30-mile radius. These facilities include:

- WCS CWF, FWF, and Byproduct Materials Disposal Facility
- WCS RCRA Treatment, Storage, and Disposal Facility Landfill
- National Enrichment Facility (NEF)
- Permian Basin Materials, a nearby quarry
- Lea County, New Mexico, landfill
- Sundance Industries, oil production water, "produced water" treatment facility

The proposed CISF would be constructed adjacent to the NEF uranium facility that supports the commercial nuclear industry and is licensed by the NRC. The NRC previously evaluated the cumulative impacts associated with the construction and operation of the NEF. The results from the NEF cumulative impacts analysis included consideration of the WCS CWF, FWF, and RCRA landfill located approximately one mile to the east; Permian Basin Materials, a nearby quarry; the Lea County landfill; and Sundance Industries "produced water" treatment facility. The NEF EIS reported that the most likely cumulative effects would be to air quality and noise during construction of this facility. These impacts would not be cumulative with the Proposed Action or the proposed CISF because the NEF facility construction has been completed.

The CISF Environmental Report states that impacts during construction of the CISF may combine with other proposed construction projects in the area, such as the licensed, phased development of the WCS CWF and FWF, to create local cumulative impacts. These cumulative impacts may affect air quality during construction of the CISF and may combine with impacts from operations at Permian Basin Materials and from the manufacture of concrete at WCS' existing batch plant, which supports WCS' LLW disposal operations. The combined cumulative impacts from these operations are reported to be small (WCS 2017a).

The radiological environmental impacts attributable to operations at the WCS CWF have been well below the TCEQ-established radiation protection standards. Since operations at this facility began in 2012, the highest effective radiation dose to a member of the public was conservatively estimated at 5.7 mrem per year (WCS 2013, as cited in WCS 2017a). The radiological impacts associated with the CISF were estimated at 11 mrem per year. Information contained in the NEF Radiological Environmental Monitoring Program reports provide a summary of potential radiological effluent releases to the environment, ambient levels of gamma and neutron radiation measurement, and other environmental media from 2006 through 2011 (WCS 2017a). Results concluded that there were no releases of manmade radioactive material, and releases from operations were consistent with those of the natural environment. The public receptor of doses from these individual facilities would not be the same location. Nonetheless, a conservative estimate of the cumulative impacts to an offsite member of the public is estimated as the sum of these doses; that is, 16.7 mrem per year. The cumulative radiological impacts from all regional sources of radiation are well below the 100 mrem per year radiation protection standard for individual members of the public established in 10 CFR 20.1301, "Dose Limits for Individual Members of the Public."

The CISF Environmental Report evaluates the same past, present, and reasonably foreseeable future actions that would be applicable to the Proposed Action to receive and dispose of the full

inventory of GTCC LLW and GTCC-like waste at the WCS FWF. There is only one additional action that should be addressed in this cumulative impacts analysis. Currently, 258 TRU waste containers from the Los Alamos National Laboratory (LANL) are being safely stored at the WCS FWF in compliance with the TCEQ Radioactive Material License No. R04100. The LANL TRU waste containers are stored in a location that is segregated and separated by a berm from the licensed disposed wastes. Therefore there is no opportunity for heat transfer to occur. The license conditions for the stored TRU waste containers took into account the waste characteristics including surface dose rates and thermal generation to ensure the current safe storage configuration. While the LANL TRU waste containers are stored in the WCS FWF, all current and future waste disposed in the WCS FWF has been and/or will be emplaced so that it is segregated and separated by a berm to ensure the stored LANL TRU waste does not have the potential for any effects on the disposed wastes' integrity or LLW facility long-term performance and does not have potential thermal interactions or heat transfer. The LANL TRU waste containers are being maintained in a monitored and safely retrievable storage configuration pending future decisions on permanent disposition. Any future decision related to these TRU waste containers would involve WCS, DOE, and TCEQ and would include an evaluation of potential environmental impacts.

The potential impacts of the Proposed Action were added to the cumulative impacts analysis in the CISF Environmental Report to complete the cumulative impacts analysis for this site-specific EA. Considering that the Proposed Action would have no incremental contribution to the potential cumulative impacts, the conclusion that was presented in the CISF Environmental Report is also applicable to this site-specific EA. That conclusion states that the cumulative impacts would include: "(1) increased output, employment and income within the region; (2) increased property and sales tax base development and positive net fiscal impacts to communities, especially in Lea County, New Mexico; (3) increased potential for future nuclear materials disposal and processing related economic development in the Region; (4) increased truck and rail traffic within the Region, especially in Andrews and Eunice, and within the transportation corridors through which wastes would travel to the disposal complex; (5) increased community perceptions of risk associated with the transportation of wastes; (6) increased perceptions of risk and uncertainty associated with the notion that recent developments and decisions could foster a growing regional potential for the emergence of a nuclear material processing and disposal complex in southeast New Mexico and west Texas."

In addition to cumulative impacts in the region surrounding the WCS FWF, this site-specific EA considers the potential cumulative dose to the public associated with transporting radioactive materials in commerce. Both the NRC and the TCEQ evaluated the environmental impacts attributable to transportation at the NEF and WCS CWF and FWF facilities, respectively (NRC 2005; TCEQ 2008). The number of annual shipments transported by highway in the NEF analysis was estimated at 1,500. WCS anticipates that no more than 200 shipments of spent nuclear fuel would be received annually at the CISF. Since the Proposed Action for this site-specific EA would not involve any operational changes beyond those already identified in the current license for the WCS FWF, the total number of shipments is expected to be within the range used in the licensing process for the disposal of GTCC LLW and GTCC-like waste.

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