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NUREG-2237

Environmental Impact Statement for the Holtec International's License Application for a Consolidated Interim Storage Facility for Spent Nuclear Fuel and High Level Waste

Draft Report for Comment

Office of Nuclear Material Safety and Safeguards

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Draft Report for Comment

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Any interested party may submit comments on this report for consideration by the NRC staff. Comments may be accompanied by additional relevant information or supporting data. Please specify the report number **NUREG-2237** in your comments, and send them by the end of the comment period specified in the *Federal Register* notice announcing the availability of this report.

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Mail comments to: Office of Administration, Mail Stop: TWFN-7-A60M, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, ATTN: Program Management, Announcements and Editing Staff.

Email comments to: Holtec-CISFEIS@nrc.gov

For any questions about the material in this report, please contact: Jill Caverly, Senior Project Manager, at 301-415-7674 or by e-mail at Jill.Caverly@nrc.gov.

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ABSTRACT

The U.S. Nuclear Regulatory Commission (NRC) prepared this draft environmental impact statement (EIS) as part of its environmental review of the Holtec International (Holtec) license application to construct and operate a consolidated interim storage facility (CISF) for spent nuclear fuel (SNF) and Greater-Than-Class C waste, along with a small quantity of mixed oxide fuel. The proposed CISF would be located in southeast New Mexico at a site located approximately halfway between the cities of Carlsbad and Hobbs, New Mexico. This draft EIS includes the NRC staff's evaluation of the environmental impacts of the proposed action and the No-Action alternative. The proposed action is the issuance of an NRC license authorizing the initial phase (Phase 1) of the project to store up to 8,680 metric tons of uranium (MTUs) [9,568 short tons] in 500 canisters for a license period of 40 years. Holtec plans to subsequently request amendments to the license to store an additional 500 canisters for each of 19 expansion phases of the proposed CISF (a total of 20 phases), to be completed over the course of 20 years, and to expand the proposed facility to eventually store up to 10,000 canisters of SNF.

Holtec's expansion of the proposed project (i.e., Phases 2-20) is not part of the proposed action currently pending before the agency. However, as a matter of discretion, the NRC staff considered these expansion phases in its description of the affected environment and impact determinations in this draft EIS, where appropriate, when the environmental impacts of the potential future expansion can be determined so as to conduct a bounded analysis for the proposed CISF project. For the bounding analysis, the NRC staff assumes the storage of up to 10,000 canisters of SNF.

Based on its environmental review, the preliminary NRC staff recommendation is issuance of a license to Holtec authorizing the initial phase of the project, unless safety issues mandate otherwise. The NRC staff based its recommendation on the following:

- the environmental report submitted by Holtec
- the NRC staff's consultation with Federal, State, Tribal, and local government agencies
- the NRC staff's independent environmental review
- the NRC staff's consideration of public comments received during the scoping process

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BACKGROUND

By letter dated March 30, 2017, the U.S. Nuclear Regulatory Commission (NRC) received an application from Holtec International (Holtec) requesting a license that would authorize Holtec to construct and operate a consolidated interim storage facility (CISF) for spent nuclear fuel (SNF) and Greater-Than-Class C (GTCC) waste, along with a small quantity of mixed-oxide fuel, which are collectively referred to in this document as SNF, and composed primarily of spent uranium-based fuel (Holtec, 2017). The license application includes an Environmental Report (ER) (Holtec, 2019a), a Safety Analysis Report (SAR), and other relevant documents (Holtec, 2019b). Holtec prepared the license application in accordance with requirements in Title 10 of the *Code of Federal Regulations* (10 CFR) Part 72, *Licensing Requirements for the Independent Storage of Spent Nuclear Fuel, High-Level Radioactive Waste, and Reactor-Related Greater Than Class C Waste*. This environmental impact statement (EIS) was prepared consistent with NRC's NEPA-implementing regulations contained in 10 CFR Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions" and the NRC staff guidance in NUREG–1748, "Environmental Review Guidance for Licensing Actions Associated with NMSS Programs" (NRC, 2003).

The proposed action is the issuance, under the provisions of 10 CFR Part 72, of an NRC license authorizing the construction and operation of the proposed Holtec CISF in southeastern New Mexico at a site located approximately halfway between the cities of Carlsbad and Hobbs, New Mexico. Holtec requests authorization for the initial phase (Phase 1) of the proposed project to store 5,000 metric tons of uranium (MTUs) [5,512 short tons] in 500 canisters for a 40-year license period. However, because the capacity of individual canisters can vary, the 500 canisters proposed in the Holtec license application have the potential to hold up to 8,680 MTUs [9,568 short tons]. Therefore, the analysis in this EIS and in the corresponding NRC safety review will analyze the storage of up to 8,680 MTUs [9,568 short tons] for Phase 1.

Holtec anticipates subsequently requesting amendments to the license to store an additional 5,000 MTUs [5,512 short tons] for each of 19 expansion phases of the proposed CISF to be completed over the course of 20 years to expand the facility to eventually store up to 10,000 canisters of SNF (Holtec, 2019a,b). Holtec's expansion of the proposed project (i.e., Phases 2-20) is not part of the proposed action currently pending before the agency. However, the NRC staff considered these expansion phases in its description of the affected environment and impact determination, where appropriate, when the environmental impacts of the potential future expansion were able to be determined so as to conduct a bounding analysis for the proposed CISF project. The NRC staff conducted this analysis as a matter of discretion because Holtec provided the analysis of the environmental impacts of the future anticipated expansion of the proposed facility as part of its license application (Holtec, 2019a). For the bounding analysis, the NRC staff assumes the storage of up to 10,000 canisters of SNF.

The NRC identified the U.S. Bureau of Land Management (BLM) as a cooperating agency for the Holtec CISF environmental review. The transfer of SNF to and from the main rail line to the proposed CISF would occur using a rail spur. The proposed rail spur would be constructed on BLM land and require BLM permitting. The Memorandum of Understanding (MOU) between the NRC and BLM can be found using the Agencywide Documents Access and Management System (ADAMS) (Accession No. ML18248A133). BLM will be the agency responsible for issuing the appropriate right-of-way for the rail spur and permitting any other project-related actions on BLM land. This EIS will serve to fulfill the National Environmental Policy Act of 1969, as amended (NEPA) responsibilities of both the NRC and BLM, with both agencies issuing a separate Record of Decision.

At the request of the State of New Mexico, the New Mexico Environment Department (NMED) was identified as a cooperating agency having special expertise in surface water and groundwater resources for the proposed CISF project. The NRC staff coordinated with NMED staff on water resources for this EIS to describe the affected environment, potential impacts from the proposed project, cumulative impacts, and any additional mitigation measures. The NMED does not have any obligations under NEPA related to the proposed project; however, NMED provided special expertise for water resources in and around the proposed site.

The scope of the EIS includes an evaluation of the radiological and non-radiological environmental impacts of consolidated interim storage of SNF at the proposed CISF location and the No-Action alternative, as well as mitigation measures to either reduce or avoid adverse effects. It also includes the NRC staff's recommendation regarding the proposed action.

PURPOSE AND NEED FOR THE PROPOSED ACTION

The purpose of the proposed Holtec CISF is to provide an option for storing SNF from nuclear power reactors before a permanent repository is available. SNF would be received from operating, decommissioning, and decommissioned reactor facilities.

The proposed CISF is needed to provide away-from-reactor SNF storage capacity that would allow SNF to be transferred from existing reactor sites and stored for the 40-year license term before a permanent repository is available. Additional away-from-reactor storage capacity is needed, in particular, to provide the option for away-from-reactor storage so that stored SNF at decommissioned reactor sites may be removed so the land at these sites is available for other uses. This definition of purpose and need reflects the Commission's recognition that, unless there are findings in the safety review or findings in the NEPA environmental analysis that would lead the NRC to reject a license application, the NRC has no role in a company's business decision to submit a license application to operate a CISF at a particular location.

The BLM purpose and need is to provide direction for managing public lands the BLM administers in accordance with its mandate under the Federal Land Policy and Management Act of 1976. The proposed rail spur is needed to efficiently transfer SNF from existing rail lines to the proposed CISF.

THE PROJECT AREA

The proposed CISF project would be built and operated on approximately 421 hectares (ha) [1,040 (acres) ac] of land in Lea County, New Mexico (EIS Figure 2.2-1) (Holtec, 2019a). The storage and operations area, which is a smaller land area within the full property boundary, would include 134 ha [330 ac] of disturbed land. The proposed project area is approximately 51 kilometers (km) [32 miles (mi)] east of Carlsbad, New Mexico, and 54 km [34 mi] west of Hobbs, New Mexico. Currently, the proposed project area is privately owned by the Eddy-Lea Energy Alliance LLC (ELEA); however, Holtec has committed to purchasing the property from ELEA (Holtec, 2019a,c) if the NRC licenses the proposed facility. The proposed project area is located 0.84 km [0.52 mi] north of U.S. Highway 62/180, and consists of mostly undeveloped land used for cattle grazing (Holtec, 2019a).

Facility Construction, Operations, and Decommissioning and Reclamation

During the construction of the proposed action (Phase 1) of the CISF, Holtec would excavate multiple areas to accommodate and install the underground portions of the facilities (Holtec, 2019b). For the proposed action (Phase 1), the proposed CISF would be prepared by excavating a pit that would house the SNF canisters in the vertical ventilated modules (VVMs). Soil would be excavated for each subsequent phase; however, for the proposed action (Phase 1) the largest amount of soil would be excavated for construction of the facility buildings (e.g., security and administration buildings) and associated infrastructure, the access road, relocating the existing road that currently runs through the proposed project area, construction of the rail spur, and construction of the parking lot.

During CISF operations, transportation casks containing canisters of SNF would arrive via rail car. Upon arrival, casks would be surveyed and inspected, moved to a cask transfer building, transported in a transfer cask to the storage pad area, and installed in the appropriate storage module at the independent spent fuel storage installation (ISFSI) pad (Holtec 2019a,b). When a geologic repository becomes available, the SNF stored at the proposed CISF would be removed and sent to the repository for disposal. Removal of the SNF from the proposed CISF, or defueling, would involve similar activities to those associated with shipping SNF from nuclear power plants and ISFSIs and emplacement of SNF at the proposed CISF project and is considered part of the operations stage of the proposed project.

Decommissioning and reclamation of the proposed facility would include the dismantling of the proposed facility and rail spur. The decommissioning evaluation in this EIS is based on currently available information and plans. At the end of the license term of the proposed CISF project, once the SNF inventory is removed, the facility would be decommissioned such that the proposed project area and remaining facilities could be released and the license terminated. Decommissioning activities, in accordance with 10 CFR Part 72 requirements, would include conducting radiological surveys and decontaminating, if necessary. Holtec has committed to reclamation of nonradiological-related aspects of the proposed project area (Holtec, 2019a). Reclamation would include dismantling and removing equipment, materials, buildings, roads, the rail spur, and other onsite structures; cleaning up areas; waste disposal; controlling erosion; and restoring and reclaiming disturbed areas. Because decommissioning and reclamation are likely to take place well into the future, technological changes that could improve the decommissioning and reclamation processes cannot be predicted. As a result, the NRC requires that licensees applying to decommission an ISFSI (such as the proposed CISF) submit a Decommissioning Plan. The requirements for the Final Decommissioning Plan are delineated in 10 CFR 72.54(d), 72.54(g), and 72.54(i). The NRC staff would undertake a separate evaluation and NEPA review and prepare an environmental assessment or EIS, as appropriate, at the time the Decommissioning Plan is submitted to the NRC.

ALTERNATIVES

The NRC environmental review regulations that implement NEPA in 10 CFR Part 51 require the NRC to consider reasonable alternatives, including the No-Action alternative, to a proposed action (Phase 1). The alternatives have been established based on the purpose and need for the proposed project. Under the No-Action alternative, the NRC would not approve the Holtec license application for the proposed CISF. The No-Action alternative would result in Holtec not constructing or operating the proposed CISF. As further detailed in EIS Section 2.3, other alternatives considered at the proposed CISF Project but eliminated from detailed analysis include storage at a government-owned CISF, alternative design and storage technologies, an alternative location, and an alternative facility layout. These alternatives were eliminated from detailed study because they either would not meet the purpose and need of the proposed project or would cause greater environmental impacts than the proposed action.

SUMMARY OF ENVIRONMENTAL IMPACTS

This EIS includes the NRC staff analysis that considers and weighs the environmental impacts from the construction, operations, and decommissioning and reclamation of the proposed CISF Project and for the No-Action alternative. This EIS also describes mitigation measures for the reduction or avoidance of potential adverse impacts that (i) the applicant has committed to in its license application, (ii) would be required under other Federal and State permits or processes, or (iii) are additional measures the NRC staff identified as having the potential to reduce environmental impacts, but that the applicant did not commit to in its application.

NUREG–1748 (NRC, 2003) categorizes the significance of potential environmental impacts as follows:

SMALL: The environmental effects are not detectable or are so minor that they would neither destabilize nor noticeably alter any important attribute of the resource.

MODERATE: The environmental effects are sufficient to alter noticeably, but not destabilize, important attributes of the resource.

LARGE: The environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

Chapter 4 of the EIS presents a detailed evaluation of the environmental impacts from the proposed action and the No-Action alternative on resource areas at the proposed CISF. For each resource area, the NRC staff identifies the significance level during each stage of the proposed project: construction, operations, and decommissioning and reclamation.

Impacts by Resource Area and CISF Stage

<u>Land Use</u>

<u>Construction</u>: Impacts would be SMALL. Approximately 48.3 ha [119.4 ac] of land disturbance would occur under the proposed action (Phase 1). The approximately 133.5 ha [330 ac] of land disturbance for full build-out (Phases 1-20) from the construction stage would be relatively minor compared to the 421-ha [1,040-ac] proposed project area. For all phases, Holtec has committed to mitigation measures, such as stabilizing disturbed areas with natural landscaping and protecting undisturbed areas with silt fencing and straw bales to reduce the impacts of surface disturbance during construction. Prohibiting grazing within the fenced 114.5-ha [283-ac] protected area would have a minor impact on local livestock production because there would be abundant open land available for grazing around the storage and operations area and surrounding the proposed project area. Likewise, because there would be abundant open land available around the proposed project area, impacts to recreational activities would be minor. The proposed CISF may reduce the total amount of potash mining in the region; however, this impact is minor considering the expansive potash leasing area surrounding the proposed project area. The proposed CISF will have no impact on oil and gas exploration and development in the proposed project area because extraction will continue to occur at depths greater than

930 m [3,050 ft]. Therefore, the NRC staff concludes that the land use impacts during the construction stage for the proposed action (Phase 1) would be SMALL, and potential impacts for Phases 2-20 would also be SMALL.

The rail spur would be constructed to connect the proposed CISF project to an industrial railroad that lies 6.1 km [3.8 mi] to the west. The disturbed land area for the rail spur would be 15.9 ha [39.4 ac] of BLM-managed land. A site access road would also be constructed across BLM-managed land from the proposed CISF project southward to U.S. Highway 62/180. Construction of the rail spur and site access road would require right-of-way approval on Federal lands from BLM. Due to the small amount of disturbed land, relatively flat terrain, lack of highway crossing, and joint location of the access road along the rail spur right-of-way, the NRC and BLM staffs conclude that impacts from construction of the rail spur on land use would be SMALL.

<u>Operations</u>: Impacts would be SMALL. For the proposed action (Phase 1), there are no activities that would require additional ground-disturbing activities. Similar to the construction stage, cattle grazing would be prohibited within the storage and operations area. The primary changes to land use during the operations stage of the proposed action (Phase 1) would be land disturbance associated with construction of SNF storage pads and modules for additional phases, because the applicant intends to operate each phase concurrently with construction of new phases. Construction of Phases 2-20 would require 85.2 ha [210.6 ac] of land in addition to the proposed action (Phase 1). To ensure that construction of additional SNF storage pads would not adversely impact operations, Holtec would maintain an adequate buffer distance between operational and construction areas (Holtec, 2019a). Furthermore, during operations, the current primary land use (cattle grazing) would be prohibited on 133.5 ha [330 ac] of land. Therefore, the NRC staff concludes that land use impacts associated with the operations stage for the proposed action (Phase 1) and for Phases 2-20 of the proposed CISF project would be similar to construction and would be SMALL.

Operation of the rail spur would be consistent with the local industrial uses of the land in the vicinity of the proposed project area, which supports potash mining, oil and gas exploration and development, and oil and gas service industry facilities, many of which make use of existing rail lines for materials transportation. Maintenance of the rail spur is anticipated during the operations stage. This may require use of limited equipment for repairs but is not anticipated to require land disturbance beyond that experienced during construction of the rail spur. For these reasons, the NRC and BLM staffs conclude that impacts from operation of the rail spur on land use would be SMALL.

<u>Decommissioning and Reclamation</u>: Impacts would be SMALL. At the end of decommissioning and reclamation of the proposed action (Phase 1) and Phases 2-20 (including the rail spur), all lands would be returned to their preoperational use of livestock grazing (Holtec, 2019a). Any remaining infrastructure would constitute a small portion of the area returned to pre-project conditions. Because the land use impacts for decommissioning and reclamation do not exceed those for construction or operation of the proposed CISF and would decrease as vegetation is reestablished in reclaimed areas, the NRC staff concludes that the land use impact associated with the decommissioning and reclamation stage for the proposed action (Phase 1) and for Phases 2-20 of the proposed CISF project would be SMALL.

Decommissioning and reclamation of the rail spur and associated access road would occur at the discretion of the land owner (BLM). As part of the rail spur permit application, BLM would define activities necessary to complete decommissioning per its authority and guidelines.

Impacts from decommissioning and reclamation would not exceed those associated with construction of the rail spur; therefore, the NRC and BLM staffs conclude that impacts from decommissioning and reclamation of the rail spur on land use would be SMALL.

Transportation

Construction: Impacts would be SMALL. During the construction stage of the proposed CISF, trucks would be used to transport construction supplies and equipment to the proposed project area. The regional and local transportation infrastructure that would serve the proposed CISF project would be accessed from U.S. Highway 62/180, which traverses the proposed project area.

The NRC staff's construction traffic impact analysis considered the volume of estimated construction traffic from supply shipments, waste shipments, and workers commuting and determined the estimated increase in the applicable annual average daily traffic counts on the roads used to access the proposed project area. The NRC staff estimated that a total of 70 daily construction supply and waste shipments would increase the existing volume of daily truck traffic on U.S. Highway 62/180 of 2,449 trucks per day by 5.6 percent. Based on this analysis, the supply and waste shipments for the construction stage of the proposed action (Phase 1) would have a minor impact on daily traffic on Highway 62/180 near the proposed CISF project. An estimated peak construction work force of 80 workers would commute to and from the proposed CISF project construction site using individual passenger vehicles and light trucks on a daily basis. These workers could account for an increase of 160 vehicles per day (80 vehicles each way) on U.S. Highway 62/180 during construction. This amounts to an approximate 5 percent increase in daily car traffic on U.S. Highway 62/180 from the proposed CISF project construction. Traffic impacts on larger capacity roads that feed U.S. Highway 62/180 would be less than the impacts estimated for U.S. Highway 62/180. Based on this analysis, the construction stage of the proposed action (Phase 1) would have a minor impact on the daily U.S. Highway 62/180 traffic near the proposed CISF project site. For the construction stage of Phases 2-20, buildings and infrastructure would already be constructed, so the same or a smaller construction worker commuting volume would occur compared to the construction phase of the proposed action (Phase 1) and would contribute the same or less transportation impacts. Therefore, the NRC staff concludes that the transportation impacts from the construction stage of the proposed action (Phase 1) and Phases 2-20 would be SMALL.

Construction of the rail spur would occur during the construction stage of the proposed action (Phase 1). The workforce required to construct the rail spur was included in the analysis of commuter impacts to transportation. The additional construction supplies necessary to build the rail spur would be significantly less than that required for construction of the proposed CISF. Therefore, the NRC and BLM staffs conclude that the addition of supplies and supply shipments would be less than those for the construction stage of the proposed action (Phase 1) and would therefore have a SMALL impact.

Operations: Impacts would be SMALL. During operations of the proposed CISF, Holtec would continue to use roadways for supply and waste shipments in addition to workforce commuting. Additionally, Holtec proposes using the national rail network for transportation of SNF from nuclear power plants and ISFSIs to the proposed CISF and eventually from the CISF to a geologic repository, when one becomes available. The operations impacts the NRC staff evaluated include traffic impacts from shipping equipment, supplies, and produced wastes, and from workers commuting during CISF operations. Other impacts evaluated included the radiological and nonradiological health and safety impacts to workers and the public under normal and accident conditions from the proposed nationwide rail transportation of SNF to and from the proposed CISF.

The NRC staff's traffic impact analysis for the operations stage of the proposed CISF considered the volume of estimated operations traffic from supply shipments, waste shipments, and workers commuting, then determined the estimated increase in the applicable annual average daily traffic counts on the roads used to access the proposed project area. The NRC staff estimated that 73 waste shipments would occur during operations per year or about 1 shipment every 5 days. The operations workforce would include 40 regular employees and 15 security staff at full build-out commuting daily to and from the proposed CISF project. These workers could account for an increase of 110 vehicles per day (55 vehicles each way) on U.S. Highway 62/180 during the operations stage of the proposed action (Phase 1) resulting in an estimated 3 percent increase in daily car traffic on U.S. Highway 62/180. Based on this analysis, the operations stage of the proposed action (Phase 1) would have a minor impact on the daily U.S. Highway 62/180 traffic near the proposed CISF project site. Traffic impacts on larger capacity roads that feed U.S. Highway 62/180 would be less than the impacts estimated for U.S. Highway 62/180. During the operations stage of Phases 2-20, construction of additional phases would occur concurrently with operations; therefore, up to an additional 80 construction workers would be commuting during the same time period. Thus, the total workforce commuting during operations (combined with construction of next phases) could add 270 vehicles per day (135 vehicles each way) to the existing U.S. Highway 62/180 traffic during operations, representing an 8 percent increase in daily car traffic on U.S. Highway 62/180. Based on this information, the NRC staff concludes that supply and waste shipments during the operation stage of the proposed action (Phase 1) and during Phases 2-20 would not noticeably contribute to traffic impacts and therefore the impacts would be SMALL.

During operation of any project phase, SNF would be shipped from existing storage sites at nuclear power plants or ISFSIs to the proposed CISF. These shipments must comply with applicable NRC and U.S. Department of Transportation (DOT) regulations for the transportation of radioactive materials in 10 CFR 71 and 73 and 49 CFR 107, 171–180, and 390–397, as appropriate to the mode of transport. The NRC staff evaluated the radiological and nonradiological health impacts to workers and the public from this project-specific transportation, considering both incident-free and accident conditions.

The potential radiological health impacts to workers and the public from incident-free transportation of SNF to and from the proposed CISF project would occur from exposures to the radiation emitted from the loaded transportation casks that are within specified regulatory limits. Radiation doses to workers involved in transportation of SNF would be limited to an annual dose of 0.05 Sv [5 rem] or less. The estimated occupational health effects estimates for the proposed action (Phase 1), including fatal cancer, nonfatal cancer, and severe hereditary effects were low (sufficient to conclude most likely zero). For all phases (full build-out), the estimated number of occupational health effects is 1.4 (a small fraction of the estimated 440,000 baseline health effects within the same population). The NRC impact analysis also included estimates of in-transit, incident-free public doses to residents along the route, to occupants of vehicles sharing the route, and to residents near SNF transportation stops. All of the estimated public health effects from the proposed incident-free SNF transportation during the operations stage of the proposed action (Phase 1) and the operations stage of Phases 2-20 are low (most likely zero). An estimate of the maximally exposed public individual located 30 m [98 ft] from the rail track who is exposed to the direct radiation emitted from all 10,000 passing rail shipments of SNF at full build-out under normal operations resulted in an accumulated dose of 0.06 mSv [6 mrem].

The NRC staff also evaluated the potential occupational and public health impacts of the proposed SNF transportation under accident conditions. Based on prior NRC analyses of cask response to transportation accident conditions, releases of SNF would not be expected from the proposed SNF shipments under accident conditions. Under accident conditions with no release, the highest estimated dose consequence to an emergency responder that spends 10 hours at an accident site at an average distance of 5 m [16 ft] from the cask is 0.92 mSv [92 mrem]. The NRC staff also evaluated the potential radiological impacts to the public from the proposed SNF transportation under accident conditions. The accident scenario involves a 10-hour delay in movement of the cask at the accident scene where members of the public in the surrounding area {800 m [2,625 ft] in all directions} are exposed to direct radiation from the cask. The estimated health effects risks were negligible for the proposed action (Phase 1) and for full build-out.

The nonradiological impacts to workers and the public associated with incident-free SNF transportation include typical occupational injuries and public traffic fatalities (e.g., accidents at rail crossings) and fatalities involving individuals trespassing on railroad tracks. For the proposed action (Phase 1), the NRC staff estimated that there would be 0.18 additional occupational injuries and 5.2×10^{-4} occupational fatalities. For the operations stage of Phases 2-20, the same estimated annual injuries and fatalities would apply. If all operations stages for the full build-out were conducted over a 20-year period, the cumulative total occupational impacts would be 3.6 injuries and 1.0×10^{-2} fatalities. The potential impacts to the public from transportation accidents include an estimated 0.08 fatalities for shipping 500 canisters of SNF from reactors to the proposed CISF. During the operations stage of Phases 2-20, an additional 500 canisters would be shipped to the proposed CISF per phase with an estimated number of fatalities equal to the proposed action (Phase 1) estimate, until the maximum of 10,000 canisters has been shipped. At full build-out, shipping 10,000 canisters from reactors to the proposed CISF over the duration of the proposed SNF shipping campaign results in 1.5 public fatalities.

Based on the NRC staff evaluation of the radiological and nonradiological health impacts to workers and the public from this project-specific transportation, considering both incident-free and accident conditions, the impact would be SMALL.

Removal of the SNF from the proposed CISF, or defueling, would contribute to additional transportation impacts that would be similar in nature to the impacts evaluated for shipping SNF from nuclear power plants and ISFSIs to the proposed CISF project and emplacing the canisters earlier in the operations stage. These additional shipments of SNF from the CISF to a repository would involve different routing and shipment distances than from the nuclear power plants and ISFSIs to the proposed CISF project. Additional impact analyses were conducted of the radiological and nonradiological health and safety impacts to workers and the public under normal and accident conditions from the national rail transportation of SNF from the proposed CISF project to a repository, based on an approach similar to the approach applied in the analysis of the SNF shipments to the proposed CISF. All of the estimated radiological health effects to workers and the public from the proposed SNF transportation under incident-free and accident conditions are low (likely to be zero). The nonradiological impacts for the repository shipments would be less than the impacts from the incoming SNF shipments. Therefore, the NRC staff concludes that the radiological and nonradiological impacts to workers and the public from SNF transportation from the CISF project to a geological repository during the defueling activities of the operation stage of the proposed action (Phase 1) and during the defueling activities of the operations stage of Phases 2-20 would be SMALL.

The transportation impacts of operating the proposed rail spur would be minor and limited by the short distance, lack of road crossings, and remote and sparsely populated location of the proposed rail spur and would not significantly add to the transportation impacts from the CISF project operations. Therefore, the NRC and BLM staffs conclude that impacts on transportation from operation of the rail spur during the operation stage of the proposed action (Phase 1) and during the operation stage of Phases 2-20 would be SMALL.

Decommissioning and Reclamation: Impacts would be SMALL. During the decommissioning and reclamation stage of the proposed CISF project, the primary transportation impacts would be traffic impacts from the use of trucks to transport decommissioning and reclamation waste materials to a disposal facility and from the commuting workforce.

The NRC staff's decommissioning and reclamation traffic impact analysis considered the volume of estimated traffic from reclamation waste shipments and workers commuting and determined the estimated increase in the applicable annual average daily traffic counts on the roads used to access the proposed project area. The NRC staff's estimated number of annual reclamation waste shipments was 18,950 or approximately 52 trucks per day, representing an estimated two percent increase in truck traffic from shipping the nonhazardous reclamation waste from the proposed action (Phase 1). For any other single phase (Phases 2-20), a shorter assumed duration of reclamation (1 year) could double this estimated increase in traffic.

At full build-out (Phases 1-20) of the proposed project, the NRC staff estimated that the volume of nonhazardous demolition waste from reclamation of the proposed CISF would require approximately 208 trucks per day if shipped over a 10-year reclamation period. This amount of shipping would result in an estimated annual 8 percent increase in future truck traffic. Based on this analysis, the nonhazardous reclamation waste shipments during the decommissioning and reclamation stage of the proposed CISF at full build-out would have a minor impact if the reclamation occurs over a period greater than 5 years. Additionally, the NRC staff assumes that a reclamation work force (similar to the construction workforce) of 80 workers would commute to and from the proposed CISF using individual passenger vehicles and light trucks on a daily basis for the duration of demolition and removal activities. These workers could account for an increase of 160 vehicles per day (80 vehicles each way) on U.S. Highway 62/180 during the decommissioning and reclamation stage. This amounts to a 4 percent increase in the current daily car traffic on U.S. Highway 62/180. The NRC staff concludes that the transportation impacts from reclamation waste shipments and commuting workers during the decommissioning and reclamation stage of the proposed action (Phase 1) and during the decommissioning and reclamation stage of Phases 2-20 would be SMALL. Impacts to truck traffic would be SMALL from reclamation of the proposed CISF at full build-out, if the reclamation occurs over a 10-year period.

Decommissioning of the rail spur would consist of dismantling the rail line and hauling the waste to a licensed facility, if the landowner (BLM) determines not to keep the infrastructure in place. There would be a small increase in traffic due to workers dismantling the rail line and a limited amount of materials that would need to be disposed, but the NRC and BLM staffs anticipate the increase in traffic from these activities to be equal to or less than the traffic increase associated with construction impacts, and therefore SMALL.

Geology and Soils

Construction: Impacts would be SMALL. Impacts to geology and soils during construction of the proposed CISF would be limited to soil disturbance, soil erosion, and potential soil contamination from leaks and spills of oil and hazardous materials. Holtec would implement mitigation measures, best management practices (BMPs), National Pollutant Discharge Elimination System (NPDES) permit requirements, and the Spill Prevention, Control, and Countermeasure (SPCC) Plan to limit soil loss, avoid soil contamination, and minimize stormwater runoff impacts. Therefore, the NRC staff concludes that the potential impacts to geology and soils associated with the construction stage for the proposed action (Phase 1) and for Phases 2-20 of the proposed CISF project would be SMALL.

Construction of the rail spur would require less soil disturbance and would incur fewer impacts than construction of the proposed action (Phase 1), and mitigation measures used for the proposed action (Phase 1) would also be applied. Therefore, the NRC and BLM staffs conclude that potential impacts to geology and soils resources from construction of the rail spur would be SMALL.

<u>Operations</u>: Impacts would be SMALL. Operation of the proposed action (Phase 1) and Phases 2-20 would not be expected to impact underlying bedrock, because storage structures are passive and designed to robustly contain radiological materials. Holtec would continue to implement the SPCC Plan to minimize the impacts of potential soil contamination, and stormwater runoff would continue to be regulated under NPDES permit requirements. Holtec would implement mitigation measures for stormwater management through its Stormwater Pollution Prevention Plan (SWPPP). Operation of the proposed CISF project would not be expected to impact or be impacted by seismic events, subsidence, or sinkhole development. Criteria would be incorporated into the facility design to prevent damage from seismic events such as earthquakes. The potential for sinkhole development or subsidence is low because (i) plugged and abandoned wells within the proposed project area are located outside the 133.5-ha [330-ac] storage and operations area, (ii) the proposed CISF project does not produce any liquid effluent that could facilitate dissolution, and (iii) no thick sections of soluble rocks are present at or near the land surface. Therefore, the NRC staff concludes that the impacts to geology and soils associated with the operations stage for the proposed action (Phase 1) and for Phases 2-20 of the proposed CISF project would be SMALL and that the potential impacts to the proposed CISF project from seismic events, subsidence, or sinkhole development would be SMALL.

Impacts to geology and soils from operation of the rail spur would be minimal because few, if any, additional geologic resources would be needed beyond those associated with construction of the rail spur, and mitigation measures would continue to be implemented. Therefore, the NRC and BLM staff concludes that the potential impacts to geology and soils from operation of the rail spur would be SMALL.

<u>Decommissioning and Reclamation</u>: Impacts would be SMALL. During decommissioning and reclamation of the proposed action (Phase 1) and Phases 2-20 (including the rail spur), contaminated soils would be disposed at approved and licensed waste disposal facilities. During dismantling of the proposed CISF project, soil disturbance would occur from the use of heavy equipment, such as bulldozers and graders, to demolish SNF storage facilities, buildings, and associated infrastructure. This soil disturbance would be limited to areas previously disturbed during the construction and operations stages. Mitigation measures used to reduce soil impacts during construction would be applied during decommissioning. After project facilities and infrastructure are removed, disturbed areas would be regraded with fill from stockpiles, covered with topsoil, contoured, and reseeded with native vegetation (Holtec, 2019a). Therefore, the NRC staff concludes that the potential impact on geology and soils

associated with the decommissioning and reclamation stage for the proposed action (Phase 1) and Phases 2-20 of the proposed CISF project would be SMALL.

Similar to the impacts to geology and soils described for the construction stage, the impacts of decommissioning and reclamation of the rail spur would be limited to soil disturbance, soil erosion, and potential soil contamination from leaks and spills of oil and hazardous materials. Mitigation measures used during construction would also be applied. Therefore, the NRC and BLM staffs conclude that potential impacts to geology and soils resources from decommissioning and reclamation of the rail spur would be SMALL.

Surface Waters and Wetlands

Construction: Impacts would be SMALL. During the construction stage of the proposed action (Phase 1), grading and clearing of the proposed project area for the SNF storage structures, site access road, security building, administration building, parking lot, concrete batch plant, laydown area, and associated infrastructure would cause surface disturbance, resulting in soil erosion and sediment runoff into nearby drainages. Holtec has committed to erosion and sediment control BMPs (e.g., sediment fences) to minimize any adverse effects, such as erosion and sedimentation, on surface water resources. Leaks and spills of fuels and lubricants from construction equipment and stormwater runoff from impervious surfaces resulting from the proposed facility construction and concrete batch plant installation could impact surface water quality. Implementation of a SPCC Plan and a SWPPP would minimize the adverse effects of any leaks or spills of fuels and lubricants. There are no floodplains located within or in the vicinity of the proposed project area. The topography of the proposed project area slopes gently northward toward two drainages, one leading to Laguna Plata to the northwest and the other to Laguna Gatuna to the east. Conditions in playa lakes that could potentially receive surface runoff from the proposed CISF project (i.e., Laguna Plata and Laguna Gatuna) are not favorable for the development of aquatic or riparian habitat (Holtec, 2019a). Furthermore, soils and water (when present) in Laguna Plata and Laguna Gatuna are highly mineralized. Holtec also states that there are no wetlands within or in the immediate vicinity of the proposed project area. Holtec may be required to obtain a Section 401 certification from NMED for any discharge to Waters of the United States (WOTUS), including jurisdictional wetlands.

Because Holtec would (i) implement mitigation measures to control erosion and sedimentation; (ii) develop and comply with a SPCC Plan; (iii) obtain a required NPDES construction permit to address potential impacts from discharge to surface water and provide mitigation as needed to maintain water quality standards; and (iv) obtain and comply with Section 401 certifications, if required, the NRC staff concludes that the potential impacts to surface waters, including jurisdictional wetlands, during the construction stage for the proposed action (Phase 1) would be SMALL. As additional phases are added, Holtec would implement BMPs appropriate for each size increase in the footprint of the proposed facility and would implement storage pad designs that would adequately direct drainage over impervious surfaces during each phase addition up to full build-out (Phases 1-20). Therefore, the NRC staff concludes that impacts to surface water from construction of Phases 2-20 would also be SMALL.

Construction of the rail spur would disturb an additional 15.9 ha [39.4 ac] of BLM-managed land. The NRC and BLM staffs anticipate that impacts to surface water would be limited to soil disturbance and soil erosion associated with the land disturbance, as well as potential soil contamination from leaks and spills of oil and hazardous materials from construction equipment. Similar to those implemented for construction of the proposed CISF, Holtec would implement mitigation measures, BMPs, NPDES construction permit requirements, Section 401 certification conditions (if required), and spill prevention and cleanup plans, to limit soil loss, avoid soil contamination, and minimize stormwater runoff impacts. Therefore, the NRC and BLM staffs conclude that the potential impacts to surface waters and wetlands from the construction of the rail spur would be SMALL.

Operations: Impacts would be SMALL. For the proposed action (Phase 1) and Phases 2-20 operations stage, the primary impact to surface water would be from runoff, although the amount of impervious cover would increase for Phases 2-20. The design and construction of the SNF storage systems and environmental monitoring measures make the potential for a release of radiological material from the proposed CISF project very low during operations. To minimize potential impacts to surface water from stormwater runoff, Holtec would (i) implement mitigation measures to control erosion, stormwater runoff, and sedimentation; (ii) develop and comply with a SPCC Plan; (iii) obtain a required NPDES permit and, if required, a Section 401 certification to address potential impacts of point-source stormwater discharge to surface water; and (iv) develop a SWPPP prescribing mitigation, as needed, to maintain water quality standards. Nearby playa lakes have adequate capacity to accept runoff from severe one-day storm events, and conditions in these playa lakes are not favorable for development of aquatic or riparian habitat (Holtec, 2019a). Therefore, the NRC staff concludes that the potential impacts to surface waters and wetlands during the operations stage of the proposed action (Phase 1) and Phases 2-20 would be SMALL.

The primary impact to surface water from the rail spur would be potential runoff from disturbed areas or from leaks or spills from equipment. To minimize any adverse impacts of runoff during operation of the rail spur, Holtec would implement mitigation measures to control erosion and sedimentation. The SNF contains no liquid component, and the SNF transportation casks are sealed to prevent any liquids from contacting the SNF assemblies. Thus, there is no potential for a liquid pathway from the SNF (such as runoff from the rail spur) to contaminate nearby surface waters. Therefore, the NRC and BLM staffs conclude that the potential impacts to surface waters and wetlands during operation of the rail spur would be SMALL.

Decommissioning and Reclamation: Impacts would be SMALL. During the decommissioning and reclamation stage for the proposed action (Phase 1) and Phases 2-20, Holtec would implement mitigation measures to control erosion, stormwater runoff, and sedimentation. Holtec's required NPDES permit and SWPPP would ensure that stormwater runoff would not contaminate surface water. In addition, Section 401 certification conditions, if required, would ensure that proposed CISF activities would not adversely impact New Mexico surface waters, including jurisdictional wetlands. Therefore, the NRC staff concludes that the potential impacts to surface waters and wetlands during decommissioning and reclamation for the proposed action (Phase 1) and Phases 2-20 would be SMALL.

Decommissioning and reclamation of the rail spur would include dismantlement of the rail spur at the discretion of the land owner (BLM). Decommissioning would be based on an NRC-approved decommissioning plan, and all decommissioning activities would be carried out in accordance with 10 CFR Part 72 requirements. Similar to decommissioning and reclamation of the proposed project at full build-out (Phases 1-20), a Section 401 certification, if required, would ensure that proposed CISF activities would not adversely impact New Mexico surface waters, including jurisdictional wetlands. Therefore, the NRC and BLM staff concludes that the potential impacts to surface waters and wetlands during decommissioning of the rail spur would be SMALL.

Groundwater

Construction: Impacts would be SMALL. For the construction stage of the proposed action (Phase 1), potable water would be supplied by a new water line that is capable of supporting the water demands of all support buildings and the concrete batch plant. Excavation of site soils and alluvium for construction of the SNF storage modules is not expected to encounter groundwater, because groundwater is discontinuous within the proposed project area and occurs at sufficient depth below the excavation depth, where present. The NPDES construction permit requirements, Section 401 certification conditions (if required), and implementation of the required BMPs would protect groundwater quality in shallow aquifers. Specifically, the NPDES permit requirements would provide controls on the amount of pollutants entering ephemeral drainages and specify mitigation measures and BMPs to prevent and clean up spills. Construction of Phases 2-20 requires less water than construction of the proposed action (Phase 1) because all facilities and infrastructure for the proposed CISF project would already have been built. In addition to consumptive use for construction, concurrent operations consume a small amount of water. Therefore, the NRC staff concludes that the impacts to groundwater during the construction stage of the proposed action (Phase 1) and Phases 2-20 would be SMALL.

Potable water for the construction of the rail spur would be supplied by an existing water pipeline or by a new water line, both of which would be capable of meeting the expected peak water demands. Additionally, the rail spur construction is not anticipated to encounter groundwater and construction of the rail spur would be under similar permit restrictions as the construction of the proposed action (Phase 1). Therefore, the NRC and BLM staffs conclude that the impacts to groundwater resources from the construction of the rail spur would be SMALL.

Operations: Impacts would be SMALL. For the proposed action (Phase 1) and Phases 2-20 operations stage, because of (i) the design and construction of the SNF storage systems, (ii) the SNF being composed of dry material, and (iii) geohydrologic conditions and the depth of groundwater at the proposed site, potential radiological contamination of groundwater is unlikely during operations. NPDES industrial stormwater permit requirements, Section 401 certification conditions (if required), and implementation of BMPs would protect groundwater quality in shallow aquifers. Specifically, the NPDES permit requirements and Section 401 certification conditions (if required) provide controls on the amount of pollutants entering ephemeral drainages and specify mitigation measures and BMPs to prevent and clean up spills. Therefore, the NRC staff concludes that the impacts to groundwater during the operation of the proposed action (Phase 1) and Phases 2-20 would be SMALL.

For the rail spur, infiltration of stormwater runoff and leaks and spills of fuels and lubricants during operations can potentially affect the groundwater quality of near-surface aquifers. Holtec's required NPDES industrial stormwater permit and Section 401 certification (if required) would set limits on the amounts of pollutants entering ephemeral drainages that may be in hydraulic communication with near-surface aquifers. Therefore, impacts from the operations stage of the rail spur are bound by the impacts of the construction stage; thus, the NRC and BLM staffs conclude that the impacts to groundwater during the operations stage for the rail spur would be SMALL.

Decommissioning and reclamation: Impacts would be SMALL. During decommissioning and reclamation of the proposed action (Phase 1) and Phases 2-20, infiltration of stormwater runoff and leaks and spills of fuels and lubricants could potentially affect the groundwater quality of near-surface aquifers. Holtec's required NPDES industrial stormwater permit and Section 401 certification, if required, would set limits on the amounts of pollutants entering ephemeral drainages that may be in hydraulic communication with alluvial aquifers at the site. Holtec also committed to developing and implementing a SPCC Plan to minimize and prevent spills. The NPDES permit, SWPPP, and, if required, Section 401 certification, would specify additional mitigation measures and BMPs to prevent and clean up spills. Therefore, the NRC staff concludes that the potential impacts to groundwater during the decommissioning stage for the proposed action (Phase 1) and Phases 2-20 would be SMALL.

Dismantling of the rail spur may occur at the discretion of the land owner (BLM) and would be based on an NRC-approved decommissioning plan and BLM requirements. All decommissioning activities would be carried out in accordance with 10 CFR Part 72 requirements. These activities would have groundwater impacts similar in scale to the construction stage. Therefore, the NRC and BLM staffs conclude that the potential impacts to groundwater during decommissioning of the rail spur would be SMALL.

Ecological Resources

Construction: Impacts would be SMALL to MODERATE. During the construction stage of the proposed action (Phase 1) and Phases 2-20, to mitigate impacts to vegetation disturbance during construction of subsequent phases, Holtec proposes to minimize the construction footprint, to the extent practicable. However, because of changes to the ecosystem function of the vegetative communities, the NRC staff concludes that impacts to vegetation from the proposed action (Phase 1) for construction could alter noticeably, but not destabilize, the vegetative communities at the proposed CISF project, resulting in a MODERATE impact. Holtec also proposes to use mitigation measures for soil stabilization and sediment control, such as stabilizing disturbed areas with native grass species, pavement, and crushed stone to control erosion; stabilizing disturbed areas with natural and low-water maintenance landscaping; and protecting undisturbed areas with silt fencing and straw bales, as appropriate. The U.S. Fish and Wildlife Service did not identify any Federally listed threatened or endangered plant or animal species, candidate species, or proposed species that are known to potentially occur at the proposed CISF project area or that the proposed CISF project may affect. Additionally, conditions in Laguna Plata and Laguna Gatuna are not favorable for the development of aquatic or riparian habitat. For all phases, Holtec would continue to monitor for and repair leaks and spills of oil and hazardous material from operating equipment, minimize fugitive dust, and conduct most construction activities during daylight hours (Holtec, 2019a). For construction of each individual subsequent phase, because (i) a smaller amount of land would be disturbed, (ii) fewer vehicles and workers would access the proposed project area, and (iii) Holtec has committed to mitigation measures, the potential impacts on wildlife and vegetation would be similar during the construction of individual Phases 2-20 as those for the proposed action (Phase 1). The combined area of disturbance from the construction of full build-out (Phases 1-20) would be approximately 133.5 ha [330 ac] of land. Because construction would occur over a number of years, and there would be abundant habitat available around the proposed facility to support the gradual movement of wildlife, and because the CISF would have no effect on Federally listed threatened or endangered species, the NRC staff concludes that overall ecological impacts during the construction stage for full build-out (Phases 1-20) would be SMALL to MODERATE.

Because of the smaller land area, construction of a rail spur would include similar or fewer potential impacts on ecological resources (e.g., vegetation removal, wildlife displacement and disturbances) than for the construction of the proposed action (Phase 1). Because the land area is smaller and the NRC and BLM staffs assume that the same mitigation measures Holtec has committed to use for the proposed action (Phase 1) construction (e.g., soil stabilization and sediment control, use of native grass species to stabilize the ground surface, and use of pavement and stone to control erosion) would also be used for the rail spur area, the NRC and BLM staffs conclude that the potential impacts to ecological resources from construction of the rail spur would be SMALL.

Operations: Impacts would be SMALL. For the operations stage of the proposed action (Phase 1), fewer effects to vegetative and wildlife communities would occur compared to the construction stage because the only planned land disturbance during the operations stage would be for movement of fences to support staggered construction of storage pads in later phases. The operations stage would continue to alter noticeably, but not destabilize, the vegetative communities within the proposed project area. Land available for ecological resources would be committed for use by the proposed CISF project for the license term (i.e., 40 years). No noxious weeds have been identified at the proposed storage and operations area; however, invasive plant species and noxious weeds may invade disturbed areas during the operations stage, but Holtec would control weeds with appropriate spraying techniques (Holtec, 2019a). Additionally, material spills from transportation vehicles, maintenance equipment, and gasoline and diesel storage tanks could also occur during the operations stage, which could kill or damage vegetation or wildlife exposed to the spilled material. However, such spills are anticipated to be few, based on permit requirements and mitigation measures that would continue to be implemented. Holtec would continue the mitigation measures implemented during the construction stage to limit potential effects on wildlife during the proposed action (Phase 1) and Phases 2-20 operations stage. For example, Holtec stated that security lighting for all ground-level facilities and equipment would be down-shielded to keep light within the boundaries of the proposed CISF project during the operations stage, helping to minimize the potential for impacts (Holtec, 2019a). Because conditions in Laguna Plata and Laguna Gatuna are not favorable for the development of aquatic or riparian habitat and Holtec has committed to implement stormwater management practices, the impacts to aquatic systems would be limited, and Holtec would implement measures to limit impacts to downstream environments. Effective wildlife management practices and additional surveys of the proposed CISF project would identify the potential for long-term nesting, and mitigation would prevent permanent nesting and lengthy stay times of wildlife that may potentially attempt to reside at the proposed CISF project. Thus, the potential impacts to vegetation and wildlife during operation of the proposed action (Phase 1) and for Phases 2-20 for the proposed CISF project would be SMALL.

For the rail spur, the primary impact to ecological resources would be from habitat fragmentation, the potential for the establishment of invasive weeds along the disturbed edges of the rail spur, and from the noise and vibrations of the trains. Lights on the trains at night could also disturb wildlife along the rail spur, and direct animal mortalities could also occur. Land within 3.2 km [2 mi] of the proposed rail spur has already been developed with several transportation corridors that oil and gas companies use on a regular basis; therefore, the NRC staff anticipates that the potential impacts from operation of the rail spur would not alter the use of habitats near the rail spur or isolate sensitive wildlife species in the area. Holtec would be required to comply with other applicable Federal laws, the NPDES, and would follow mitigation measures that BLM requires to limit potential effects on wildlife. Therefore, the NRC and BLM staffs conclude that the potential impacts from operation of the rail spur to ecological resources would be SMALL.

Decommissioning and Reclamation: Impacts would be SMALL to MODERATE. Replanting the disturbed areas with native species after completion of the decommissioning and reclamation activities would restore the site to a condition similar to the preconstruction condition. Impacts on vegetation during decommissioning and reclamation of the proposed CISF project would include removal of existing vegetation from the area required for equipment laydown and disassembly. However, the area disturbed would be bounded by the construction stage activities. While vegetation becomes established, potential impacts to surface-water runoff receptors, including Laguna Gatuna and Laguna Plata, would be limited because of Holtec's commitment to implement stormwater management practices. As is the case during operations, the playas are not expected to support permanent aquatic communities, because they do not permanently hold sufficiently deep water and maintain the quality of water needed to support aquatic species. Thus, there would not be aquatic communities present to impact during decommissioning. The NRC staff concludes that the impact on ecological resources from decommissioning and reclamation of the proposed action (Phase 1) and Phases 2-20 would be MODERATE until vegetation is reestablished in reseeded areas and then would be SMALL thereafter.

Dismantling the rail spur would have impacts on ecology similar in nature and scale to those impacts experienced during construction of the rail spur (e.g., vegetation removal, wildlife displacement and disturbances). The establishment of mature, native plant communities may require decades. However, because of the relatively small disturbed area of the rail spur and because Holtec commits to reseed all disturbed areas, the NRC and BLM staff conclude that ecological impacts on the rail spur area from decommissioning would be SMALL.

Air Quality

Construction: Impacts would be SMALL. The proposed action (Phase 1) construction consists of building the storage modules and pad for 500 SNF canisters and the associated infrastructure for the CISF (e.g., the site access road, cask transfer building, security building, administration building, and parking lot). These activities primarily generate combustion emissions from mobile sources as well as fugitive dust from clearing and grading of the land, and vehicle movement over unpaved roads. The proposed action (Phase 1) peak-year emission levels for all of the pollutants are below the New Mexico “no permit required thresholds” except for particulate matter PM_{10}, which is about 1.7 times this threshold. The NRC staff concludes that pollutants with emission levels below this New Mexico “no permit required threshold” would have minor impacts. For the one pollutant that is above the threshold, $PM_{10,}$ the distance between the proposed CISF emission sources and these receptors, along with the nature of the PM_{10}, reduces the potential for impacts. Pollutants disperse as distance from the source increases, and PM_{10} settles out of the air quickly. Therefore, the NRC staff concludes that the potential impacts to air quality from peak-year emission levels from the proposed action (Phase 1) and Phases 2-20 would be SMALL.

Construction of the rail spur is included as part of the proposed action (Phase 1) construction stage. Rail spur construction emissions compose only a portion of the total proposed action (Phase 1) construction emissions. The NRC and BLM staffs anticipate the rail spur construction emission levels to be below the New Mexico thresholds. The NRC and BLM staffs conclude that the potential impacts to air quality during the rail spur construction would be SMALL because the of the low emission levels.

Operations: Impacts would be SMALL. For the proposed action (Phase 1) and full build-out (Phases 1-20) operations stage, the primary activity is receiving and loading SNF into modules.

Combustion emissions from equipment used to conduct this activity are the main contributors to air quality impacts. Impacts during the operations stage are either the same as or bounded by those for the peak-year impact assessment and therefore SMALL for the proposed action (Phase 1) and Phases 2-20.

During the operations stage, transportation of SNF on the rail spur occurs intermittently over the 8.9 km [5.5 mi] length of the rail spur rather than continuously generating emissions from a specific stationary location, such as operation of the CISF. Because of the intermittent and widespread nature of these emissions, the NRC and BLM staffs conclude that the potential impacts to air quality during rail spur operations would be SMALL.

Decommissioning and Reclamation: Impacts would be SMALL. The NRC staff anticipates that decommissioning and reclamation activities would generate combustion emissions from mobile sources associated with equipment and transportation. However, the levels would be much less than those of the peak-year emissions and, taking into account air quality and proximity of emission sources to receptors, the impacts would also be the same. The NRC staff concludes that the potential impacts to air quality from the decommissioning and reclamation stage for the proposed action (Phase 1) and Phases 2-20 would be SMALL. Similarly, for the rail spur, the decommissioning and reclamation activities would generate combustion emissions and have similar air quality impacts as well as proximity to receptors. Therefore, the NRC and BLM staffs conclude that the potential impacts to air quality from decommissioning and reclamation of the rail spur for the proposed action (Phase 1) and Phases 2-20 would be SMALL.

Noise

Construction: Impacts would be SMALL. For the proposed action (Phase 1) and Phases 2-20, some increased traffic associated with construction activities (e.g., building infrastructure) could increase noise levels. However, the proposed project area is undeveloped, and land in the area is currently used for mineral extraction and grazing with a number of transportation activities already occurring, particularly associated with oil and gas development. Additionally, there are no sensitive noise receptors located within the proposed project area (Holtec, 2019a). The nearest resident is located approximately 2.4 km [1.5 mi] away and due to the dissipation of sound with increasing distance, the current vehicular traffic rates, and that construction activities would occur predominantly during the day, the NRC staff concludes that noise impacts from the proposed action (Phase 1) and Phases 2-20 construction stage would be SMALL.

Noise impacts associated with the construction of the rail spur and associated infrastructure would include similar construction activities to those described for the construction of the proposed facility and associated infrastructure, but on a smaller scale. Therefore, the NRC and BLM staffs conclude that overall noise impacts during the construction stage of the rail spur would be SMALL.

Operations: Impacts would be SMALL. For both the proposed action (Phase 1) and Phases 2-20, noise from the operation of the proposed CISF project would be primarily generated from the delivery of casks (train or truck); operation of cranes and other loading equipment; and site vehicles (e.g., commuter vehicles or supply movements). In addition, noise point sources would include rooftop fans, air conditioners, transformers, and other equipment associated with the site infrastructure buildings. Once storage modules in each phase are fully loaded, operation noise at the storage pads is very limited because it is a passive system. Thus, the noise impacts associated with the operations stage are anticipated to be less than those from the construction stage. Therefore, the NRC staff concludes that the noise impacts from operation of the proposed action (Phase 1) and Phases 2-20 would be SMALL.

During the operations stage of all phases of the CISF, use of the rail spur would generate noise from trains operating on the spur, but these noise levels are not anticipated to exceed those generated during the construction stage of the rail spur and the proposed CISF. Therefore, the NRC and BLM staffs conclude that overall noise impacts during the operations stage for the rail spur would be SMALL.

Decommissioning and Reclamation: Impacts would be SMALL. Noise sources (e.g., heavy equipment and trucks) and impacts would be similar to those associated with the construction stage; therefore, the NRC staff concludes that the noise impacts from the decommissioning stage for the proposed action (Phase 1) and Phases 2-20 would be SMALL. Noise sources and levels associated with the dismantling of the rail spur would be similar to those incurred during the construction stage of the rail spur; therefore, the NRC and BLM staffs conclude that the noise impacts from dismantling the rail spur would be SMALL.

Historic and Cultural Resources

Construction: Impacts would be SMALL. The construction of the proposed action (Phase 1) would include multiple areas where excavation would be required to accommodate and install the underground facilities.

Several surveys have been conducted over the proposed project area to investigate potential historic and cultural resources. One historic resource was identified within the area of potential effect (APE) for the proposed action (Phase 1) construction stage and is a segment of earthen and caliche gravel two-track road. The road dates between 1920 and 1954, and artifacts located near the road included bottle glass, car parts, an insulator fragment, metal cans, tobacco tins, metal fragments, and a 1954 New Mexico license plate. However, the proposed project would not disturb the site, nor was it recommended as eligible for National Register of Historic Places (NRHP), and the NRC has determined that the resource does not constitute a historic property under the National Historic Preservation Act (NHPA). A prior survey also identified one archaeological site (Site LA 187010) immediately inside the proposed project property boundary where the rail spur crosses onto the privately-owned land of the proposed project area. The current APE intersects with this archaeological site, which had previously been described as a small prehistoric camp of unknown temporal affiliation with a diffuse scatter of lithic artifacts and burned caliche. However, on February 4, 2020, the NRC staff, the NRC's archeological contractor, Tribal representatives, and Holtec's archeological contractor visited the proposed project area to inspect and assess the sites identified in the Class III survey. During the site visit, NRC and Holtec staffs and Tribal representatives noted that Site LA 187010 consisted only of two surface finds and a presumed thermal feature, most likely a hearth. The only evidence of the thermal feature that could be identified during the site visit were approximately six pieces of thermally altered stone. No sign of burned caliche or ash was visible. The involved staffs and Tribal representatives noted that such a light scatter of artifacts, without an associated datable feature, would not meet BLM criteria for definition as an archaeological site, and could be more accurately recorded as an isolated manifestation (IM). Therefore, the consensus among all parties in attendance at the site visit was that Site LA 187010 should not be recommended eligible for listing on the NRHP. The NRC staff has requested that Holtec conduct additional fieldwork to document the current condition of Site LA 187010 and amend the Class III report and site files to note the site recommendation change of Site LA 187010. The updated Class III report, along with the NRC staff recommendations, will be submitted to the New Mexico State Historic Preservation Office (NM SHPO) for concurrence prior to finalization of this EIS. Because a historic resource will not be recommended eligible for listing on the NRHP, the NRC staff concludes that cultural and historic resources would not be impacted from construction of the proposed action (Phase 1), and impacts would be SMALL. While consultation under NHPA Section 106 is ongoing, the NRC staff's preliminary conclusion is that no historic properties would be affect by construction activities.

Construction of Phases 2-20 would disturb additional land. Within the protected (i.e., fenced) area, Holtec estimates that construction of the concrete pads for all 20 phases (i.e., full build-out), would disturb approximately 44.5 ha [110 ac] of land. In addition to the two historic sites identified for the proposed action (Phase 1) construction, 17 isolated occurrences are located within the direct APE for Phases 2-20 of the proposed CISF; however, isolated occurrences do not constitute archaeological sites, and, therefore, do not constitute historic properties. Because no historic or cultural resources have been identified in the direct APE that the construction of the proposed Phases 2-20 could disturb, the NRC staff's conclusion, pending completion of ongoing consultation, is that construction of Phases 2-20 would not affect historic properties, and impacts to historic and cultural resources would be SMALL.

Construction of the proposed action (Phase 1) would include ground disturbance over 15.9 ha [39.4 ac] for a rail spur to connect the proposed project area to the main rail line, which is approximately 6.1 km [3.8 mi] west of the proposed project area, with a length of 8 km [5 mi]. Because no historic or cultural resources were identified within the direct APE for the rail spur, the NRC and BLM staffs conclude that the construction of the rail spur would not affect historic properties, and impacts to historic and cultural resources would be SMALL.

<u>Operations</u>: Impacts would be SMALL. During operations of the proposed action (Phase 1) and Phases 2-20, no new ground disturbance is anticipated beyond that associated with maintenance and traffic around the facility. Because no historic or cultural resources have been identified in the direct APE and operations would not disturb additional land, the NRC staff concludes that the operation of the proposed facility for the proposed action (Phase 1) and Phases 2-20 would result in a SMALL impact on historic and cultural resources.

No additional ground-disturbing activities would occur, and no historic or cultural resources are present within the APE of the rail spur that would be located on BLM-managed land, therefore the NRC and BLM staffs conclude that operation of the rail spur on BLM land would result in a SMALL impact on historic and cultural resources. While consultation under NHPA Section 106 is ongoing, the NRC staff's preliminary conclusion is that no historic properties would be affected by operations activities.

<u>Decommissioning and Reclamation</u>: Impacts would be SMALL. Decommissioning and reclamation could result in the dismantling and removal of the proposed CISF and the rail spur. The total land disturbed for decommissioning and reclamation would not be greater than that disturbed during the construction stage, therefore the NRC staff concludes that decommissioning and reclamation of the proposed facility for the proposed action (Phase 1) and Phases 2-20 would have a SMALL impact on historic and cultural resources.

No historic or cultural resources that constitute historic properties are present within the direct APE for the rail spur on BLM-managed land; therefore, no historic and cultural impacts would result from decommissioning and reclamation of those areas. The NRC and BLM staffs conclude that decommissioning and reclamation of the rail spur would result in a SMALL impact on historic and cultural resources. While consultation under NHPA Section 106 is ongoing, the NRC staff's preliminary conclusion is that no historic properties would be affected by decommissioning and reclamation activities.

Visual and Scenic Resources

Construction: Impacts would be SMALL. As part of the proposed action (Phase 1), the most visible structure constructed would be the cask transfer building, which would be approximately 18 m [60 ft] high. Because of the relative flatness of the proposed CISF project area, the structure may be observable from nearby highways and properties. For the remaining structures associated with the proposed CISF project, visibility would be restricted to east and west traffic on U.S. Highway 62/180. The proposed CISF project structures would not be visible to any city or township with an identifiable population center. Other than the support buildings (including the cask transfer building), the proposed facility is predominantly subgrade, meaning the majority of the storage structure would be below ground surface. Although the proposed CISF project would alter the natural state of the landscape, the NRC concludes that due to the absence of regional or local high quality scenic views in the area, lack of a unique or sensitive viewshed, the subgrade design of the facility, the remote locale, and planned dust suppression mitigation, the impact to visual and scenic resources from the proposed action (Phase 1) and Phases 2-20 would result in a SMALL impact.

The rail spur is expected to be at or very near ground surface level and less visible than the other structures associated with the proposed CISF project. Therefore, NRC and BLM staffs conclude that visual and scenic resource impacts from the construction of the rail spur would also be SMALL.

Operations: Impacts would be SMALL. For both the proposed action (Phase 1) and Phases 2-20, the facilities built during the construction stage (particularly the cask transfer building) would continue to impact the visual and scenic resources. However, the use of security lights at the proposed CISF project would create visual impacts at night because of the contrast with the darkness of the surrounding landscape. Holtec has committed to down-shielding all security lighting for all ground-level facilities and equipment to keep light within the proposed project area to help minimize the potential impacts (Holtec, 2019a). Because buildings associated with the proposed CISF project would have already been constructed, the storage of SNF would be primarily subgrade, and lighting associated with security would be mitigated to minimize impacts, the NRC staff concludes that the visual and scenic resource impacts from the operations stage of the proposed action (Phase 1) and Phases 2-20 would be SMALL.

The operation of the rail spur would result in minimal impacts associated with rail shipments of SNF to and from the proposed CISF project and any associated vehicle traffic along the access road from rail maintenance. The presence of trains on the rail spur would create a temporary visual impact that is consistent with normal train operations, which already occurs in the area on the existing main rail line. Therefore, the NRC and BLM staffs conclude that the impact to visual and scenic resources for the operations stage of the rail spur would be SMALL.

Decommissioning and Reclamation: Impacts would be SMALL. Decommissioning and reclamation activities would be similar to those occurring during the construction stage; therefore, the NRC staff concludes that impacts to visual and scenic resources from decommissioning the proposed action (Phase 1) or Phases 2-20 (including at full build-out) would be SMALL.

Dismantling of the rail spur would include similar activities and impacts as those associated with construction of the rail spur. Therefore, the NRC and BLM staffs conclude that visual and scenic resource impacts from the decommissioning of the rail spur would be SMALL.

Socioeconomics

Construction: Impacts would be SMALL to MODERATE and beneficial. The NRC staff anticipates that economic impacts could be experienced throughout the 80-km [50-mi] region of influence (ROI) surrounding the proposed project area as a result of peak employment (135 workers per year) of the proposed CISF project [i.e., concurrent construction and operations stages for the proposed action (Phase 1)] and associated revenue and tax generation. Expenditures for goods and services to support the peak employment of the proposed CISF project would occur both inside and outside the ROI. The NRC staff recognizes that not all individuals in the ROI are likely to be affected equally; however, most community members would share, to some degree, in the economic growth the proposed CISF project would be expected to generate. Furthermore, the NRC staff estimates a population growth in the area of less than 0.1 percent, which is not likely to cause adverse impacts on housing, schools, or other public services. Therefore, the NRC staff concludes that socioeconomic impacts resulting from construction of the proposed action (Phase 1) and Phases 2-20 (including full build-out) would be SMALL for population, employment, housing, and public services and MODERATE and beneficial for local finance.

Construction of the rail spur will occur as part of the proposed action (Phase 1) prior to any concurrent construction and operation. The labor and costs to construct a rail spur to support the proposed action (Phase 1) would be significantly less than what would be required for peak employment of the proposed action (Phase 1) or Phases 2-20. Specifically, no additional construction workers would be expected to be hired. Therefore, the NRC and BLM staffs conclude that the potential impacts to socioeconomics from construction of the rail spur would be SMALL.

Operations: Impacts would be SMALL. Because the size of the operations workforce would be smaller than during the construction stage or peak of construction and operation, the NRC staff determine that there would not be a noticeable impact on public services during the operations stage. The local economy would continue to experience a SMALL beneficial impact from the purchasing of local goods and services and an increase in sales and income tax revenues.

Because the operation of the rail spur mostly involves offsite transportation of SNF, and fewer workers would be needed to operate the rail spur compared to the proposed action (Phase 1) or Phases 2-20, the NRC and BLM staffs anticipate that impacts to population, employment, wages, and community services would not change. Therefore, the NRC and BLM staffs conclude that the overall socioeconomic impacts associated with operations for the rail spur would be SMALL.

Decommissioning and Reclamation: Impacts would be SMALL to MODERATE and beneficial. Potential environmental impacts on socioeconomics could result from hiring additional workers compared to the operations stage of the proposed action (Phase 1) and Phases 2-20 to conduct radiological surveys; dismantle and remove equipment, materials, buildings, roads, rail, and other onsite structures; clean up areas; dispose of wastes; and reclaim disturbed areas. However, Holtec anticipates that the workforce needed for dismantling the proposed project would not exceed the number of workers needed for the construction of the proposed CISF project (Holtec, 2019a). If no additional workers are hired beyond the number that were directly employed during the construction stage of the proposed action (Phase 1), then the NRC staff expects that there would be no increased demand for housing and public services during the decommissioning and reclamation stage of the proposed project. Therefore, the NRC staff concludes that socioeconomic impacts resulting from decommissioning and reclamation of the proposed action (Phase 1) and Phases 2-20 would be SMALL for population, employment, housing, and public services and MODERATE and beneficial for local finance.

There would not be detectable changes in the potential socioeconomic impacts during decommissioning and reclamation of the rail spur. Therefore, the NRC and BLM staffs conclude that the potential socioeconomic impacts of decommissioning the rail spur would be SMALL.

Environmental Justice

Construction, Operation, and Decommissioning and Reclamation: The NRC staff considered the potential physical environmental impacts and the potential radiological health effects from constructing, operating, and decommissioning and reclaiming the proposed action (Phase 1), including the rail spur, and for full buildout (Phases 2-20), to identify means or pathways for the proposed project to disproportionately affect minority or low-income populations. No means or pathways have been identified for the proposed project (Phase 1 or Phases 2-20) to disproportionately affect minority or low-income populations. Because land access restrictions would limit hunting, and no fish or crops on the land are available for consumption, the NRC staff concludes that there is minimal, if any, risk of radiological exposure through subsistence consumption pathways. Moreover, adverse health effects to all populations, including minority and low-income populations, are not expected under the proposed action because Holtec is expected to maintain current access restrictions; comply with license requirements, including sufficient monitoring to detect radiological releases; and maintain safety practices following a radiation protection program that addresses the NRC safety requirements in 10 CFR Parts 72 and 20 (EIS Section 4.13.1.2).

After reviewing the information presented in the license application and associated documentation, considering the information presented throughout this EIS, and considering any special pathways through which environmental justice populations could be more affected than other population groups, the NRC staff did not identify any high and adverse human health or environmental impacts and concludes that no disproportionately high and adverse impacts on any environmental justice populations would exist. Furthermore, the NRC and BLM staffs have not identified any potential impacts on the natural or physical environment from constructing, operating, or decommissioning the rail spur that would significantly and adversely affect a particular population group. Therefore, the NRC and BLM staffs conclude that the rail spur would have no disproportionately high and adverse impacts on any group, including minority and low-income populations.

Public and Occupational Health

Construction: Impacts would be SMALL. Construction activities at the proposed CISF would include clearing and grading for roads; excavating soil, building foundations, and assembling buildings; constructing the rail spur, and laying fencing. Workers and the public could be exposed to low levels of background radiation or nonradiological emissions during the construction stage. Background radiation exposures could result by direct exposure, inhalation, or ingestion of naturally occurring radionuclides during construction activities. Holtec has proposed implementing standard dust control measures, such as water application or chemical dust suppression compounds, to reduce and control fugitive dust emissions (Holtec, 2019a).

Therefore, the NRC staff estimates that the direct exposure, inhalation, or ingestion of fugitive dust would not result in an increased radiological hazard to workers and the general public during the construction stage of the proposed action (Phase 1) and Phases 2-20 of the proposed CISF project.

Nonradiological impacts to construction workers during the construction stage of the proposed action (Phase 1) and Phases 2-20 of the proposed CISF project would be limited to the normal hazards associated with construction (i.e., no unusual situations would be anticipated that would make the proposed construction activities more hazardous than normal for an industrial construction project). The proposed CISF project would be subject to Occupational Safety and Health Administration (OSHA) General Industry Standards (29 CFR Part 1910) and Construction Industry Standards (29 CFR Part 1926). These standards establish practices, procedures, exposure limits, and equipment specifications to preserve worker health and safety. Because the construction activities at the proposed CISF during any phase would be typical and subject to applicable occupational health and safety regulations, there would be only minor impacts to worker health and safety from construction-related activities. Therefore, the NRC staff concludes that the nonradiological occupational health effects of the construction stage of the proposed action (Phase 1) and the construction stage of Phases 2-20 would be minor.

The construction activities conducted for the rail spur would be significantly less than the construction activities for the proposed CISF project and therefore would be expected to result in fewer background radiological exposures or nonradiological occupational injuries and fatalities. Therefore, the NRC and BLM staffs conclude that the public and occupational health impacts of constructing the rail spur, which would be completed as part of the construction stage of the proposed action (Phase 1), would be SMALL.

<u>Operations</u>: The radiological impacts from normal operations would be SMALL. Operational activities at the proposed CISF would include the receipt, transfer, handling, and storage of canistered SNF. During these activities, the radiological impacts would include expected occupational and public exposures to low levels of radiation. Per individual canister, the collective dose estimate for the entire work crew was 0.0081 person-Sv [0.81person-rem]. These estimates were conservative because they did not account for shielding. The resulting single worker annual dose estimate for processing 500 canisters during any single phase was 0.025 Sv [2.5 rem]. This estimated dose, applicable to the most highly exposed group of workers, is below the 0.05 Sv/yr (5 rem/yr) occupational dose limit specified in 10 CFR 20.1201(a) for occupational exposure. Because these exposures do not exceed NRC dose limit for workers, the NRC staff concludes that the radiological impacts to workers during the operations stage of the proposed action (Phase 1) and the operations stage of Phases 2-20 would be minor.

Nonradiological impacts to operations workers would be limited to the normal hazards associated with CISF operations. The proposed CISF would be subject to OSHA's General Industry Standards (29 CFR Part 1910), which establish practices, procedures, exposure limits, and equipment specifications to preserve worker health and safety. Because the operation activities at the proposed CISF project would be typical and subject to applicable occupational health and safety regulations, there would be only small impacts to nonradiological worker health and safety from operations-related activities. Therefore, the NRC staff concludes that the nonradiological occupational health impacts of the operations stage of the proposed action (Phase 1) and Phases 2-20 would be minor.

The operation of the rail spur within the proposed CISF boundary is associated with the receipt of shipments, and impacts from the shipments are assessed as part of the operation of the proposed action (Phase 1) and Phases 2-20, and as part of transportation impacts. Therefore, the NRC and BLM staffs conclude that the public and occupational health impacts of the rail spur as part of the operations stage of the proposed action (Phase 1) and Phases 2-20 would be SMALL.

Decommissioning and Reclamation: Impacts would be SMALL. Based on the effective containment of SNF during operations under normal conditions, the existing radiological and nonradiological controls and decommissioning planning, and the similarity of reclamation activities and impacts to construction, the public and occupational health impacts for the decommissioning and reclamation stage of the proposed action (Phase 1) and the decommissioning and reclamation stage of Phases 2-20 would be SMALL.

The decommissioning activities conducted for the rail spur would be significantly less than the decommissioning activities for the proposed CISF project, and therefore would be expected to result in fewer occupational injuries and fatalities. Because of the radiological protection program and the containment of the casks and canisters, the NRC and BLM staffs do not anticipate the rail spur having radiological contamination. Therefore, the NRC and BLM staffs conclude that the public and occupational health impacts of decommissioning the rail spur as part of the decommissioning stage of the proposed action (Phase 1) and Phases 2-20 would be SMALL.

Waste Management

Construction: Impacts would be SMALL. The proposed action (Phase 1) would generate a volume of 5,080 metric tons [5,600 short tons] of nonhazardous solid waste over the 2-year construction stage (Holtec, 2019a), which is about 5.4 percent of the annual volume of waste disposed at the Sandpoint Landfill. For construction of Phases 2-20, the total nonhazardous solid waste the proposed CISF project generated over the project would be 96,525 metric tons [106,394 short tons] (Holtec, 2019a). This would be about 3.3 percent of the capacity of the Sandpoint Landfill, based on multiplying the annual volume of waste disposed at this landfill by the projected lifespan of this landfill (Holtec, 2019a). The NRC staff considers that the amount of nonhazardous solid waste that the construction stage would generate for the proposed action (Phase 1) and Phases 2-20 would be minor in comparison to the capacity of the landfills to dispose of such waste. Additionally, the proposed action (Phase 1) and Phases 2-20 would generate 11,360 liters (L)/day [3,000 gal/day] of sanitary liquid waste. Sanitary liquid waste would be collected onsite using sewage collection tanks and underground digestion tanks and then disposed at an offsite treatment facility (Holtec, 2019a). Sanitary wastes would be managed in accordance with State of New Mexico requirements, and the NRC staff considers the amount of liquid sanitary waste that would be generated by the proposed CISF construction stage to be relatively minor in comparison to the capacity of publicly-owned treatment works to process such waste. Therefore, the NRC staff concludes that the impact for waste streams for both the proposed action (Phase 1) and for Phases 2-20 would be SMALL.

The amounts of waste that construction of the rail spur would generate would be much less than those generated during the construction of the proposed CISF storage pads, buildings, and other infrastructure; therefore, the NRC and BLM staffs conclude that the potential impacts to waste management for the construction stage of the rail spur would be SMALL.

Operations: Impacts would be SMALL. The proposed action (Phase 1) would involve limited activities that generate hazardous waste, such as the use of solvents or other chemicals during operations (Holtec, 2019a). Holtec estimates that the operations stage would generate up to 1.2 metric tons [1.32 short tons] per year of hazardous waste. Based on this volume of waste, Holtec expects to be classified as a Conditionally Exempt Small Quantity Generator (CESQG) (Holtec, 2019a). The NRC staff considers the amount of hazardous waste that the operations stage for the proposed action (Phase 1) would generate to be minor in comparison to the capacity for disposing of such waste. The amount of nonhazardous solid waste the proposed action (Phase 1) would generate during the operations stage would be 91.1 metric tons [100.4 short tons] per year (Holtec, 2019a), and for Phases 2-20, 3,460 metric tons [3,814 short tons] would be generated. These volumes would be relatively minor in comparison to the capacity of the landfills. Similar to the construction stage, the proposed action (Phase 1) and Phases 2-20 would generate 11,360 liters (L)/day [3,000 gal/day] of sanitary liquid waste. The operations stage for the proposed action (Phase 1) would generate limited amounts of low-level radioactive waste (LLRW), consisting of contamination survey rags, anti-contamination garments, and other health physics materials (Holtec, 2019a). The NRC staff consider the impact from all waste streams for the proposed action (Phase 1) and Phases 2-20 for the operations stage to be SMALL.

Similar to the construction stage, the NRC and BLM staffs assume that limited quantities of nonhazardous waste, hazardous waste, and sanitary waste would be generated during operations of the rail spur (Holtec 2019a). These impacts would be bounded by those under the construction stage; therefore, the NRC and BLM staffs conclude that the potential impacts to waste management for the operations stage of the rail spur would be SMALL.

Decommissioning and Reclamation: Impacts would be SMALL to MODERATE. The decommissioning and reclamation stage generates nonhazardous solid waste, LLRW, hazardous solid waste, and sanitary liquid wastes. Nonhazardous demolition waste would encompass the majority of the waste that would be generated by decommissioning the proposed CISF and reclamation of the project area. The NRC staff anticipates that the State of New Mexico would put in place additional landfill facilities as part of the normal urban development needs of the area. The NRC staff assumes that the volume of nonhazardous waste would be disposed according to all applicable regulations and future capacity would remain available.

For LLRW, decommissioning would generate 0.91 metric tons [1.00 short tons] for the proposed action (Phase 1) and 18.14 metric tons [20 short tons] of waste for Phases 2-20, which would be disposed at one of the two identified disposal facilities for LLRW. Historically, private industry has met the demand for LLRW disposal capacity. The NRC expects that this trend would continue; therefore, the NRC staff consider the amount of LLRW the decommissioning stage of the proposed action (Phase 1) would generate to be minor in comparison to future disposal capacity for LLRW.

Like the construction stage, both the proposed action (Phase 1) and Phases 2-20 would generate 11,360 liters/day [3,000 gallons/day] of liquid sanitary waste, which would be relatively minor in comparison to the capacity of publicly owned treatment works to process such waste.

The NRC staff assumes that any additional hazardous waste generated for decommissioning and reclamation of the proposed action (Phase 1) and Phases 2-20 would be equal to or less than hazardous waste produced as part of the operations stage {1.2 metric ton per year [1.32 short tons]}. The NRC staff concludes that for the decommissioning and reclamation stage of the proposed action (Phase 1) and Phases 2-20, the impacts for LLRW, hazardous waste, and sanitary waste streams would be SMALL, and MODERATE for nonhazardous waste until a new landfill becomes available, after which the impact would be SMALL.

The amounts of waste decommissioning and reclamation of the rail spur would generate would be much less than those generated from decommissioning and reclamation of the proposed CISF storage pads, buildings, and other infrastructure. Therefore, the NRC and BLM staffs conclude that the potential impacts to waste management for the decommissioning and reclamation stage of the rail spur would be SMALL

CUMULATIVE IMPACTS

Chapter 5 of the EIS provides the NRC staff's evaluation of potential cumulative impacts from the construction, operations, and decommissioning and reclamation of the proposed CISF, considering other past, present, and reasonably foreseeable future actions. Cumulative impacts from past, present, and reasonably foreseeable future actions were considered and evaluated in this EIS, regardless of what agency (Federal or non-Federal) or person undertook the action. The NRC staff determined that the SMALL to MODERATE impacts (excluding historic and cultural resources) from the proposed project would contribute SMALL to MODERATE impacts to the SMALL to MODERATE cumulative impacts that exist in the area due primarily to oil and gas exploration activities, nuclear facilities, and potential wind and solar energy projects. For historic and cultural resources the NRC staff acknowledges that without mitigation, the current proposed location of the rail spur would likely cause adverse impacts to historic and cultural resources and contribute a LARGE impact to SMALL existing cumulative impacts. However, with implementation of mitigation measures, such as a redesign of the rail line to the west side of the APE (within BLM-managed land) and establishing a no-entry buffer around the site, the potential disturbance of the site from the rail spur would be similarly reduced. Therefore, if these mitigations were implemented, the NRC staff concludes that the cumulative impacts from the rail spur would not adversely affect historic properties, and impacts would be SMALL.

SUMMARY OF COSTS AND BENEFITS OF THE PROPOSED ACTION

The cost-benefit analysis in the EIS compares the costs and benefits of the proposed action to the No-Action alternative using various scenarios and discounting rates. The proposed project would generate primarily regional and local costs and benefits, both from an environmental and economic perspective. For the environmental costs and benefits, the key distinction between the proposed CISF and the No-Action alternative is the location where the impacts occur. Under the proposed action (Phase 1), the environmental impacts of storing SNF would occur at the proposed CISF site, and environmental impacts would continue to occur at the nuclear power plant and ISFSI sites whose licensees did not transfer all fuel to the proposed CISF. Under the No-Action alternative, environmental impacts from storing SNF would continue to occur at the generation site ISFSI and new impacts would not occur at the proposed CISF site. In addition, because the proposed CISF would involve two transportation campaigns (shipment from the nuclear power plants and ISFSIs to the CISF and from the CISF to a repository), compared to one shipping campaign under the No-Action alternative, the No-Action alternative results in a net reduction in overall occupational and public exposures from the transportation of SNF because of the lower overall distance traveled.

The regional benefits of building the proposed CISF would be increased employment, economic activity, and tax revenues in the region around the proposed site. For both the proposed action (Phase 1) and full build-out (Phases 1-20), the NRC staff compared the proposed CISF costs to the No-Action alternative costs. In all cases for Phase 1, the No-Action alternative costs exceeds the proposed action (Phase 1) costs (i.e., a net benefit for the proposed CISF). For full build-out (Phases 1-20), some cases resulted in a net benefit, while other cases resulted in a net cost.

NO-ACTION ALTERNATIVE

Under the No-Action alternative, the NRC would not approve the Holtec license application for the proposed CISF in Lea County, New Mexico. The No-Action alternative would result in Holtec not constructing or operating the proposed CISF. No concrete storage pad or infrastructure (e.g., rail spur or cask-handling building) for transporting and transferring SNF to the proposed CISF would be constructed. SNF destined for the proposed CISF would not be transferred from commercial reactor sites (in either dry or wet storage) to the proposed facility. In the absence of a CISF, the NRC staff assumes that SNF would remain on site in existing wet and dry storage facilities and be stored in accordance with NRC regulations and be subject to NRC oversight and inspection. Site-specific impacts at each of these storage sites would be expected to continue as detailed in generic (NRC, 2013, 2005) or site-specific environmental analyses. In accordance with current U.S. policy, the NRC staff also assumes that the SNF would be transported to a permanent geologic repository, when such a facility becomes available. Inclusion of the No-Action alternative in the EIS is a NEPA requirement and serves as a baseline for comparison of environmental impacts of the proposed action.

PRELIMINARY RECOMMENDATION

After comparing the impacts of the proposed action (Phase 1) to the No-Action alternative, the NRC staff, in accordance with 10 CFR Part 51, recommends the proposed action (Phase 1), which is the issuance of an NRC license to Holtec to construct and operate a CISF for SNF at the proposed location. In addition, BLM staff recommends the issuance of a permit to construct and operate the rail spur. This recommendation is based on (i) the license application, which includes the ER and supplemental documents and Holtec's responses to the NRC staff's requests for additional information; (ii) consultation with Federal, State, Tribal, local agencies, and input from other stakeholders; (iii) independent NRC and BLM staff review; and (iv) the assessments provided in this EIS.

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ABBREVIATIONS AND ACRONYMS

AADT	annual average daily traffic
ac	acre
ACEC	area of critical environmental concern
ACHP	Advisory Council on Historic Preservation
ACS	American Community Survey
AEA	Atomic Energy Act
ALARA	as low as reasonably achievable
APE	area of potential effect
APLIC	Avian Power Line Interaction Committee
AQCR	Air Quality Control Region
ARMS	Archaeological Records Management Section
AT&SF	Atchiso, Topeka, and Santa Fe
AUM	animal unit month
BBER	Bureau of Business and Economic Research
BD	Badland
BEA	Bureau of Economic Analysis
BGEPA	Bald and Golden Eagle Protection Act
BISON-M	Biota Information System of New Mexico
BLM	U.S. Bureau of Land Management
BLM-CFO	Bureau of Land Management – Carlsbad Field Office
BLS	Bureau of Labor Statistics
BMP	best management practice
BNSF	Burlington Northern-Santa Fe
bp	before present
CAP	Corrective Action Plan
cbms	centimeters below mean surface
CCA	Candidate Conservation Agreement
CCAA	Candidate Conservation Agreement with Assurances
CCD	Census County Division
CDD	Carlsbad Department of Development
CEC	Cavity Enclosure Containers
CEHMM	Center for Excellence in Hazardous Materials Management
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CEQ	Council on Environmental Quality
CESQG	Conditionally Exempt Small Quantity Generator
CFR	Code of Federal Regulations
CISF	Consolidated Interim Storage Facility
CLSM	Controlled Low Strength Material
CO_2e	carbon dioxide equivalents
CPI	consumer price index
CSGEIS	Continued Storage Generic Environmental Impact Statement
CWA	Clean Water Act
CWF	Compact Waste Disposal Facility
dB(A)	decibel
DCSS	dry cask storage system

DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
DPA	Designated Potash Area
DSL	dunes sagebrush lizard
EA	environmental assessment
EIS	Environmental Impact Statement
ELEA	Eddy-Lea Energy Alliance
EPA	U.S. Environmental Protection Agency
ER	Environmental Report
ERG	Escondia Research Group, LLC
ESA	Endangered Species Act
FEP/DUP	Fluorine Extraction Process and Depleted Uranium De-conversion Plant
ft	feet
FR	Federal Register
FTE	full-time equivalents
FWF	Federal Waste Disposal Facility
FWS	U.S. Fish and Wildlife Service
GDP	gross domestic product
GEIS	Generic Environmental Impact Statement
GHG	greenhouse gases
GLO	General Land Office
GMUs	game management units
GNEP	Global Nuclear Energy Partnership
gpm	gallons per minute
GPS	Global Positioning System
GTCC	Greater-Than Class C
ha	hectares
HCPI	Historic Cultural Property Inventory
HELMS	Hardened Extended-Life Local Monitored Surface Storage
HI-STORM UMAX	Holtec International Storage Module Underground MAXimum Capacity
HLW	high-level radioactive waste
HOSS	Hardened Onsite Storage System
HUD	U.S. Department of Housing and Urban Development
IAEA	International Atomic Energy Agency
ICRP	International Commission on Radiological Protection
IIFP	International Isotopes Fluorine Products Inc.
inbs	inches below surface
Intrepid	Intrepid Mining, LLC
IO	isolated occurrence
IPA	important plant areas
IPaC	Information Planning and Conservation
ISFSI	Independent Spent Fuel Storage Installation
ISP	Interim Storage Partners
JA	Jal association

km	kilometers
km^2	square kilometers
LCED	Lea County Economic Development
LCF	latent cancer fatalities
LLRW	low-level radioactive waste
LP	Largo-Pajarito complex
LPC	Lesser prairie-chicken
Lpm	Liters per minute
m	meter
MBTA	Migratory Bird Treaty Act
MDC	minimum detectable concentration
mi	miles
mi^2	square mile
mg/L	milligrams per liter
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
MOX	mixed oxide fuel
mrem	millirem
mSv	millisieverts
MTRU	transuranic mixed waste
MTU	metric tons of uranium
mw	megawatts
NAAQS	National Ambient Air Quality Standards
NCRP	National Council on Radiation Protection and Measurements
NEF	National Enrichment Facility
NEP	non-essential experimental population
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMAAQS	New Mexico Ambient Air Quality Standards
NMBF	New Mexico Board of Finance
NMCRIS	New Mexico Cultural Resources Information Center
NMDA	New Mexico Department of Agriculture
NMDGF	New Mexico Department of Game and Fish
NMDOH	New Mexico Department of Health
NMDOT	New Mexico Department of Transportation
NMED	New Mexico Environment Department
NMHPD	New Mexico Historic Preservation Division
NMOCC	New Mexico Oil Conservation Commission
NM SHPO	New Mexico State Historic Preservation Officer
NMSS	Office of Nuclear Material Safety and Safeguards
NMTRD	New Mexico Taxation and Revenue Department
NMWQB	New Mexico Water Quality Bureau
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NRC	U.S. Nuclear Regulatory Commission
NRHP	National Register of Historic Places
NSC	National Safety Council

NWPA	Nuclear Waste Policy Act of 1982
NWR	National Wildlife Refuge
OMB	Office of Management and Budget
OSHA	Occupational Safety and Health Administration
PB	Playas
PFYC	Potential Fossil Yield Classification
PFSF	Private Fuel Storage Facility
ppm	parts per million
PSD	Prevention of Significant Deterioration
RAIs	requests for additional information
rem	roentgen equivalent man
REMP	Radiological Environmental Monitoring Program
ROI	region of influence
SAR	Safety Analysis Report
SE	Fine Sandy Loam
SER	Safety Evaluation Report
SFP	Support Foundation Pad
SGCN	species of greatest conservation need
SGP CHAT	Southern Great Plains Crucial Habitat Assessment Tool
SNF	spent nuclear fuel
SPCC	Spill Prevention, Control, and Countermeasure
SR	Simona-Upton Association
SRI	Statistical Research, Inc.
Sv	sievert
SWPPP	Storm Water Pollution Prevention Plan
SwRI®	Southwest Research Institute®
TCEQ	Texas Commission on Environmental Quality
TCP	Traditional Cultural Property
TCPA	Texas Comptroller of Public Accounts
TDS	total dissolved solid
TEDE	total effective dose equivalent
TLD	thermoluminescent dosimeters
TNMR	Texas-New Mexico Railroad
TRU	transuranic radioactive waste
TSCA	Toxic Substances Control Act
USACE	U.S. Army Corps of Engineers
USCB	U.S. Census Bureau
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey
VRM	Visual Resource Management
VVM	Vertical Ventilated Modules

WCS	Waste Control Specialists
WIPP	Waste Isolation Pilot Plant
WOTUS	Waters of the U.S.

1 INTRODUCTION

1.1 Background

> **Spent nuclear fuel (SNF)**
> Nuclear reactor fuel that has been removed from a nuclear reactor because it can no longer sustain power production for economic or other reasons.
>
> **Greater-Than-Class-C waste (GTCC)**
> GTCC waste means low-level radioactive waste that exceeds the concentration limits of radionuclides established for Class C waste in 10 CFR 61.55.
>
> **Mixed oxide fuel (MOX)**
> A type of nuclear reactor fuel (often called "MOX") that contains plutonium oxide mixed with either natural or depleted uranium oxide, in ceramic pellet form. Using plutonium reduces the amount of highly enriched uranium needed to produce a controlled reaction in commercial lightwater reactors.

By letter dated March 30, 2017, the U.S. Nuclear Regulatory Commission (NRC) received an application from Holtec International (Holtec) requesting a license that would authorize Holtec to construct and operate a consolidated interim storage facility (CISF) for spent nuclear fuel (SNF) and Greater-Than Class C waste, along with a small quantity of mixed oxide fuel, which are collectively referred to in this document as SNF, and composed primarily of spent uranium-based fuel (Holtec, 2017). The license application includes an Environmental Report (ER) (Holtec, 2019a), a Safety Analysis Report (SAR), and other relevant documents (Holtec, 2019b). The proposed Holtec CISF would provide an option for storing SNF from nuclear power reactors for a period of 40 years. Holtec prepared the license application in accordance with requirements in Title 10 of the *Code of Federal Regulations* (10 CFR) Part 72, "Licensing Requirements for the Independent Storage of Spent Nuclear Fuel, High-Level Radioactive Waste, and Reactor-Related Greater Than Class C Waste." This environmental impact statement (EIS) was prepared consistent with NRC's National Environmental Policy Act (NEPA)-implementing regulations contained in 10 CFR Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions" and the NRC staff guidance in NUREG–1748, "Environmental Review Guidance for Licensing Actions Associated with NMSS Programs" (NRC, 2003).

1.2 Proposed Action

1.2.1 The NRC Proposed Action

The proposed action is the issuance, under the provisions of 10 CFR Part 72, of an NRC license authorizing the construction and operation of the proposed Holtec CISF in southeast New Mexico at a site located approximately halfway between the cities of Carlsbad and Hobbs, New Mexico, as discussed in more detail in EIS Section 2.2. Holtec requests authorization for the initial phase (Phase 1) of the project to store up to 8,680 metric tons of uranium (MTUs) [9,568 short tons] in 500 canisters for a license period of 40 years (Holtec, 2019c). Holtec plans to subsequently request amendments to the license to store an additional 500 canisters for each of 19 expansion phases of the proposed CISF (a total of 20 phases), to be completed over the course of 20 years, and to expand the facility to eventually store up to 10,000 canisters of SNF (Holtec, 2019a).

Holtec's expansion of the proposed project (i.e., Phases 2-20) is not part of the proposed action currently pending before the agency. However, the NRC staff considered these expansion phases in its description of the affected environment and impact determinations in this

Environmental Impact Statement (EIS), where appropriate, when the environmental impacts of the potential future expansion can be determined so as to conduct a bounded analysis for the proposed CISF project. The NRC staff conducted this analysis as a matter of discretion because Holtec provided the analysis of the environmental impacts of the future anticipated expansion of the proposed facility as part of its license application (Holtec, 2019a,b). For the bounding analysis, the NRC staff assumes the storage of up to 10,000 canisters of SNF. During operation, the proposed CISF would receive SNF from decommissioned reactor sites, as well as from operating reactors prior to decommissioning. The CISF would serve as an interim storage facility before a permanent geologic repository is available.

The NRC has previously licensed a consolidated spent fuel storage installation (Private Fuel Storage), and NRC regulations continue to allow for licensing private away-from-reactor interim spent fuel installations (e.g., G.E. Morris) under 10 CFR Part 72. For more information on the NRC's regulation of spent fuel transportation, see https://www.nrc.gov/waste/spent-fuel-transp.html.

1.2.2 U.S. Bureau of Land Management (BLM) Proposed Action

Holtec proposes building a rail spur across BLM-managed lands to connect existing rail lines to the proposed CISF site. The BLM's Federal decision is to either approve Holtec's Plan of Operations (pending submission), subject to mitigation included in the Holtec license application and this EIS, or deny approval of the Plan of Operations if it is found that Holtec's proposal would result in unnecessary or undue degradation of the public lands. The total amount of BLM-managed land expected to be disturbed by Holtec for construction and operation of the rail spur would be 15.9 hectares (ha) [39.4 acres (ac)]. The rail spur would be routed across BLM-managed land west of the proposed CISF project and would not cross any major highways (Holtec, 2019a). A site access road would also be constructed across BLM-managed land from the proposed CISF project southward to U.S. Highway 62/180 and would be approximately 1.6 kilometers (km) [1 mile (mi)] in length. Construction of the rail spur and site access road would require right-of-way approval on Federal lands from BLM.

1.3 <u>Purpose and Need for the Proposed Action</u>

1.3.1 NRC Purpose and Need

The purpose of the proposed Holtec CISF is to provide an option for storing SNF from nuclear power reactors before a permanent repository is available. SNF would be received from operating, decommissioning, and decommissioned reactor facilities.

The proposed CISF is needed to provide away-from-reactor SNF storage capacity that would allow SNF to be transferred from existing reactor sites and stored for the 40-year license term before a permanent repository is available. Additional away-from-reactor storage capacity is needed, in particular, to provide the option for away-from-reactor storage so that stored SNF at decommissioned reactor sites may be removed so the land at these sites is available for other uses.

The Nuclear Waste Policy Act of 1982 required the Federal government to site, build, and operate a geologic repository for high-level radioactive waste (HLW) and spent fuel by the mid-1990s. Several factors have contributed to the delay, but in 2003 DOE reaffirmed the Federal Government's commitment to the ultimate disposal of the spent fuel and predicted that a repository would be available by 2048 (DOE, 2003). The delay in the availability of a Federal repository for disposal of SNF has extended the SNF storage period at reactor sites. As a result, several decommissioned reactor sites exist where a facility for storing SNF is the only remaining structure licensed by the NRC. This circumstance has delayed complete site decommissioning and prevented these sites from being put to other uses.

1.3.2 BLM Purpose and Need

The BLM purpose and need is to provide direction for managing public lands the BLM administered in accordance with its mandate under the Federal Land Policy and Management Act of 1976. The proposed rail spur is needed to efficiently transfer SNF from existing rail lines to the proposed CISF.

1.4 Scope of the EIS

The scope of the EIS includes an evaluation of the radiological and non-radiological environmental impacts of consolidated interim storage of SNF at the proposed CISF location and the No-Action alternative. This EIS also considers unavoidable adverse environmental impacts, the relationship between short-term uses of the environment and long-term productivity, and irreversible and irretrievable commitments of resources.

1.4.1 Public Participation Activities

On March 30, 2018, in accordance with 10 CFR 51.26, the NRC published a Notice of Intent (NOI) to prepare an EIS and conduct scoping in the *Federal Register* (FR): "Holtec International HI-STORE Consolidated Interim Storage Facility Project" (83 FR 13802). Through the NOI, the NRC invited potentially affected Federal, Tribal, State, and local governments; organizations; and members of the public to provide comments on the scope of the Holtec CISF EIS. The initial scoping period was scheduled to end on May 29, 2018, and was subsequently extended to July 30, 2018, in response to several requests for an extension (83 FR 22714). Comments were accepted via the Federal rulemaking website (www.Regulations.gov), email, or regular U.S. mail. The purpose of the scoping process (83 FR 13802) is to

- ensure that important issues and concerns are identified early and are properly studied
- identify alternatives to be examined
- identify significant issues to be analyzed in depth
- eliminate unimportant issues from detailed consideration
- identify public concerns

Public Scoping Meetings

During the 120-day scoping comment period, the NRC staff hosted six public scoping meetings, five in person and one by webinar. All comments received during these meetings were transcribed. All transcribed comments, as well as any written comments submitted in person during the scoping meetings, were considered by NRC staff and are included in the comment summaries. On Wednesday, April 25, 2018, the NRC staff conducted a public scoping meeting and webinar at NRC headquarters in Rockville, Maryland, at 7 p.m. EST. This meeting was held in the evening to accommodate stakeholders in western time zones. Approximately 45 people attended, primarily by phone. A transcript of the meeting is available in ADAMS under Accession No. ML18130A895.

Five in-person public scoping meetings were held in New Mexico. The dates and locations for these meetings were (i) April 30, 2018, in Roswell; (ii) May 1, 2018, in Hobbs; (iii) May 3, 2018, in Carlsbad; (iv) May 21, 2018, in Gallup; and (v) May 22, 2018, in Albuquerque. The NRC expanded the Roswell meeting and added the latter two meetings in response to requests from stakeholders. The number of meeting attendees was approximately 105 people in Roswell, 150 people in Hobbs, 120 people in Carlsbad, 90 people in Gallup, and 155 people in Albuquerque. Preceding each public scoping meeting, the NRC staff conducted an "open house" at the meeting facility. Transcripts from each meeting, along with handouts and the NRC presentations, can be found on the NRC website (https://www.nrc.gov/waste/spent-fuel-storage/cis/hi/public-meetings.html).

To accommodate members of the public with limited English proficiency, the NRC staff provided presentation slides, a fact sheet about the project, and information about how to comment on the project in Spanish. These materials are also available on the NRC website (https://www.nrc.gov/waste/spent-fuel-storage/cis/hi/public-meetings.html). Fluent Spanish-speaking NRC staff opened all of the public scoping meetings by stating, in Spanish, that although the meetings were being conducted in English, requests to translate into Spanish were welcomed and would be honored.

In advance of each of these meetings, meeting announcements were posted on the NRC public meeting notification system website, and notices were placed in local newspapers and radio stations. In addition, the NRC's Office of Public Affairs issued press releases and posted notice of the meetings on the NRC's Facebook and Twitter accounts.

1.4.2 Issues Studied in Detail

To meet its NEPA obligations related to its review of the proposed CISF project, the NRC staff conducted an independent and detailed evaluation of the potential environmental impacts from construction, operation, and decommissioning of the proposed facility at the proposed location and of the No-Action alternative. This EIS provides a detailed analysis of the following resource areas:

- Land Use
- Transportation
- Geology and Soils
- Water Resources
    - Surface Water
    - Groundwater
- Ecology
    - Vegetation
    - Wildlife
    - Protected Species and Species of Concern
- Air Quality
- Noise
- Visual and Scenic Resources
- Historic and Cultural Resources
- Socioeconomics
- Environmental Justice
- Public and Occupational Health and Safety
- Waste Management

As part of the cumulative impacts analysis, the NRC also considers the effects the proposed project could have on global climate change. The analysis estimates the potential effect of the facility's greenhouse gas emissions based on a 40-year license term.

1.4.3 Issues Outside the Scope of the EIS

This EIS evaluates the environmental impacts of construction, operation, and decommissioning of a consolidated interim storage facility for SNF. Some issues and concerns raised during the public scoping process on the EIS (NRC, 2019a – NRC scoping report) were determined to be outside the scope of the EIS. As a result, these issues and concerns are not addressed in the EIS. These topics include (but are not limited to)

- consideration of noncommercial SNF (e.g., defense waste, foreign waste)
- concerns about nuclear power and alternatives to nuclear power
- consideration of environmental impacts of constructing and operating reprocessing facilities for commercial SNF
- concerns associated with the Yucca Mountain licensing proceeding and national progress in developing a repository
- legacy issues from prior nuclear activities not in the vicinity of the proposed project
- site-specific issues at other facilities

1.4.4 Relationship to the Continued Storage Generic Environmental Impact Statement (GEIS) and Rule

In September 2014, the NRC issued the Continued Storage Generic Environmental Impact Statement [NUREG–2157 (NRC, 2014)] and updated its Continued Storage Rule at 10 CFR 51.23. The Continued Storage GEIS analyzed the environmental effects of the continued storage (i.e., beyond a facility's license term) of SNF at both at-reactor and away-from-reactor independent spent fuel storage installations (ISFSIs) (NRC, 2014) and served as the regulatory basis for the Rule. The Rule codified the NRC's generic determinations made in the GEIS regarding the environmental impacts of continued storage of SNF beyond the licensed life of a facility.

The GEIS is applicable for the period of time after the license term of an away-from-reactor independent spent fuel storage installation (ISFSI) (i.e., a CISF) (NRC, 2014). Consistent with 10 CFR 51.23(c), this EIS serves as the site-specific review conducted for the construction and operation of the proposed CISF for the period of its proposed license term. In accordance with the regulation at 10 CFR 51.23(b), the impact determinations from the GEIS are deemed incorporated into this EIS for the timeframe beyond the period following the term of the CISF license. Thus, those impact determinations are not reanalyzed in this EIS.

1.5 Applicable Regulatory and Statutory Requirements

NEPA established national environmental policy and goals to protect, maintain, and enhance the environment and provided a process for implementing these specific goals for those Federal agencies responsible for an action. This EIS was prepared in accordance with the NRC's

NEPA-implementing regulations at 10 CFR Part 51. In addition, pursuant to 10 CFR Part 72, the NRC regulations establish requirements, procedures, and criteria for the issuance of licenses to receive, transfer, and possess power reactor spent fuel, power reactor-related GTCC waste, and other radioactive materials associated with spent fuel storage in an ISFSI.

BLM regulatory requirements include the Federal Land Policy and Management Act of 1976*,* as amended, which is a Federal law that governs the way in which BLM-administered public lands are managed. This regulatory requirement would apply to the proposed CISF project connected action of construction, operation, and decommissioning of the rail spur on BLM land to transport SNF from the main rail line to the proposed CISF (NRC, 2018a). In addition, BLM would be the responsible agency for granting rights-of-way under 43 CFR Part 2800. The BLM objective under this regulation is to grant rights-of-ways to any qualified individual, business, or government entity and to direct and control the use of rights-of-way on public lands in a manner that (i) protects the natural resources associated with public lands and adjacent lands; (ii) prevents unnecessary or undue degradation to public lands; (iii) promotes the use of rights-of-way considering engineering and technological compatibility, national security, and land use plans; and (iv) coordinates, to the fullest extent possible, all BLM actions under the regulations in this part with State and local governments, interested individuals, and appropriate quasi-public entities (NRC, 2018a).

New Mexico Environment Department (NMED) statutory requirements in Section 74-1-6(C) of the New Mexico Environmental Improvement Act allows NMED to enter into agreements with environmental and consumer protection agencies of other States and the Federal Government pertaining to duties of the department. Under the NRC and NMED Memorandum of Understanding, NMED has provided information on State permitting requirements as input to this EIS (NRC, 2019b).

1.6 Licensing and Permitting

1.6.1 NRC Licensing Process

By letter dated March 30, 2017, Holtec submitted a license application to the NRC for the proposed CISF project (Holtec, 2017). The NRC initially conducts an acceptance review of a license application to determine whether the application is sufficient to begin a detailed technical review. The NRC staff accepted the proposed CISF project license application for detailed technical review by letter dated July 7, 2017 (NRC, 2017).

The NRC staff's detailed technical review of Holtec's license application is composed of both a safety review and an environmental review. These two reviews are conducted in parallel. The focus of the safety review is to assess compliance with the applicable regulatory requirements at 10 CFR Part 72. The environmental review has been conducted in accordance with the regulations at 10 CFR Part 51.

1.6.2 Status of Permitting With Other Federal and State Agencies

In addition to obtaining an NRC license prior to construction of the proposed CISF project, Holtec is required to obtain all necessary permits and approvals from other Federal and State agencies during construction and operation of the proposed facility. EIS Table 1.6-1 lists the status of the required permits and approvals.

Table 1.6-1 Environmental Approvals for the Proposed CISF Project		
Regulatory Agency	**Description**	**Status***
U.S. Nuclear Regulatory Commission (NRC)	License Application	Under review. Submitted March 31, 2017
U.S. Bureau Land Management (BLM)	Land Use Permit – Rail Spur	Pending – Will apply for prior to construction
U.S. Fish and Wildlife Service (FWS)	ESA-Ecological surveys complete, informal consultation conducted	Initial Survey Complete
U.S. Environmental Protection Agency (EPA)	National Pollutant Discharge Elimination System (NPDES) Industrial Stormwater Permit	Pending
U.S. Environmental Protection Agency (EPA)	NPDES Construction Permit	Pending
New Mexico State Historic Preservation Office (NM SHPO)	NHPA-Surveys complete, informal consultation conducted (Appendix C of ER). Two prehistoric sites identified as eligible for listing in National Register of Historic Places (NRHP). Avoidance is recommended.	Initial Survey Complete
New Mexico Department of Transportation (NMDOT)	NM243 Rail Road Spur ROW Crossing	Pending – Will apply for prior to construction
New Mexico Environment Department (NMED)	Groundwater Discharge Permit/Plan	Pending – Will apply for prior to construction, if required
New Mexico Environment Department (NMED)	Hazardous Waste Generation and Storage	Pending – Will apply for prior to construction
New Mexico Environment Department (NMED)	Environmental Protection Agency (EPA) Notification of Hazardous Waste Activity to obtain an EPA Identification Number	Pending – Will apply for the ID number prior to generation of waste during facility construction and operation
New Mexico Environment Department (NMED)	Petroleum Storage Tank Registration	Will register storage tanks as required
New Mexico Environment Department (NMED)	Sanitary Waste Permit	Pending – Will apply for prior to construction
New Mexico Environment Department (NMED)	401 Certification for Site Specific NPDES Permit	Pending – Will apply for prior to construction, if required
*Under Review indicates that the applicant has submitted its application for the permit. Pending indicates the applicant has not yet submitted its application for the permit.		

1.7 Consultation

Federal agencies are required to comply with consultation requirements in Section 7 of the Endangered Species Act of 1973 (ESA), as amended, and Section 106 of the National Historic Preservation Act of 1966 (NHPA), as amended. Section 7 (ESA) and Section 106 (NHPA) consultations conducted for the proposed CISF project are summarized in EIS Sections 1.7.1

and 1.7.2. A list of the consultation correspondence is provided in EIS Appendix A. EIS Section 1.7.3 describes the NRC coordination with other Federal, Tribal, State, and local agencies conducted during the development of this EIS.

1.7.1 Endangered Species Act of 1973 Consultation

The ESA was enacted to prevent the further decline of endangered and threatened species and to restore those species and their critical habitats. ESA Section 7 requires agencies to consult with the U.S. Fish and Wildlife Service (FWS) to ensure that actions it authorizes, permits, or otherwise carries out will not jeopardize the continued existence of any listed species or adversely modify designated critical habitats. The FWS has responsibility for certain species of New Mexico wildlife under the ESA, the Migratory Bird Treaty Act (MBTA) as amended (16 USC 701-715), and the Bald and Golden Eagle Protection Act (BGEPA) as amended (16 USC 668-668c).

On November 21, 2019, the NRC staff obtained an official species list from the FWS Information Planning and Conservation (IPaC) website (FWS, 2019a). This list is provided pursuant to Section 7 of the ESA and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action." The FWS official species lists are considered valid for 90 days (FWS, 2019b). The NRC staff will regularly request updated species lists during the EIS review process.

The NRC staff met with the New Mexico Game and Fish Department (NMDGF) on May 2, 2018, to discuss the potential impacts on ecological resources associated with the proposed CISF. By letter dated August 31, 2018, the NMDGF (C. Hayes) submitted scoping comments on the proposed CISF project (NMDGF, 2018). The NRC staff used the interactive New Mexico Environmental Review Tool to generate a site-specific report of NMDGF recommendations regarding potential impacts to wildlife or wildlife habitats from the proposed CISF project (NMDGF, 2019). The NMDGF and NRC staffs then discussed the recommendations in the report. To date, NMDGF staff has not provided additional recommendations beyond those provided in their August 2018 scoping comments (NMDGF, 2018). The NRC staff will continue to be in regular communication with the NMDGF during the EIS review process.

1.7.2 National Historic Preservation Act of 1966 Consultation

Section 106 of the NHPA requires that Federal agencies take into account the effects of their undertakings on historic properties and afford the Advisory Council on Historic Preservation an opportunity to comment on such undertakings. The Section 106 process seeks the views of consulting parties, including the Federal agency, the State Historic Preservation Officer, Indian Tribes, Tribal Historic Preservation Officers, local government leaders, Holtec, cooperating agencies, and the public. The NRC staff is complying with NHPA requirements by performing the Section 106 consultation in coordination with performing the NEPA environmental review, in accordance with 36 CFR 800.8. By conducting the NHPA Section 106 evaluation through the NEPA process, the NRC staff will be able to assess if there are historic properties the proposed project adversely affected and potential ways to avoid, minimize, or mitigate adverse effects while identifying alternatives and preparing NEPA documentation.

The goal of consultation is to identify historic properties the undertaking potentially affects, assess the effects of the undertaking on these properties, and seek ways to avoid, minimize, or mitigate any adverse effects on historic properties. As detailed in 36 CFR 800.2(c)(1)(i), the role of the New Mexico State Historic Preservation Office (NM SHPO) in the Section 106 process is to advise and assist Federal agencies in carrying out their Section 106 responsibilities.

The NRC initiated consultation with the NM SHPO and Federally recognized Tribes having current or historic connection to the proposed project area (NRC, 2018b). Four Tribes have agreed to consult on the proposed project. The NRC staff will continue to consult with the NM SHPO and other consulting parties throughout the environmental review process to evaluate the effects of the proposed project on cultural and historical resources.

1.7.3 Coordination with Other Federal, State, Local, and Tribal Agencies

The NRC staff interacted with Federal, State, local, and Tribal agencies during preparation of this EIS to gather information on potential issues, concerns, and environmental impacts related to the proposed CISF project. The consultation and coordination process has included discussions with NMED, FWS, NMDGF, local organizations (e.g., county commissioners), as well as Tribal governments.

1.7.3.1 Interactions with Tribal Governments

The NRC recognizes that there are specific government-to-government consultation responsibilities regarding interactions with Federally recognized Tribal governments because of their status as sovereign nations. As such, the NRC offers Federally recognized Tribes the opportunity for government-to-government consultation consistent with the principles in its Tribal Policy Statement, which was issued on January 9, 2017 (82 FR 2402). The Tribal Policy Statement promotes effective government-to-government interactions with Indian and Alaska Native Tribes and encourages and facilitates Tribal involvement in the areas over which the NRC has jurisdiction. To date, the NRC staff has contacted all Federally recognized Indian Tribes with current or historic ties to the project location in southeast New Mexico. Eleven Tribes were contacted in total: the Apache Tribe of Oklahoma, the Comanche Nation, the Hopi Tribe, the Jicarilla Apache Nation, the Kiowa Tribe of Oklahoma, the Mescalero Apache Tribe, the Navajo Nation, the Pawnee Nation of Oklahoma, the Pueblo of Isleta, the Pueblo of Tesuque, and the Ysleta del Sur Pueblo. Appendix A of this EIS contains correspondence related to NRC's outreach with Indian Tribes. The NRC encourages interested Indian Tribes to participate throughout the Holtec CISF environmental review and will continue outreach efforts.

1.7.3.2 Coordination with Federal and State Agencies

Coordination with BLM

The NRC identified the BLM as a cooperating agency for the Holtec CISF environmental review. The transfer of SNF to and from the main rail line to the proposed CISF would occur using a rail spur. The proposed rail spur would be constructed on BLM land and require BLM permitting. The Memorandum of Understanding (MOU) between the NRC and BLM can be found using ADAMS (Accession No. ML18248A133). For additional details on the BLM Federal action and purpose and need, see EIS Sections 1.2.2 and 1.3.2, respectively. BLM will be the agency responsible for issuing the appropriate right-of-way for the rail spur and permitting any other project-related actions on BLM land. This EIS will serve to fulfill the NEPA responsibilities of both the NRC and BLM, with both agencies issuing a separate Record of Decision.

Coordination with NMED

At the request of the State of New Mexico, NMED was identified as a cooperating agency having special expertise in surface water and groundwater resources for the proposed CISF project. The NRC staff coordinated with NMED staff on water resources for this EIS to describe the affected environment, potential impacts from the proposed project, cumulative impacts, and any additional mitigation measures. The NMED does not have any obligations under NEPA related to the proposed project; however, NMED provided special expertise for water resources in and around the proposed site. NMED submitted comments on the preliminary draft EIS, which the NRC staff addressed as appropriate in this draft EIS when doing so would advance the evaluation of the proposed project impacts.

1.7.3.3 Coordination with Localities

The NRC staff met with city council members of the City of Artesia on April 30, 2018; with the City of Hobbs Mayor's Office on May 1, 2018; with the Lea and Eddy County Commissioners and city managers on May 3, 2018; and with the City of Carlsbad Mayor's Office on May 3, 2018, to provide a brief overview of the NRC environmental review process and, when possible, address any questions or concerns by members of these local agencies. The NRC staff also met with the Economic Development Board of Lea County (May 1, 2018) and the Carlsbad Soil and Water Conservation Service (May 3, 2018). Lists of attendees and summaries of these discussions can be found in the NRC Site Trip Report (ADAMS Accession No. ML18164A217).

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2 PROPOSED ACTION AND ALTERNATIVES

2.1 Introduction

By letter dated March 30, 2017, the U.S. Nuclear Regulatory Commission (NRC) received an application from Holtec International (Holtec) requesting authorization to construct and operate a consolidated interim storage facility (CISF) for spent nuclear fuel (SNF) and high level waste in Lea County, New Mexico (Holtec, 2017). The application included an Environmental Report (ER) (Holtec, 2019a) and Safety Analysis Report (SAR) (Holtec, 2019b). The proposed Holtec CISF would provide an option for away-from-reactor interim storage of SNF and Greater-Than Class C waste as well as a small quantity of mixed oxide fuel from nuclear power reactors (collectively referred to in this document as SNF), before a permanent repository is available. Holtec prepared the license application in accordance with requirements in Title 10 of the *Code of Federal Regulations* (10 CFR), Part 72, *Licensing Requirements for the Independent Storage of Spent Nuclear Fuel, High-Level Radioactive Waste, and Reactor-Related Greater Than Class C Waste*. This environmental impact statement (EIS) is being prepared consistent with NRC's NEPA-implementing regulations contained in 10 CFR Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions" and the NRC staff guidance in NUREG–1748, "Environmental Review Guidance for Licensing Actions Associated with NMSS Programs" (NRC, 2003).

Descriptions of the proposed action and alternatives to the proposed action are provided in the following sections for use in developing the EIS. The sections discussed include (i) the proposed action; (ii) reasonable alternatives to the proposed action to be analyzed in detail in the EIS; and (iii) additional alternatives that were considered in the draft EIS but eliminated from detailed analysis, including reasons for elimination. The reasonable alternatives to the proposed action considered in the discussion below include the "No-Action" alternative (i.e., the license would not be authorized), as the National Environmental Policy Act of 1969, as amended (NEPA) requires.

2.2 Alternatives Considered for Detailed Analysis

2.2.1 The Proposed Action (Alternative 1)

The proposed action is the issuance, under the provisions of 10 CFR Part 72, of an NRC license authorizing the construction and operation of the proposed Holtec CISF in southeastern New Mexico at a site located approximately halfway between the cities of Carlsbad and Hobbs, New Mexico. Holtec requests authorization for the initial phase (Phase 1) of the proposed project to store 5,000 metric tons of uranium (MTUs) [5,512 short tons] in 500 canisters for a license period of 40 years. However, because the capacity of individual canisters can vary, the 500 canisters proposed in the Holtec license application have the potential to hold up to 8,680 MTUs [9,568 short tons]. Therefore, the analysis in this EIS and in the corresponding safety review will analyze the storage of up to 8,680 MTUs [9,568 short tons] for Phase 1.

Holtec anticipates subsequently requesting amendments to the license to store an additional 5,000 MTUs [5,512 short tons] for each of 19 expansion phases of the proposed CISF to be completed over the course of 20 years to expand the facility to eventually store up to 10,000 canisters of SNF (Holtec, 2019a,b). Holtec's expansion of the proposed project (i.e., Phases 2-20) is not part of the proposed action currently pending before the agency. However, the NRC staff considered these expansion phases in its description of the affected environment and impact determination, where appropriate, when the environmental impacts of the potential future expansion were able to be determined so as to conduct a bounding analysis for the proposed CISF project. The NRC staff conducted this analysis as a matter of discretion because Holtec provided the analysis of the environmental impacts of the future anticipated expansion of the proposed facility as part of its license application (Holtec, 2019a). For the bounding analysis, the NRC staff assumes the storage of up to 10,000 canisters of SNF. Therefore, this EIS chapter discusses the impacts from construction and operations stage of proposed action (Phase 1) as well as subsequent phases of the proposed CISF project (i.e., Phases 2-20).

For the initial and subsequent phases of the proposed CISF, SNF would be received from operating, decommissioning, and decommissioned reactor facilities. The CISF would serve as an interim storage facility for several decades before a geologic repository is opened.

The proposed CISF would be licensed by the NRC to operate for a period of 40 years. Holtec has indicated that it may seek to renew the license for two additional renewal periods of up to 40 years each for a total of up to 120 years (Holtec, 2019a). Renewal of the 40-year license would require Holtec to submit a license amendment request, which would be subject to a new safety and environmental review [Environmental Assessment (EA) or EIS]. Therefore, the period analyzed in this EIS is the licensing period of 40 years. By the end of the license term of the proposed CISF, the NRC expects that the SNF would have been shipped to a permanent repository. This expectation of repository availability is consistent with Appendix B of NUREG–2157, "*Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel*," (NRC, 2014).

Transportation of SNF to the proposed Holtec CISF would be by rail. The license application proposes that transfer of SNF from the main rail line to the CISF facility would occur by the construction and operation of a rail spur on land the Bureau of Land Management (BLM) owns. Additional information about the use of the rail spur is discussed in Section 2.2.1.6.

2.2.1.1 Site Location and Description

The proposed CISF project would be built and operated on approximately 421 hectares (ha) [1,040 acres (ac)] of land in Lea County, New Mexico (EIS Figure 2.2-1) (Holtec, 2019a). The storage and operations area, which is a smaller land area within the full property boundary, would include 134 ha [330 ac] of disturbed land. The proposed project area is approximately 51 kilometers (km) [32 miles (mi)] east of Carlsbad, New Mexico, and 54 km [34 mi] west of Hobbs, New Mexico (EIS Figure 2.2-1). Currently, the proposed project area is privately owned by the Eddy-Lea Energy Alliance LLC (ELEA); however, Holtec has committed to purchasing the property from ELEA (Holtec, 2019a,c) if NRC licenses the proposed facility. The proposed project area is located 0.84 km [0.52 mi] north of U.S. Highway 62/180 and consists of mostly undeveloped land used for cattle grazing (Holtec, 2019a).

Within the proposed project area, there is a communications tower in the southwest corner; a former gas-producing well with associated tank battery located near the communications tower; a small livestock water drinker; an abandoned oil-recovery facility in the northeast corner; and an oil-recovery facility in the southeast corner (ELEA, 2007). While there are no water wells within the proposed project area, there are 18 plugged and abandoned oil and gas wells located on the property (Holtec, 2019c). None of these plugged and abandoned oil and gas wells are

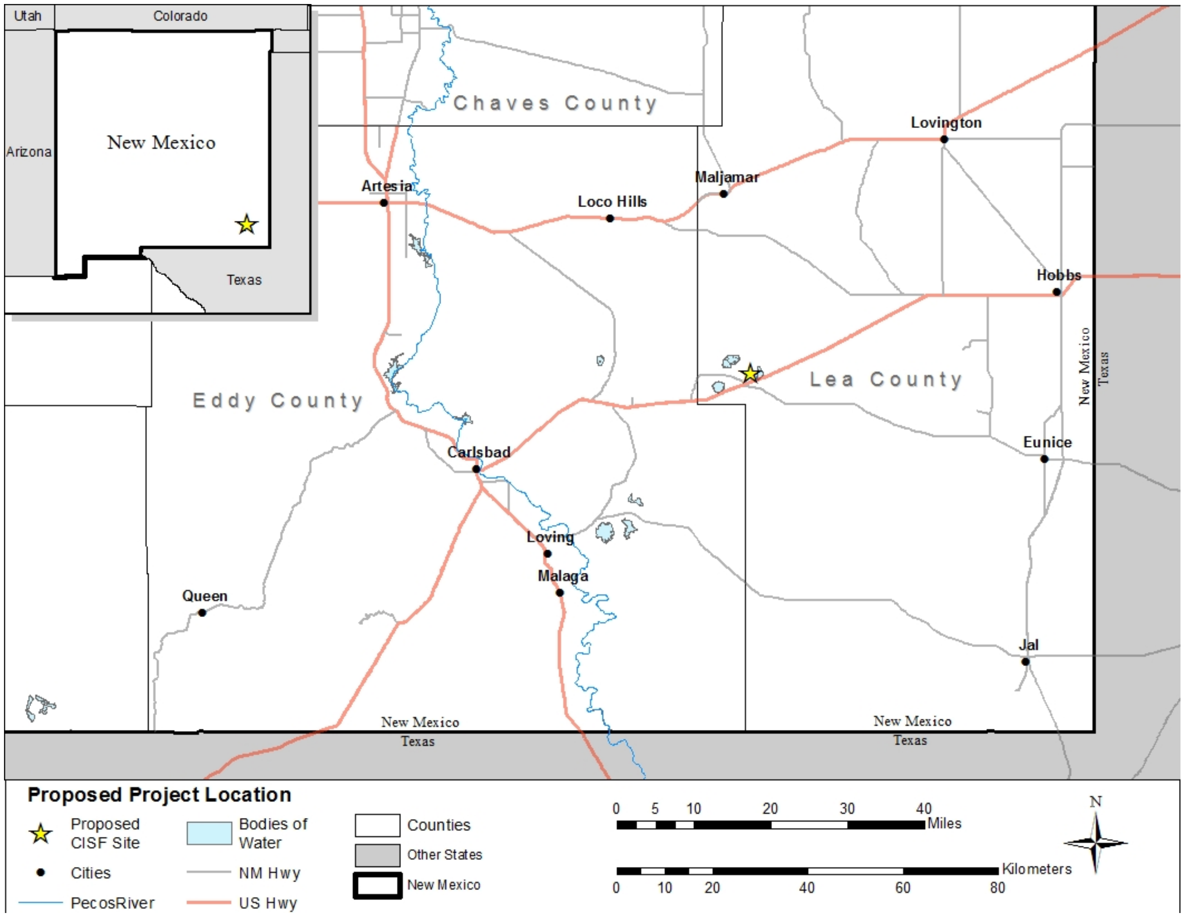

Figure 2.2-1 Proposed Project Location (Source: Holtec, 2019b)

located within the storage and operations area where the independent spent fuel storage installation (ISFSI) would be located or where any land area that would be disturbed as part of the proposed construction and operation of the proposed CISF project.

Land uses in the vicinity of the proposed project area include oil and gas exploration and production, oil and gas related industries, potash mining, solar and wind projects, and livestock grazing, and the nearest resident is approximately 2.4 km [1.5 mi] away. There is also a large transient population of employees in the area at nearby potash mines, oil fields, an oilfield waste treatment facility, and an industrial landfill (Holtec, 2019a). The major roads in the area are county and state roads interconnecting the various population centers. U.S. Highway 285 runs south to north with U.S. Highway 62/180 running southwest to the northeast through Carlsbad and Hobbs, New Mexico. U.S. Highway 82 travels west to east from Artesia through Lovington, New Mexico (ELEA, 2007). There are several existing right-of-ways within and in the vicinity of the proposed project area. These existing right-of-ways include pipelines, roads, well pads, power lines, a telephone line, and a communications tower (ELEA, 2007; Holtec, 2019a).

Description of the Proposed Facility

The proposed CISF project would use the Holtec International Storage Module Underground MAXimum Capacity (HI-STORM UMAX) technology (certified in NRC Docket Number 72-1040), which is a dry, in-ground storage system that stores a hermetically sealed canister containing

SNF in a number of vertical ventilated modules (VVM) (Holtec, 2019b). For the proposed action (Phase 1) there would be 500 VVMs constructed on 48.3 ha [119.4 ac] of land within the proposed project boundary. If the NRC approves future amendments, at full build-out (Phases 1-20), the proposed facility would contain 10,000 VVMs that would be constructed in 20 phases with a storage and operations total land disturbance area of approximately 134 ha [330 ac] of land (EIS Figure 2.2-2) (Holtec, 2019a). Within the storage and operations area, there would be the HI-STORM UMAX SNF storage units licensed under 10 CFR Part 72; the cask transfer building where casks would be brought in and prepared for canister placement in permanent storage in the HI-STORM UMAX VVMs; the security building; the administration building; the site access road; and construction laydown area that would contain an equipment storage building and a concrete batch plant (EIS Figure 2.2-3).

2.2.1.2 SNF Storage Systems

In dry cask storage systems, SNF that has been cooled in a spent fuel pool (at nuclear power plant sites) for at least one year and is surrounded by inert gas inside a steel canister that is either welded or bolted closed to provide leak-tight confinement of the SNF. Each canister is then surrounded by additional steel, concrete, or other material to provide radiation shielding to workers and members of the public.

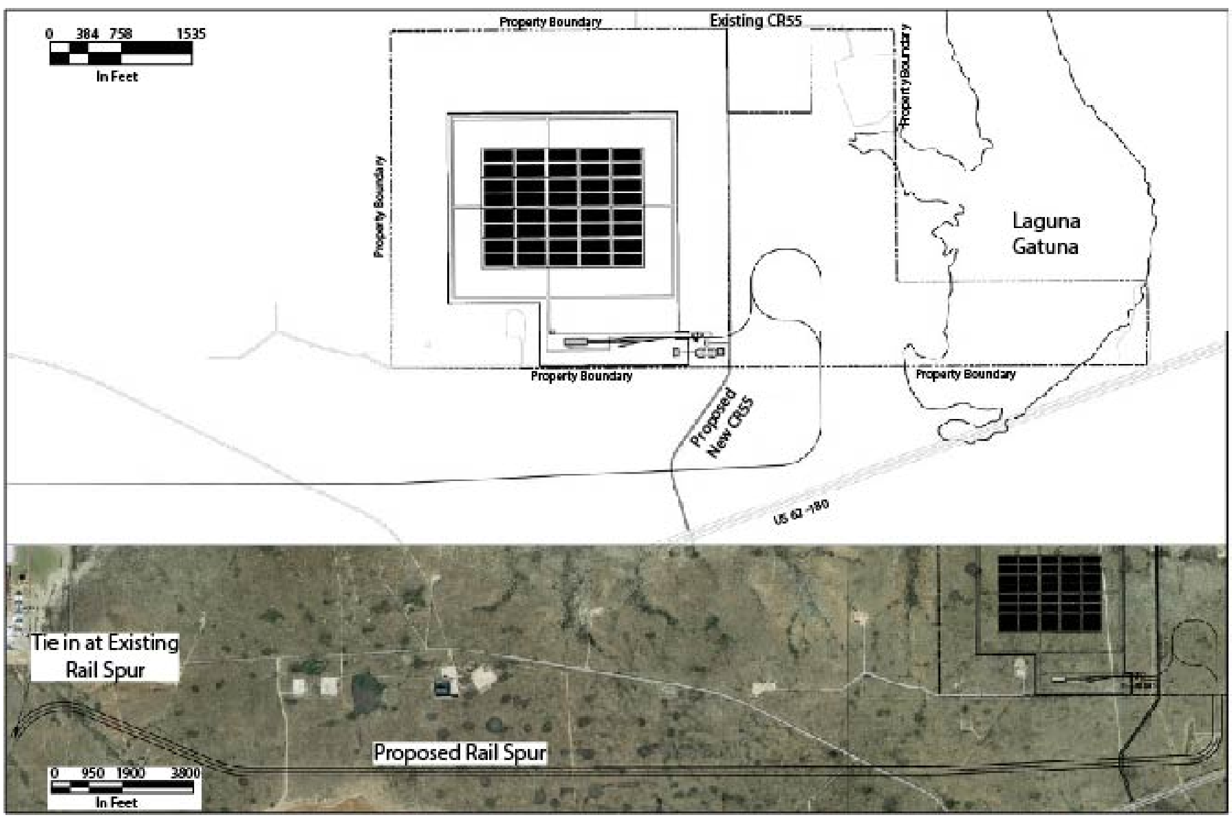

Figure 2.2-2 Aerial View of Full Build-Out (Source: Holtec, 2019b)

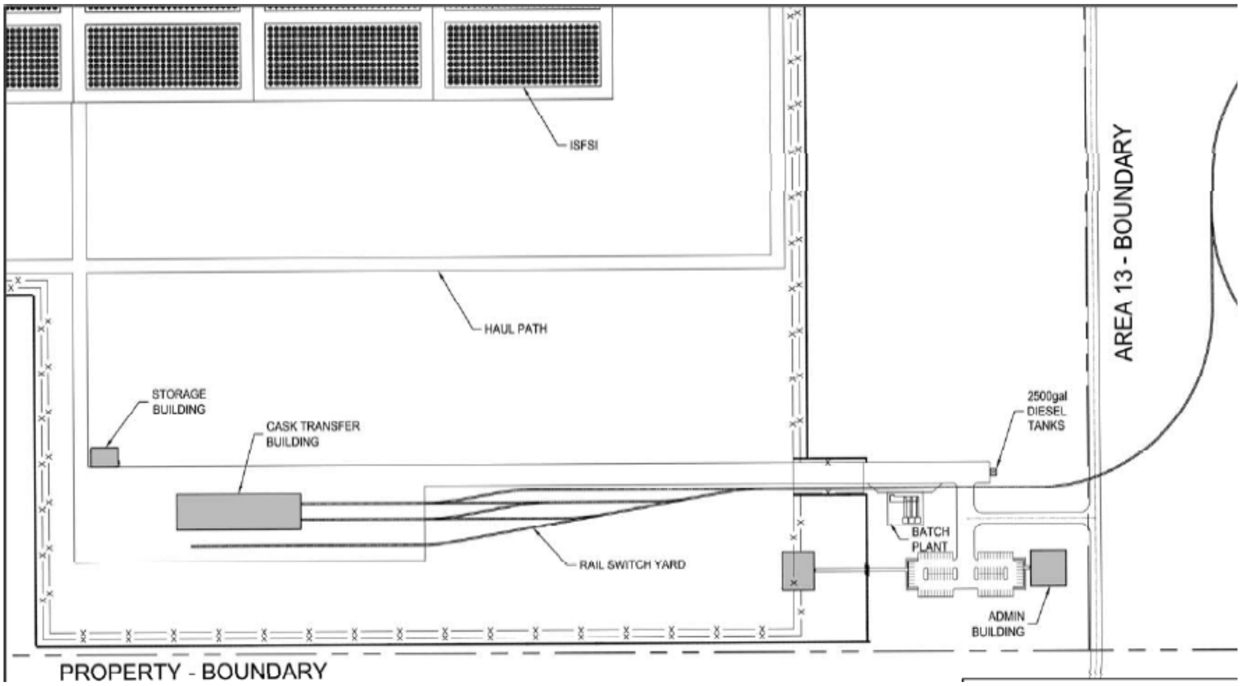

Figure 2.2-3 Proposed Project Building Layout (Source: Holtec, 2019a)

SNF waste at the proposed CISF would be stored in dry cask storage systems that the NRC previously approved. These cask systems include transportable dual-purpose (transportation/storage) or multi-purpose (transportation/storage/disposal) canister-based storage systems. Each of these systems is engineered to safely store SNF and is subject to rigorous inspections, aging management programs, maintenance, and relicensing.

The proposed CISF project would use the HI-STORM UMAX (EIS Figure 2.2-4) for in-ground storage. The HI-STORM UMAX system would vertically store the SNF underground to a total depth of approximately 6.9 m [22.5 ft] (Holtec, 2019b). The HI-STORM UMAX is designed to be fully compatible with all HI-TRAC transfer casks and canisters NRC previously certified for storage. The proposed Holtec HI-STORM UMAX Storage System would be capable of storing the SNF from all existing SNF storage systems (Holtec, 2019a,b). The storage cavity of HI-STORM UMAX is large enough to accommodate almost every canister type in use in the United States.

Canister
A large rugged cylinder containing one to six dozen spent fuel assemblies. A canister, typically made of a corrosion-resistant metal, is filled with inert gas and bolted or welded closed. The sealed canister is typically emplaced inside an outer shell of steel, concrete, lead, or other material as part of a dry cask storage system.

Cask
A heavily shielded container used for the dry storage or shipment (or both) of radioactive materials, such as spent nuclear fuel (spent fuel) or other high-level radioactive waste. Casks are often made from lead, concrete, or steel. Casks must meet regulatory requirements and are not intended for long-term disposal in a repository.

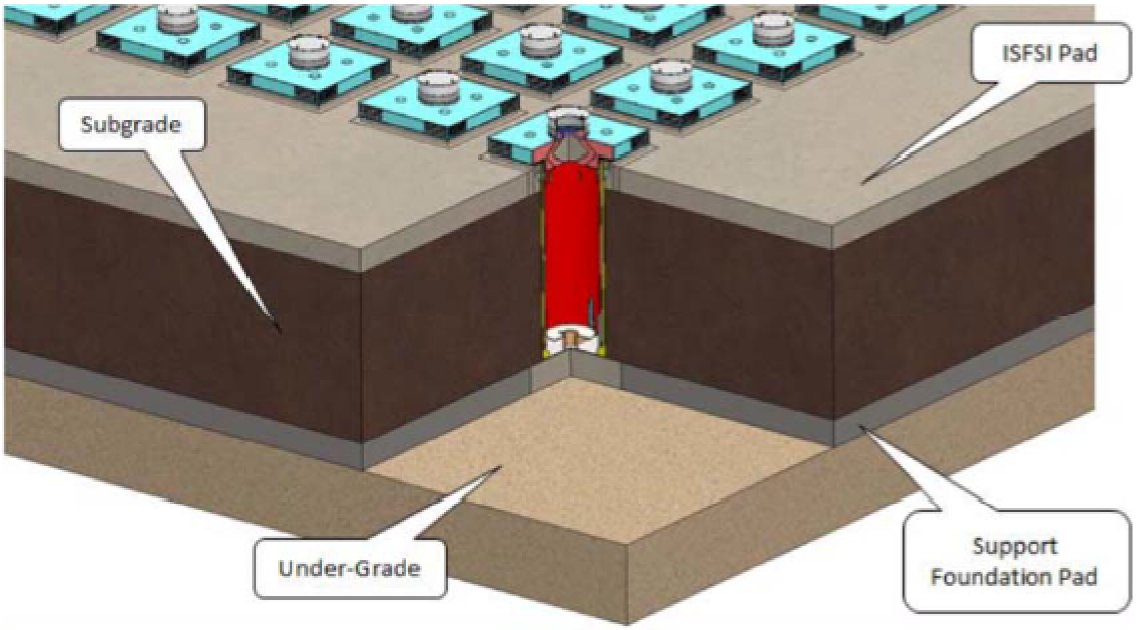

Figure 2.2-4 HI-STORM UMAX ISFSI in Partial Cut-Away View (Source: Holtec, 2019a)

If all 20 phases were constructed, the proposed CISF project would contain 10,000 VVMs units, each storing one canister of SNF. Each phase would consist of constructing 500 units with concrete approach aprons that surround two individual 250 units HI-STORM UMAX ISFSI Pads (Holtec, 2019a).

2.2.1.3 Facility Construction

During the construction of the proposed action (Phase 1) of the HI-STORE CISF, Holtec would excavate multiple areas to accommodate and install the underground portions of the facilities (Holtec, 2019b). For the proposed action (Phase 1), the proposed CISF would be prepared by excavating a pit that would house the SNF canisters in the VVMs. Approximately 135,517 m^3 [177,250 yd^3] of soil would be excavated per phase. However, for the proposed action (Phase 1) an additional 61,547 m^3 [80,500 yd^3] of soil would be excavated for construction of the facility buildings (e.g., security and administration buildings) and associated infrastructure, the access road, relocating the existing road that currently runs through the proposed project area, and construction of the parking lot. Excavated soil would be stockpiled in an open area inside the property boundary, but outside the protected area (i.e., area with the VVMs). The expected total excavation depth would be approximately 7.6 m [25 ft] (Holtec, 2019b).

Per geotechnical borings, there are two layers of subsurface material that would be encountered during construction excavations: (i) the native caliche layer, which is approximately 3.6 m [12 ft] from the top of existing grade and (ii) the native residual soil layer, which makes up the remaining approximately 4 m [13 ft] of the required excavation depth (Holtec, 2019b).

Cask Transfer Building

The cask transfer building is where transportation casks would be brought in and the canisters removed from the casks and prepared for storage in the VVMs. The cask transfer building would be approximately 122 m [400 ft] long by 45.7 m [150 ft] wide and have a height of approximately 18 m [60 ft]. The building would be located south of the Support Foundation Pads (SFPs) and inside the protected area (Holtec, 2019a,b). The cask transfer building would likely contain two bays in a single building, but there is a possibility that it could contain multiple bays in multiple buildings for contingency or increased operational capacity. However, any modification to the cask transfer building design would be within the same land disturbance footprint (Holtec, 2019a,b). The cask transfer building would be the tallest structure within the proposed project area (Holtec, 2019a). The cask transfer building would contain a service crane and gantry crane, which would run along independent rails, with the gantry crane used to move casks.

Rail cars would enter the east side of the building, and a gantry crane would unload the casks. After unloading, rail cars would also exit the cask transfer building on the east side of the building. Along the rail line, inside the cask transfer building, there would be space for cask staging and transporter loading. Within the cask transfer building, the SNF canister would be removed from the transportation cask, the canister would be tested for integrity, and then the canister would be loaded into a transfer cask and moved onto a transporter. A transporter is a vehicle that moves and supports the transfer cask containing the SNF canister. Once loaded, the transporter would exit the building and proceed to the appropriate storage module at the HI-STORM UMAX ISFSI pad (Holtec, 2019a).

Preventative maintenance would be performed on a regular basis on the cranes, transfer equipment, shipping casks, and other equipment in the cask transfer building (Holtec, 2019a). Within the building, additional storage would be used for temporary staging of impact limiters and casks, as well as storage for maintenance tools and supplies. The cask transfer building would also include waste management areas and chemical storage areas for cleaning supplies needed to support activities at the proposed facility. In addition, a small storage building would be located northwest of the cask transfer building inside the protected area (Holtec, 2019a).

Security and Administration Building

The security building would be located east of the cask transfer building and would be part of the protected area. The single-story building would be approximately 30 m [100 ft] long by 30 m [100 ft] wide. Inside the building would be the surveillance and monitoring stations for the central alarm station, access control, and the armory. Security personnel would monitor sensors and intrusion alarms, control employee access, process visitors into the proposed facility, and control rail and vehicle access (Holtec, 2019a).

The single-story administration building, approximately 30 m [100 ft] long by 30 m [100 ft] wide, would be outside the protected area. The building would contain offices for operations, maintenance, and material control personnel; administrative functions related to processing shipments; emergency equipment and operations; a communication and tracking center; training and visitor centers; a health physics area; records storage; a conference room; a break room; and restroom facilities (Holtec, 2019a).

Concrete Batch Plant

To facilitate the construction of the proposed action (Phase 1) and any subsequent phases, Holtec anticipates installing a mobile concrete batch plant (Holtec, 2019c). The concrete batch plant would be a pre-fabricated system that is easily mobilized and demobilized using only a small crew. This onsite concrete batch plant would provide concrete onsite, rather than transporting it to the proposed project area. The concrete batch plant would be located outside of the protected area and would be capable of producing 191 m^3 [250 yd^3] an hour (Holtec, 2019b). The components of the concrete batch plant would include mechanisms for aggregate handling, water handling, cement handling, and scales as well as transfer conveyors, pneumatic systems, and dust-collection systems. Depending on the type of concrete batch plant, the New Mexico Environment Department (NMED) may require the concrete batch plant to obtain a General Construction Permit, a Title V Operating Permit, a Storm Water Pollution Prevention Plan (SWPPP), and an Air Quality Permit (Holtec, 2019b).

Support Foundation Pad (SFP) and Subgrade Features

Once the excavation pit is complete, the subsurface would be compacted and prepared (i.e., use of a heavy vibrating compactor) to receive the reinforced concrete SFP (Holtec, 2019b). After surface preparation, a mud mat (or leveling slab) would be poured to ensure there is an even surface to pour the HI-STORM UMAX SFP.

Upon completion of subgrade preparation/compaction, placement of the reinforced concrete SFP and UMAX Cavity Enclosure Containers (CECs), and backfilling would start (Holtec, 2019b). Once the SFP is poured, the CEC would be staged and leveled using designed leveling bolts. Upon completion of the CEC leveling process, formwork would be erected to grout the CEC baseplates in place, followed by the actual grouting process itself. The Self-Hardening Engineering Subgrade layer, composed of engineered backfill, Controlled Low Strength Material or lean concrete, would be installed to the appropriate elevation, and the top surface would be prepped for the top slab or ISFSI pad. As the subgrade layer is installed, excavated areas would be backfilled and utilized. This backfill material would reuse excavated soils, to the extent practicable. After the concrete is poured and set for the ISFSI pad, the HI-STORM UMAX system would be complete. Final site grading would also reuse stockpiled soils. Approximately 10 percent of the stockpiled soils would be expected to be reused for backfilling and final site grading. The remainder of stockpiled soils would be shipped offsite via heavy-haul trucks (Holtec, 2019a,b).

Facility Operations

During CISF operations, transportation casks containing canisters of SNF would arrive via rail car. Upon arrival, security personnel would perform an initial receipt inspection of the cask prior to transport into the protected area. The transportation cask would then be transported into the cask transfer building, and radiological personnel would conduct a receipt inspection of the cask (Holtec, 2019a,b). The inspection would include initial radiological surveys and an examination of the integrity of the transportation cask. The cask would then be transferred to a receiving pad using the movable gantry crane. The SNF canister would be removed from the transportation cask, tested for integrity, loaded into a transfer cask, and moved onto a transporter. Once loaded, the transporter would proceed to the appropriate storage module at the HI-STORM UMAX ISFSI pad (Holtec, 2019a). The transfer cask would be aligned with the storage location, the lower lid of the transfer cask would be removed, and the canister would be lowered onto the storage pad. The transfer cask would be disconnected, removed from the storage pad area, and the transfer cask would be returned to the cask transfer building (Holtec 2019a,b). When a geologic repository becomes available, the SNF stored at the proposed CISF would be removed and sent to the repository for disposal. Removal of the SNF from the proposed CISF, or defueling, would involve similar activities to those associated with shipping SNF from nuclear power plants and ISFSIs and emplacement of SNF at the proposed CISF project.

2.2.1.4 Facility Closure, Decommissioning, and Reclamation

Decommissioning and reclamation of the proposed facility would include the dismantling of the proposed facility and rail spur. The decommissioning evaluation in this EIS is based on currently available information and plans. At the end of the license term of the proposed CISF project, once the SNF inventory is removed, the facility would be decommissioned such that the proposed project area and remaining facilities could be released and the license terminated. Decommissioning activities, in accordance with 10 CFR Part 72 requirements, would include conducting radiological surveys and decontaminating, if necessary. Holtec has committed to reclamation of nonradiological-related aspects of the proposed project area (Holtec, 2019a). Reclamation would include dismantling and removing equipment, materials, buildings, roads, the rail spur, and other onsite structures; cleaning up areas; waste disposal; controlling erosion; and restoring and reclaiming disturbed areas. Because decommissioning and reclamation are likely to take place well into the future, technological changes that could improve the decommissioning and reclamation processes cannot be predicted. As a result, the NRC requires that licensees applying to decommission an ISFSI (such as the proposed CISF) submit a Decommissioning Plan. The requirements for the Final Decommissioning Plan are delineated in 10 CFR 72.54(d), 72.54(g), and 72.54(i). The NRC staff would undertake a separate evaluation and NEPA review and prepare an environmental assessment or EIS, as appropriate, at the time the Decommissioning Plan is submitted to the NRC.

> Decommissioning activities include conducting radiological surveys and decontaminating, if necessary. (10 CFR Part 72).
>
> Reclamation activities include dismantling and removing equipment, materials, buildings, roads, the rail spur, and other onsite structures; cleaning up areas; waste disposal; controlling erosion; and restoring and reclaiming disturbed areas (Holtec, 2019a).

2.2.1.5 Use of the Rail Spur

The main rail line is approximately 6.1 km [3.8 mi] to the west of the proposed project area, and a private rail spur would be constructed as part of the proposed action. The rail spur would be exclusively used by Holtec (i.e., would be a non-carrier private rail spur not used by commercial rail carriers) to transport SNF from the main rail line to the proposed CISF with an approximate total length of 8 km [5 mi]. The disturbed land area for the rail spur would be 15.9 ha [39.4 ac] of BLM-managed land. The rail spur would be routed across relatively flat BLM-managed land west of the proposed CISF project and would not cross any major highways (Holtec, 2019a). A site access road would also be constructed across relatively flat BLM-managed land from the proposed CISF project southward to U.S. Highway 62/180 and would be approximately 1.6 km [1 mi] in length. Construction of the rail spur and site access road would require BLM right-of-way approval on Federal lands.

2.2.1.6 Emissions and Waste Generation

All stages of the proposed CISF (i.e., construction, operation, and decommissioning) would generate effluents and waste streams that must be handled and disposed of properly. This section describes the various types and volumes of effluents or wastes the proposed CISF generates.

Nonradiological Gaseous or Airborne Particulate Emissions

The primary nonradiological emissions the proposed CISF generated would be combustion emissions and fugitive dust. The main sources of the combustion emissions would be mobile sources and construction equipment. Combustion emissions are further categorized into non-greenhouse gases and greenhouse gases. The main sources of fugitive dust (e.g., particulate matter $PM_{2.5}$ and particulate matter PM_{10}) would be travel on unpaved roads and wind erosion from disturbed land. Particulate matter PM_{10} refers to particles that are 10 micrometers [3.9×10^{-4} in] in diameter or smaller, and $PM_{2.5}$ refers to particles that are 2.5 micrometers [9.8×10^{-5} in] in diameter or smaller.

EIS Table 2.2-1 contains the proposed action (Phase 1) estimated emission levels for each project stage (i.e., construction, operation, and decommissioning) as well as for the peak year. The peak-year emissions represent the highest emission levels associated with the proposed action (Phase 1) for each individual pollutant in any one year and therefore also represent the greatest potential impact to air quality. For the proposed action (Phase 1), no stages overlap, so the peak year for each pollutant occurs during the stage with the highest emissions levels for that pollutant. Construction activities would primarily generate combustion emissions from mobile sources as well as fugitive dust from clearing and grading of the land and vehicle movement over unpaved roads. Operation activities would primarily generate combustion emissions from equipment used to receive SNF and load it into modules or unload the SNF from the modules and remove the SNF from the proposed CISF. Decommissioning and reclamation activities are described in EIS Section 2.2.1.4. Reclamation activities would primarily generate combustion emissions from mobile sources as well as fugitive dust from clearing and grading of the land and vehicle movement over unpaved roads. For the proposed action (Phase 1) the operations stage generates the peak-year emission levels for carbon dioxide, carbon monoxide, and hazardous air pollutants. For the proposed action (Phase 1), the construction and decommissioning stages generate the same emission levels (EIS Table 2.2-1), and generate the peak-year emission levels for the other pollutants identified in EIS Table 2.2-1. This table also includes hourly emissions, which reflects the peak emissions levels of combustion sources that do not operate continuously over the year or even a day.

Table 2.2-1 Estimated Proposed Action (Phase 1) Emission Levels of Various Pollutants for the Proposed CISF

Pollutant	Construction		Operations		Decommissioning		Peak Year
	kg/h*	T/yr†	kg/h*	T/yr†	kg/h*	T/yr†	T/yr†
Carbon Dioxide	695	2,244	216	2,306	695	2,244	2,306
Carbon Monoxide	1.71	7.18	0.49	7.62	1.71	7.18	7.62
Hazardous Air Pollutants	< 0.004	0.01	< 0.004	0.02	< 0.004	0.01	0.02
Nitrogen Oxides	3.72	9.01	0.98	7.53	3.72	9.01	9.01
Particulate Matter‡ $PM_{2.5}$	0.96	1.96	0.05	0.34	0.96	1.96	1.96

Table 2.2-1 Estimated Proposed Action (Phase 1) Emission Levels of Various Pollutants for the Proposed CISF

Pollutant	Construction		Operations		Decommissioning		Peak Year
	kg/h*	T/yr[†]	kg/h*	T/yr[†]	kg/h*	T/yr[†]	T/yr[†]
Particulate Matter[‡] PM_{10}	8.01	14.82	0.07	0.53	8.01	14.82	14.82
Sulfur Dioxide	< 0.004	0.03	< 0.004	0.02	< 0.004	0.03	0.03
Volatile Organic Compounds	4.19	4.40	0.1	1.14	4.19	4.40	4.40

*Stands for kilograms per hour. To convert to pound per hour, multiply by 2.2046
[†]Stands for metric tons per year. To convert to short tons per year, multiply by 1.10231.
[‡]The proposed action includes a single concrete batch plant. If a second concrete batch plant is utilized, then NRC staff assume that the concrete batch plant emission levels would double.
Source: Holtec, 2019a and 2019d; SwRI, 2019

EIS Table 2.2-2 contains the Phases 2-20 estimated emission levels for the various project stages and the peak year. The peak year for Phases 2-20 accounts for when stages (regardless of phase) overlap. Construction stage emission levels for Phases 2-20 are estimated at 15 percent of the proposed action (Phase 1) construction stage emission levels. None of the subsequent expansion phase construction stages overlap with each other. For the operations stage, the primary activity that would generate air emissions would be the loading and unloading of SNF, and subsequent expansion operation stages would not overlap with the operations from other phases. However, operation stages would overlap with construction stages (e.g., Phase 1 operations would overlap with Phase 2 construction). For Phases 2-20, the overlapping construction and operation stages generate the peak-year emission levels for carbon dioxide, carbon monoxide, and hazardous air pollutants, and the decommissioning stage generates the peak-year emission levels for the other pollutants identified in EIS Table 2.2-2. The manner in which the stages overlap for full build-out (Phases 1-20) would be the same as the manner in which the stages overlap for Phases 2-20 (i.e., subsequent construction stages overlap with operation stages). This means the peak-year emission levels for full build-out (Phases 1-20) are the same as the peak-year emission levels for Phases 2-20.

Table 2.2-2 Estimated Phases 2-20 Emission Levels of Various Pollutants for the Proposed CISF

Pollutant	Construction		Operations		Decommissioning		Peak Year
	kg/h*	T/yr[†]	kg/h*	T/yr[†]	kg/h*	T/yr[†]	T/y[†]
Carbon Dioxide	104	337	216	2,306	695	2244	2,643
Carbon Monoxide	0.26	1.08	0.49	7.62	1.71	7.18	8.70
Hazardous Air Pollutants	< 0.004	< 0.004	< 0.004	0.02	< 0.004	0.01	0.02
Nitrogen Oxides	0.56	1.35	0.98	7.53	3.72	9.01	9.01
Particulate Matter[‡] $PM_{2.5}$	0.14	0.29	0.05	0.34	0.96	1.96	1.96

Table 2.2-2	Estimated Phases 2-20 Emission Levels of Various Pollutants for the Proposed CISF						
Pollutant	Construction		Operations		Decommissioning		Peak Year
	kg/h*	T/yr†	kg/h*	T/yr†	kg/h*	T/yr†	T/y†
Particulate Matter‡ PM_{10}	1.20	2.22	0.07	0.53	8.01	14.82	14.82
Sulfur Dioxide	< 0.004	< 0.004	< 0.004	0.02	< 0.004	0.03	0.03
Volatile Organic Compounds	0.63	0.66	0.10	1.14	4.19	4.40	4.40

*Stands for kilograms per hour. To convert to pounds per hour, multiply by 2.2046
†Stands for metric tons per year. To convert to short tons per year, multiply by 1.10231.
‡The proposed action includes a single concrete batch plant. If a second concrete batch plant is used, then NRC staff assume that the concrete batch plant emission levels would double.
Source: Holtec, 2019a and 2019d; SwRI, 2019

Waste Generation

This section provides a detailed description of various waste streams the proposed CISF project generates. This section describes the types and volumes of effluents or wastes Holtec estimates would be generated during all stages of the proposed CISF and definitions of the types of waste that would be generated.

Quantities for each of the waste streams analyzed in this EIS (Section 4.14) and produced during all phases of the proposed CISF are provided in the below EIS Table 2.2-3. Depending on the stage of the proposed CISF, different types of waste are produced, including nonhazardous, low-level radiological waste (LLRW), hazardous, and sanitary.

Table 2.2-3	Quantities of Different Types of Waste Generated by the Various Stages of the Proposed CISF			
	Solid Waste			Liquid Waste
Stage	Nonhazardous*	Low-Level Radiological (LLRW)	Hazardous	Sanitary†
Construction–Phase 1 (including rail spur)	5,080 metric tons	none	none	11,360 liters/day†
Construction–Phases 2-20	96,525 metric tons (total for Phases 2-20)	none	none	11,360 liters/day
Operation of Phase 1 capacity only (500 casks, including use of rail spur and defueling)	91.1 metric tons/year (1,110 m^3)	0.45 metric tons/year	1.20 metric tons/year	11,360 liters/day

Table 2.2-3 Quantities of Different Types of Waste Generated by the Various Stages of the Proposed CISF

	Solid Waste			Liquid Waste
Stage	**Nonhazardous***	**Low-Level Radiological (LLRW)**	**Hazardous**	**Sanitary†**
Operation of Phases 2-20, (including rail spur and defueling)	3,460 metric tons ($42,180 m^3$) (total for Phases 2-20)	8.61 metric tons (total for Phases 2-20)	1.20 metric tons/year	11,360 liters/day
Decommissioning – Dismantling (Phase 1, including rail spur)	281,228 metric tons ($290,000 m^3$) ‡	0.91 metric tons	1.20 metric tons/year	11,360 liters/day
Decommissioning – Dismantling (Phases 2-20)	5,343,324 metric tons ($5,800,000 m^3$) ‡ (total for Phases 2-20)	17.24 metric tons (total for Phases 2-20)	1.20 metric tons/ year	11,360 liters/day

*Volumes provided for nonhazardous waste were calculated as described in EIS Section 4.3.1. To convert metric tons to short tons, multiply by 1.10231

†This value is the system capacity rather than the waste generation rate. To convert liters to gallons, multiply by 0.264.

‡Nonhazardous waste volumes provided under decommissioning represent waste generated from optional reclamation, which would include removal of structures such that the land is returned to its preoperational state, or equivalent. While reclamation is not required by NRC regulations, nonhazardous waste generated from reclamation would primarily include non-radiological construction and demolition waste generated from removal of structures and facilities.

Source: Modified from Holtec (2019a,c)

Nonhazardous waste includes waste that is neither radioactive nor hazardous and typically disposed of in a municipal landfill. For the proposed CISF, nonhazardous waste includes typical office/personnel waste the work force generates, concrete truck washout materials from concrete placement activities, miscellaneous construction wastes (dumpsters), and steel bins for disposal/recycling of extraneous steel material. Holtec has selected two municipal landfill facilities that have permits from the State of New Mexico to handle nonhazardous waste: (i) the Sandpoint Landfill, located 40 km [25 mi] west of the proposed CISF site and (ii) the Lea County Landfill, located east of Eunice, New Mexico.

Nonhazardous waste
Waste that is neither radioactive nor hazardous and typically deposited in a landfill.

Low-level radiological waste (LLRW)
A general term for a wide range of items that have become contaminated with radioactive material or have become radioactive through exposure to neutron radiation. The radioactivity in these wastes can range from just above natural background levels to much higher levels, such as those levels seen in parts from inside the reactor vessel in a nuclear power reactor.

For the proposed CISF, typical LLRW produced would include contamination survey rags, anti-contamination garments, and other health physics materials. Based on fuel storage loading campaign experience, quantities of this waste produced are dependent on the number of casks loaded and are estimated to be limited. Under normal operations, the use of NRC-certified storage casks at the proposed CISF project would fully contain the stored radioactive material. The proposed CISF would not be expected to generate LLRW other than an estimated small amount of LLRW resulting from health physics activities. Any LLRW generated would be managed (e.g., handled and stored) in accordance with an NRC-approved and 10 CFR Part 20-compliant radiation protection plan, and consequently, the possibility of releases to the environment would be minimized. LLRW generated from the proposed CISF would be transported to one of two offsite licensed disposal facilities, the Waste Control Specialists (WCS) LLRW disposal facility in Andrews County, Texas, and the Energy*Solutions* LLRW disposal facility in Clive, Utah. The WCS LLRW disposal facility is licensed by the Texas Commission on Environmental Quality (TCEQ) and authorized to receive dry packaged Class A LLRW not to exceed 26,000,000 ft^3 [736238 m^3] (TCEQ, 2019). The Energy*Solutions* LLRW disposal facility in Clive, Utah, is authorized to receive 235,550,619 ft^3 [6670051 m^3] of Class A LLRW (Energy*Solutions*, 2015).

For the proposed CISF, hazardous waste produced would primarily occur from the potential use of small quantities of chemicals or other solvents. These activities would be performed using proper handling procedures that would prevent releases of hazardous materials into the environment (Holtec, 2019a,b).

> **Hazardous waste**
> A solid waste or combination of solid wastes that, because of its quantity, concentration, or physical, chemical, or infectious characteristics, may (i) cause or significantly contribute to an increase in mortality or an increase in serious irreversible or incapacitating reversible illness or (ii) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed, or otherwise managed (as defined in the Resource Conservation and Recovery Act, as amended, Public Law 94-5850).
>
> **Sanitary waste**
> Liquid or solid waste originating from humans and human activities.

Holtec proposes that limited quantities of hazardous wastes would be generated that would fall within State and Federal requirements applicable to a Conditionally Exempt Small Quantity Generator (CESQG). As such, for the proposed CISF, hazardous waste would be identified, stored, and disposed of in accordance with State and Federal requirements applicable to CESQG. For the proposed CISF, mixed waste (e.g., waste that contains both radioactive and hazardous components) would not be expected to be generated based on the proposed activities; however, if any mixed waste were generated it would be handled and stored in accordance with a 10 CFR Part 20 radiation protection plan and applicable hazardous waste requirements and would be sent to a licensed facility for disposal.

Sanitary waste produced from the proposed CISF would include waste from bathrooms, lavatories, mop sinks, and other similar fixtures located in the cask transfer building, security building, and administrative building. Sanitary wastewater would be contained using onsite sewage collection tanks and underground digestion tanks similar to septic tanks but with no drain field. In the State of New Mexico, sanitary waste management systems are regulated by NMED. Should the generation of sanitary waste exceed 18,940 liters (L) [5,000 gallons (gal)] per day, NMED would require a more comprehensive Groundwater Discharge Permit pursuant to State of New Mexico ground and surface water protection regulations in 20 NMAC 6.2.3104. Sanitary (i.e. domestic) waste management resulting from the generation of less than 18,940 L [5,000 gal] per day would require a liquid waste permit pursuant to State of New Mexico liquid waste disposal and treatment regulations in 20 NMAC 7.3.201. For the proposed CISF, the sanitary waste management systems would be designed and operated in accordance with all applicable NMED and Federal standards. After testing the waste in the collection tanks to ensure 10 CFR Part 20 release criteria and applicable State of New Mexico requirements are met, the sewage would be disposed of at an offsite treatment facility.

Stormwater runoff would be managed in accordance with a National Pollutant Discharge Elimination System (NPDES) permit. In the State of New Mexico, the Environmental Protection Agency (EPA) administers the NPDES program and issuance of NPDES permits (EPA, 2019a,b). Per current EPA regulations, Holtec would be required to apply for NPDES permits for both construction and operation stages of the proposed CISF project (EPA, 2019c,d; 2020).

2.2.1.7 Transportation

Throughout the facility lifecycle stages, Holtec would use roadways for commuting workers, equipment, supply shipments, and any produced-waste shipments. Additionally, during operations Holtec proposes using the national rail network for transportation of SNF from nuclear power plants and ISFSIs to the proposed CISF project and eventually from the CISF to a permanent geologic repository, when one becomes available.

Transportation During Construction of the Proposed CISF

During the construction stage of the proposed CISF, Holtec would use trucks to transport construction supplies and equipment to the proposed project area and to transport wastes from the proposed project area. The volume of estimated construction traffic from supply shipments, waste shipments, and workers commuting was estimated from information provided in the application (Holtec, 2019a,b).

The NRC staff approximated the number of construction supply shipments based on Holtec's estimated volume of facility decommissioning waste for Phases 1-20. Holtec estimated the mass of demolition waste based on the total volume of material in all the empty storage casks from the full build-out of the proposed CISF project. The resulting mass of 5.6 million metric tons [6.2 million short tons] (Holtec, 2019a) was converted to an annual volume of 275,000 m^3 [360,000 yd^3] for a single phase by the NRC staff using volume-to-weight conversion factors for construction and demolition waste consisting of concrete and rebar of 300 kg/m^3 [860 lb/yd^3] (EPA, 2016) and then dividing by the number of phases (20) and the years of construction (2) per phase. The NRC staff estimated the annual volume of demolition waste per phase for the upper and lower concrete pads of the proposed CISF as 14,100 m^3 [18,500 yd^3] from facility dimensions provided in the SAR (Holtec, 2019b), assuming the top pad included 50 percent void space to allow for emplaced casks. The resulting total annual volume of demolition waste for a single phase was 290,000 m^3 [379,000 yd^3]. Assuming that approximately this volume of aggregate material would need to be shipped each year during the construction of the proposed action (Phase 1), the NRC staff's estimated number of annual supply shipments during construction is 25,300, or approximately 69 trucks per day. This estimate assumes a truck capacity of 11 m^3 [15 yd^3], which is applicable to large capacity concrete aggregate shipment volume.

Holtec also estimated the mass of waste that would be produced during the construction of the proposed action (Phase 1). These waste estimates were provided as 2,720, 2,270, and 86 metric tons [3,000, 2,500, and 95 short tons] for concrete truck washout, miscellaneous construction wastes, and steel, respectively (Holtec, 2019a). The NRC staff converted these waste estimates to volumes by applying the applicable waste volume-to-mass conversion factors (EPA, 2016) and dividing by the duration of the construction for the proposed action (Phase 1) (i.e., 2 years). The resulting annual construction waste volume was 6,940 m^3 [9,080 yd^3] resulting in 454 annual shipments (of 15 m^3 [20 yd^3] capacity) or 1.2 shipments per day. Considering the NRC staff's estimated annual construction supply and waste shipments, the total number of shipments per year during the construction phase would be 25,754, or 70 shipments per day.

For the construction stages of Phases 2-20, the approximate volume of construction supplies and wastes would be less than that required for construction of the proposed action (Phase 1) because the proposed facilities and infrastructure would already be built; however, the construction would occur in 1 year instead of 2 and therefore the number of supply shipments and waste shipments would double resulting in bounding estimates of 140 supply shipments and 2.4 waste shipments per day.

In addition to construction supply shipments, an estimated peak construction work force of 80 workers would commute to and from the proposed CISF project construction site using individual passenger vehicles and light trucks on a daily basis (Holtec, 2019a). These workers could account for an increase of 80 vehicles per day going to and from the proposed project area each day during construction, for a total of 160 trips.

The workforce required to construct the rail spur was included in the preceding analysis of the commuting construction workforce. The additional construction supplies necessary to build the rail spur would be only a small fraction of that required for construction of the proposed CISF. Therefore, the additional supplies and supply shipments associated with rail spur construction is expected to not significantly add to the preceding estimate for the construction stage of the proposed action (Phase 1).

Transportation During Operation of the Proposed CISF

During operation of the proposed CISF project, Holtec would continue to use roadways for supply and produced waste shipments, in addition to workforce commuting. Additionally, Holtec proposes using the national rail network for transportation of SNF from nuclear power plants and ISFSIs to the proposed CISF project and eventually from the CISF to a permanent geologic repository, when one becomes available.

The ER did not provide estimates of operations supply shipments; however, based on the nature of dry cask storage and the proposed operations, the NRC staff expects that the number of annual supply shipments would not significantly contribute to shipment estimates.

For waste shipments during the operations stage of the proposed action (Phase 1) and any of the subsequent Phases 2-20, Holtec estimated the annual generation of nonhazardous solid waste that would need to be shipped offsite for disposal would be approximately 91 metric tons [100 short tons] (Holtec, 2019a). The NRC staff converted Holtec's waste estimate to a volume of 1,110 m^3 [1,460 yd^3] using available conversion factors for commercial municipal waste (EPA, 2016). Assuming a hauling capacity of 15 m^3 [20 yd^3] per truck, the NRC staff estimated 73 waste shipments would occur during operations per year or about 1 shipment every 5 days. Other wastes would be generated in much smaller quantities during operations and would therefore not contribute significantly to the proposed shipping activity.

Holtec estimated that the workforce for the operations stage of the proposed action (Phase 1) would include 40 regular employees and 15 security staff at full build-out. This workforce of 55 individuals is assumed to commute to and from the proposed CISF project using separate passenger vehicles and light trucks on a daily basis (Holtec, 2019a). During the operations stage of Phases 2-20, construction of additional phases would occur concurrently with operations; therefore, up to an additional 80 construction workers would be commuting during the same time period. Therefore, the total workforce commuting during operations of Phases 2-20 (combined with construction of next phases) could add a peak of 135 commuting workers and vehicles traveling to and from the proposed project area each day.

During operation of any project phase, SNF would be shipped by rail from existing storage sites at nuclear power plants or ISFSIs to the proposed CISF. These shipments must comply with applicable NRC and U.S. Department of Transportation (DOT) regulations for the transportation of radioactive materials in 10 CFR Parts 71 and 73 and 49 CFR Parts 107, 171–180, and 390–397, as appropriate to the mode of transport. For the operations stage of the proposed action (Phase 1), Holtec proposes to ship 500 canisters of SNF from reactors to the proposed

CISF (Holtec, 2019a) over the course of a year resulting in approximately 1.4 shipments per day. During the operations stage of Phases 2-20, an additional 500 canisters would be shipped to the proposed CISF per phase at the same approximate rate until the maximum of 10,000 canisters has been shipped at full build-out. When a repository becomes available, the daily number of SNF shipments to the repository would be determined by several factors but would be limited by the same loading and transfer capabilities at the CISF that factored into the average rate of SNF receipt (1.4 shipments per day).

Transportation During Decommissioning and Reclamation of the Proposed CISF

During the decommissioning and reclamation stage of the proposed CISF project, Holtec would use roadways for the transportation of waste materials and for commuting workers. Reclamation activities are those actions that Holtec has committed to completing to restore and reclaim the site during and after decommissioning.

Decommissioning activities would be limited based on the design and expected performance of the dry storage cask systems. Regarding the potential for LLRW shipments, the NRC staff expects that generated radioactive waste would be limited to small volumes because SNF canisters would remain sealed during storage, and external contamination would have been limited by required surveys at the reactor site prior to shipment, and canister inspections upon arrival at the proposed CISF project. Therefore, the volume of low-level radioactive waste shipments would be very low during decommissioning activities. The workforce and resulting number of vehicles required for commuting during decommissioning is expected to be negligible.

Reclamation transportation activities would predominantly involve shipments of demolition waste materials and workers commuting to and from the proposed CISF project area. In the absence of estimates of reclamation shipments in the ER, the NRC staff approximated the number of annual shipments based on the volume of demolition waste materials from reclamation that would need to be shipped offsite.

For the decommissioning and reclamation stages of the proposed action (Phase 1), the annual volume of nonhazardous demolition waste from reclamation activities would be the same as the preceding estimate for construction. The resulting total annual volume of demolition waste for a single phase was 289,755 m^3 [379,000 yd^3], assuming a 2-year duration of reclamation (i.e., comparable to the construction duration of Phase 1). The NRC staff estimated the number of annual reclamation waste shipments as 18,950, or approximately 52 trucks per day. This estimate assumes a waste hauling capacity of 15 m^3 [20 yd^3], which is applicable to a typical roll-off container. For the decommissioning and reclamation stage of Phases 2-20, this same waste volume estimate would also apply to the reclamation of any individual phase; however, the number of shipments could increase to 104 shipments per day if subsequent phases were reclaimed in a year's time (i.e., comparable to the construction duration of phases beyond Phase 1).

The NRC staff also estimated the volume of nonhazardous demolition waste from reclamation of the full build-out (Phases 1-20) of the proposed project. Holtec estimated the mass of demolition waste based on the total volume of material in all the empty storage casks from the full build-out of the proposed CISF project. The resulting mass of 5.6 million metric tons [6.2 million short tons] (Holtec, 2019a) was converted to a volume of 1.10×10^7 m^3 [1.44×10^7 yd^3] by the NRC staff using volume-to-weight conversion factors for demolition waste consisting of concrete and rebar of 298 kg/m^3 [860 lb/yd^3] (EPA, 2016). The NRC staff estimated the total volume of demolition waste at full build-out for the upper and lower concrete pads of the proposed CISF as 564,600 m^3 [738,500 yd^3] from the proposed facility dimensions provided in the SAR (Holtec, 2019b), assuming the top pad included 50% void space to allow for emplaced casks. The resulting total volume of nonhazardous demolition waste for full build-out was 1.16×10^7 m^3 [1.52×10^7 yd^3].

For the purpose of assessing the impacts of reclamation, the NRC staff assumed that this volume of waste material would be shipped during a 10-year reclamation period for the proposed CISF project. The NRC staff's estimated number of annual shipments during reclamation of full build-out was 75,800, approximately 208 trucks per day, or approximately 9 shipments per hour, assuming a 24-hour day for shipping activities. This estimate assumes a truck capacity of 15 m^3 [20 yd^3], which is applicable to a typical roll-off container. The workforce and resulting number of vehicles required for commuting during reclamation is assumed to be the same as for construction (80 workers in individual vehicles). Table 2.2-4 summarizes the estimated transportation trips by proposed project stage, phase, and purpose.

Table 2.2-4 Summary of Estimated Transportation by Proposed Project Stage, Phase, and Purpose

CISF Lifecycle Stage and Purpose	CISF Phase	Estimated Daily Vehicle Round Trips*
Construction		
Supplies	Phase 1	69
Wastes	Phase 1	1.2
Commuting Workers	Phase 1	80
Supplies	Phases 2-20	140
Wastes	Phases 2-20	2.4
Commuting Workers	Phases 2-20	80
Operations		
Wastes	Phase 1	0.2
Commuting Workers	Phase 1	55
SNF Shipments	Phase 1	1.4
Wastes	Phases 2-20	0.2
Workers	Phases 2-20	135
SNF Shipments	Phases 2-20	1.4
Decommissioning and Reclamation		
Wastes	Phase 1	52
Commuting Workers	Phase 1	80
Wastes	Phases 2-20	104
Commuting Workers	Phases 2-20	80

*Estimates of transportation vehicle round trips are based on information provided in the license application, as described in ER Section 4.3. No estimates are provided for departing SNF shipments, because the schedule for defueling depends on repository availability. The rate would be limited by the rate of canister loading and transfer capabilities at the proposed CISF.

2.2.2 No-Action (Alternative 2)

Under the No-Action alternative, the NRC would not approve the Holtec license application for the proposed CISF in Lea County, New Mexico. The No-Action alternative would result in Holtec not constructing or operating the proposed CISF. No concrete storage pad or infrastructure (e.g., rail spur or cask-handling building) for transporting and transferring SNF to the proposed CISF would be constructed. SNF destined for the proposed CISF would not be transferred from commercial reactor sites (in either dry or wet storage) to this proposed facility. In the absence of a CISF, the NRC staff assumes that SNF would remain on site in existing wet and dry storage facilities and be stored in accordance with NRC regulations and be subject to NRC oversight and inspection. Site-specific impacts at each of these storage sites would be expected to continue as detailed in generic (NRC, 2013, 2005) or site-specific environmental analyses. In accordance with current U.S. policy, the NRC staff also assumes that the SNF would be transported to a permanent geologic repository, when such a facility becomes available. Inclusion of the No-Action alternative in the EIS is a NEPA requirement and serves as a baseline for comparison of environmental impacts of the proposed action.

2.3 Alternatives Eliminated from Detailed Analysis

2.3.1 Storage at a Government-Owned CISF Operated by the U.S. Department of Energy (DOE)

The U.S. Department of Energy (DOE) is planning for an integrated waste management system to transport, store, and dispose of the nation's SNF and high-level radioactive wastes (https://www.energy.gov/ne/integrated-waste-management). Such an integrated waste management system would include facilities and other key infrastructure needed to safely manage SNF from commercial nuclear reactors. The DOE's planned integrated waste management system would include pilot interim storage facilities initially focused on accepting SNF from shut down reactor sites and full-scale CISFs that provide greater SNF storage capacity. Although this alternative meets the purpose and need for the proposed action, the DOE has not released detailed information concerning the planned SNF interim storage facilities, such as site locations, SNF transportation options and details, or facility design information that would allow this alternative to be analyzed in detail. Because the DOE's integrated waste management system is in the planning stages and provides no siting, transportation, and facility design details that would be needed for a comparison of environmental impacts, this alternative was eliminated from detailed consideration in this EIS.

2.3.2 Alternative Design or Storage Technologies

2.3.2.1 Dry Cask Storage System Design Alternatives

Holtec considered other dry cask storage system (DCSS) designs as an alternative to the proposed action (Holtec, 2019b). To date, the NRC has licensed and approved SNF storage systems Holtec owns: AREVA, NAC, and Energy*Solutions*. In its license application, Holtec proposed to use its proprietary system to store SNF at the proposed CISF. A potential design alternative would be to use the AREVA, NAC, and Energy*Solutions* systems. Among the NRC-licensed and approved SNF storage systems, the NRC has determined that each of them meets appropriate safety regulations; thus, none is deemed technologically preferable to another. In the event that Holtec requests a license amendment in the future to include additional storage design technologies, Holtec would be required to submit appropriate design certifications and undergo any necessary safety and environmental reviews. The NRC staff determined that at this time the prospect of the use of additional technology is too speculative to be considered as an alternative in this EIS.

2.3.2.2 Hardened Onsite Storage Systems (HOSS)

HOSS is a concept that aims to reduce the threat and vulnerability of currently deployed DCSSs at nuclear reactor sites. The primary components of HOSS include: (i) constructing reinforced concrete and steel structures around each waste container; (ii) protecting each of these structures with mounds of concrete, steel, and gravel; and (iii) spacing the structures over a larger area (Citizens Awareness Network, 2018a). The purpose of HOSS is to increase security and resistance to potential damage of DCSSs from natural disasters, accidents, and attacks. At this time, HOSS is a generalized concept, and detailed plans that would allow NRC staff to conduct a detailed safety, environmental, and cost/benefit analysis are not available. Furthermore, HOSS does not meet the purpose and need for the proposed action (provide away-from-reactor SNF storage capacity that would allow SNF to be transferred from existing reactor sites and stored for several decades before a permanent repository is available). Therefore, this alternative was eliminated from detailed consideration in this EIS.

2.3.2.3 Hardened Extended-Life Local Monitored Surface Storage (HELMS)

HELMS was suggested by commenters during scoping for consideration as an alternative to the proposed action. Similar to HOSS, HELMS is a proposal that defines a strategy to enhance the safety of SNF DCSSs (Citizens Oversight, 2018b). The components of the HELMS strategy are defined as follows:

- Hardened—storage facilities having design features to resist non-nuclear attack.
- Extended Life—cask systems providing a 1,000-year design life (suggested dual-wall canister design).
- Local—cask systems located near companion nuclear plant (in-state or within regional consortia of states), but away from water resources, dense populations, and seismic zones.
- Monitored—each canister outfitted with an electronic monitoring system to detect cracks and radiation.
- Surface—spent fuel stored on surface (above ground) for cooling for at least the next 200 to 300 years.

The group Citizens Oversight and its founder, Raymond Lutz, filed a petition (NRC, 2018) with NRC for rulemaking under 10 CFR 2.802 regarding regulations and enforcement for spent fuel storage systems under 10 CFR Part 72, specifically requesting consideration of HELMS. Further, the HELMS proposal sets forth a set of criteria and general design recommendations for managing the nation’s commercially generated SNF (Citizens Oversight, 2018). However, the proposal does not include specific information about interim storage site locations, SNF transportation options and details, DCSS designs, and facility design information that would allow this alternative to be analyzed in detail in this EIS. Moreover, HELMS does not fully meet the purpose and need for the proposed action (provide away-from-reactor SNF storage capacity that would allow SNF to be transferred from existing reactor sites and stored for several decades before a permanent repository is available). As of January 23, 2020, this petition was denied by the NRC (85 FR 3860). Therefore, this alternative was eliminated from detailed consideration in this EIS.

2.3.3 Location Alternative

The NRC staff reviewed Holtec's site-selection process and its determination regarding site alternatives. This section discusses the site-selection process and the selection criteria, and describes the candidate sites for the proposed CISF. Holtec based its siting process on a process previously undertaken in 2007 as part of the ELEA response to a grant issued by DOE to develop a facility to recycle SNF and reuse constituents of the SNF to fuel other reactors and produce energy under the Global Nuclear Energy Partnership (GNEP) program. The site-selection process identified the viability of several locations and ranked the sites based on a number of factors. EIS Figure 2.3-1 shows the location of the six sites evaluated as part of the GNEP program. To evaluate whether any of the environmental impacts could be avoided or significantly reduced through site selection, the NRC staff evaluated the site-selection process to determine if the site Holtec proposed was the environmentally favorable location when compared to other evaluated sites.

Holtec Site-Selection Process

As part of the aforementioned 2007 GNEP grant process, DOE developed the following set of screening criteria to apply to prospective sites:

- Site data (size and availability)
- Ecological communities
- Water resources
- Critical terrestrial habitats
- Threatened and endangered species
- Regional demography
- Cultural resources
- Future projects
- Geology/seismology
- Climatology
- Hydrology/flooding
- Regulatory/permitting
- Construction costs
- Storage capacity
- Presence of other hazardous facilities with 16 km [10 mi]
- Status on National Priorities List or Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) (ELEA, 2007)

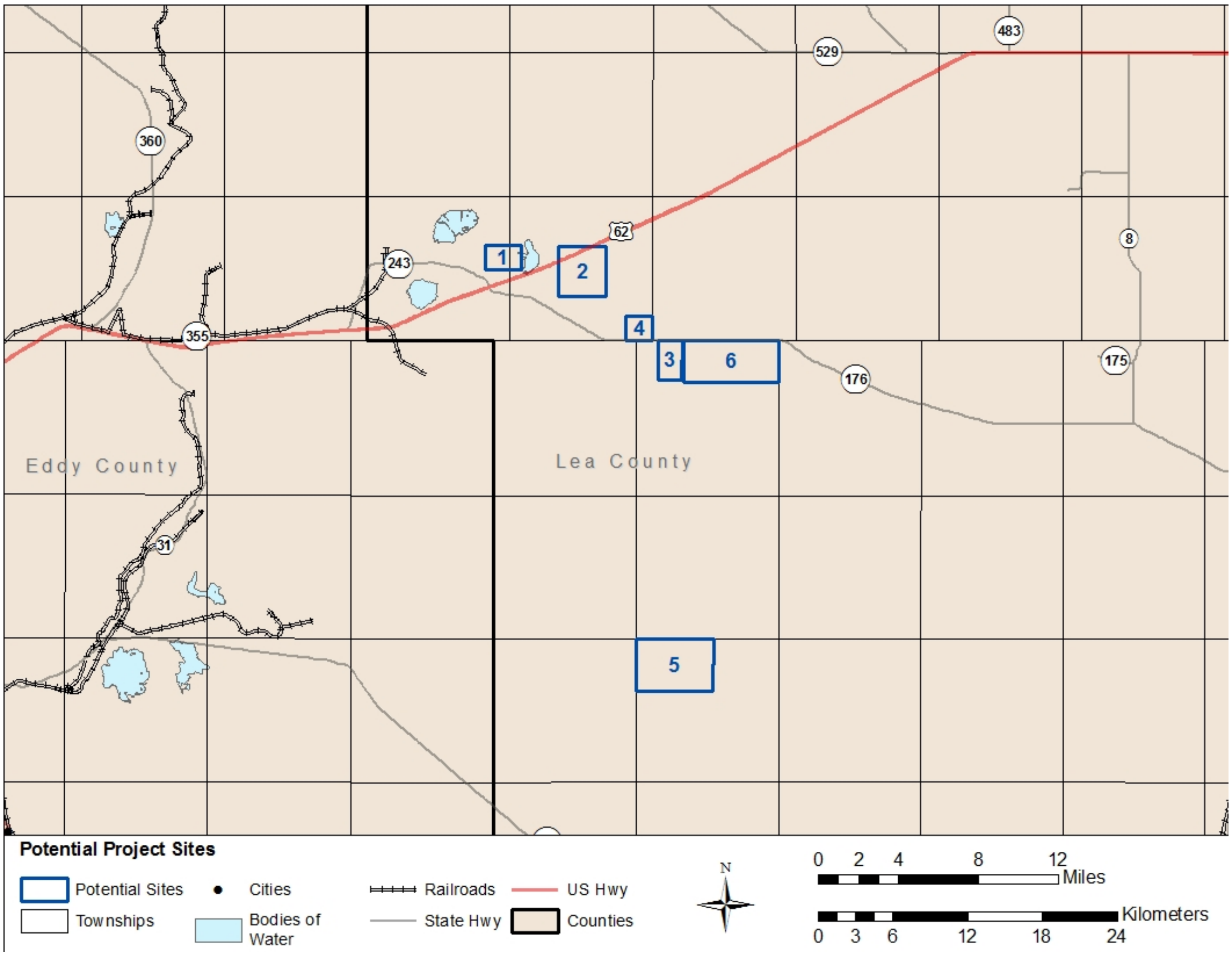

Figure 2.3-1 Potential Sites ELEA Evaluated for GNEP Siting Studies (Source: ELEA, 2007)

ELEA focused on eight sub-criteria (size, hydrology, electricity capability, population, zoning, road access, seismic stability, and water availability) to apply to prospective sites for consideration in the GNEP program. ELEA further refined those eight criteria into 31 site-specific screening factors:

- Size
- Largest contiguous area
- State owned
- Federally owned
- Privately owned
- Surface water
- Depth to water
- Faults
- Historical/archeological
- Public water supply wells
- Buffer zone potential
- Active alluvial fans
- Threatened and endangered species

- Seismic impact zones
- Unstable area/karst
- Easements/pipelines
- Utilities
- Estimated number of oil/gas wells
- Topography/slopes
- Distance to airports – Carlsbad
- Distance to airports – Hobbs
- Proximity to Carlsbad (road mileage)
- Proximity to Hobbs (road mileage)
- Proximity to Carlsbad (direct mileage)
- Proximity to Hobbs (direct mileage)
- Existing site development
- Environmental justice
- Land Use
- Access to State/Federal highway
- Rail access
- Zoning

ELEA compiled information on these characteristics for six potential sites in the region, EIS Figure 2.3-1. The information was collected from readily available sources and existing literature, which was ample because of the number of recent projects and studies in the area (ELEA, 2007)

Once the information for each of the prospective sites was tabulated, ELEA developed a screening process to systematically evaluate sites using a ranking matrix. Each criteria was assigned an importance factor ranging from 1 to 3, with 3 being the most important. For each of the criteria for an individual site, the characteristic was assigned a ranking factor from 1 to 5, 5 being the most favorable site for a particular criterion. Final scores were determined based on the combined importance factor and site characteristics. Site 1 ranked highest in the overall scores (ELEA, 2007). ELEA eliminated two of the six sites with very low scores (Sites 5 and 6) from further consideration. Of the remaining four sites, Site 1 ranked first and Site 4 ranked second.

Although the GNEP program ended, Holtec utilized information from these evaluations by ELEA conducted for the GNEP project as part of their site-selection process. Holtec considered the top ranked sites and decided that one, Site 1, offered more favorable siting factors and selected this site as the proposed action location for the currently proposed CISF. The favorable siting factors Holtec used included (i) private ownership of the land; (ii) equal distance between the cities of Hobbs and Carlsbad, which optimized access for housing, jobs, supplies and other support; (iii) proximity to U.S. Highway 62/180, which provided an advantage for transporting SNF; and (iv) Federal land south of the proposed site offered a potential for expansion of the facilities if needed. The site with the favorable factors was put forward in the Holtec license application (Holtec, 2017, 2019a,b). Holtec also reviewed the eight criteria that were developed for the GNEP facilities and determined that electricity capacity and water availability were not as important as the other six criteria, because the CISF would not require significant amounts of either. Holtec stated in its ER (Holtec, 2019a) that neither electric capacity nor water availability were factors that affected the selection of Site 1 for the GNEP nuclear facilities.

In considering site location alternatives for this EIS, the NRC staff conducted a sensitivity analysis of the siting process to ensure that the site selection was not sensitive to small changes in the relative weights of objectives or criteria. The NRC staff evaluated the information by equally ranking each of the criteria, segregating certain criteria for specific evaluation, and applying higher ranking to environmental- and safety-related criteria.

The NRC staff's first step in assessing the siting process was to review the original grading criteria. The NRC staff found that the top-weighted categories were practical because they were based on the site's suitability to host the proposed project. Those categories included faulting, seismic impact area, and presence of karst material. Next, the NRC staff performed a sensitivity analysis. First, the staff set all criteria weights equal so that no one characteristic would skew the outcome. The second step was to weight highly several specific safety and environmental characteristics (seismic impact zone, karst area, easements/pipelines faulting, topography, rail access, and zoning) to determine if that changed the site ranking. Finally, the NRC staff revised all safety and environmental characteristics to highly weight these to determine if doing this changed the site ranking. At each step of this process, Site 1 rated consistently highest. Sites 2 and 4 interchanged ranks of second and third depending on the criteria evaluated. Sites 5 and 6 consistently ranked lowest.

In addition to the results of the siting process evaluation and sensitivity analysis, the NRC staff considered the fact that Site 1 is the only site that is entirely privately owned land and where the presence of a species of concern has not been identified. Site 1 also offers the shortest distance to the nearest rail line at 9.4 km [5.9 mi]. Sites 2 and 4 ranked higher than the remaining sites but are either not entirely privately owned, contain habitat for identified species of concern, or are further from the existing rail line. Based on these considerations and the results of the NRC staff's siting process evaluation and sensitivity analysis, the NRC staff eliminated the remaining alternative sites from further consideration in this EIS.

2.3.4 Facility Layout Alternative

In determining the layout of the proposed CISF, Holtec evaluated site access considerations for workers, materials, and SNF deliveries, a process which dictated that support facilities such as the security building, the administration building, and the cask transfer building be located on the southern boundary of the proposed site. Operational efficiencies and worker dose considerations also dictated that the ISFSI pad be located in close proximity to the cask transfer building. Additionally, the proposed action (Phase 1) storage locations for SNF are proposed to be located at the northeastern-most point of the ISFSI pad so that subsequent phases of construction would have minimal interference with ongoing operations. Furthermore, environmental, safety, and security considerations indicated that the ISFSI pad be a compact design to minimize infrastructure requirements, with minimal land disturbance within the protected area, and with clear sight lines around the perimeter. This compact design would also minimize any potential impacts related to ecological and cultural resources, and would minimize ground disturbance and air quality impacts. Also, 10 CFR 72.106 requires any facility or storage location for SNF to be no closer than 100 m [328 ft] from the protected area boundary. For these reasons, Holtec deemed the proposed facility layout as the optimized configuration and eliminated other layouts from consideration.

The NRC staff's review of Holtec's proposed facility layout determined that the current proposal optimizes the site access and facility layout and minimizes the potential impact to ecological and cultural resources. The staff evaluated the proposed layout of the facility and did not identify any other facility layout that was clearly superior for the proposed CISF such that it should be considered as an alternative to the proposed facility layout. Therefore, other site facility design alternatives were eliminated from detailed consideration in this EIS.

2.4 Comparison of Predicted Environmental Impacts

NUREG–1748 (NRC, 2003) categorizes the significance of potential environmental impacts as follows:

SMALL: The environmental effects are not detectable or are so minor that they would neither destabilize nor noticeably alter any important attribute of the resource.

MODERATE: The environmental effects are sufficient to alter noticeably, but not destabilize, important attributes of the resource.

LARGE: The environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

Chapter 4 presents a detailed evaluation of the environmental impacts from the proposed action and the No-Action alternative on resource areas at the proposed CISF. EIS Table 2.4-1 compares the significance level (SMALL, MODERATE, or LARGE) of potential environmental impacts of the proposed action and the No-Action alternative. For each resource area, the NRC staff identifies the significance level during each stage of the proposed project: construction, operations, and decommissioning and reclamation.

Table 2.4-1 Summary of Impacts for the Proposed CISF Project

	Land Use		
	Proposed Action (Phase 1)	**Phases 2-20**	**No-Action**
Construction	SMALL	SMALL	NONE
Operation	SMALL	SMALL	NONE
Decommissioning and Reclamation	SMALL	SMALL	NONE
	Transportation		
	Proposed Action (Phase 1)	**Phases 2-20**	**No-Action**
Construction	SMALL	SMALL	NONE
Operation	SMALL	SMALL	NONE
Decommissioning and Reclamation	SMALL	SMALL	NONE
	Geology and Soils		
	Proposed Action (Phase 1)	**Phases 2-20**	**No-Action**
Construction	SMALL	SMALL	NONE
Operation	SMALL	SMALL	NONE
Decommissioning and Reclamation	SMALL	SMALL	NONE
	Surface Water		
	Proposed Action (Phase 1)	**Phases 2-20**	**No-Action**
Construction	SMALL	SMALL	NONE

Table 2.4-1 Summary of Impacts for the Proposed CISF Project			
Operation	SMALL	SMALL	NONE
Decommissioning and Reclamation	SMALL	SMALL	NONE
	Groundwater		
	Proposed Action (Phase 1)	**Phases 2-20**	**No-Action**
Construction	SMALL	SMALL	NONE
Operation	SMALL	SMALL	NONE
Decommissioning and Reclamation	SMALL	SMALL	NONE
	Ecology		
	Proposed Action (Phase 1)	**Phases 2-20**	**No-Action**
Construction	SMALL to MODERATE	SMALL to MODERATE	NONE
Operation	SMALL to MODERATE	SMALL to MODERATE	NONE
Decommissioning and Reclamation	SMALL to MODERATE	SMALL to MODERATE	NONE
	Air Quality		
	Proposed Action (Phase 1)	**Phases 2-20**	**No-Action**
Construction	SMALL	SMALL	NONE
Operation	SMALL	SMALL	NONE
Decommissioning and Reclamation	SMALL	SMALL	NONE
	Noise		
	Proposed Action (Phase 1)	**Phases 2-20**	**No-Action**
Construction	SMALL	SMALL	NONE
Operation	SMALL	SMALL	NONE
Decommissioning and Reclamation	SMALL	SMALL	NONE
	Historic and Cultural		
	Proposed Action (Phase 1)	**Phases 2-20**	**No-Action**
Construction	SMALL. Pending completion of consultation under NHPA Section 106, the NRC staff's preliminary conclusion is that the proposed project would have no effect on historic properties.	SMALL. Pending completion of consultation under NHPA Section 106, the NRC staff's preliminary conclusion is that the proposed project would have no effect on historic properties.	NONE
Operation	SMALL. Pending completion of consultation under	SMALL. Pending completion of consultation under	NONE

Table 2.4-1	Summary of Impacts for the Proposed CISF Project		
	NHPA Section 106, the NRC staff's preliminary conclusion is that the proposed project would have no effect on historic properties.	NHPA Section 106, the NRC staff's preliminary conclusion is that the proposed project would have no effect on historic properties.	
Decommissioning and Reclamation	SMALL	SMALL	NONE
	Visual and Scenic		
	Proposed Action (Phase 1)	**Phases 2-20**	**No-Action**
Construction	SMALL	SMALL	NONE
Operation	SMALL	SMALL	NONE
Decommissioning and Reclamation	SMALL	SMALL	NONE
	Socioeconomics		
	Proposed Action (Phase 1)	**Phases 2-20**	**No-Action**
Construction	SMALL to MODERATE (beneficial to local finance)	SMALL to MODERATE (beneficial to local finance)	NONE
Operation	SMALL	SMALL	NONE
Decommissioning and Reclamation	SMALL to MODERATE (beneficial to local finance)	SMALL to MODERATE (beneficial to local finance)	NONE
	Environmental Justice		
	Proposed Action (Phase 1)	**Phases 2-20**	**No-Action**
Construction	No disproportionately high and adverse human health and environmental effects	No disproportionately high and adverse human health and environmental effects	No disproportionately high and adverse human health and environmental effects
Operation	No disproportionately high and adverse human health and environmental effects	No disproportionately high and adverse human health and environmental effects	No disproportionately high and adverse human health and environmental effects
Decommissioning and Reclamation	No disproportionately high and adverse human health and environmental effects	No disproportionately high and adverse human health and environmental effects	No disproportionately high and adverse human health and environmental effects
	Public and Occupational Health		
	Proposed Action (Phase 1)	**Phases 2-20**	**No-Action**
Construction	SMALL	SMALL	NONE
Operation	SMALL	SMALL	NONE

Table 2.4-1 Summary of Impacts for the Proposed CISF Project			
Decommissioning and Reclamation	SMALL	SMALL	NONE
	Waste Management		
	Proposed Action (Phase 1)	**Phases 2-20**	**No-Action**
Construction	SMALL	SMALL	NONE
Operation	SMALL	SMALL	NONE
Decommissioning and Reclamation	SMALL	SMALL to MODERATE (until a new landfill is established)	NONE

The predicted environmental impact to each resource area for the proposed project can also be found in the Executive Summary.

2.5 Preliminary Recommendation

After comparing the impacts of the proposed action (Phase 1) to the No-Action alternative, the NRC staff, in accordance with 10 CFR Part 51, recommends the proposed action (Phase 1), which is the issuance of an NRC license to Holtec to construct and operate a CISF for SNF at the proposed location. In addition, BLM staff recommends the issuance of a permit to construct and operate the rail spur**.** This recommendation is based on (i) the license application, which includes the ER and supplemental documents, and Holtec's responses to the NRC staff's requests for additional information; (ii) consultation with Federal, State, Tribal, local agencies, and input from other stakeholders; (iii) independent NRC and BLM staff review; and (iv) the assessments provided in this EIS.

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3 DESCRIPTION OF THE AFFECTED ENVIRONMENT

3.1 Introduction

The proposed Holtec Consolidated Interim Storage Facility (CISF) would be located in Lea County, New Mexico. The proposed CISF project area is defined as the land within Holtec's proposed license boundary. The proposed CISF project area encompasses 421 hectares (ha) [1,040 acres (ac)] of mostly private land. The proposed CISF project area is larger than the total disturbed land area associated with the proposed action (Phase 1) or any potential license amendments (Phases 2-20). The proposed action is to construct, operate, and decommission Phase 1 of a facility, which would disturb 48.2 ha [119 ac] of land. The total land disturbed by the proposed CISF project at full build-out (Phases 2-20) would be approximately 134 ha [330 ac]. Additional information on the proposed CISF project is included in EIS Section 2.2.1. As part of the proposed action, Holtec would apply for a permit from the U.S. Bureau of Land Management (BLM) for a parcel of BLM land that would be used to access the proposed CISF project area. This right-of-way access across BLM land would be used to construct a rail spur to transport spent nuclear fuel (SNF) from the main rail line to the proposed CISF project area and is therefore considered a connected action for the purpose of this environmental review.

This chapter describes the existing environmental conditions within the proposed CISF project area and, for some resource areas, the region surrounding the proposed CISF project location. The resource areas described in this section include land use, transportation, geology and soils, water resources, ecology, noise, air quality, historic and cultural resources, visual and scenic resources, socioeconomics, public and occupational health, and current waste management practices. The descriptions of the affected environment are based upon information provided in Holtec's Environmental Report (ER) (Holtec, 2019a), Safety Analysis Report (SAR) (Holtec, 2019b), and responses to U.S. Nuclear Regulatory Commission (NRC) requests for additional information (RAIs) (Holtec, 2019c,d,e, 2018) and supplemented by additional information the NRC staff identified. The information in this chapter will form the basis for assessing the potential impacts of the proposed action (including the rail spur for SNF transport to the CISF) and the No-Action alternative (EIS Chapter 4), and also provides information for the cumulative impacts analysis (EIS Chapter 5). As previously stated, the proposed CISF project area includes all land within the proposed project boundary. To provide a thorough evaluation of the potential impacts of the proposed action (which are assessed in Chapter 4 of this EIS), for some resource areas (e.g., land use, socioeconomics), the region surrounding the proposed CISF project area is discussed and defined in this Chapter, as needed.

3.2 Land Use

This section describes current land use within a 10 kilometer (km) [6 miles (mi)] radius of the proposed CISF project area (referred to as the land use study area). Holtec provided information for this land use study area to describe the conditions within and surrounding the proposed CISF project area. Use of such a radius is reasonable, per NUREG–1748 (NRC, 2003), because of the small footprint, low profile, and passive nature of the project. Existing land uses include cattle grazing, oil and gas exploration and development, oil and gas related service industry facilities, underground potash mining, and recreational activities (Holtec, 2019a,b).

3.2.1 Land Ownership

The Eddy-Lea Energy Alliance (ELEA) currently owns the proposed CISF project area, a limited liability company jointly owned by Eddy and Lea counties and the cities of Carlsbad and Hobbs (Holtec, 2019b). In April 2016, Holtec and ELEA executed a memorandum of agreement (MOA) describing the design, licensing, construction, and operation of the proposed CISF and the terms by which Holtec could purchase the land (ELEA, 2016). On July 19, 2016, the New Mexico Board of Finance (NMBF) approved the sale of the land to Holtec (NMBF, 2016).

Land surrounding the proposed CISF project area is either privately-owned or owned by the BLM or the State of New Mexico (EIS Figure 3.2-1). Split estate occurs on privately-owned land within and surrounding the proposed CISF project area. Split estate is an estate where property rights (or ownership) to the surface and the subsurface are split between two parties. The State of New Mexico owns the subsurface property rights within the proposed CISF project area, and BLM or the State of New Mexico owns subsurface property rights on privately-owned land surrounding the proposed CISF project area (EIS Figure 3.2-2).

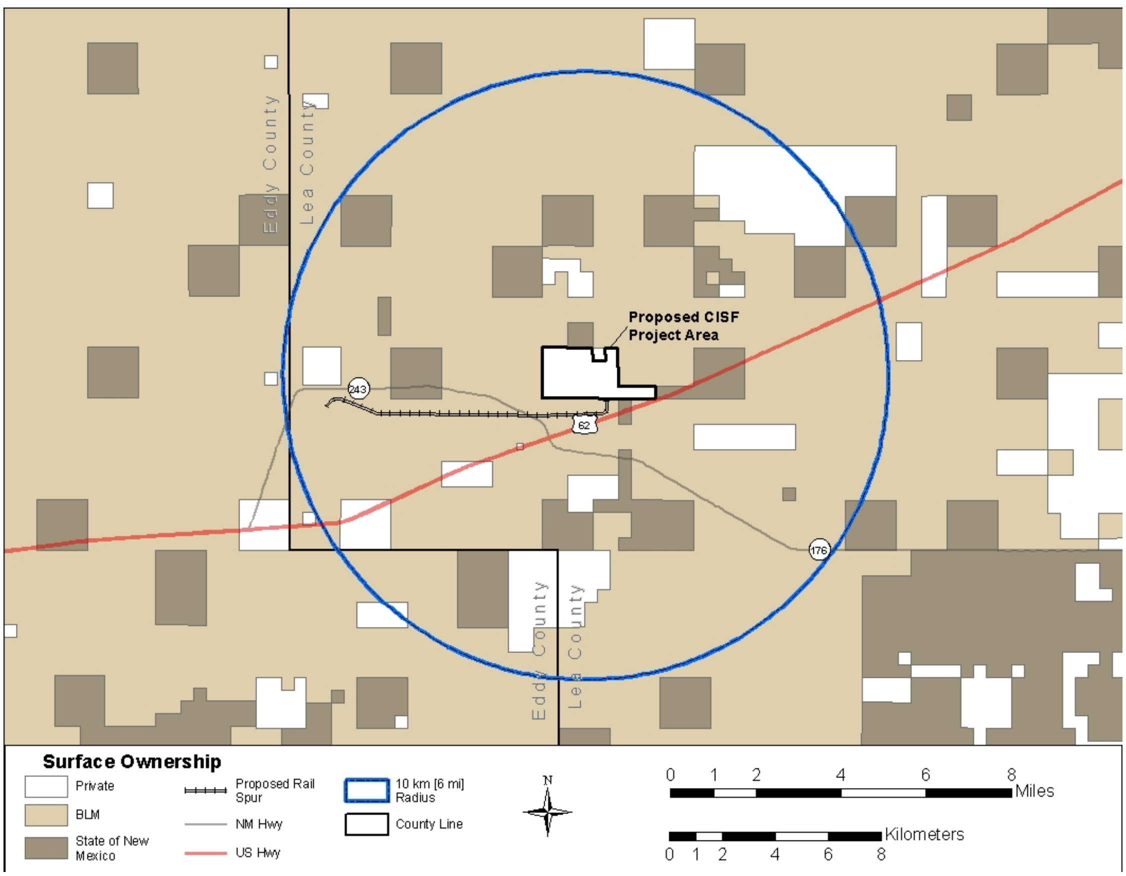

Figure 3.2-1 Surface Ownership Within and Surrounding the Proposed CISF Project Area (Source: BLM, 2012a)

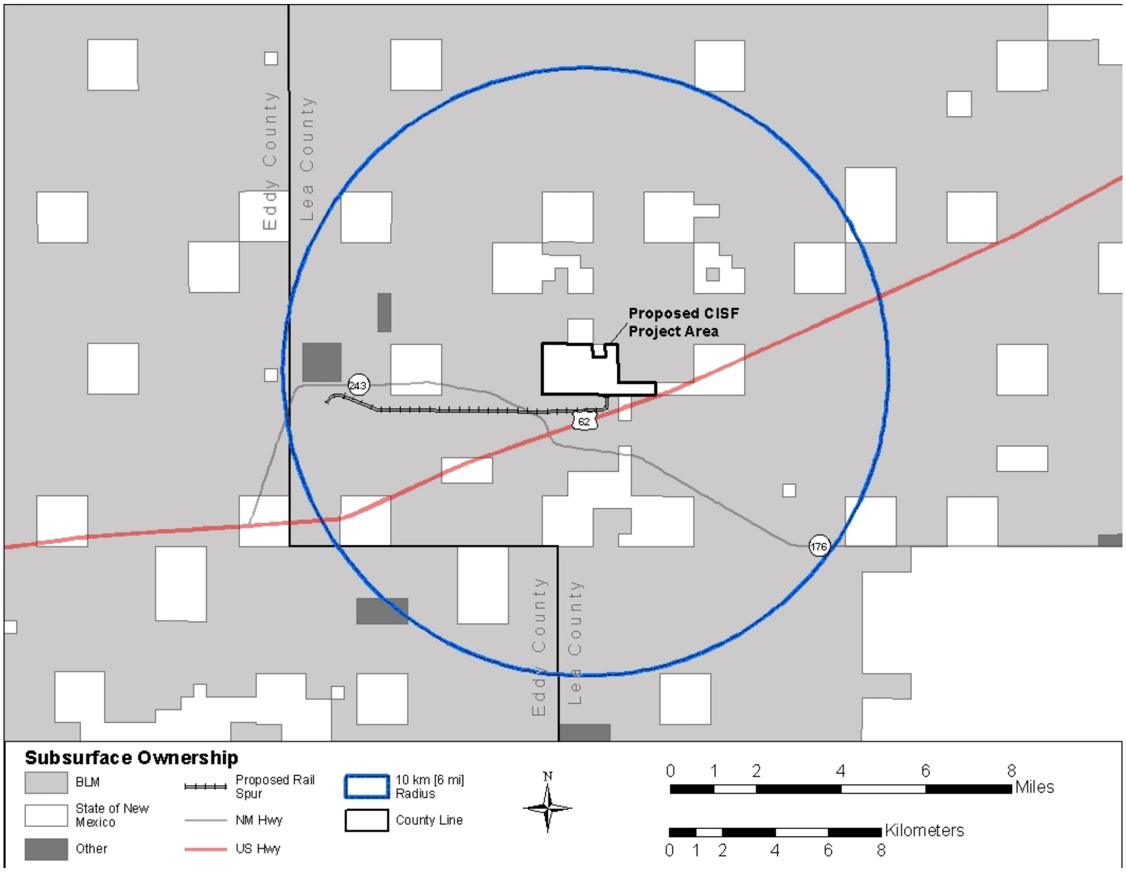

Figure 3.2-2 Subsurface Mineral Ownership Within and Surrounding the Proposed CISF Project Area (Source: BLM, 2012b)

3.2.2 Land Use Classification

Land within and surrounding the proposed CISF project area has been classified by BLM as mostly rangeland used for cattle grazing (EIS Figure 3.2-3) (Holtec, 2019a). The rangeland consists of shrubland and herbaceous upland. Livestock grazing on public lands is managed by the BLM. BLM-administered grazing allotments in the vicinity of the proposed CISF project area are shown in EIS Figure 3.2-4. The terms and conditions for grazing on BLM-managed lands (such as stipulations on forage use and season of use) are set forth in permits and leases BLM issues to public land ranchers. Standard management practice on BLM-administered grazing allotments include pasture rotation, with some of the pastures being unused for at least a portion of the year. Currently, the entire proposed CISF project area is used for cattle grazing. Other than grazing, there is no commercial agriculture in the land use study area. Because the proposed CISF project area is privately owned, it does not fall under the BLM range management rules; however, the rules apply to adjacent public lands that are managed by the same rancher who currently grazes cattle on the proposed CISF project area (Holtec, 2019a).

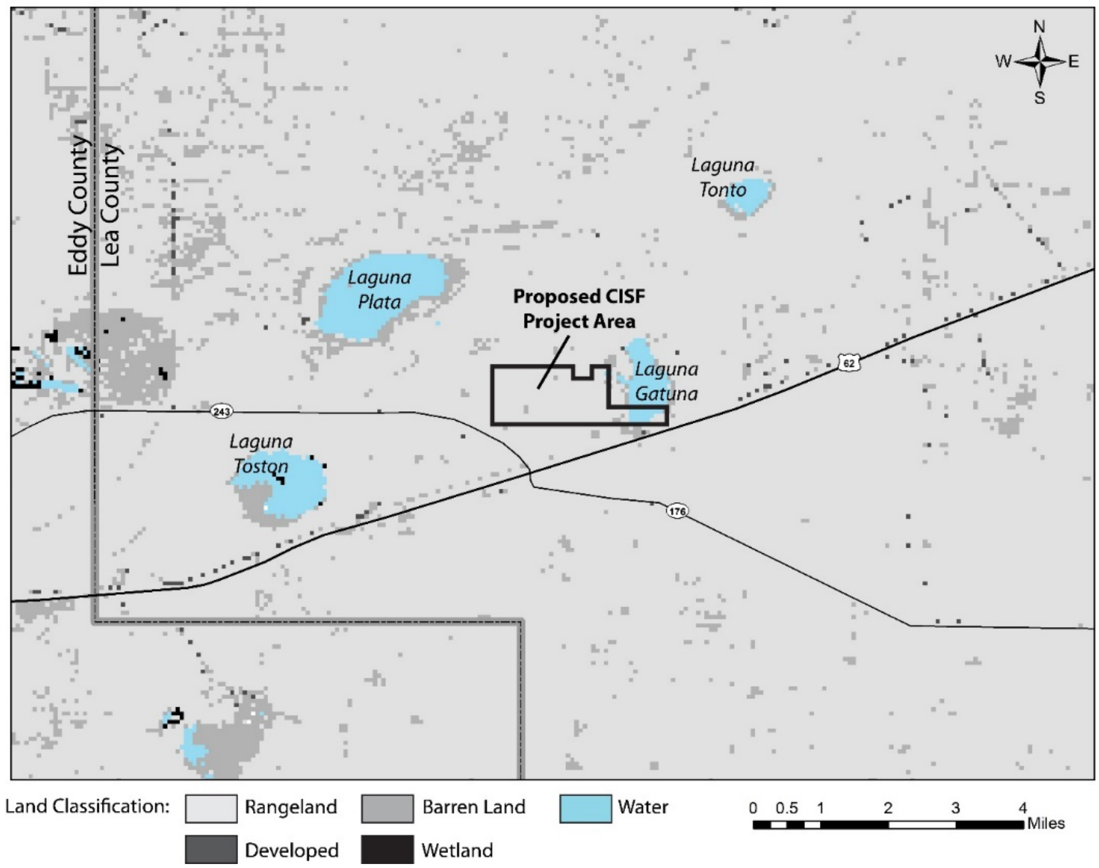

Figure 3.2-3 Land Classification Within and Surrounding the Proposed CISF Project Area (Source: USGS, 2009)

Other land use classes within and surrounding the proposed CISF project area include water, barren land, developed, and wetlands [located near the potash mine (EIS Figure 3.2-3)]. Land classified as water consists of playa lakes, including Laguna Gatuna, Laguna Plata, Laguna Toston, and Laguna Tonto (EIS Figure 3.2-3). Barren land consists mostly of salt flats and barren rock surrounding the playa lakes. Developed land comprises minor residential and commercial development. The nearest residence to the proposed CISF project area is located at the Salt Lake Ranch, 2.4 km [1.5 mi] north of the proposed CISF project area (Holtec, 2019a,b). Additional residences are located at the Bingham Ranch, 3.2 km [2 mi] to the south, and near the R360 (a hydrocarbon remediation landfarm), 3.2 km [2 mi] to the southwest. There are a total of nine occupied residences within the land use study area (Holtec, 2019b). Commercial development consists of industrial and transportation facilities associated with extractive industries (potash mining and oil and gas production). Minor wetlands consisting of emergent herbaceous vegetation are present near water bodies to the west and southwest of the proposed CISF project area near the potash mining area (EIS Section 3.5.1.5).

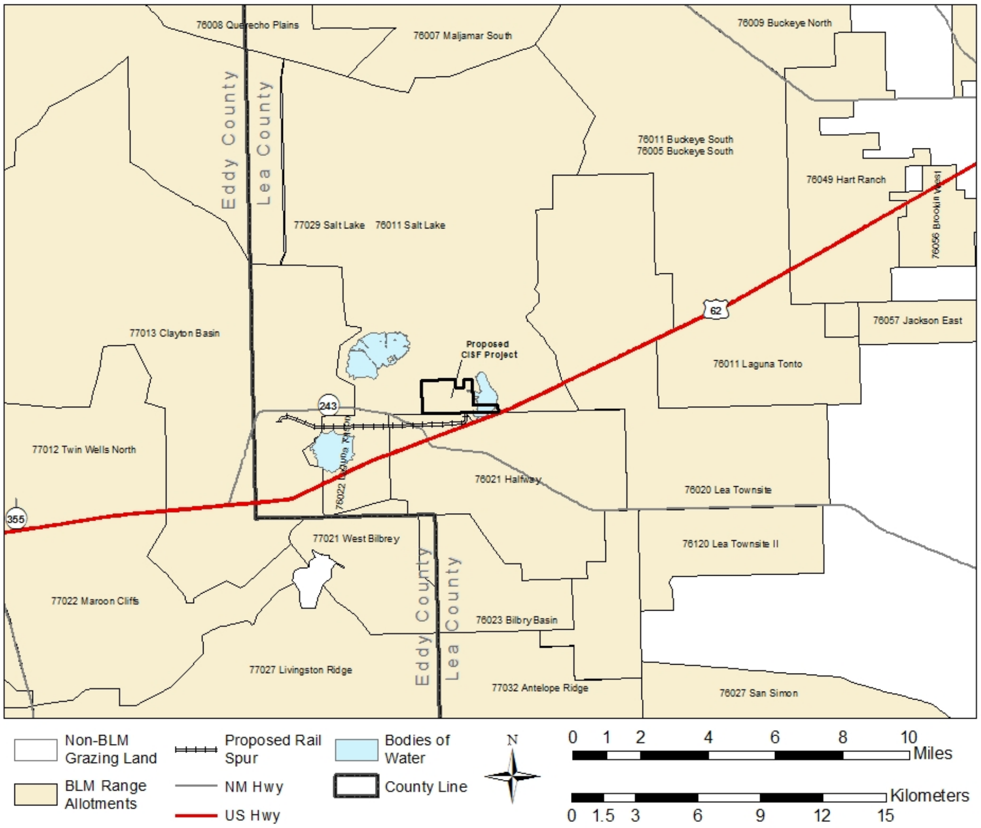

Figure 3.2-4 BLM-Managed Grazing Allotments Showing Allotment Name and Number Within and Surrounding the Proposed CISF Project Area (Source: BLM, 2011)

3.2.3 Hunting and Recreation

Recreational activities within the land use study area include big- and small-game hunting, camping, horseback riding, hiking, bird watching, and sightseeing. The proposed CISF project area is currently private property owned by ELEA and would continue to be private property after purchase by Holtec. As such, the property would be designated “Off-Limits” to the general public and “No Trespassing” signs would be posted along the property boundary, in accordance with State and Federal requirements for posting real estate property (Holtec, 2019a).

Major national and State parks and recreational areas in the vicinity of the proposed CISF project area are shown in EIS Figure 3.2-5. Carlsbad Caverns National Park is located south of Carlsbad and contains some of the largest caves in North America, including Carlsbad Cavern. Carlsbad Wilderness is desert backcountry surrounding Carlsbad Caverns National Park. The Guadalupe Back County Byway west of Carlsbad is a 48-km [30-mi] road, which ascends about 915 meters (m) [3,000 feet (ft)] from the Chihuahuan Desert into the Guadalupe Mountains. The Living Desert Zoo and Gardens is located in Carlsbad and is dedicated to the interpretation of the Chihuahuan Desert. Brantley Lake State Park, located between the cities of Carlsbad and Artesia, includes a 1,214-ha [3,000-ac] lake on the Pecos River created by construction of the Brantley Dam. Avalon Reservoir located 4.8 km [3 mi] north of Carlsbad is a shallow 27-ha [66-ac] lake on the Pecos River, and the New Mexico Department of Fish and Game (NMDFG)

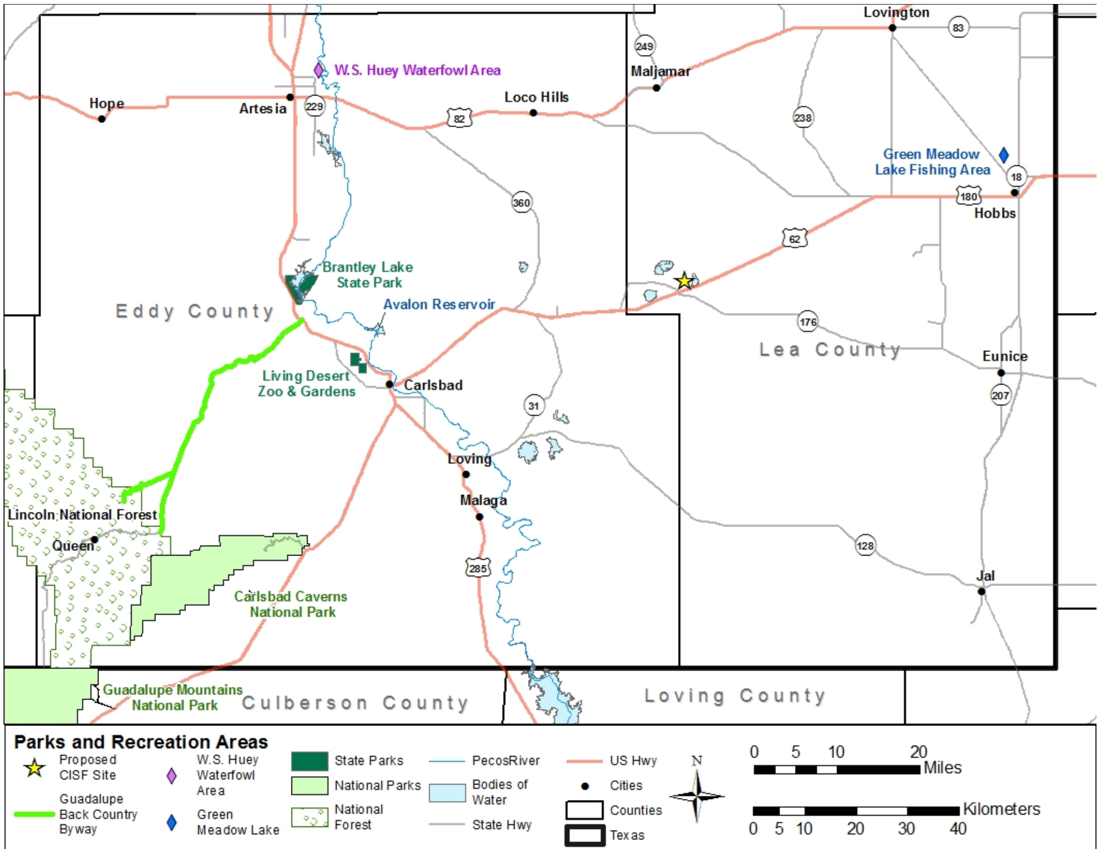

Figure 3.2-5 Major Parks and Recreational Areas in the Vicinity of the Proposed CISF Project Area (Modified from ELEA, 2007)

stocks it for fishing. The W.S. Huey Waterfowl Area, located northeast of Artesia, is a stopping and resting area for migrating waterfowl, including sandhill cranes and snow geese. Green Meadow Lake Fishing Area, located north of Hobbs, the NMDFG stocks for fishing. Local parks and recreational facilities (e.g., sport complexes, swimming pools, golf courses, hiking and biking trails, shooting ranges, and lakes) are also maintained by the cities of Carlsbad, Hobbs, Artesia, and Lovington.

3.2.4 Mineral Extraction Activities

Mineral extraction in the area of the proposed CISF project area consists of underground potash mining and oil and gas extraction (EIS Section 4.4.1.2) (Holtec, 2019a,b). As described in EIS Section 3.2.1, BLM or the State of New Mexico owns the minerals (potash and oil and gas) beneath the proposed CISF project area and surrounding area. These minerals are leased to production companies for development. The New Mexico State Land Office administers mineral leases (potash and oil and gas) on land the State of New Mexico owns.

The proposed CISF project area is in a region of active oil and gas exploration and development, with producing oil and gas fields, support services, pipelines, and compressor stations. Compressor stations are used to pump oil and gas through pipelines. The locations of compressor stations surrounding the proposed CISF project area are shown in EIS Figure 3.2-6. Other facilities related to oil and gas activity in the area include the Zia Gas Plant located approximately 11.6 km [7.2 mi] northwest of the proposed CISF project area and the R360

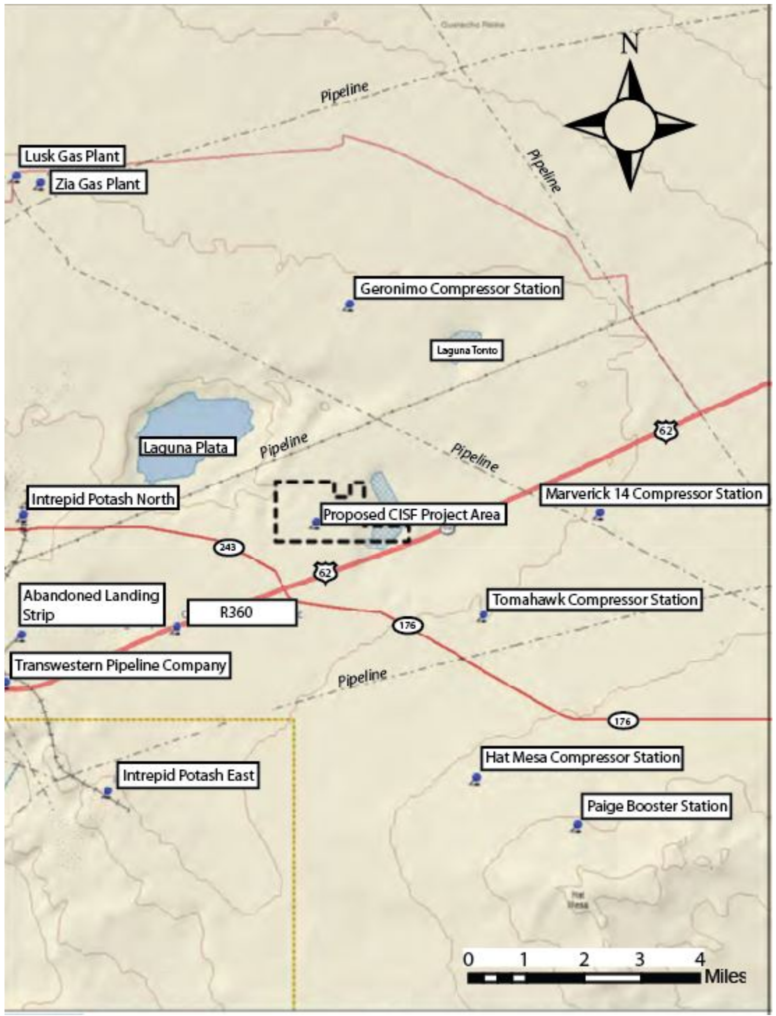

Figure 3.2-6 Facilities Surrounding the Proposed CISF Project Area (Modified from ELEA, 2007)

(a hydrocarbon remediation landfarm) located 3.2 km [2 mi] southwest of the proposed CISF project area (EIS Figure 3.2-6).

Wells associated with past and present oil and gas exploration and development within and surrounding the proposed CISF project area are shown in EIS Figure 3.2-7. The eastern portion of the proposed CISF project area has 18 plugged and abandoned oil and gas wells. However, none of these plugged and abandoned oil and gas wells are located within the area where the proposed CISF pads would be located or where any land would be disturbed. The closest plugged and abandoned well to the storage and operations area is approximately 0.65 km [0.4 mi] to the east. There is one active oil/gas well on the southwest portion of Section 13 that operates at minimum production to maintain mineral rights.

All oil and gas production horizons in Eddy and Lea Counties, New Mexico, are older (and therefore deeper) than the Salado Formation (Cheeseman, 1978). In the area of the proposed project area, the Salado Formation occurs at depths of 549 to 914 m [1,800 to 3,000 ft] below ground surface. Oil and gas exploration targets within and surrounding the proposed project

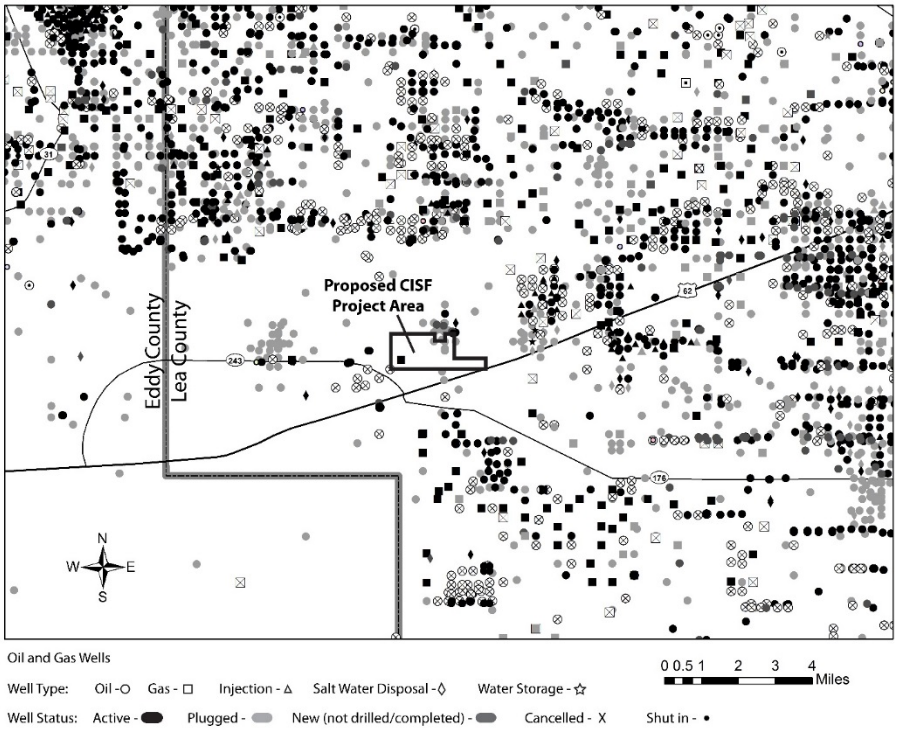

Figure 3.2-7 Oil and Gas Industry Wells Within and Surrounding the Proposed CISF Project Area (Source: NMOCD, 2016)

area range from relatively shallow oil and gas at approximately 930 to 1,524 m [3,050 to 5,000 ft] in upper and middle Permian formations (EIS Section 3.4.1.2) to deep gas targets in middle Paleozoic formations in excess of 4,877 m [16,000 ft] deep (ELEA, 2007). The Belco Tetris Shallow and Belco Deep drill islands are located approximately 0.4 km [0.25 mi] and 0.8 km [0.5 mi] west of the proposed project area, respectively, and the Anise Tetris drill island is south of the proposed project area. The no-longer-proposed Green Frog Café drill island would have been located just outside the eastern boundary of the proposed project area (Holtec, 2017, 2019c). These drill islands were established by the BLM in consideration of appropriate oil and gas technology, such that wells can be drilled from the drilling islands to effectively extract oil and gas resources, while managing the impact on underground potash resources (77 FR 71814; December 4, 2012). The drill islands can accommodate multiple oil and gas well locations.

Potash is a major resource in the area of the proposed project. Numerous potash coreholes have been drilled in areas surrounding the proposed CISF project area, and there are potash leases both within and on land adjacent to the proposed CISF project area. Underground potash in the area of the proposed project is owned by BLM or the State of New Mexico and is leased to potash production companies. Potash beneath the proposed project area is owned by the State of New Mexico and is leased to Intrepid Mining LLC (Intrepid). Potash surrounding the proposed project area is leased to various potash production companies, including Intrepid, Mosaic Potash, and Western Ag-Minerals.

Intrepid operates two underground potash mines (Intrepid North and Intrepid East), within 9.6 km [6 mi] of the proposed CISF project area (EIS Figure 3.2-6). The Intrepid North mine, located to the west, is no longer mining potash underground; however, surface facilities are currently being used in the manufacture of potash products. The Intrepid East mine, located to the southwest, is still mining underground potash ore (Holtec, 2019a). The potash in these mines is extracted from the Permian Salado Formation at depths of approximately 1,800 to 3,000 ft (Holtec, 2019b). The closest mined potash is approximately 3.2 km [2 mi] from the southwestern boundary of the proposed CISF project area. However, the closest active potash mines are at a distance of approximately 6.8 km [4.2 mi] from the proposed CISF project area (Holtec, 2019b).

3.2.5 Utilities and Transportation

Oil and gas extraction is prevalent in the region, and electric power is needed at the well pads to operate pumps, compressors, and other equipment. Therefore, numerous power transmission and distribution lines exist within the region surrounding the proposed CISF project area. Xcel Energy would provide the electrical power needed for the proposed CISF project (Holtec, 2019a). An existing electrical service along the southern border of the proposed CISF project location would be used to provide electrical power for the proposed CISF project (Holtec, 2019a).

There are four pipelines that cross the proposed CISF project area: (i) a Transwestern 50.8-cm [20-in] diameter natural gas pipeline along the western boundary of the proposed CISF project area; (ii) a DCP Midstream 50.8-cm [20-in] diameter natural gas pipeline in the east central portion of the proposed CISF project area; (iii) a DCP Midstream 25.4-cm [10-in] diameter natural gas pipeline also in the east central portion of the proposed CISF project area; and (iv) a 61-cm [24-in] diameter above ground water pipeline in the western portion of the proposed CISF project area (Holtec, 2019a,b). Another natural gas pipeline is proposed to be constructed near the two existing DCP Midstream pipelines (Holtec, 2019b). Major oil and gas pipelines surrounding the proposed CISF project area are shown in EIS Figure 3.2-8.

The City of Carlsbad Water Department would provide potable water for construction and operation of the proposed CISF location through the existing water supply pipeline currently in place at the proposed CISF project area (Holtec, 2019a). The City of Carlsbad Water Department has municipal wellfields that withdraw water from the Ogallala Aquifer. The existing potable water pipeline that bisects the proposed CISF project area is owned by Intrepid Mining, LLC and services their Intrepid East Facility. Intrepid is aware of the need to relocate this pipeline, and Holtec would coordinate with Intrepid to reroute this pipeline around the proposed CISF project area prior to the beginning of construction. The pipeline is a surface pipeline and would require no significant construction to reroute (Holtec, 2019a).

The nearest municipal solid waste facility that serves Eddy County (and is jointly owned by Eddy County and the City of Carlsbad) is the Sandpoint Landfill, located 40 km [25 mi] west of the proposed CISF project area (Holtec, 2019a). The landfill is outside of the land use resource area radius, as defined in EIS Section 3.2. However, more information on the generation and disposal of wastes at the proposed CISF can be found in EIS Section 3.13.2. Some land in the area is used to support road and rail transportation. Road and rail transportation is discussed in more detail in EIS Section 3.3. Regional airports with services regional air carriers provide are located in Carlsbad, Hobbs, and Roswell. Small, general aviation airports are located in Artesia, Jal, and Lovington. An abandoned landing strip that is about 305 m [1,000 ft] long is located 8 km [5 mi] west of the proposed CISF project area (EIS Figure 3.2-6).

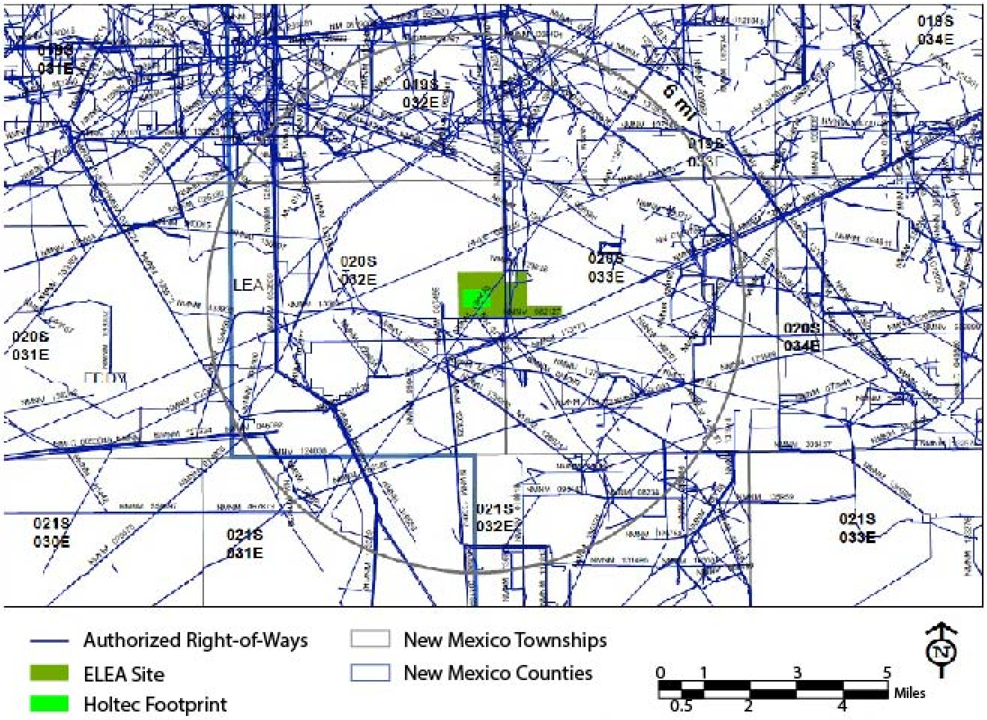

Figure 3.2-8 Pipelines Within the Land Use Study Area of the Proposed CISF Project (Holtec, 2019a)

3.3 Transportation

This section describes the transportation infrastructure and conditions in the region surrounding the proposed CISF project area as well as the national transportation infrastructure and conditions that would support shipment of SNF to and from the proposed CISF. As described in EIS Section 2.2.1, Holtec has proposed to use roads to ship equipment, supplies, and produced wastes, as well as to move commuting workers during the lifecycle of the proposed CISF project. Rail is proposed as the primary means of transportation for the shipments of SNF to and from the proposed CISF project (Holtec, 2019a).

3.3.1 Regional and Local Transportation Characteristics

EIS Figure 3.2-5 shows parks and recreation areas as well as the transportation corridor of the region surrounding the proposed CISF project area. The major roads in the area consist of county and State roads interconnecting the various population centers, but only four U.S. highways traverse the area. U.S. Highway 285 runs south to north along the Pecos River through Carlsbad and to points south, including Pecos, Texas, where it intersects with Interstate 20. U.S. Highway 62/180 runs southwest to the northeast through Carlsbad, past the location of the proposed CISF project area, and continues northeast to Hobbs, New Mexico, and points beyond to the east in the direction of Fort Worth, Texas. U.S. Highway 82 travels west to east from Artesia through Lovington, New Mexico.

Regional access to the proposed CISF project area is by U.S. Highway 62/180, which is a four-lane highway that connects Carlsbad and Hobbs. In 2015, the New Mexico Department of Transportation (NMDOT) reported annual average daily traffic (AADT) on U.S. Highway 62/180 ranged from approximately 9,952 vehicles per day near Hobbs, to 5,696 vehicles per day near the proposed CISF project area (near the Eddy-Lea County line), to 7,273 vehicles per day near Carlsbad. Commercial trucks represented approximately 43 percent of the vehicles counted near the proposed CISF project area (NMDOT, 2016). U.S. Highway 62/180 is also the final major highway segment on the Waste Isolation Pilot Plant (WIPP) facility transportation route. From 1999 to 2014, there have been almost 12,000 shipments of waste to WIPP, traveling over 22 million km [14 million mi] (DOE, 2016). Additional information about WIPP is in Section 5.1.1.2 of this document.

Local access to the proposed CISF project area from U.S. Highway 62/180 follows Laguna Road. The intersection of Laguna Road with U.S. Highway 62/180 is approximately 0.8 km [0.5 mi] to the south of the proposed CISF project area. Laguna Road travels south to north through the proposed CISF project area and then connects to small county roads north of the proposed CISF project area (Holtec, 2019a).

Two railroads service the region surrounding the proposed CISF project area. To the west of the proposed CISF proposed area, Burlington Northern-Santa Fe (BNSF) operates the Carlsbad Subdivision (Carlsbad to Clovis, plus industrial spurs serving potash mines east of Carlsbad and east of Loving) (BNSF, 2019; Holtec, 2019a). Customers include potash mines, a petroleum refinery in Artesia, and various feed mills and agricultural-related businesses in Roswell and Portales. The Carlsbad spur ends at the Intrepid North potash facility, which is 6.1 km [3.8 mi] west of the proposed CISF project area (Holtec, 2019a). Intrepid reported loading 596 railroad cars in 2018 on this spur, averaging around 50 cars per month (Holtec, 2019a).

East of the proposed CISF project area, the Texas-New Mexico Railroad (TNMR) operates 172 km [107 mi] of track near the Texas-New Mexico border from a Union Pacific connection at Monahans, Texas, to Lovington, New Mexico. The railroad serves the oil fields of West Texas and Southeast New Mexico as well as the Waste Control Specialists (WCS) waste disposal facility. The primary cargo shipped on this track includes oilfield commodities, such as drilling mud and hydrochloric acid, fracking sand, pipe, and petroleum products, including crude oil as well as iron and steel scrap (Watco, 2019). In 2015, the operator estimated approximately 22,500 railroad carloads per year would travel on this rail (USRRB, 2016).

Holtec proposes to construct a new rail spur across uninhabited BLM-managed land due west of the proposed CISF project area to connect the Carlsbad spur located near the Intrepid potash facility to the proposed CISF project area. This extension of the rail line extends the affected environment for the connected action involving the transportation of SNF to and from the proposed CISF project to include the right-of-way for this rail spur and the area surrounding it.

3.3.2 Transportation from Nuclear Power Plants and ISFSIs to a Permanent Repository

For transportation of SNF from a nuclear power plant site (i.e., the generation sites of SNF that could be transported to the CISF) or ISFSI, the affected environment includes transportation workers and all rural, suburban, and urban populations living along the transportation routes within range of exposure to radiation emitted from the packaged material during normal transportation activities or that could be subjected to nonradiological accident hazards or exposed in the unlikely event of a severe accident involving a release of radioactive material. The affected environment also includes people in rail cars using the same transportation route, people at stops, and workers who are involved with the transportation activities. This discussion of the affected environment supports the radiological and nonradiological impact analyses of transportation of SNF to and from the proposed CISF project (EIS Section 4.3).

All U.S. nuclear power plants sites are serviced by controlled access roads. In addition to the access roads, many of the plants also have railroad connections that can be used for moving heavy loads, including SNF. Some of the plants that are located on navigable waters, such as rivers, the Great Lakes, or oceans, have facilities to receive and ship loads on barges. Power plants that are not served by rail would need to ship SNF by truck or barge to the nearest rail facility that can accommodate an intermodal transfer of the SNF cask (DOE, 2008).

Because no arrangements regarding which nuclear power plants will ship SNF to the proposed CISF have been made yet, the exact locations of SNF shipment origins have not been determined; therefore, the details regarding the specific routes that would be used also are not known at this time. Potential origins of SNF shipments for the proposed action (Phase 1) include existing shut down and decommissioned reactor sites. If the proposed CISF is loaded to full capacity, then it is reasonable to assume that shipments of SNF would come from most or all existing reactor sites nationwide. Additionally, the SNF stored at the proposed CISF project would eventually need to be transported to an offsite geologic repository, in accordance with the national policy for SNF management established in the Nuclear Waste Policy Act of 1982, as amended (NWPA). The NWPA requires that DOE submit an application for a repository at Yucca Mountain, Nevada. Unless and until Congress amends the statutory requirement, NRC assumes that the transportation of SNF from the CISF to a repository will be to a repository at Yucca Mountain, Nevada.

The exact routes for SNF transportation to and from the proposed CISF would be determined in the future, prior to making the shipments. However, to evaluate the potential impacts of these shipments, representative or bounding routes applicable to a national SNF shipping campaign [such as those described and evaluated in Section 2.1.7.2 of DOE's final supplemental environmental impact statement for a geologic repository at Yucca Mountain (DOE, 2008) or NRC's most recent spent nuclear fuel transportation risk assessment in NUREG–2125 (NRC, 2014)] provide sufficient information about potential transportation routes to support the analysis of impacts in Chapter 4 of this EIS. The NRC staff consider the routes evaluated in these prior transportation analyses to be representative or bounding for SNF shipments to and from the proposed CISF project because they were derived based on typical transportation industry route selection practices, they considered existing power plant locations, and they cover large distances across the U.S. with diverse transportation characteristics.

3.4 <u>Geology and Soils</u>

A description of the geology, seismology, and soils within and in the vicinity of the proposed CISF project area is presented in this section. The geology of the proposed CISF project area in southeastern New Mexico is characterized by sediments of Quaternary age in the form of alluvial deposits of both Pleistocene and Recent age and dune sands of Recent age that overlie a thick sequence of complexly interbedded sandstone, shale, limestone, and evaporite deposits of Paleozoic to Tertiary age.

3.4.1 Regional Geology

Information presented in this section on the physiography, structure, and stratigraphy of southern Lea County, where the proposed CISF would be located, is taken largely from Nicholson and Clebsch (1961), Geology and Ground-Water Conditions in Southern Lea County, New Mexico, because this work is considered to be the most comprehensive geology reference available for this portion of New Mexico. Additional references are cited, as applicable.

3.4.1.1 Physiography

The proposed CISF project area is near the boundary of the Pecos Valley and High Plains (also referred to as the Llano Estacado or Staked Plains) sections of the Great Plains physiographic province in southeastern New Mexico (EIS Figure 3.4-1). The primary contrast between the Pecos Valley and High Plains sections is the abrupt change in topographic texture. The Pecos Valley section is a very irregular erosional surface that slopes west-southwestward toward the Pecos River, whereas the High Plains is a depositional surface of low relief that slopes southeastward. The topography of the Pecos Valley section is characterized by areas of interior drainage resulting from collapse due to dissolution, and by vast areas of both stabilized and drifting dune sand.

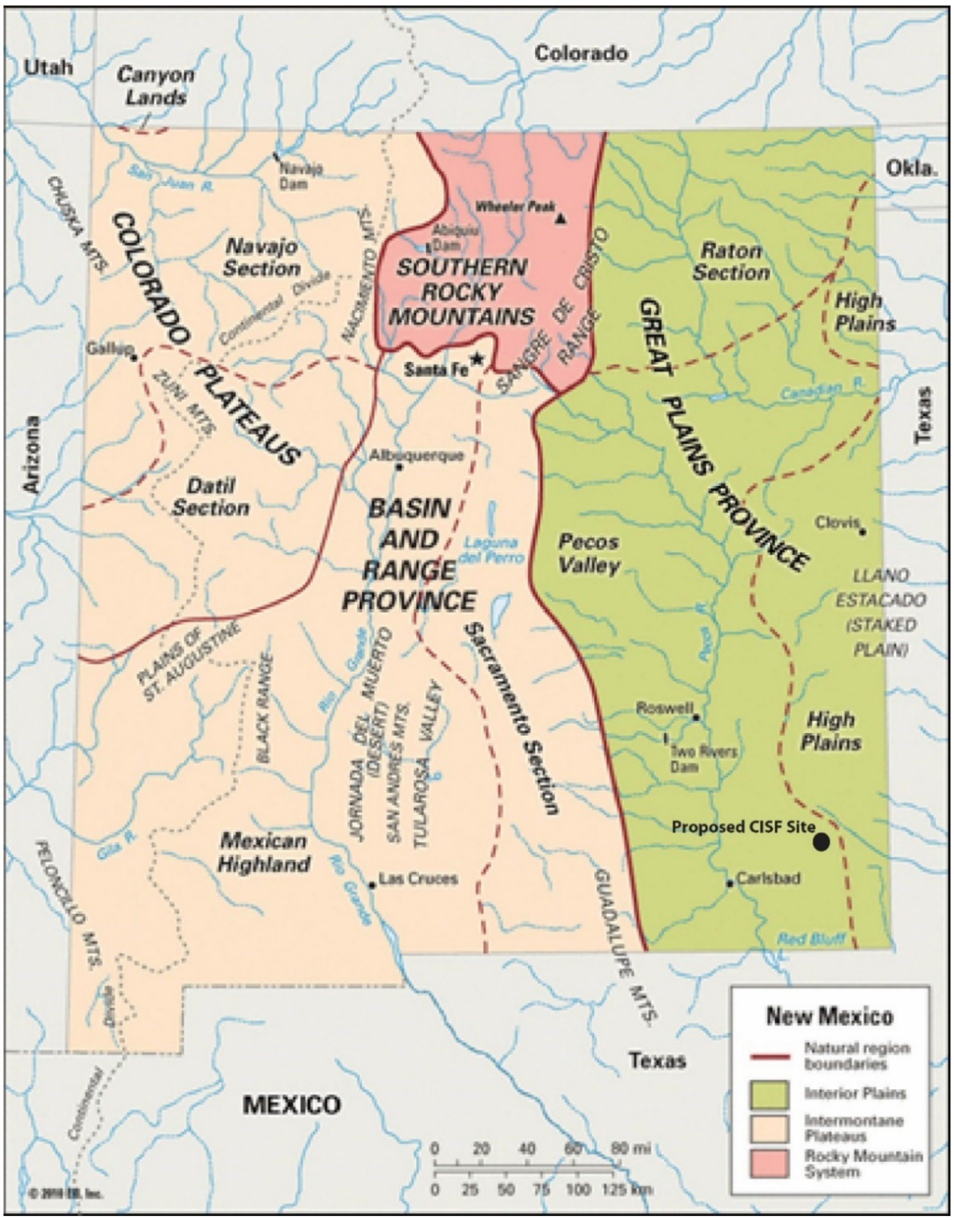

Figure 3.4-1 Map of Physiographic Provinces in New Mexico (Source: Encyclopedia Britannica, 2010)

The proposed CISF project area is located in a vast sand dune area known as the Querecho Plains (EIS Figure 3.4-2). The continuation of this sand dune area to the east is known as the Laguna Valley. Dune sand covering the Querecho Plains and Laguna Valley is stable to semi-stable, but locally drifts. The surface is very irregular and has no drainage features except at the edges of several playas (i.e., dry-lake bed). The dune sand is generally underlain by recent alluvium, but at several locales the sand forms topographic highs where it is underlain by a caliche (i.e., hardened calcic soils) surface. The thickness of the sand deposit ranges from a few centimeters (few inches) to approximately 6 m [20 ft].

Other prominent physiographic features in the vicinity of the proposed CISF project area include Mescalero Ridge, Nash Draw, Clayton Basin, Grama Ridge, and San Simon Swale. Mescalero Ridge is a prominent topographic feature that marks the southwestern limit of the High Plains. The ridge is located about 11 km [7 mi] northeast of the proposed CISF project area and rises sharply about 46 m [150 ft] above the Querecho Plains to the southwest. Mescalero Ridge is capped by a thick layer of resistant caliche, locally called caprock, which underlies the High Plains. Nash Draw and the Clayton Basin are topographic depressions to the west and southwest of the Querecho Plains. These depressions formed as a result of karstic collapse in response to dissolution (i.e., dissolving) of underlying salt and evaporite beds (Vine, 1963; Hill, 2006; Powers et al., 2006).

Grama Ridge is a topographically high area south to the Querecho Plains with a southwestward-facing scarp that borders San Simon Swale. Grama Ridge is characterized by a hard caliche surface covered in some places by sand, notably on the north where dune sand overlaps from the Querecho Plains. The surface slope and texture of the Grama Ridge area

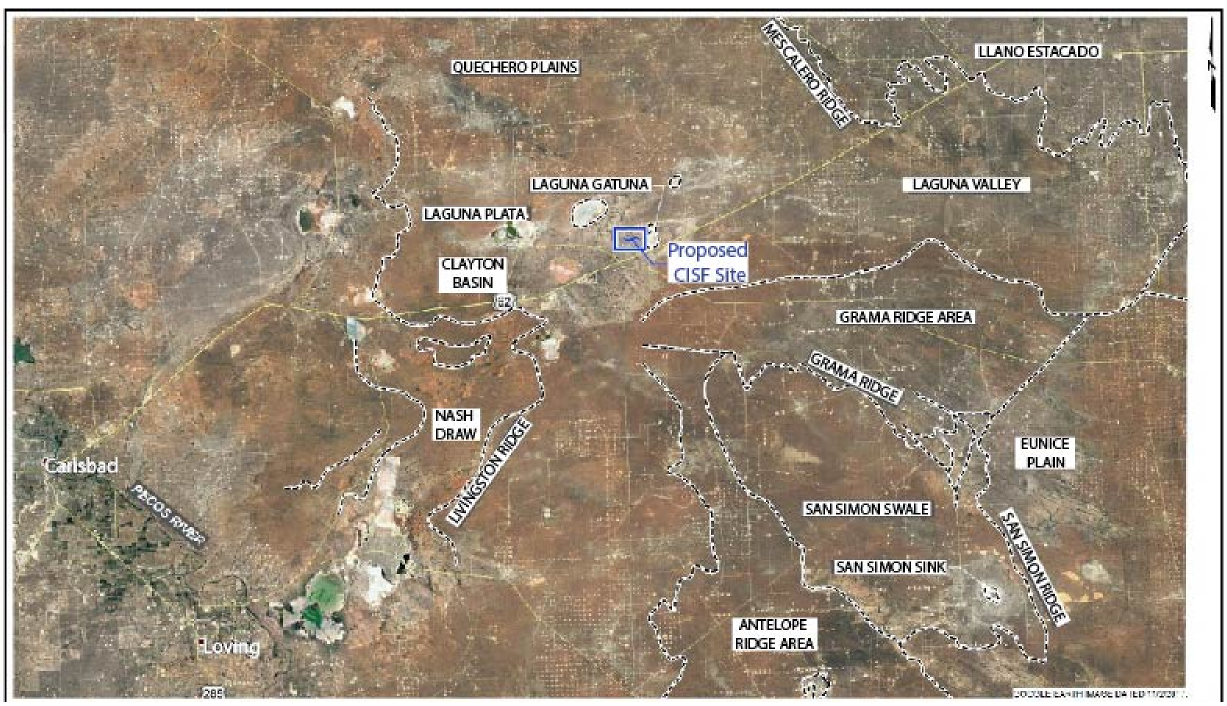

Figure 3.4-2 Map of Physiographic Features in Southern Lea County and Eastern Eddy County, New Mexico (Modified from Holtec, 2019a)

and the composition of the underlying materials indicate that it was once part of the High Plains. San Simon Swale is a large depression covered mostly by dune sand that is bounded on the northeast by Grama Ridge and on the southwest by areas of higher altitude. San Simon Swale is interpreted to have originated from a combination of deep-seated solution subsidence in Tertiary age calcretes and surface erosion of an ancestral tributary of the Pecos River (Bachman and Johnson, 1973).

3.4.1.2 Structure and Stratigraphy

The Permian Basin, a large subsurface structural feature, underlies southeastern New Mexico and a large part of western Texas. Major structural elements of the Permian Basin in southeastern New Mexico, where the proposed CISF project area and the surrounding area would be located, include parts of the Delaware Basin, Capitan Reef Complex, and Central Basin Platform (EIS Figure 3.4-3). The Central Basin Platform is a steeply fault-bounded uplift of basement rocks that forms an abrupt eastern terminus of the Delaware Basin. Between the Delaware Basin and Central Basin Platform is the Capitan Reef Complex. The Delaware Basin, Central Basin Platform, and Capitan Reef are defined on the basis of differing sedimentary depositional environments that existed during Permian (Late Paleozoic) time.

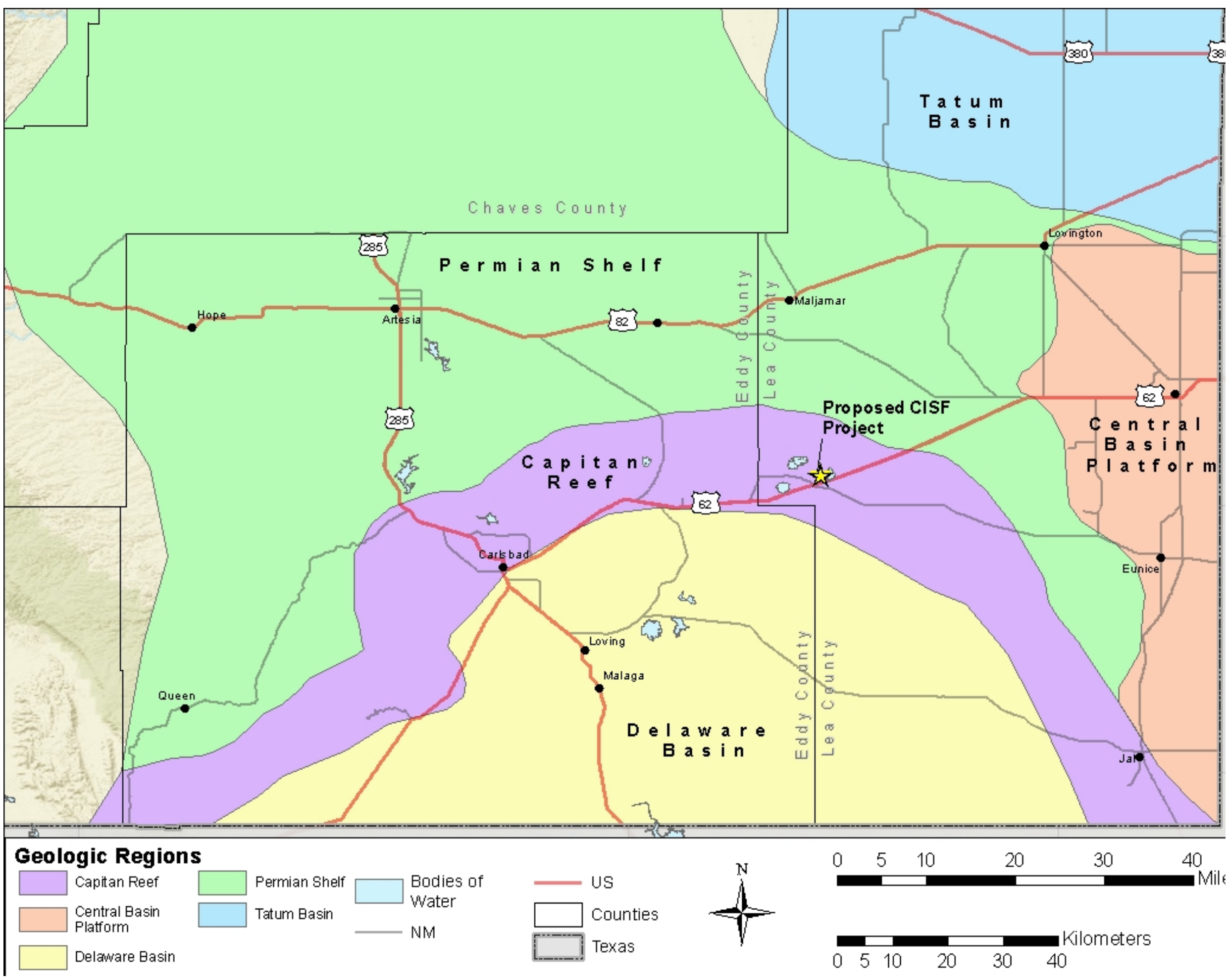

Figure 3.4-3 Major Geologic Regions of the Permian Basin of West Texas and Southeastern New Mexico (Source: Jerina, 2014)

Paleozoic Rocks

During the Early and Middle Paleozoic (Ordovician to Pennsylvanian time period), southeastern New Mexico and western Texas was an embayment covered by a shallow sea that accumulated a thick sequence of marine sediments. In the Late Paleozoic period, Permian age rocks were deposited on an irregular surface formed by Late Pennsylvanian folding. Throughout most of the Permian Period, the Delaware Basin was the site of a deep marine canyon. The Permian Basin subsided more rapidly than the Central Basin Platform and continued to accumulate sediments at times when there was little or no deposition on the platform. During early Permian time, about 3,048 m [10,000 ft] of sediments consisting of sand, shale, and limestone accumulated in the basin. Uplift of the platform was active through the early and middle Paleozoic period such that most of the pre-Permian sedimentary section is missing. In middle Permian time, a back-reef or shelf area composed of limestone (Capitan Reef Complex) began forming along the margins of the basin. Significant reef developments are present through 2,134 m [7,000 ft] of Middle Permian strata along the reef complex. Middle Permian sediments on the south or basin side of the reef (fore-reef, or basin facies) are mostly clastic sandstones and shales, whereas Middle Permian sediments on the north or shelf side of the reef (back reef, or shelf facies) are primarily carbonates. In Late Permian time, sandstone and shale beds in the basin were covered by evaporates and limestone interbedded with dolomite, sand, and shale. The reef created steep slopes toward the center of the basin, and the thickness of sediments increases toward the center of the basin.

The stratigraphy of Permian to Quaternary geologic units in the Delaware Basin is shown in EIS Figure 3.4-4. Permian rocks are divided into four series: Wolfcamp, Leonard, Guadalupe, and Ochoa.

<u>Wolfcamp Series</u>: The Wolfcamp Series consists of dark shale and limestone in the Delaware Basin. The Wolfcamp is present in structurally lower parts of the Central Basin Platform where it consists mostly of limestone, but it thins and is absent in structurally higher parts of the Central Basin Platform. Both the basin and shelf facies of the Wolfcamp are targets for oil and gas exploration (Powers et al., 1978).

<u>Leonard Series</u>: The Leonard Series consists mainly of the Bone Springs limestone. In the basin area, it is black calcareous shale interbedded with black limestone and is as much as 914 m [3,000 ft] thick. Toward the basin margins and in the shelf and platform areas, the Leonard is represented by the Abo reef facies, which has a diverse lithology. The Abo reef facies in southeastern New Mexico is a prolific oil and gas-producing formation.

<u>Guadalupe Series</u>: In the Delaware Basin, the Guadalupe Series is represented by the Delaware Mountain Group, which is subdivided into three formations, from oldest to youngest: Brushy Canyon, Cherry Canyon, and Bell Canyon. Each of these formations is up to 305 m [1,000 ft] thick. These formations consist primarily of sandstones and shales in the basin facies and limestones in the shelf facies and are important oil and gas exploratory targets (Vertrees et al., 1959). Toward the margins of the basin, the upper two formations of the Delaware Mountain Group (Cherry Canyon and Bell Canyon) grade into the Capitan reef facies.

The Capitan is a fossiliferous, locally vuggy (i.e., consisting of small-to-medium sized cavities or voids) limestone and breccia (Hayes, 1964). The Capitan forms an arc around the west, north, and east margins of the Delaware Basin (EIS Figure 3.4-3).

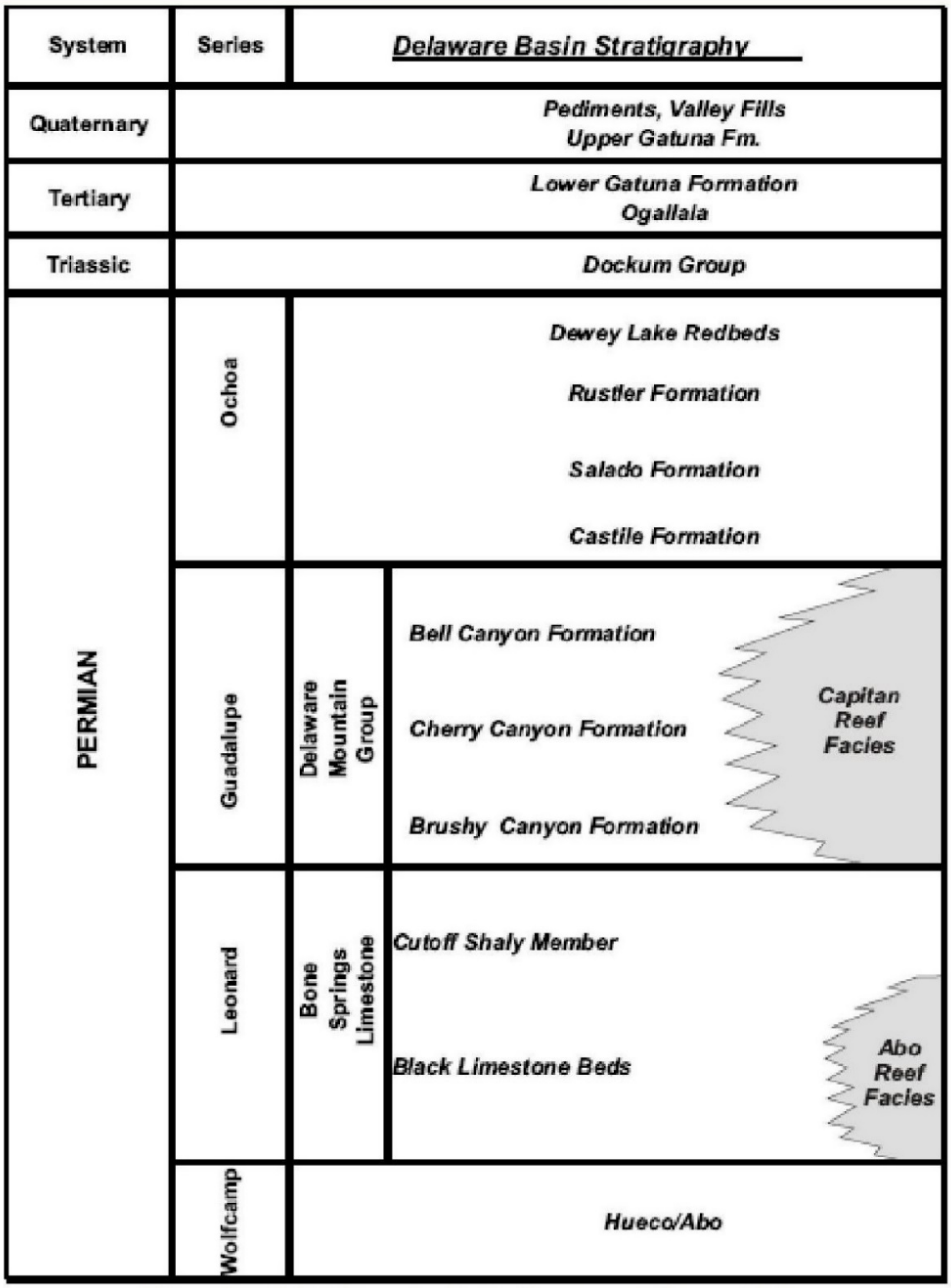

Figure 3.4-4 Stratigraphy of Permian to Quaternary-Aged Geologic Units in the Delaware Basin (Source: ELEA, 2007)

Ochoa Series: The Ochoa Series consists mainly of evaporates deposited during regressions of shallow sea waters. The Ochoa is represented from oldest to youngest by the following geologic units: Castile Formation, Salado Formation, Rustler Formation, and Dewey Lake Redbeds. The Castile Formation consists primarily of anhydrite but contains some halite beds. The Castile rests unconformably on the Delaware Mountain Group but does not extend beyond the basin margin. The Castile Formation ranges in thickness from zero to about 549 m [1,800 ft]. The Salado Formation overlies the Castile Formation and extends across both the Delaware Basin and Central Basin Platform. The Salado ranges in thickness from zero to about 610 m [2,000 ft]. It consists mainly of halite with some anhydrite. The Salado also contains significant accumulations of potash mineral ore (Vine, 1963). Overlying the Salado Formation is the Rustler Formation, which consists primarily of anhydrite but includes red beds and halite.

The Rustler ranges in thickness from 27 to 110 m [90 to 360 ft]. The Dewey Lake Redbeds overlie the Rustler Formation and are represented by about 183 m [600 ft] of red siltstone, shale, and sandstone commonly cemented by gypsum. This unit is laterally extensive and was deposited in shallow water remaining in the Delaware Basin before final sea regression (Mercer and Orr, 1977).

Mesozoic Rocks

In the Delaware Basin area, the Mesozoic era is represented only by Upper Triassic rocks of the Dockum Group (EIS Figure 3.4-4). The Dockum Group is separated from the Upper Permian age Dewey Lake Redbeds by an erosional unconformity. The Dockum Group is represented by the Santa Rosa Sandstone and the overlying Chinle Formation; however, the distinction between these two units cannot be made throughout the area, because of lithologic similarities and poor exposures. The Santa Rosa is fine- to coarse-grained sandstone containing minor shale layers. The thickness of the Santa Rosa ranges from about 43 m [140 ft] to more than 91 m [300 ft]. The overlying Chinle Formation ranges in thickness from zero to 387 m [1,270 ft]. The formation is thickest in the eastern part of the basin and is entirely absent in the western part, where it has been removed by erosion. The Chinle consists mainly of red and green claystone but also contains minor fine-grained sandstone and siltstone.

Cenozoic Rocks

Tertiary rocks in southeastern New Mexico are represented by the Ogallala Formation of Pliocene age. The Ogallala consists of up to 122 m [400 ft] of calcareous sand, gravel, silt, and clay deposited over an irregular terrain (Bachman, 1976). The Ogallala is capped by a layer of dense caliche, which ranges in thickness from a few meters [feet] to as much as 18 m [60 ft]. Following the Pliocene, the Ogallala was removed by erosion in much of southwestern Lea County and eastern Eddy County. The Ogallala remains beneath the High Plains (Central Basin Platform) and Grama Ridge in Lea County. The caliche capping the Ogallala is resistant to erosion and forms a prominent ledge along Mescalero Ridge.

Sediments of Quaternary age in southern Lea County are present in the form of alluvial deposits of both Pleistocene and Recent age and dune sands of Recent age. The alluvium was deposited in low-lying areas where the Ogallala Formation had been stripped away. The dune sands mantle the older alluvium and the Ogallala Formation over most of the area. The older alluvium formed the Gatuna Formation, which is likely of early to middle Pleistocene age. The Gatuna underlies the Querecho Plains, Laguna Valley, San Simon Swale, and several smaller areas in southern Lea County. The Gatuna is up to several hundred meters [several thousand feet] thick and consists of reddish brown friable sandstone, siltstone, and siliceous conglomerate with local gypsum and claystone (Powers et al., 1978). The dune sands are stable or semi-stable over most of the area but are actively drifting in some places. The thickness of the dunes ranges from a few centimeters [inches] to 9 m [30 ft], but generally the sand forms a veneer 1.5 to 3 m [5 to 10 ft] thick.

Across much of southeastern New Mexico, laterally extensive caliche deposits called the Mescalero are present above the Gatuna Formation and other alluvial materials. The Mescalero is considered the remnant of an extensive soil profile and is described as a sandy light gray to white lower nodular and upper laminar caliche zone ranging in thickness from 1 to 3 m [3 to 10 ft] (Bachman, 1973).

3.4.2 Site Geology

A map showing the topography within and in the vicinity of the proposed CISF project area is depicted in EIS Figure 3.4-5. Ground elevation ranges from about 1,067 to 1,082 m [3,500 ft to 3,550 ft] across the proposed CISF project area. Ground elevation is highest along the southern boundary of the proposed CISF project area and slopes gently northward and eastward toward two drainages. One of these drainages leads to Laguna Plata to the northwest and the other drainage leads to Laguna Gatuna to the east.

A map showing surface geology within and in the vicinity of the proposed CISF project area is depicted in EIS Figure 3.4-6. The ground surface at the proposed CISF project area is covered by a laterally extensive veneer of Quaternary alluvial deposits. Drillhole logs indicate that the alluvial deposits range from 7.6 to 12.2 m [25 to 40 ft] in thickness across the proposed CISF project area and consist of surface soil (topsoil), a caliche caprock, and underlying residual soil (ELEA, 2007; Holtec, 2019b; GEI Consultants, 2017). Topsoil covering the ground surface ranges from 0 to 0.6 m [0 to 2 ft] in thickness and consists of varying amounts of sand and clay (Holtec, 2019b; GEI Consultants, 2017). A laterally continuous layer of caliche (referred to as the Mescalero) is present beneath the topsoil. The caliche ranges from 0.6 to 4.1 m [2 to

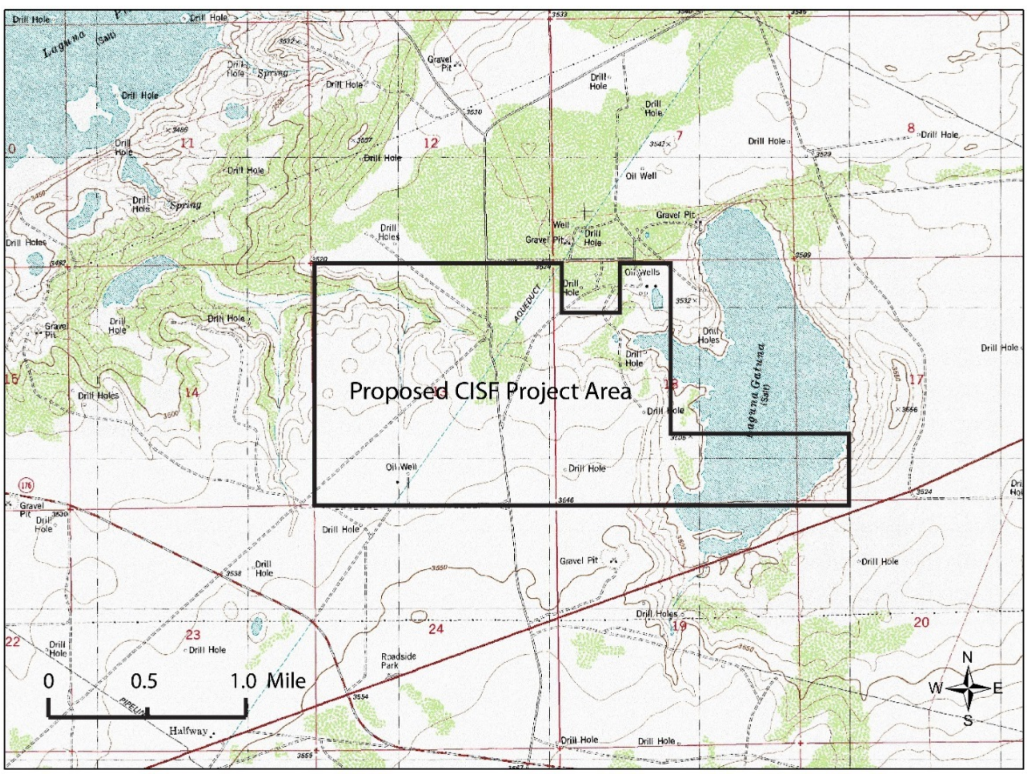

Figure 3.4-5 Topographic Map of the Proposed CISF Project Area and Surrounding Area (Source: USGS, 2013)

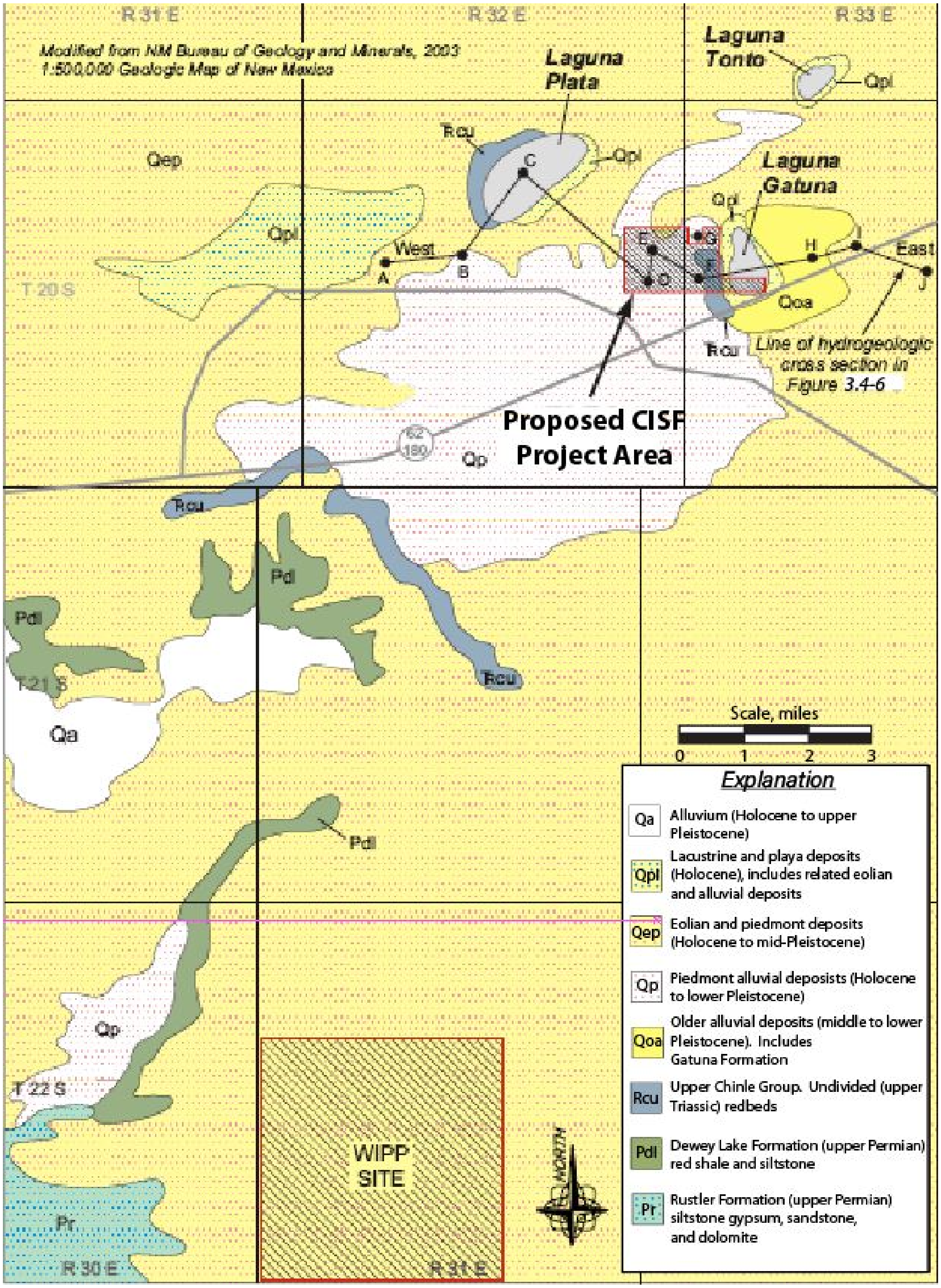

Figure 3.4-6 Map of Surface Geology Within and in the Vicinity of the Proposed CISF Project Area (Modified from ELEA, 2007)

13.5 ft] in thickness across the proposed CISF project area (ELEA, 2007; Holtec, 2019b; GEI Consultants, 2017). Residual soil consisting of clayey sand or sandy clay with trace gravel is present beneath the caliche. The residual soil ranges from 5.2 to 8.5 m [17 to 28 ft] in thickness across the proposed CISF project area (ELEA, 2007; GEI Consultants, 2017).

A geologic cross-section showing subsurface stratigraphy within and in the vicinity of the proposed CISF project area is depicted in EIS Figure 3.4-7. The geologic cross-section was constructed from available oil and water well logs (ELEA, 2007). Quaternary alluvial deposits within and surrounding the proposed CISF project area (described previously) are underlain by bedrock of the Triassic Dockum Group (ELEA, 2007; Holtec, 2019b). As described previously, the Dockum Group is composed of shale, siltstone, and sandstone of the Santa Rosa Formation and the overlying Chinle Formation. Lithologic information from geotechnical borings within the proposed CISF project area indicate that the Chinle Formation is encountered at depths from 8.4 to 12.3 m [27.5 to 40.5 ft] and consists of poorly indurated mudstone with interbedded lenses of moderately to well indurated siltstones and conglomerate (GEI Consultants, 2017). Results of eight *in-situ* permeability tests performed in the Chinle Formation ranged from 3.2×10^{-7} to 7.7×10^{-6} cm/s [1.2×10^{-7} to 3.0×10^{-6} in/s], indicating very low permeability material (GEI Consultants, 2017). The Santa Rosa Formation was encountered at a depth of about 65.5 m [215 ft] in the geotechnical borings and consists of fine- to coarse-grained sandstone, with minor reddish-brown siltstones and conglomerates (GEI Consultants, 2017).

Results of two *in-situ* permeability tests performed in the Santa Rosa Formation indicated permeability in the range of 3.4×10^{-7} to 9.2×10^{-7}cm/s [1.3×10^{-7} to 3.6×10^{-7} in/s], indicating very low permeability material (GEI Consultants, 2017). Geotechnical borings were terminated before reaching the base of the Santa Rosa Formation (GEI Consultants, 2017); however, information from well logs indicate that the Dockum Group (Chinle and Santa Rosa Formations) is about 183 m [600 ft] thick beneath the proposed CISF project area (EIS Figure 3.4-7). The Dockum Group at the proposed CISF project area is underlain by the Upper Permian Dewey Lake Redbeds, which is about 152 m [500 ft] thick beneath the proposed CISF project area (EIS Figure 3.4-7).

3.4.3 Soils

As described in Section 3.4.2, surface soil (topsoil) at the proposed CISF project area ranges from 0 to 0.6 m [0 to 2 ft in] thickness and consists of varying amounts of sand and clay (Holtec, 2019b; GEI Consultants, 2017). A soil survey map of the proposed CISF project area is depicted in EIS Figure 3.4-8. The Simona fine sandy loam (SE) and Simona-Upton association (SR) compose the majority (about 60 percent) of soils within the proposed CISF project area. SE and SR soils are located in the south central, southeastern, and north central portions of the proposed CISF project area. These soils are calcareous eolian deposits derived from sedimentary rocks and consist of fine sandy loam underlain by gravelly fine sandy loam.

Other soils mapped within the proposed CISF project area include Badland (BD), Jal association (JA), Largo-Pajarito complex (LP), and Playas (PB) (EIS Figure 3.4-8). These soils occur along the eastern boundary of the proposed CISF project area within and surrounding Laguna Gatuna. All of these soils are derived from sedimentary rocks. BD soils are erosional remnants of bedrock alluvium and eolian deposits that occur along slopes leading to Laguna Gatuna. JA soils are calcareous alluvium and eolian deposits consisting of sandy loam and loam that occur along the rim of Laguna Gatuna. LP soils are calcareous loamy alluvium consisting of loam and silty clay loam that occur along backslopes of Laguna Gatuna.

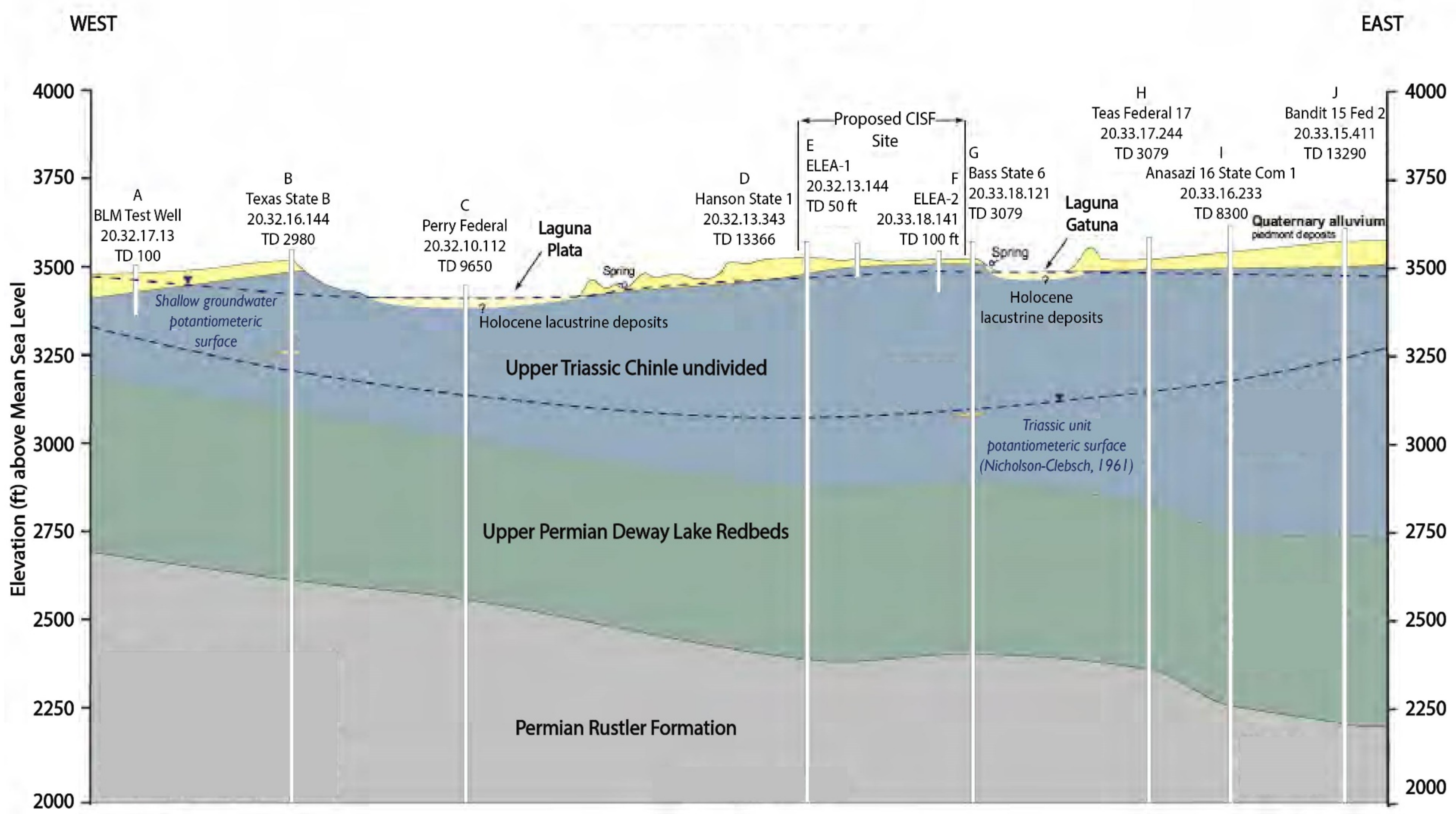

Figure 3.4-7 Hydrogeologic Cross-Section (Modified from ELEA, 2007)

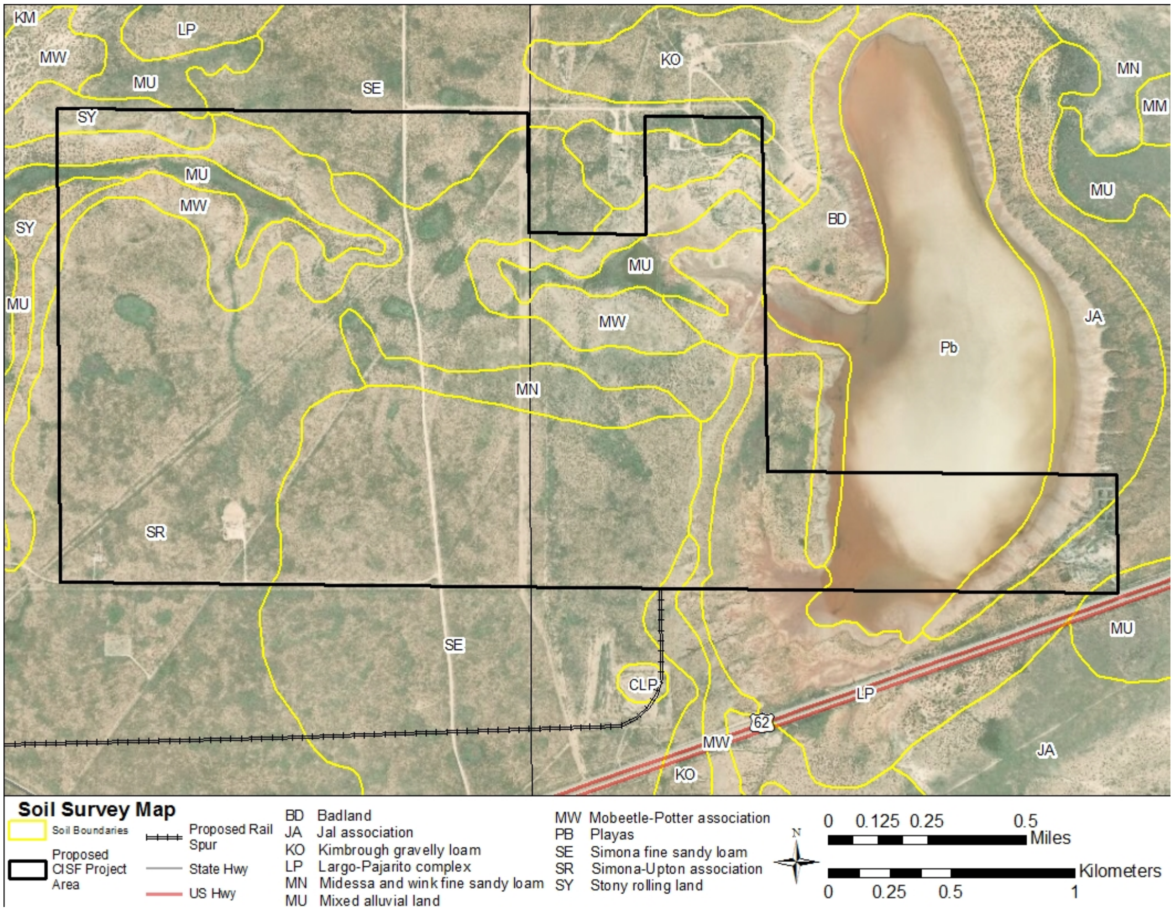

Figure 3.4-8 Soil Survey Map of Proposed CISF Project Area (Source: ELEA, 2007)

PB soils are mixed alluvium and lacustrine deposits consisting of silty clay loam and clay that occurs on the floor of Laguna Gatuna.

3.4.4 Seismicity

Recorded earthquakes from 1973 to August 2017 in the region surrounding the proposed CISF project area are shown in EIS Figure 3.4-9. Most of these earthquakes have had low to moderate magnitude (Richter scale magnitudes between 2.5 and 5.0). The majority of historic earthquake activity is located southeast of the proposed CISF project area in west Texas, to the west/northwest in central New Mexico, and to the southwest along the Mexico-Texas border (EIS Figure 3.4-9). The closest earthquake to the proposed CISF project area occurred on March 18, 2012. This earthquake was located about 39 km [24 mi] southwest of the proposed CISF project area and had a magnitude of 3.1. Historically, three earthquakes with magnitudes of 5.0 or above have occurred within 320 km [200 mi] of the proposed CISF project area. The Valentine, Texas, earthquake occurred on August 16, 1931 and had a magnitude of 6.5. This earthquake was located about 225 km [140 mi] southwest of the proposed CISF project area.

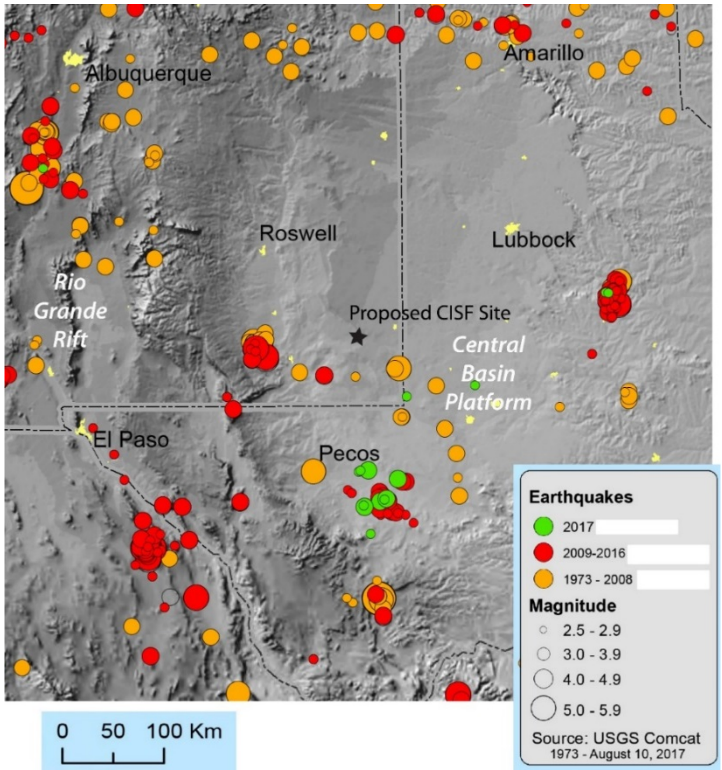

Figure 3.4-9 Earthquakes in the Region of the Proposed CISF Project Area (Modified from USGS, 2017)

On January 2, 1992, an earthquake with a magnitude of 5.0 was recorded near Eunice. This earthquake was located about 63 km [39 mi] east of the proposed CISF project area. On April 14, 1995, an earthquake with a magnitude of 5.7 was recorded near Alpine, Texas, about 265 km [165 mi] south of the proposed CISF project area.

Seismic source zones within 320 km [200 mi] of the proposed CISF project area include the Rio Grande Rift located to the west and southwest and the Central Basin Platform located to the east (EIS Figure 3.4-9). Prior to 1962, earthquake activity in New Mexico was mostly limited to the Rio Grande Rift region. Recently, the most active seismic areas within 320 km [200 mi] of the proposed CISF project area are in west Texas to the south and southeast (EIS Figure 3.4-9). The seismicity in this area correlates with the locations of oil and gas fields and is likely induced by production, secondary recovery, and waste injection into deep wells (ELEA, 2007; Holtec, 2019a). Clusters of earthquakes associated with the locations of oil and gas fields in west Texas typically have magnitudes ranging from 2.5 to 4.0 (EIS Figure 3.4-9). In addition, recent seismic information indicates a cluster of earthquakes (typically 2.5 to 4.0 magnitude) located about 80.5 km [50 mi] west of the proposed CISF project area (EIS Figure 3.4-9). This seismic activity is suspected to be induced by wastewater injection from natural gas production into deep wells (ELEA, 2007; Holtec, 2019a). A recent study conducted by Snee and Zoback (2018) used stress data to estimate or model the potential for slip on mapped faults across the Permian Basin in response to injection-related pressure changes at depths that might be associated with future oil and gas development activities. This study concluded that existing faults located in the western Delaware Basin where the proposed project area is located are unlikely (<10 percent probability) to slip in response to fluid-pressure increase (Snee and Zoback, 2018).

A seismic hazard map of the southwestern U.S. showing earthquake ground motion (peak ground acceleration) for a probability of 10 percent in the next 50 years is depicted in EIS Figure 3.4-10. For southeastern New Mexico where the proposed CISF project area is located, EIS Figure 3.4-10 shows that there is a 10 percent probability that an earthquake will occur with a ground motion of 0.01 to 0.02 standard gravity in the next 50 years. This means that there is a 10 percent probability that an earthquake will occur in the next 50 years that will cause the ground to move at a rate of 0.098 to 0.196 m/s^2 [0.32 to 0.64 ft/s^2], which corresponds to a Modified Mercalli Intensity Scale of III to IV (or a Richter Scale magnitude of 3 to 4). An earthquake with a Modified Mercalli Intensity of III (or Richter Scale magnitude of 3) would slightly shake a building similar to when a heavy truck passes by a house, while an earthquake with a Modified Mercalli Intensity of IV (or Richter Scale magnitude of 4) would cause pictures to fall off walls and furniture to move. This actual amount of damage that could result from ground motions depends on factors such as the distance to the epicenter of the earthquake, duration of shaking, attenuation of the earthquake energy as it propagates from the epicenter to the location, and the local amplification caused by the location's near-surface soil conditions.

The location of Quaternary-age faults in the southwestern U.S. are depicted in EIS Figure 3.4-11. Quaternary faults are those that have been active during the past 1.6 million years (USGS, 2018a). The closest Quaternary-age fault to the proposed CISF project area is the Guadalupe Fault located about 85 mi to the southwest (EIS Figure 3.4-11). The Guadalupe Fault is a normal fault with a slip rate of less than 0.2 mm/yr [0.01 in/yr] (USGS, 2018a). The Guadalupe Fault is a capable fault (i.e., it has exhibited movement at or near the ground surface at least once within the past 35,000 years, as defined in 10 CFR 100, Appendix A.III). Within a 320 km [200 mi] radius of the proposed CISF project area, numerous other Quaternary-age

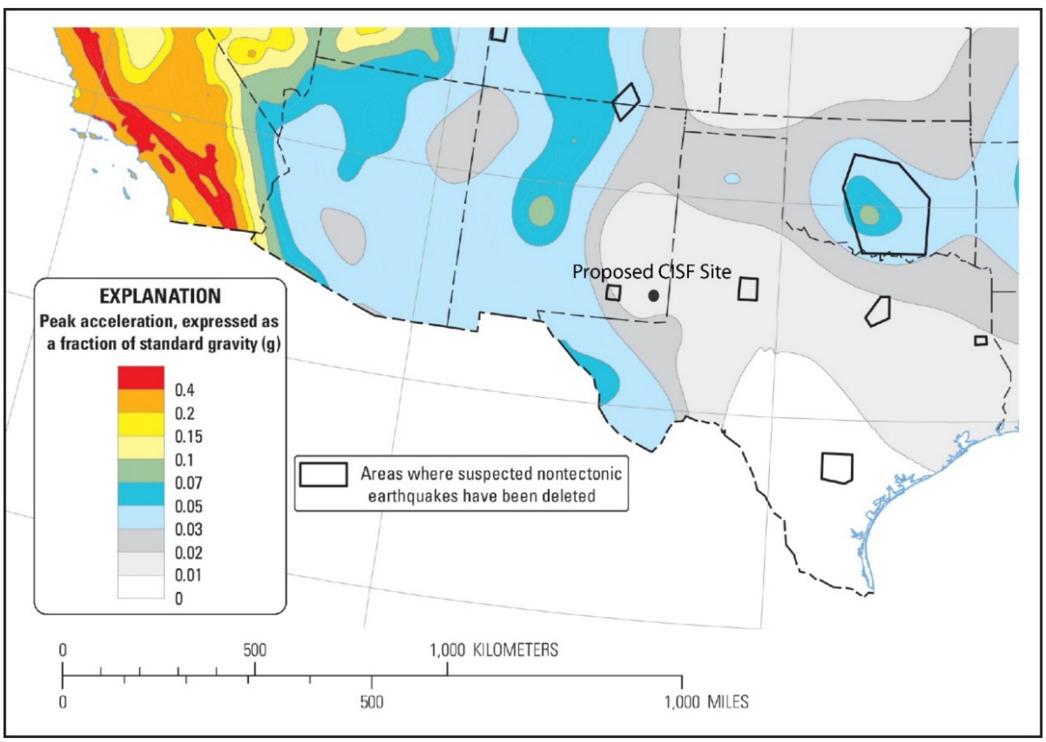

Figure 3.4-10 National Seismic Hazard Map Showing the 10 Percent Probability of Exceeding a Peak Ground Acceleration (PGA) in 20 Years (Modified from USGS, 2014)

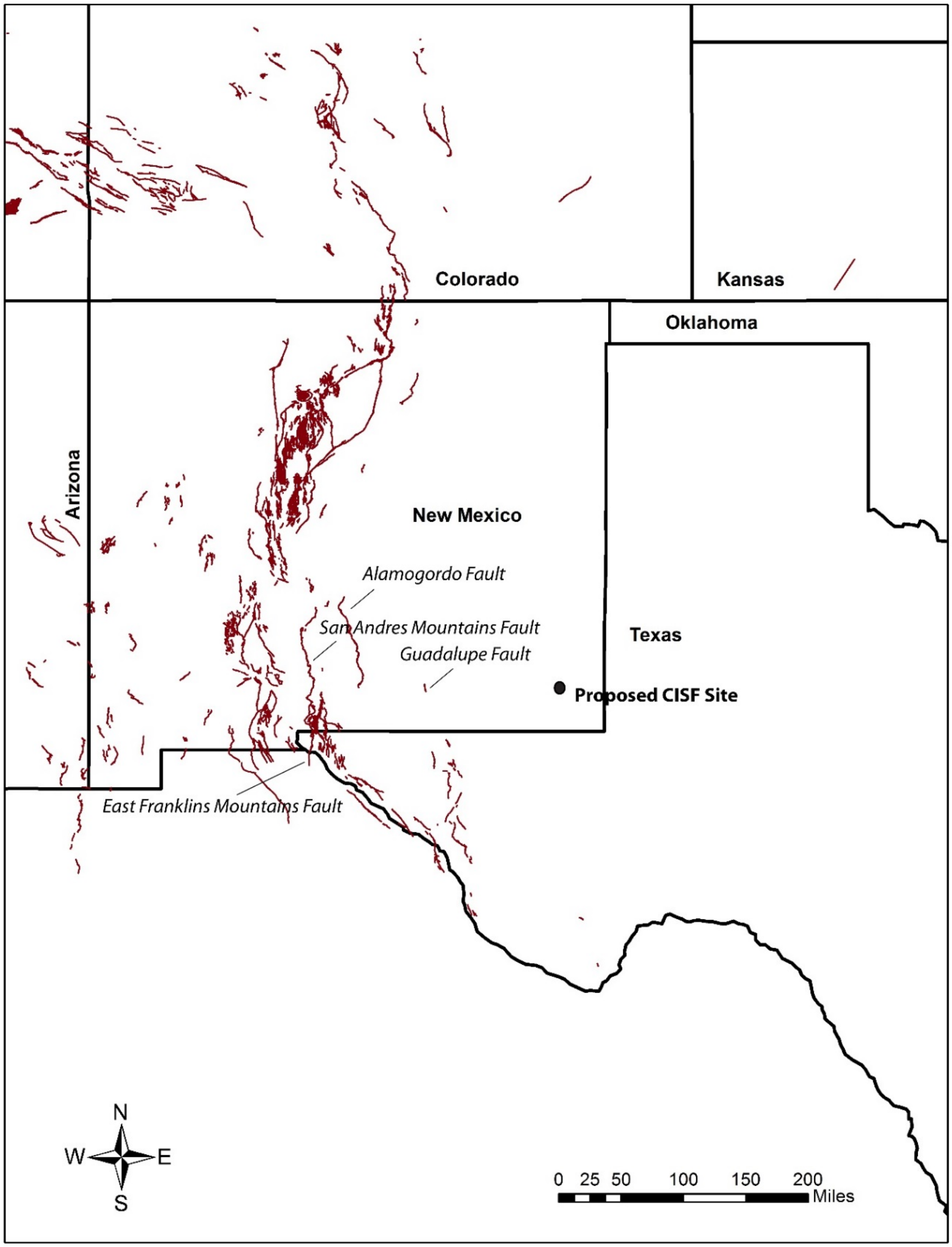

Figure 3.4-11 Quaternary Faults in the Southwestern U.S. (Source: USGS, 2018a)

faults are located to the west and southwest. These faults are within or along the margins of the Rio Grande Rift of central New Mexico. In addition to the Guadalupe Fault, three other capable faults are located within a 200-mi radius of the proposed CISF project area: the Alamogordo, San Andres Mountains, and East Franklin Mountains faults (EIS Figure 3.4-11). All of these faults are normal faults with slip rates of less than 0.2 mm/yr [0.01 in/yr] (USGS, 2018a).

3.4.5 Subsidence and Sinkholes

Sinkholes and karst fissures formed in gypsum bedrock are common features of the lower Pecos region of west Texas and southeastern New Mexico. New sinkholes form almost annually, often associated with upward artesian flow of groundwater from regional karstic aquifers that underline evaporitic rocks at the surface (Land, 2003, 2006). A number of these sinkholes are of anthropogenic (man-made) origin and are associated with improperly cased abandoned oil and water wells, or with solution mining of salt beds in the shallow subsurface (Land, 2009, 2013). The location of anthropogenic sinkholes and dissolution features in southeastern New Mexico and west Texas are shown in EIS Figure 3.4-12 and include the Wink, Jal, Jim's Water Service, Loco Hills, and Denver City sinkholes and the I&W Brine Well. All of these features formed around a well location and the sinkholes have diameters ranging from 30 to over 213 m [100 to over 700 ft] in diameter (Land, 2013). The Wink sinkholes in Winkler County, Texas, are approximately 120 km [75 mi] southeast of the proposed CISF project area and probably formed by dissolution of salt beds in the upper Permian Salado Formation that resulted from an improperly cased, abandoned oil well (Johnson et al., 2003). The Jal Sinkhole near Jal is approximately 80 km [50 mi] southeast of the proposed CISF project area and also probably formed by dissolution of salt beds in the Salado Formation caused by an improperly cased water well (Powers, 2003). The Jim's Water Service Sinkhole, Loco Hills Sinkhole, Denver City Sinkhole, and I&W Brine Well resulted from injection of freshwater into underlying salt beds and pumping out the resulting brine for use as oilfield drilling fluid (Land, 2013). The Jim's Water Service, Loco Hills, and Denver City sinkholes are located in relatively remote areas; however, the I&W Brine Well is located in a more densely populated area within the City of Carlsbad (EIS Figure 3.4-12).

Recent studies employing satellite imagery have identified movement of the ground surface across an approximate 10,360 km^2 [4,000 mi^2] area of west Texas that includes Winkler, Ward, Reeves, and Pecos counties (Kim et al., 2016; SMU Research News, 2018). In one area, as much as 102 cm [40 in] of subsidence was identified over the past 2.5 years. This area is about 0.8 km [0.5 mi] east of the Wink No. 2 sinkhole in Winkler County, Texas, where there are two subsidence bowls. The rapid sinking in this area is most likely caused by water leaking through abandoned wells into the Salado Formation and dissolving salt layers (SMU Research News, 2018).

Another recent study employing satellite imagery identified a significant amount of subsidence in several distinct areas located within potash mining areas east of Carlsbad (Zhang et al., 2018). Subsidence caused by potash mining results from the collapse of strata above the mining level. In response to this collapse, the overlying and surrounding rock deforms, which may result in surface collapse (subsidence) and potential sinkhole development. As a general rule, the amount of subsidence (i.e., the depth of surface collapse) cannot exceed the thickness of mined potash zone. The areas of distinct subsidence the satellite imagery study identified are located approximately 16 km [10 mi] west-southwest of the proposed CISF project area (Zhang et al., 2018). The authors of the study found little correlation between the rate of subsidence and groundwater levels or precipitation, suggesting that the subsidence was not induced by natural occurrence. Instead, the authors observed a strong correlation between the rate of subsidence and the potash production rate, indicating that potash extraction is the cause of the subsidence (Zhang et al., 2018).

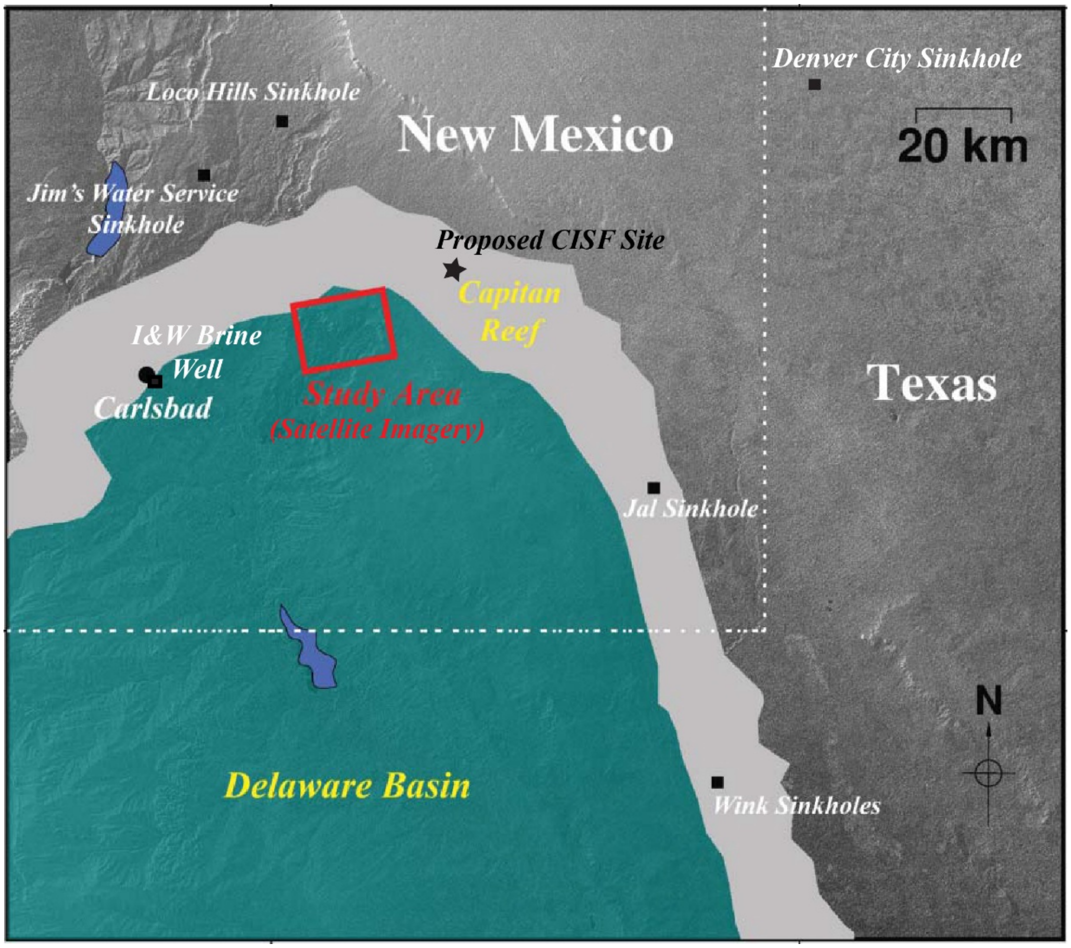

Figure 3.4-12 Regional Map of Southeastern New Mexico and West Texas Showing Locations of Anthropogenic Sinkholes and Satellite Imagery Study Area Discussed in the Text (Modified from Zhang et al., 2018)

3.5 Water Resources

This section presents a description of water resources, including surface water and groundwater hydrology, water use, and water quality within and in the vicinity of the proposed CISF project area.

3.5.1 Surface Water Resources

3.5.1.1 Surface Water Features and Flow

The proposed CISF project area lies within the Pecos River drainage basin, as shown in EIS Figure 3.5-1. The Pecos River generally flows year-round and extends from northern New Mexico to its confluence with the Rio Grande in southwest Texas. Tributaries convey rainfall and snowmelt to the Pecos River mainstream. Major tributaries supplying water to the Pecos River drain from the western mountains eastward. A few of these major tributaries have perennial flow, but none maintains a surface flow over its entire length. The vast majority of tributaries to the Pecos River flowing westward are ephemeral arroyos and many of the surface

Figure 3.5-1 Map of the Pecos River Drainage Basin (Source: Modified from USGS, 2018b)

drainage features east of the Pecos River are closed depressions that do not provide surface flow to the Pecos.

The proposed CISF project area is located 42 km [26 mi] east of the Pecos River (EIS Figure 3.5-1) in the Laguna Plata drainage subbasin (EIS Figure 3.5-2). No perennial streams are located within the proposed CISF project area. Surface drainage at the proposed CISF project area flows into two ephemeral playa lakes having no external drainage: Laguna Gatuna to the east and Laguna Plata to the northwest (EIS Figure 3.5-2). The NRC identified two other ephemeral playa lakes (Laguna Tonto to the northeast and Laguna Toston to the southwest) within 10 km [6 mi] of the proposed CISF project area.

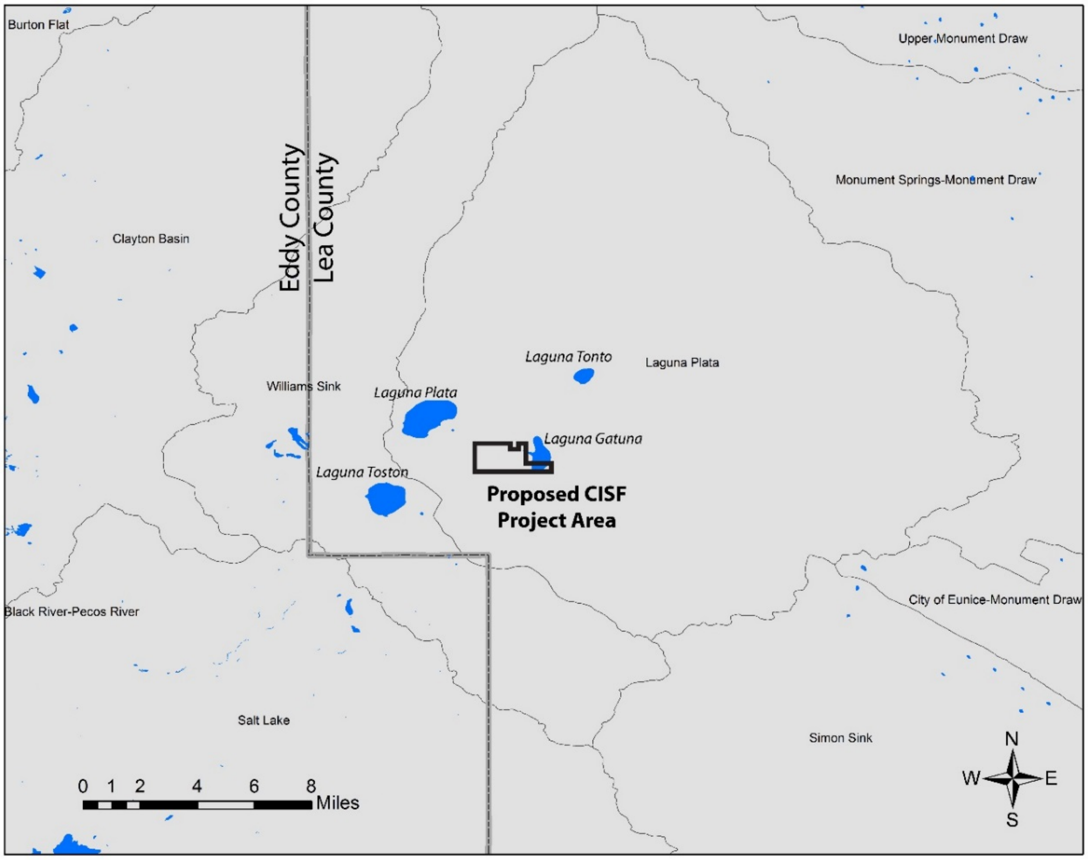

Figure 3.5-2 Map of Subbasin Drainage Areas in the Vicinity of the Proposed CISF Project Area (Source: NRCS, 2005)

The New Mexico Environmental Department (NMED) informed the NRC staff of the presence of, what NMED identified as approximately 20 circular playas within or adjacent to the proposed CISF footprint. According to NMED, these playas are freshwater playas and are different from saline playas in both form and origin. NMED also stated that these waters may be protectable as surface waters of New Mexico. The NRC staff reviewed ecological surveys of the proposed project area and maps of probable playa lakes in Lea County, New Mexico (Holtec, 2019a; ELEA, 2007; PLJV, 2019). Neither of the two ecological surveys of the proposed CISF project area, which are further described in EIS Section 3.6, identified any clusters of vegetation that NMED described as indicative of these playas, suggesting that they occur intermittently (Holtec, 2019a; ELEA, 2007).

Laguna Gatuna covers a surface area of 1.4 km^2 [0.54 mi^2], has an average depth of 3 m [10 ft], and has a total shoreline of 6.4 km [4 mi] (Holtec, 2019b). The playa lake drains a watershed that covers approximately 440 km^2 [170 mi^2].

Laguna Gatuna is generally dry. Water in the playa comes from surface water drainage after precipitation events. Precipitation events in this area are usually in the form of erratic, unpredictable, and sometimes violent thunderstorms, which can leave several centimeters [inches] of rainfall in Laguna Gatuna in a relatively short period of time (Holtec, 2019a). Historically, the months of July and August are the wettest of the year.

Between 1969 and 1992, Laguna Gatuna was used by multiple facilities for collection and discharge of brines produced from oil and gas wells in the area. During this time, facility permits authorized discharge of almost 1 million barrels of oilfield brine per month. As a result of these discharges, shallow groundwaters in the areas adjacent to the playa lake have become brines (Holtec, 2019b).

Laguna Plata is the largest of the playa lakes in the vicinity of the proposed CISF project area. The playa lake covers a surface area of 5.2 km^2 [2 mi^2], has an average depth of 4.3 m [14 ft], and has a total shoreline of 9.6 km [6 mi] (Holtec, 2019b). Laguna Plata is topographically the lowest point in the area and drains a watershed that covers approximately 658 km^2 [254 mi^2].

As with Laguna Gatuna, Laguna Plata is generally dry but retains drainage after precipitation events. Laguna Plata is also fed by one spring with very minimal flow, described as a "seep" (Holtec, 2019a).

For both playas, evaporation is the primary natural mechanism for water loss and typically occurs quickly, leaving behind a slurry of salt and other minerals (Holtec, 2019a). Infiltration can also occur in both playas, but due to the rapid rate of evaporation, is minimal. Both playa lakes are designated as "Surface Waters of the State" under 20 NMAC 6.4 and have additional protections as Surface Waters of the State (Holtec, 2019a), as discussed later in this chapter.

3.5.1.2 Surface Water Use

Surface water is diverted from the Pecos River and its tributaries for storage in reservoirs for later release and use for agricultural irrigation. Flow in the Pecos River below Fort Sumner is regulated by storage in Sumner Lake, Brantley Reservoir, Lake Avalon, and several other small dams, such as Tansill Dam and Lower Tansill Dam in the City of Carlsbad. Surface water is also consumed by unmanaged riparian vegetation.

3.5.1.3 Surface Water Quality

Mineral dissolution from natural sources and from irrigation return flows has affected water quality in the Pecos River basin. Water quality is best in the upstream reaches and increases in salinity downstream, particularly south of Carlsbad. Near Roswell, large amounts of chlorides from Salt Creek and Bitter Creek enter the river. River inflow between Roswell and Artesia contribute increased amounts of calcium, magnesium, sulfate, and chloride. Below Brantley Lake near Carlsbad, springs have total dissolved solid (TDS) concentrations of 3,350 to 4,000 mg/L [3,350 to 4,000 ppm]. At Malaga Bend south of Carlsbad, brine is generated as the river contacts the Salado Formation, adding approximately 370 tons/day [407 short tons] of chloride to the Pecos River (Powers et al., 1978).

Surface water that collects in the playa lakes surrounding the proposed CISF project area is lost through evaporation, resulting in high salinity conditions in waters and soils associated with the playas. These conditions are not favorable for the development of viable aquatic or riparian habitats. A surface water sample collected from Laguna Gatuna had a TDS concentration of 300,000 milligrams per liter (mg/L) [300,000 parts per million (ppm)] (ELEA, 2007). Another surface water sample collected from water impounded behind an earthen dike constructed to prevent nonaqueous phase liquids (floating oil) from entering Laguna Gatuna had a TDS concentration of 180,000 mg/L [180,000 ppm] (ELEA, 2007). TDS values greater than 10,000 mg/L [10,000 ppm] are considered brackish, and the EPA set a limit of 500 mg/L [500 ppm] for drinking water (New Mexico Bureau of Geology and Mineral Resources, 2019).

3.5.1.4 Floodplains

Holtec states that no floodplains (i.e., low-lying areas adjacent to stream systems) are located within or in the vicinity of the proposed CISF project area (Holtec, 2019b). The topography of the proposed CISF project area shows a high point located on the southern border of the project area and gentle slopes leading to the two drainages previously described: Laguna Plata and Laguna Gatuna (EIS Figure 3.4-5). Holtec states that both of these drainages would be able to accept runoff from a 24-hour/19 cm [7.5 inch] rain event with excess freeboard space, assuming the lagunas were dry prior to the start of the rain event (Holtec, 2019a).

3.5.1.5 Wetlands

Holtec stated that there are no U.S. Army Corps of Engineers (USACE)-designated jurisdictional waters within or in the immediate vicinity of the proposed CISF project area (ELEA, 2007; Holtec, 2019a, b). "Jurisdictional" waters are subject to the Clean Water Act and may include wetlands. However, the National Wetland Inventory identifies several surface water features, including Laguna Gatuna and Laguna Plata, as wetlands (EIS Figure 3.5-3) and the USACE has not yet made a determination as to whether these surface water features are jurisdictional (FWS, 2019a; EPA, 2019). Conditions in the playa lakes that surround the proposed CISF project area are not favorable for the development of aquatic or riparian habitats, as described in EIS Section 3.6.3. However, smaller wetlands consisting of emergent herbaceous vegetation are present near water bodies to the west of the proposed CISF project area (EIS Figure 3.2-3). Most of these wetlands are located adjacent to holding ponds at the Intrepid North potash mine facilities located approximately 8 km [5 mi] west of the proposed CISF project area.

3.5.2 Groundwater Resources

In New Mexico, groundwater resources are protected by NMED. All groundwater resources with total dissolved solids (TDS) less than 10,000 mg/L [10,000 ppm] are under NMED jurisdiction, as described in NMAC 20.6.2.3103, and may be subject to groundwater quality standards.

3.5.2.1 Regional Groundwater Resources

Major aquifers in southeastern New Mexico include the Capitan Aquifer (Capitan Reef), Rustler Formation, Dockum Group (Santa Rosa Formation), Ogallala Formation, and Quaternary alluvial deposits (Quaternary alluvium) (Nicholson and Clebsch, 1961; Richey et al., 1985). The stratigraphic position of these aquifers in the subsurface is shown in EIS Figure 3.4-4. These aquifers are described below.

Capitan Aquifer

The Capitan Aquifer (Capitan Reef) of Permian age is present along the margins of the Delaware Basin (EIS Figure 3.2-4). The Capitan Aquifer is composed of the Capitan and Goat Seep Limestones and consists of dolomite and limestone strata deposited as reef, fore-reef, and back-reef facies (Richey et al., 1985). The Capitan Aquifer ranges in thickness from 61 to 719 m [200 to 2,360 ft] in Eddy and Lea counties (Richey et al., 1985). The Capitan Aquifer in southeastern New Mexico is recharged by precipitation on its outcrop in the

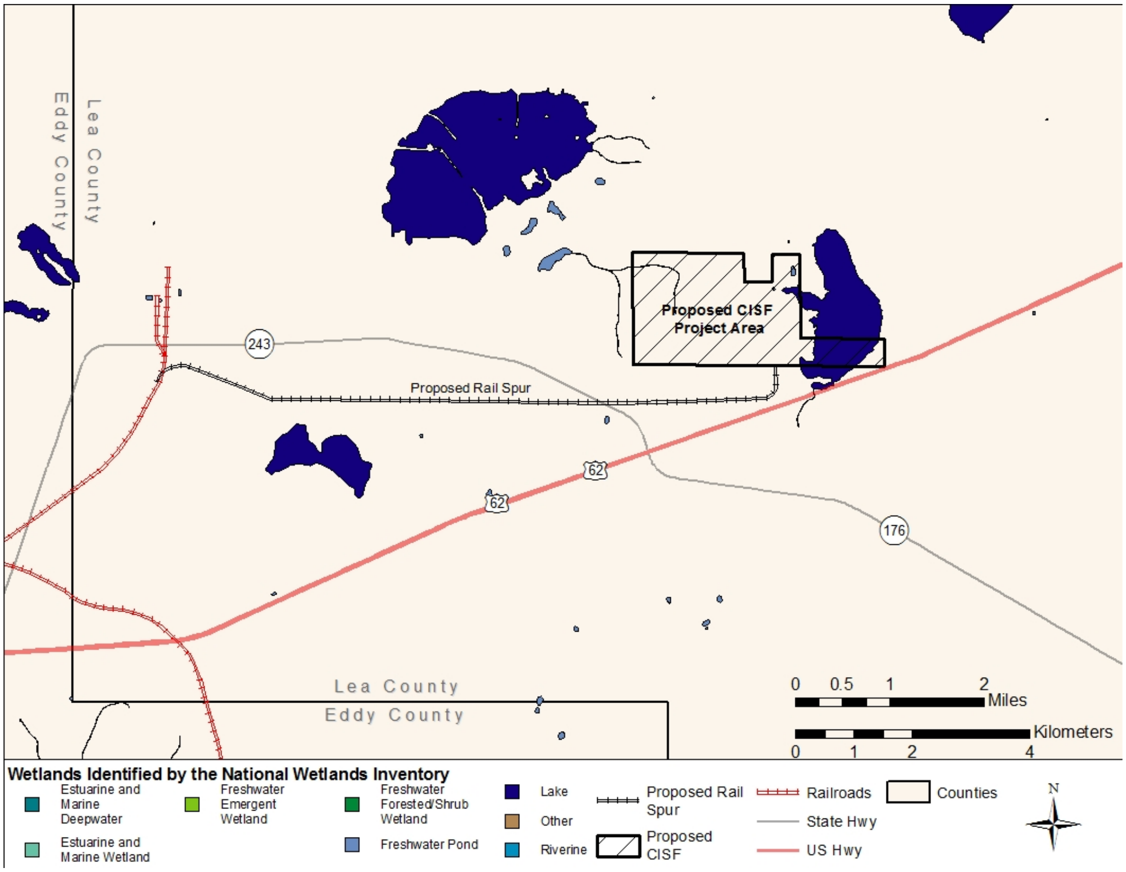

Figure 3.5-3 Wetlands Identified by U.S. Fish and Wildlife Services' National Wetlands Inventory

Guadalupe Mountains and Guadalupe Ridge along the New Mexico-Texas border. Recharge is by slow percolation of water through reef deposits and direct infiltration into cavernous zones. Surface water also flows directly into the Capitan through caverns in the area of outcrop adjacent to the reef escarpment (Bjorklund and Motts, 1959).

Rustler Formation

The Rustler Formation of Permian age underlies most of the Delaware Basin. The Rustler Formation is underlain by the Salado Formation and overlain by the Dewey Lake Redbeds (EIS Figure 3.4-4). In southeastern New Mexico, the Rustler Formation consists mainly of anhydrite or gypsum, dolomite beds (Magneta and Culebra Dolomite Members), minor salt, and a basal zone of sandstone, siltstone, and shale (Richey et al., 1985). The thickness of the Rustler ranges from 61 to 152 m [200 to 500 ft] in Eddy County and from 27 to 110 m [90 to 360 ft] in Lea County (Richey et al., 1985). Known water-bearing zones in the Rustler are at the Rustler-Salado contact and the Magneta and Culebra Dolomite Members (Mercer, 1983).

Recharge to the Rustler Formation is by precipitation, seepage from streams where the formation crops out, and by inflow from adjacent formations (Richey et al., 1985). Groundwater movement is generally downgradient from recharge areas in higher elevations to discharge areas along the Pecos River and its tributaries.

Santa Rosa Sandstone

The Santa Rosa Sandstone is part of the Dockum Group of Triassic age (EIS Section 3.4.1.2). In southeastern New Mexico, the Santa Rosa Sandstone crops out in north-trending scarps a few miles west of the Eddy-Lea County line and in south facing scarps in the southwestern corner of Lea County (Richey et al., 1985). The Santa Rosa Sandstone has been described as a coarse, angular, conglomeratic sandstone with thin to thick beds, which interfinger locally with shale (Bachman, 1980). The thickness of the Santa Rosa Sandstone ranges from 0 to 91 m [0 to 300 ft] in Eddy County and from 43 to 91 m [140 to over 300 ft] in Lea County (Richey et al., 1985).

The Santa Rosa Sandstone in Eddy and Lea Counties is recharged by precipitation on sand dunes that overlie the aquifer, precipitation and runoff directly on the outcrop, and migration of groundwater from the overlying Ogallala Formation and Quaternary alluvium (Richey et al., 1985).

Ogallala Formation

The Ogallala Aquifer, the primary source of water in Lea County, is the water-bearing portion of the Ogallala Formation (NMOSE, 2016). The Ogallala Formation of Tertiary age is composed of fluviatile sand, silt, clay, and gravel capped by caliche (Richey et al., 1985). In southern Lea County, the Ogallala Formation underlies the High Plains where it ranges in thickness from 30 to 76 m [100 to 250 ft] (Nicholson and Clebsch, 1961). The saturated thickness of the Ogallala Formation on the High Plains ranges from 7.6 to 53 m [25 to 175 ft] (Richey et al., 1985). Groundwater yields from the Ogallala Aquifer in the High Plains area of southern Lea County range from 113 to 2,650 liters per minute (Lpm) [30 to 700 gallons per minute (gpm)] with the highest yields from wells east of Jal.

As described in EIS Section 3.4.1.1, the Mescalero Ridge, a prominent topographic feature, marks the southwest limit of the High Plains in southeastern New Mexico. Southwest of the Mescalero Ridge in southern Lea County, where the proposed CISF site lies, the Ogallala Formation has been mostly stripped away, but remnants are present in some areas such as Antelope Ridge and Grama Ridge in thicknesses ranging from a few meters to over 30 m [a few feet to over 100 ft]. According to Nicholson and Clebsch (1961), the Ogallala is generally unsaturated in these areas, but in some places the basal few meters [feet] are saturated. However, no wells are known that produce water from the basal Ogallala in these areas (Nicholson and Clebsch, 1961).

The recharge of the Ogallala Formation on the High Plains is due entirely to precipitation.

Quaternary Alluvium

Aquifers in Quaternary alluvium are present in the Delaware Basin area of southeastern New Mexico. The lithology of the alluvium is highly variable, consisting of clastics eroded from surrounding uplands, fluvial deposits, caliche, gypsite, conglomerates, terrace deposits, windblown sand, and playa deposits (Richey et al., 1985). The thickness of alluvium ranges from 0 to over 76 m [0 to over 250 ft] in Eddy County and from 0 to 122 m [0 to 400 ft] in Lea County (Richey et al., 1985). Aquifers in the Quaternary alluvium in southeastern New Mexico are generally considered as distinct units and are usually under water-table conditions, but artesian conditions may exist locally where clay layers act as confining beds (Richey et al., 1985).

The Quaternary alluvium is recharged generally by infiltration of surface water from surrounding uplands and along channels of ephemeral streams and the Pecos River. Due to the semiarid climate, recharge by infiltration from precipitation is significant only during intense rainfall events (storms) of long duration or frequent occurrence (Richey et al., 1985). Recharge may also occur by flow from adjacent formations. Near Carlsbad, the alluvium is partially recharged by flow from underlying Permian artesian limestone aquifers (Richey et al., 1985). Along the southwestern edge of the High Plains in southern Lea County, water leaves the Ogallala Formation of the High Plains and enters the Quaternary alluvium, which underlies the Laguna Valley area (Nicholson and Clebsch, 1961). The saturated thickness of the Quaternary alluvium of the Laguna Valley area ranges from 4.6 to 9.1 m [15 to 30 ft], and water levels are about 9.1 m [30 ft] below the land surface.

3.5.2.2 Local Groundwater Resources

The proposed CISF project area is located in the Capitan Underground Water Basin, which covers approximately 296,028 ha [731,500 ac] in south-central Lea County (EIS Figure 3.5-4). The Capitan Underground Water Basin is oriented northwest-southeast and follows the arc-shaped location of the Capitan Reef Complex in the subsurface along the northern and eastern margins of the Delaware Basin. In addition to the Capitan Aquifer, important sources of groundwater in the Capitan Underground Water Basin include the Rustler Formation, Dockum Group (Santa Rosa Sandstone and Chinle Formation), Ogallala Formation, and Quaternary alluvium.

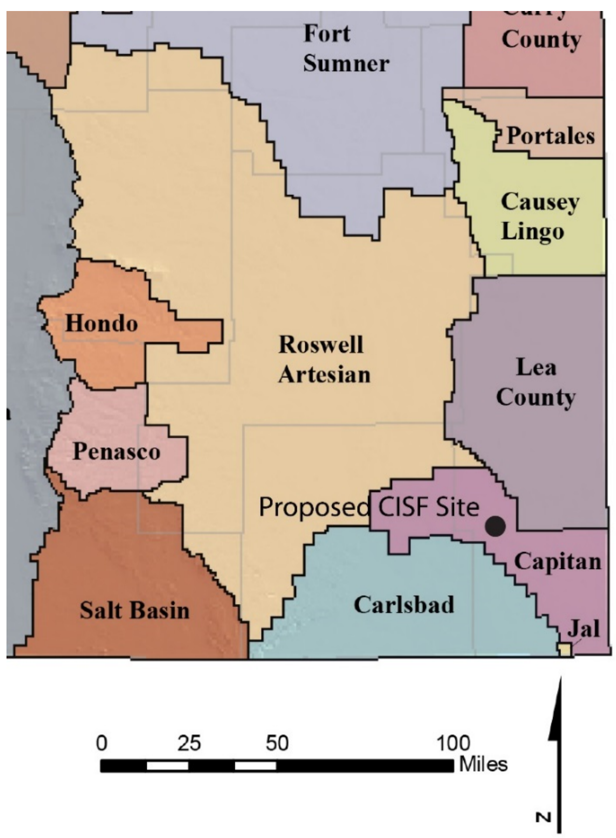

Figure 3.5-4 Declared Underground Water Basins in Southeastern New Mexico (Modified from NMOSE, 2005)

In the vicinity of the proposed CISF project area, no wells producing from the Capitan Aquifer are known to exist. A stock well located 9.6 km [6 mi] southwest of the proposed CISF project area was reported to be completed in the Rustler Formation at a depth of 112 m [367 ft] (Kelly, 1979). This well produced water having a TDS concentration of 1,250 mg/L [1,250 ppm]. No other wells producing from the Rustler Formation are known to exist in the vicinity of the proposed CISF project area.

The proposed CISF project area is underlain by several hundred meters [several hundred feet] of the Triassic Dockum Group consisting of the Santa Rosa Sandstone and Chinle Formation (EIS Figure 3.4-7). The Dockum Group is exposed around the flanks of Laguna Gatuna, Laguna Plata, and along an outcrop belt 8 km [5 mi] west of the proposed CISF project area and south of U.S. Highway 62/180 (EIS Figure 3.4-6). Several wells are completed in the Dockum Group in the vicinity of the proposed CISF project area (EIS Figure 3.5-5). These wells have total depths ranging from 14.5 to 207 m [47.5 to 680 ft] and groundwater depth levels ranging from 10.8 to 99 m [35.42 to 325 ft]. Nicholson and Clebsch (1961) produced a potentiometric surface map for water in the Dockum Group in southern Lea County that showed saturation in the vicinity of the proposed CISF project area at depths of 76 to 126 m [250 to 415 ft] below ground surface and a groundwater flow direction to the southwest.

The Tertiary Ogallala Formation is not present beneath the proposed CISF project area (Holtec, 2019a). As described previously, in southern Lea County, the Ogallala Formation has been mostly stripped away, but remnants are present in some areas. A water well located about 5.6 km [3.5 mi] south of the proposed CISF project area is reported to be completed in the Tertiary Ogallala Formation at a total depth of 17 m [55 ft] (EIS Figure 3.5-5).

Groundwater in the Quaternary alluvium occurs where stream beds and playas have incised into the Dockum Group, and the resulting low area has been filled with aeolian (i.e., wind-blown) sand or pediment materials (ELEA, 2007). Recharge occurs by infiltration along stream channels or on the flanks of the playas. The total depth and groundwater level in wells completed in the Quaternary alluvium, based on available water well data in the vicinity of the proposed CISF project area, is shown in EIS Figure 3.5-5. The data in EIS Figure 3.5-5 indicate that groundwater in the alluvium is discontinuous and has saturated thicknesses that are typically less than 7.6 m [25 ft].

Well drilling was conducted at the proposed CISF project area in 2007 and 2017 to identify and characterize groundwater in the alluvium perched on the Dockum Group and deeper groundwater in the Chinle Formation and Santa Rosa Formation of the Dockum Group (ELEA, 2007; GEI Consultants, 2017). In 2007, wells ELEA–1 and ELEA–2 were drilled as part of the Global Nuclear Energy Partnership (GNEP) Eddy Lea Siting Study (ELEA, 2007). The locations of these wells are shown on EIS Figure 3.5-5.

Well ELEA–1 was drilled to a total depth of 24.4 m [80 ft]. During drilling, no groundwater saturation was encountered in either the alluvium or the Dockum Group. The well was plugged back to 15.2 m [50 ft] using hydrated bentonite and completed with a gravel pack and well screen from 6.1 to 15.2 m [20 to 50 ft] (ELEA, 2007). After plugging and completion, a small amount of water was detected in the well, but the water steadily declined to within a few inches of the bottom of the well (ELEA, 2007). This has been attributed to a small amount of bentonite hydration water that was placed in the well to seal the upper annulus during completion and is not indicative of the presence of groundwater (ELEA, 2007).

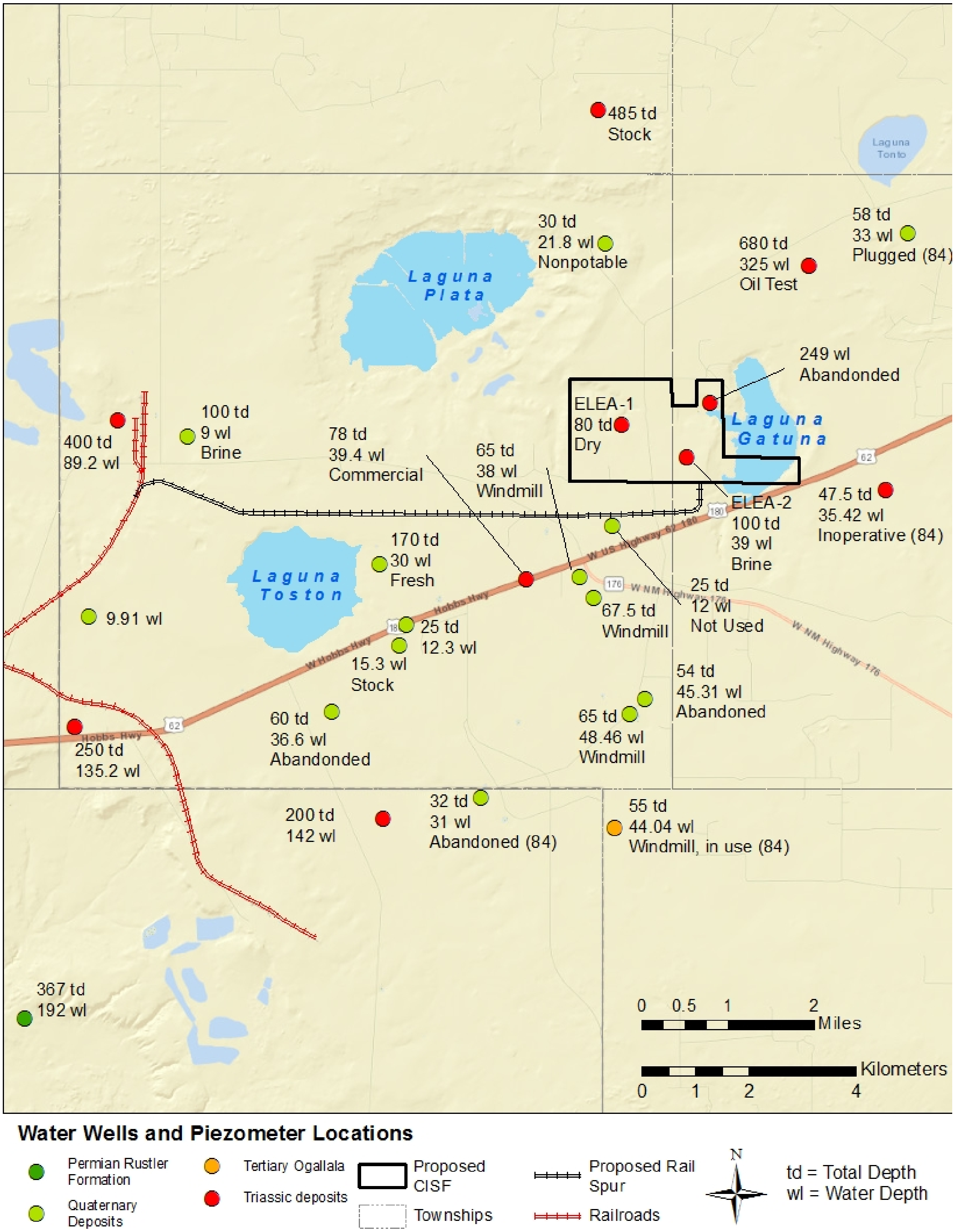

Figure 3.5-5 Water Wells and Piezometer Locations Within and Surrounding the Proposed CISF Project Area (Holtec, 2019a)

Well ELEA–2 was drilled to a total depth of 30 m [100 ft]. During drilling, drill cuttings were slightly moist in the upper 7.6 m [25 ft] of the Dockum Group and then appeared dry to the total depth of 30 m [100 ft]. The well was cased with a screen interval from 17.7 to 29.9 m [58 to 98 ft] and completed with a gravel pack. Over several days, water in Well ELEA–2 rose to a static depth of 10.4 m [34 ft] below ground surface. Lithologic characterization indicated that the water-bearing zone in the Dockum Group in this well consists of either fractures or sandy zones between the depths of 25.9 to 30 m [85 to 100 ft] (ELEA, 2007). Water in this zone is under artesian head of 12.2 m [50 ft].

In 2017, GEI Consultants drilled three monitoring wells to identify groundwater beneath the area proposed for the initial phase (Phase 1) of the proposed CISF (GEI Consultants, 2017). The three monitoring wells - B101(MW), B106(MW), and B107(MW) - were located at the southeast, northwest, and northeast corners of the proposed action (Phase 1) concrete pads. The presence of saturated zones could not be determined, because drilling of the monitoring wells used water for rock coring and the rock had low permeability. Two monitoring wells – B106(MW) and B107(MW) – were screened in the Chinle Formation of the Dockum Group at depths of 53.1 to 61.9 m [174.3 to 203 ft] and 25.1 to 32.8 m [82.4 to 107.5 ft], respectively (GEI Consultants, 2017). One monitoring well – B101(MW) – was screened in the Santa Rosa Formation of the Dockum Group at a depth of 115.1 to 126.3 m [377.7 to 414.4 ft] (GEI Consultants, 2017).

Depth to groundwater in the monitoring wells B101(MW), B106(MW), and B107(MW) was measured periodically over a 1-month period (from 10/15/2017 to 11/16/2017) (GEI Consultants, 2017). Groundwater was not observed in B106(MW), although it was observed in the shallower well, B170(MW), and in B101(MW) (GEI Consultants, 2017).

During 2017 site characterization activities, GEI Consultants measured depth to groundwater in well ELEA–2 on November 11 and 16, 2017 (GEI Consultants, 2017). Groundwater in well ELEA–2 was observed from a depth range of 11.46 to 11.49 m [37.6 to 37.7 ft] (GEI Consultants, 2017). This depth range is consistent with the GNEP study, which reported a static depth of groundwater in well ELEA–2 of 10.4 m [34 ft] below ground surface (ELEA, 2007).

GEI Consultants (2017) interpreted, and the NRC staff concur, that the deep groundwater level measured in B101(MW) is indicative of the primary groundwater aquifer in the Santa Rosa Formation beneath the proposed CISF project area at about 77 to 80 m [253 to 263 ft] below ground surface. They interpreted the groundwater observed in B107(MW) and well ELEA–2 as indicating the presence of limited water in discontinuous aquifers above lower permeability zones in the Chinle Formation (GEI Consultants, 2017).

3.5.3 Groundwater Use

3.5.3.1 Regional Groundwater Use

In southeastern New Mexico, the Permian Capitan Aquifer is of primary importance to Eddy County, where it is the main source of domestic water for the cities of Carlsbad, Happy Valley (a suburb of Carlsbad), and Whites City (Richey et al., 1985). The Capitan Aquifer yields 1,135 to 3,785 Lpm [300 to 1,000 gpm] (Richey et al., 1985). The Capitan Aquifer is also used for irrigation near La Huerta, Happy Valley, and Carlsbad. In Lea County, the Capitan Aquifer is a source of highly mineralized water used for enhanced oil recovery (Richey et al., 1985).

Water in the Permian Rustler Formation is generally not suitable for domestic use and the quality ranges from slightly saline to brine. In Eddy and Lea counties, the Rustler yields about 38 to 378 Lpm [10 to 100 gpm] of slightly to moderately saline water, which supplies some stock, irrigation, industrial, and domestic wells. The only domestic use of water from the Rustler Formation is at Red Bluff in Eddy County (Richey et al., 1985).

The Santa Rosa Sandstone and other undifferentiated sandstones of the Triassic Dockum Group are the chief sources of groundwater in the eastern part of Eddy County in a belt 16 to 32 km [10 to 20 mi] wide along the Lea County border (Richey et al., 1985). The quality of water is generally sufficient for stock and domestic use and the depth of water is generally less than 122 m [400 ft] (Hendrickson and Jones, 1952). The Santa Rosa Sandstone in eastern and southeastern Eddy County yields some slightly saline water for stock purposes (Richey et al., 1985). The Santa Rosa Sandstone is the principal aquifer in the southwestern part of Lea County. Wells in Lea County yield as much as 378 Lpm [100 gpm] of fresh to slightly saline water (Richey et al., 1985).

The Tertiary Ogallala Formation is a source of groundwater on the High Plains in southern Lea County, where it is used for domestic, municipal, industrial, stock, and agricultural purposes (EIS Figure 3.4-1). As described previously, groundwater yields from the Ogallala in the High Plains area of southern Lea County range from 113 to 2,650 Lpm [30 to 700 gpm] with the highest yields from wells east of Jal (Richey et al., 1985). The City of Carlsbad owns and operates the Double Eagle Water System, which supplies groundwater pumped from wells completed in the Ogalalla Formation in northwestern Lea County via pipeline to the City of Carlsbad (City of Carlsbad Water Department, 2018).

The Quaternary alluvium is a major source of groundwater for domestic water supplies, irrigation, industry, and livestock in southeastern New Mexico. In southern Eddy and Lea counties, the Quaternary alluvium is a principal domestic aquifer but usually yields less than 113 Lpm [30 gpm] (Richey et al., 1985).

3.5.3.2 Local Groundwater Use

Water suitable for human consumption is referred to as potable water. No potable groundwater is known to exist in the vicinity {i.e., within 10 km [6 mi]} of the proposed CISF project area (EIS Section 3.5.4.2) (Holtec, 2019a). Potable water for area domestic use in the vicinity of the proposed CISF project area is obtained from pipelines that convey water to area potash refineries from the Ogallala Formation on the High Plains area of eastern Lea County. Shallow groundwater in the Quaternary alluvium and Dockum Group is present in a number of wells in the surrounding area (EIS Figure 3.5-5). A few of these wells are used for stock watering, but water quality and quantity are marginal at best, and most, if not all, wells in the area have been either abandoned or are not currently in use (Holtec, 2019a).

3.5.4 Groundwater Quality

3.5.4.1 Regional Groundwater Quality

In southeastern New Mexico, water quality in the Permian Capitan Aquifer is highly variable. Bjorklund and Motts (1959) described three ranges of water quality in the Capitan Aquifer in southern Eddy County. The freshwater zone contains water with TDS concentrations of less than 700 mg/L [700 ppm] and extends from the southern part of Carlsbad southwestward toward the outcrop of the Capitan Reef in the Guadalupe Mountains. The potable mixed-water zone contains water with TDS concentrations ranging from 700 to 1,700 mg/L [700 to 1,700 ppm] and underlies the northern and western parts of Carlsbad. The non-potable water zone contains water with TDS concentrations greater than 1,700 mg/L [1,700 ppm] and is north of the potable mixed-water zone, extending northeastward into Lea County. In Lea County, the quality of water in the Capitan Aquifer is very poor with TDS concentrations ranging from 10,000 to 30,000 mg/L [10,000 to 30,000 ppm] (Richey et al., 1985).

As described previously, groundwater quality in the Permian Rustler Formation ranges from slightly saline to brine. At the WIPP site in Eddy County, the quality of water in the Rustler is variable, but is generally brine with TDS concentrations ranging from 10,347 to 325,800 mg/L [10,347 to 325,800 ppm] (Mercer and Orr, 1979; Mercer, 1983). Water from a well about one mile southwest of the WIPP site (Well 574) had a TDS concentration of 3,860 mg/L [3,860 ppm] (Richey et al., 1985).

Analyses of groundwater from the Santa Rosa Sandstone in southern Lea County showed TDS concentrations ranging from 426 to 1,950 mg/L [426 to 1,950 ppm], sodium concentrations from 131 to 563 mg/L [131 to 563 ppm], sulfate concentrations from 74 to 934 mg/L [74 to 934 ppm], and chloride concentrations ranging from 21 to 252 mg/L [21 to 252 ppm] (Nicholson and Clebsch, 1961). In Eddy County, Hendrickson and Jones (1952) reported analyses of groundwater with hardness ranging from 201 to 3,550 mg/L [201 to 3,550 ppm] and chloride concentrations from 17 to 785 mg/L [17 to 785 ppm].

The Ogallala Formation in southern Lea County generally yields freshwater. Nicholson and Clebsch (1961) reported analyses of groundwater from the Ogallala Formation collected from wells in southern Lea County. The TDS concentration is relatively low, typically less than 1,100 mg/L [1,100 ppm]. Groundwater from the Ogallala is high in silica {49 to 73 mg/L [49 to 73 ppm]}, contains moderate concentrations of calcium and magnesium, is low in sodium and chloride, and very low in sulfate (Nicholson and Clebsch, 1961).

Water quality in Quaternary alluvium aquifers of the Delaware Basin is highly variable because of the local presence of adjacent evaporite beds (gypsum and halite) (Bjorklund and Motts, 1959), recharge by highly mineralized irrigation and Pecos River water, and saline intrusion from extensive pumping. Richey et al. (1985) reported TDS concentrations ranging from 188 to 15,000 mg/L [188 to 15,000 ppm] with an average value of 2,319 mg/L [2,319 ppm], chloride concentrations ranging from 5 to 7,400 mg/L [5 to 7,400 ppm] with an average value of 627 mg/L [627 ppm], and fluoride concentrations ranging from 0.3 to 10 mg/L [0.3 to 10 ppm] with an average of 1.8 mg/L [1.8 ppm].

3.5.4.2 Local Groundwater Quality

TDS measurements were taken from groundwater wells within and in the vicinity of the proposed CISF project area (Kelly, 1979; ELEA, 2007) and are summarized in EIS Figure 3.5-6 and EIS Table 3.5-1. Groundwater collected from BLM Test Well 21.31.3.22, 8 km [5 mi] southwest of the proposed CISF project area, comes from the Triassic Dockum Group and had a TDS concentration of 424 mg/L [424 ppm]. BLM Test Wells 20.32.22.33, near Laguna Toston, and 20.32.17.13, near the Intrepid North Potash Mine, are completed in the Quaternary alluvium and had TDS concentrations of 3,136 and 172,828 mg/L [3,136 and 172,828 ppm], respectively. Groundwater from piezometer ELEA–2, within the proposed CISF project area, had a TDS concentration of 83,000 mg/L [83,000 ppm] and comes from the Triassic Dockum Group. Spring 1, a brine spring within the proposed CISF project area from the

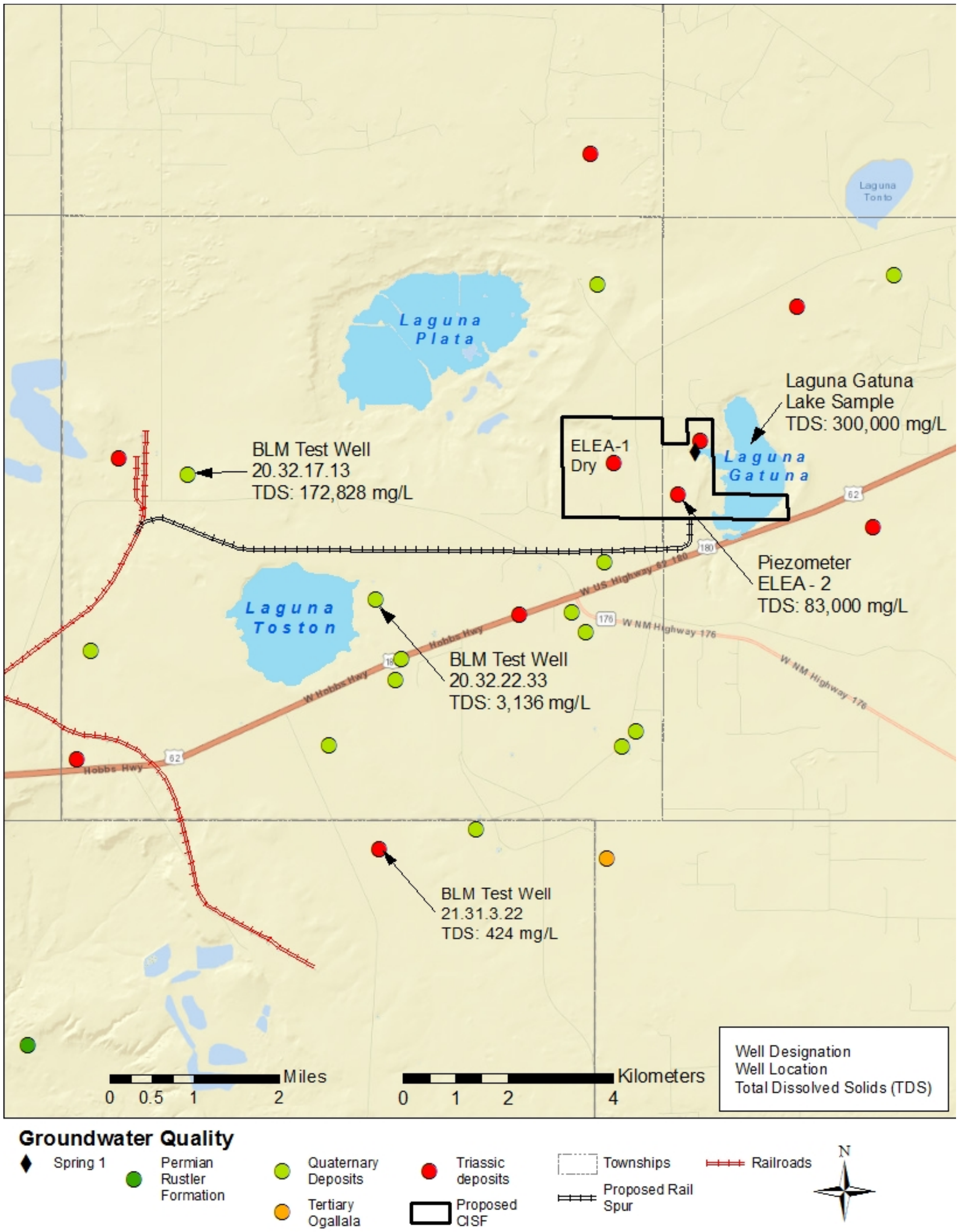

Figure 3.5-6 Groundwater Quality Within and in the Vicinity of the Proposed CISF Project Area (Modified from ELEA, 2007)

1 alluvium/Dockum Group deposit contact, had a TDS concentration of 120,000 mg/L
2 [120,000 ppm]. This spring contributes to drainage entering Laguna Gatuna.

Table 3.5-1 Groundwater Quality Data Within and in the Vicinity of the Proposed CISF Project Area		
Sample	**Source Formation**	**TDS Concentration in mg/L***
BLM Test Well 20.32.17.13	Alluvium	172,828
BLM Test Well 20.32.22.33	Alluvium	3,136
BLM Text Well 21.31.3.22	Dockum Group	424
Spring 1	Alluvium/Dockum Group Interface	120,000
Piezometer ELEA-2	Dockum Group	83,000

*1 mg/L = 1 ppm
Sources: Kelly, 1979; ELEA, 2007

Based on available groundwater quality data, brine discharges from potash refining or oil and gas production into local playas has directly or indirectly affected most of the shallow groundwater in the immediate vicinity of the proposed CISF project area (ELEA, 2007; Holtec, 2019a). For many years, potash mines discharged thousands of acre-feet of near-saturated potash refinery process brine to Laguna Plata and Laguna Toston. Discharges ceased in Laguna Plata in the mid-1980s and in Laguna Toston in 2001. As described previously, Laguna Gatuna received brine discharges from multiple facilities in the area between 1969 and 1992 (ELEA, 2007). As a result, saturations of shallow groundwater brine are present in shallow sediments having hydrogeologic connections with the playa lakes. Holtec has stated that highly mineralized groundwater in the Triassic Dockum Group at the proposed CISF project area, as detected in piezometer ELEA–2, is likely associated with brine in Laguna Gatuna (Holtec, 2019a).

3.6 Ecology

This section describes the characteristics of terrestrial and aquatic plants and animals within the proposed CISF project boundary, as well as along the proposed rail spur and in the vicinity of the proposed CISF project. The section also discusses important plant and animal species that occur or have the potential to occur on the proposed CISF project area, and habitats that are important to those species.

An ecological survey was conducted in March 2007 by Metric Corporation of Albuquerque, New Mexico, as part of ELEA's GNEP application on approximately 407 ha [1,005 ac] of the 421 ha [1,040 ac] land parcel proposed for the CISF project (Holtec, 2019a; ELEA, 2007). The 2007 ecological survey included descriptions of aquatic and riparian communities, wetlands, and critical and important terrestrial habitats within a 9.6-km [6-mi] buffer around the proposed project area that the GNEP project may disturb. The Metric Corporation staff that conducted the 2007 ecological survey consulted with FWS staff, NMDGF staff, and staff at the BLM Carlsbad Field Office prior to initiating onsite surveys. Metric Corporation staff walked representative portions of the current 421 ha [1,040 ac] land parcel and reported plants and wildlife that were observed. Particular attention was given to rare plants and wildlife, including a Lesser prairie-chicken survey.

On October 14, 2016, Tetra Tech, Inc. performed an ecological survey of the 134 ha [330 ac] disturbed land area associated with the proposed CISF project. The survey included the access road and rail spur (Holtec, 2019a). The survey consisted of six vegetation sample points along eight transect lines, visual observations of wildlife, noxious weeds, and other notable features.

During both the 2007 and 2016 ecological surveys, no trap or capture-and-release surveys were conducted. Emphasis was placed on determining the habitats of candidate species that would occur within the proposed CISF project area. To describe the affected environment, specifically ecological resources at the proposed CISF, the NRC staff reviewed prior ecological surveys and information related to the ecology of the region, as referenced, and consulted with FWS, BLM, and NMDGF.

3.6.1 Description of Ecoregions and Habitats Found in Eddy and Lea County

The proposed CISF project is located within the eastern boundary of the Chihuahuan Desert Grasslands ecoregion of New Mexico identified by the U.S. Environmental Protection Agency (EPA) (EPA, 2013). The Chihuahuan Desert ecoregion extends west of the Pecos River in New Mexico. The High Plains ecoregion is present within 3.2 km [2 mi] east of the proposed CISF project and extends eastward into Texas. The vegetation cover at the proposed CISF project is indicative of the Apacherian-Chihuahuan mesquite upland scrub ecological system. Furthermore, the proposed CISF project is located in a transitional zone between the short grass prairie of the High Plains habitat and the Chihuahuan Desert Scrub habitat (Holtec, 2019a; NMDGF, 2016; Elliott, 2014). During the last century, conversion of grasslands to scrublands has occurred within this transition zone in Lea and Eddy Counties as result of combinations of land use changes, drought, livestock overgrazing, and decreases in fire frequency (NMDGF, 2016). Examples of sensitive species that could occur within these habitats include the black-tailed prairie dog (*Cynomys ludovicianus*), burrowing owls (*Athene cunicularia*), Northern aplomado falcon (*Falco femoralis septentrionalis*), and Lesser prairie-chicken (*Tympanuchus pallidicinctus*) (NMDGF, 2016). In addition, many common animals such as the kangaroo rat (*Dipodomys sp.*), southern plains wood rat (*Neotoma micropus)*, desert cottontail (*Sylvilagus audubonii*), black-tailed jackrabbit (*Lepus californicus*), mule deer (*Odocoileus hemionus*), coyotes (*Canis latrans*), and hawks use both grassland and shrubs for foraging, nesting, and protection. However, birds are the dominant animal group (taxa) within the High Plains and Chihuahuan Desert Scrub habitats (NMDGF, 2016).

Southern New Mexico and the Texas High Plains are covered with numerous small depressions that create playa lakes. These playa lakes have a variety of ecosystem functions, depending on their particular qualities that affect the plants and animals that may use them. Shells from freshwater clams, brought from the nearby Pecos River, have been found on the edges of the saline playa lakes in the vicinity of the proposed CISF project (BLM, 2018a). Playa lakes are also prime hunting sites because animals use them as sources of water (BLM, 2018a). During seasonal migrations, migratory birds that use the Central Flyway, one of the four major North American bird migration corridors between northern nesting grounds and southern wintering grounds, are known to use the playa lakes in this region depending on the available food and water present (Holtec, 2019a).

The Endangered Species Act (ESA) provides for the conservation of "critical habitat," the areas of land, water, and airspace that an endangered species needs for survival. These areas include sites with food and water, breeding areas, cover or shelter sites, and sufficient habitat to provide for normal population growth and behavior. One of the primary threats to endangered and threatened species is the destruction or modification of essential habitat areas by uncontrolled land and water development. No designated critical habitat for any Federal threatened or endangered plant or animal species occurs within Lea County (FWS, 2018a). Two areas identified as critical habitat for Federally listed species are located in Eddy County, approximately 64 km [40 mi] from the proposed CISF project (FWS, 2018a). Species of greatest conservation need (SGCN) and threatened and endangered species that could occur within the proposed CISF project area are further discussed in Sections 3.6.4 and 3.6.5.

3.6.2 Vegetation of the Proposed Holtec CISF Project

According to the 2007 and 2016 vegetation surveys conducted within the 421 ha [1,040 ac] proposed CISF project area, the vegetative cover community over the majority of the proposed project CISF area is typically mesquite scrubland. The primary plant species at the proposed CISF project area generally consisted of shrubs dominated by honey mesquite (*Prosopis glandulosa*) and perennial broomweed or broom snakeweed (*Gutierrezia sarothrae*) (Holtec, 2019a). Over half of the proposed CISF project area consists of sandy and gravelly loams that allow woody plant roots to penetrate from 25.4 to 51 cm [10 to 20 in] below ground (Holtec, 2019a). As described in EIS Section 3.3.1.4, the proposed CISF project area is underlain with a layer of hardened caliche, which can significantly limit root growth of grasses and cacti and cause accelerated soil erosion (Holtec, 2019a; Idowu and Flynn, 2015). Vegetation at the proposed project area is in a climax successional stage (the last stage of an ecosystem) that has been established in western Lea County for an extended period. The presence of herbaceous flowering plants (forbs) within the CISF project area fluctuates greatly from season to season and year to year (BLM, 2017a).

Virtually no vegetation was observed on the portion of the shore of Laguna Gatuna that is included as part of the proposed CISF project area. A 2018 photo taken in the spring from the south-central portion of the ELEA property depicting the sparsely vegetated honey mesquite- and broom snakeweed-dominated land cover common within the proposed CISF project boundary is provided in EIS Figure 3.6-1. Several low-lying areas within the proposed CISF project area and along the proposed rail spur route showed evidence of a thicker vegetative cover dominated by Western peppergrass, suggesting areas where water is retained longer when water is present (*Lepidium montanum*) (Holtec, 2019a). A photograph of the white-flowered Western peppergrass is provided in EIS Figure 3.6-2.

Noxious weed infestations are reported to be the second leading cause of native plant and animal species being listed as threatened or endangered nationally (NMDGF, 2016). As of 1998, non-native species have been implicated in the decline of 42 percent of Federally listed species under the ESA (NMDGF, 2016). The New Mexico Department of Agriculture (NMDA) coordinates weed management among local, State, and Federal land managers as well as private land owners (NMDA, 2016). The proposed CISF project is surrounded by State- and BLM-managed lands, and the proposed rail spur is located on BLM-managed land (EIS Figure 3.2-1). The NMDA identifies invasive plant species across the State that, if present, should be managed to control infestation and stop further spread. The current noxious weeds that could be present in the BLM Carlsbad Field Office area, which includes Eddy and Lea County, are Malta Starthistle (*Centaurea melitensis*), African rue (*Peganum harmala*), Scotch Thistle (*Onopordum acanthium*), salt cedar (*Tamarix spp.*), and Rayless goldenrod (*Haplopappus heterophyllus*) (BLM, 2018a). No plants the NMDA or BLM classified as noxious or invasive species have been reported at the proposed CISF project area; however, Holtec has not conducted a vegetation survey along the proposed rail spur (Holtec, 2019a).

The two vegetation surveys that were conducted within the proposed CISF project area showed relatively low plant diversity (i.e., few plant species). The 2007 vegetation survey was conducted in October, which is not the spring growing season when more vegetation species may be present. The 2016 vegetation survey was conducted within the 134 ha [330 ac] area

Figure 3.6-1 Photograph Taken in the South-Central Portion of the ELEA/Holtec Property Showing Typical Vegetation (Source: B. Werling)

that is proposed to be the total disturbed land area at full build-out. Neither survey was conducted over a period of more than one growing season. Therefore, some plants that could potentially be present within the proposed CISF project area may have not been observed during the two surveys. A list of plants observed during the 2007 and 2016 surveys is provided in EIS Table 3.6-1.

3.6.3 Habitats and Traits of Laguna Gatuna

A number of playa lakes in Lea and Eddy Counties have been used as water disposal locations for produced water from the potash mining industry and oil and gas extraction activities (EIS Section 3.2.4). Historically, Laguna Gatuna has received brine disposal from several adjacent oil pumping operations but did not receive direct potash waste disposal. According to Lang and Rogers (2002), "[t]hese practices have dramatically altered the hydrologic condition, water quality, and ecological balance of numerous playas as suitable wildlife habitat at all trophic levels of the food web." As described in EIS Section 3.5.1.1, the water present in Laguna Gatuna comes solely from surface water drainage after precipitation events.

As described previously in EIS Section 3.5.1.1, precipitation events in this area are usually in the form of unpredictable thunderstorms, which can leave several inches of rainfall in Laguna Gatuna in a relatively short period of time. Evaporation is the only natural mechanism for water loss and typically occurs quickly, leaving behind a slurry of salt and other minerals (Holtec, 2019a).

Figure 3.6-2 Photograph Taken Along the Proposed Rail Spur showing Western peppergrass (Source: A. Minor)

Table 3.6-1 List of Plants Observed Within the Proposed CISF Project Area	
Common Name	**Scientific Name**
Trees and Woody Shrubs	
Dwarf desert holly	*Acourtia nana*
Honey mesquite	*Prosopis glandulosa*
Joint fir	*Ephedra sp.*
Lotebush	*Condalia (Microrhamnus) ericoides*
Prickly pear cactus	*Glandularia bipinnatifida*
Small soapweed	*Yucca glauca*
Wooly croton	*Croton capitatus*
Subshrubs and Herbs	
Bladderpod	*Lesquerella sp.*
Broom (perennial) snakeweed	*Gutierrezia sarothrea*
Buffalobur	*Solanum rostratum*
Cowpen daisy	*Verbesina encelioides*
Fourwing saltbush	*Atriplex canescens*
Glovemallow	*Sphaeralcea sp.*
James' nailwort	*Paronychia jamesii*
Milkvetch	*Astragalus sp.*
Mock vervain	*Glandularia sp.*
Ragweed	*Ambrosia sp.*
Scarlet globemallow	*Sphaeralcea coccinea*
Silver nightshade	*Solanum elaeagnifolium*
Spiny dogweed	*Thymophylla acerosa*

Table 3.6-1 List of Plants Observed Within the Proposed CISF Project Area	
Common Name	**Scientific Name**
Pott's leatherweed	*Croton pottsii*
Western peppergrass	*Lepidium montanum*
Grasses	
Alkali sacaton	*Sporobolus arioides*
Black grama	*Bouteloua eriopoda*
Blue grama	*Bouteloua gracilis*
Bristlegrass	*Setaria leucopila*
Burrograss	*Scleropogon brevifolius*
Muhly	*Muhlenbergia sp.*
Panicgrass	*Panicum sp.*
Plains bristlegrass	*Setaria leucopila*
Tabosa grass	*Pleuraphis (Hilaria) mutica*
Threeawn	*Aristida sp.*
Vine mesquite	*Panicum obtusum*
Source: ELEA, 2007	

A saline lake is another term for a playa lake the environmental community uses to indicate a discharge wetland (McLachlan et al., 2014). For the purposes of this EIS, the term playa lakes is used for consistency with the description in EIS Section 3.5.1.

In the early- to mid-1990s, in response to significant bird deaths consistently observed at Laguna Toston, Laguna Gatuna (within the proposed CISF project area), and Laguna Quatro, the Nash Draw saline playa complex in Eddy and Lea counties was the subject of several biotic surveys. The biotic surveys performed at Laguna Gatuna included water quality and contaminants investigations, and biological analyses of phytoplankton, diatoms, and macroinvertebrates (Davis and Hopkins, 1993; Dein et al., 1997; Bristol, 1999). Because of the results of these studies, Lang and Rogers (2002) included the Nash Draw saline playa complex in a survey of large branchiopod crustaceans. The Lang and Rogers (2002) branchiopod survey revealed that no aquatic macroinvertebrates were observed or collected from Laguna Toston, Laguna Plata, and Laguna Gatuna. This finding is consistent with the observations of Davis and Hopkins (1993).

A picture taken of Laguna Gatuna in the spring of 2018 during the NRC staff's site visit of the proposed CISF project area is provided in EIS Figure 3.6-3. At the time of the NRC site visit in spring 2017, no standing water was present, but a white layer of salt deposits covered the surface of the playa. A few unidentified birds were observed flying over Laguna Gatuna. Very little vegetation was present on the western edge of Laguna Gatuna. Laguna Toston is located approximately 0.4 km [0.25 mi] south of the proposed rail spur depicted in EIS Figure 3.6-4.

Figure 3.6-3 **Western Edge of Laguna Gatuna in Spring 2018 Showing Salt Deposits at the Surface (Source: B. Werling)**

Figure 3.6-4 **Photograph of a Laguna Toston Located South of the Proposed Rail Spur (Source: A. Minor)**

3.6.4 Wildlife that Could Occur at the Proposed Holtec CISF Project

This section describes the wildlife that could be present at the proposed CISF project and provides information on important animal species that have been observed at the proposed CISF project and Laguna Gatuna (EIS Table 3.6-2). Information about wildlife at Laguna Gatuna is provided in this section because approximately 9 percent of the eastern part of proposed CISF property overlaps a small portion of the southern end of Laguna Gatuna (Holtec, 2019a). As previously stated, the proposed CISF project is located within the Central Flyway migratory bird path, and migratory shorebirds such as sandhill cranes and waterfowl use playa lakes in this region (EIS Section 3.6.1). Eagles and other raptors such as those listed in EIS Table 3.6-2 are known to feed on shorebirds and waterfowl that may be present at Laguna Gatuna or other nearby playa lakes (Mitchusson, 2003). During winter migrations, many bird species rely on cultivated grains and invertebrates such as grubs and grasshoppers found in agricultural fields (Mitchusson, 2003). Virtually no vegetation was observed on the portion of the shore of Laguna Gatuna that is included as part of the proposed CISF project area (EIS Section 3.6.2), and there is no commercial agriculture within 10 km [6 mi] of the proposed CISF project area (EIS Section 3.2.2). Based on recent ecological analysis BLM conducted within 3.2 km [2 mi] of the proposed project area, many species of songbirds are known to nest within 3.2 km [2 mi] of the proposed CISF project area, but many more use the habitats in the area during migration and for non-nesting activities (BLM, 2018b). According to the BLM, common birds of prey within 3.2 km [2 mi] of the proposed CISF project area include Northern harrier (*Circus cyaneus*), red-tailed hawk (*Buteo jamaicensis*), American kestrel (*Falco sparverius*), and Chihuahuan raven (*Corvus cryptoleucus*) (BLM, 2018b). The majority of Laguna Gatuna is located on BLM-managed land, and a small area of Laguna Gatuna is located on ELEA-owned land in the southeastern portion of the proposed CISF project area. The proposed CISF project area is surrounded by BLM-managed land that is under consideration as an area of critical environmental concern (ACEC), called Salt Playas ACEC, due to the importance that salt playas are to local plant and animal communities (BLM, 2018a). ACECs are public land areas where special management attention is needed to protect and prevent irreparable damage to important historical, cultural, or scenic values, fish and wildlife resources, or other natural systems or processes, or to protect life and provide safety from natural hazards. The Laguna Plata playa lake is located approximately 1.6 km [1 mi] northwest of the northwest corner of the proposed CISF project property boundary. Laguna Plata is also nominated as an ACEC (Laguna Plata ACEC) by the BLM Carlsbad Field Office because of its use by migratory birds. The BLM indicates there is known Western snowy plover (*Charadrius alexandrines nivosus*) winter nesting habitat at Laguna Plata (BLM, 2018a). Western snowy plover is a SGCN identified by the NMDGF and a Special Status Species identified by BLM, as discussed further in EIS Section 3.6.5 (NMDGF, 2016; BLM, 2018a).

Few migratory bird surveys have been conducted for either Laguna Gatuna or Laguna Plata; however, several birds have been observed at Laguna Gatuna in the past [EIS Table 3.6-2, and, according to the NMDGF, ephemeral saline lakes provide habitat for some birds, especially when holding water after rain events (NMDGF, 2018c)]. The NRC staff considered that other saline lakes in the region may also provide a refuge for bird species that could potentially use Laguna Gatuna and Laguna Plata regularly; however, the NRC staff did not find comparable playa lakes with similar intermittent water availability or salinity in the region with well-documented bird surveys. For example, Bitter Lake National Wildlife Refuge (NWR) is located approximately 117.5 km [73 mi] north-northwest of the proposed CISF project area within the Pecos River drainage basin and received its name because of its brackish water and provides habitat for over 300 bird species (FWS, 2001). The FWS has managed lake water levels and plant species at the refuge in part to reduce the amount of salinity in the water and

Table 3.6-2 Mammals and Birds Observed at the Proposed CISF Project Area and Laguna Gatuna		
Common Name	**Scientific Name**	**Preferred Season or Habitat**
Birds		**Seasonal Preference**
Cassin's sparrow	*Aimophila cassinii*	Spring and summer
Green-winged teal	*Anas crecca**	Spring and fall migrant
Blue-winged teal	*Anas discors**	Spring and fall migrant
Canvasback	*Aythya valisineria*	Spring and fall migrant
Red-tailed hawk	*Buteo jamaicensis*	Winter
Ferruginous hawk	*Buteo regalis*	Winter
Lark bunting	*Calamospiza melanocorys*	Spring and summer
Least sandpiper	*Calidris fuscicollis*	Spring and fall migrant
Scaled quail	*Callipepla squamata*	Year round
Cactus wren	*Campylorhynchus brunneicapillus*	Year round
Western snowy plover	*Charadrius alexandrines nivosus*	Winter
Killdeer	*Charadrius vociferus*	Spring and summer
Northern harrier	*Circus cyaneus*	Winter
Horned lark	*Eremophila alpestris*	Year round
American coot	*Fulica americana*	Spring and fall migrant
Loggerhead shrike	*Lanius ludovicianus*	Spring and fall
Long-billed curlew	*Numenius americanus*	Summer
Ruddy duck	*Oxyura jamaicensis**	Spring and fall migrant
Savannah sparrow	*Passerculus sandwichensis*	Winter
Ladder-backed woodpecker	*Picoides scalaris*	Year round
Pied-billed grebe	*Podilymbus podiceps**	Spring and fall migrant
American avocet	*Recurvirostra americana**	Year round
Northern shoveler	*Spatula clypeata**	Spring and fall migrant
Eurasian collared dove	*Streptopelia decaocto*	Year round
Western meadowlark	*Sturnella neglecta*	Year round
Crissal thrasher	*Toxostoma crissale*	Year round
Greater yellowlegs	*Tringa melanoleuca*	Winter
Mourning dove	*Zenaida macroura*	Year round
White-winged dove	*Zenaida asiatica*	Year round
White-crowned sparrow	*Zonotrichia leucophrys*	Winter and migrant
Mammals		**Preferred Habitat**
Coyote	*Canis latrans*	Open space, grasslands, and brush country
Black-tailed jackrabbit	*Lepus californicus*	Grasslands and open areas

Table 3.6-2 Mammals and Birds Observed at the Proposed CISF Project Area and Laguna Gatuna		
Common Name	**Scientific Name**	**Preferred Season or Habitat**
Birds		**Seasonal Preference**
Southern plains wood rat	*Neotoma micropus*	Grasslands, prairies, and mixed vegetation
Mearn's grasshopper mouse	*Onychomys arenicola*	Desert shrubs and grasslands
Desert cottontail	*Sylvilagus audubonii*	Brushy areas and valleys in arid lowlands
*Species observed dead in Laguna Gatuna in March 1992 Source: Holtec, 2019a (2019 ER Rev 5); Davis and Hopkins, 1993		

concentrate forage for migratory birds. By comparing total dissolved solids at Laguna Gatuna and Laguna Plata to the salinity at Bitter Lake, the estimated salinity in Laguna Gatuna and Laguna Plata (330,000 mg/l) is more than 100 times higher than the salinity in Bitter Lake (32,500 mg/l) (Davis and Hopkins, 1993; FWS, 2001; New Mexico Energy and Minerals Department, 1985).

In addition, surface water is present all year at the Bitter Lake NWR, whereas Laguna Gatuna and Laguna Plata are usually dry. Many NWRs and fresh water lakes are located within 161 km [100 mi] of the proposed CISF project area that are managed to conserve wetlands and other habitat vital to migratory birds (e.g., Muleshoe NWR, Grulla NWR, Salt Creek Wilderness, Bottomless Lakes State Park, Brantley State Park, and Red Bluff Reservoir). Because of differences in water and habitat availability and water quality between Laguna Gatuna and Laguna Plata and other surface water sources within 161 km [100 mi], the NRC staff anticipates that the diversity and frequency of birds that would rely on Laguna Gatuna and Laguna Plata are significantly limited compared to bird populations found at many of the other water basins in the region.

The FWS identified three migratory bird species of conservation concern that could be present in the proposed CISF project area: burrowing owl (*Athene cunicularia*), Cassin's sparrow (*Aimophila cassinii*), and lark bunting (*Calamospiza melanocorys*) (FWS, 2019b). As shown in EIS Table 3.6-2, Cassin's sparrow and lark bunting have been observed within the proposed CISF project area. Although burrowing owls were not observed during biological surveys conducted as part of the proposed Holtec license application, burrowing owls have been observed within 3.2 km [2 mi] of the proposed CISF project area (Holtec, 2019a; BLM, 2018b; BLM, 2017a).

Deer [i.e., mule deer and white-tailed deer (*Odocoileus virginianus*)] and pronghorn antelope (*Antilocapra americana*) are economically important large mammal species in New Mexico (NMDGF, 2016). To better manage deer populations, NMDGF has assigned land areas as game management units (GMUs). Lea County lies within NMDGF's GMU 31 (NMDGF, 2017). During the 2017–2018 hunting season, an estimated 777 mule deer (*Odocoileus hemionus*) and white-tailed deer combined were harvested in GMU 31 (NMDGF, 2018a). Pronghorn antelope are much less prevalent than deer in southeast New Mexico, but the State still hunts and manages them. NMDGF estimates that 102 antelope were harvested during the 2017–2018 hunting season (NMDGF, 2018b).

Reptiles and amphibians (i.e., herpetofauna) that could occur in the proposed CISF project area include but are not limited to the Texas horned lizard (*Phrynosoma cornutum*), greater earless lizard (*Cophosaurus texanus*), dunes sagebrush lizard (*Sceloporus arenicolus*), several species of spiny and whip tail lizards, and several species of venomous and non-venomous snakes (NMDGF, 2019a; Holtec, 2019a; BLM, 2018b). No reptiles or amphibians were observed during either the 2007 or 2016 ecological surveys conducted within the proposed CISF project area. Additional information on the dunes sagebrush lizard (DSL) is provided in EIS Section 3.6.5.

Medium-sized carnivorous mammals that are likely to occur in the proposed CISF project area include coyote, bobcat, badger, striped skunk, and swift fox (BLM, 2018b). Several small mammals, including desert cottontail rabbits, blacktailed jackrabbit, and numerous rodent species, are common residents of the proposed CISF project area and were all observed within the proposed CISF project area (BLM, 2018b). Habitat within the proposed CISF project area is marginally suitable foraging diurnal roosting habitat for a number of bat species based on the patchy shrubs and grasses and sparsely spaced trees and structures. The cave myotis (*Myotis velifer*) and Yuma myotis (*Myotis yumanensis*) are the most likely bat species that would occur at the proposed project (BLM, 2018b; NMDGF, 2019a). Bat species occurring in the proposed CISF project area are likely to forage for aerial insects above the shrublands, but foraging activities would be expected to be more common near surface water bodies, where flying insects would be more abundant. Bats have not been the subject of surveys conducted at the proposed CISF project area.

As described in EIS Section 3.5.1 and based on the results of ecological surveys conducted at the proposed CISF project area, there are no permanent surface water features within the proposed CISF project area. Ephemeral surface water features in the immediate vicinity of the proposed project area include Laguna Gatuna. There is no evidence of riparian habitat or sufficiently deep-water habitat or extensive water sources, including Laguna Gatuna, that would support the presence of fish or shellfish within the proposed CISF project area (Holtec, 2019a; Davis and Hopkins, 1993; Dein et al., 1997; Bristol, 1999). The aquatic traits of Laguna Gatuna are further discussed in EIS Section 3.6.3.

3.6.5 Protected Species and Species of Concern

The NRC has an obligation under Section 7 of the ESA to determine whether the proposed CISF project may affect Federally listed or species proposed to be listed under the ESA. The NRC staff obtained an official species list from the FWS Information Planning and Conservation (IPaC) website in November 2019 (FWS, 2019b). FWS staff identified one species, the Northern aplomado falcon, which could occur at the proposed CISF project (FWS, 2019b). The Northern aplomado falcon is identified by FWS as a non-essential experimental population (NEP) in all of New Mexico (FWS, 2014). According to the FWS, for Section 7 consultation purposes, NEPs are treated as if they are proposed under the ESA unless located on National Park Service lands or National Wildlife Refuges, in which case they are treated as threatened (Forest Service, 2016). The occurrence of the falcon in the U.S. declined in the early 1900s, was uncommonly observed by the 1930s, and was last reported to nest in 1952 in Luna County, New Mexico, until FWS reintroduction programs were initiated along the eastern Texas coast in the late 1970s (FWS, 2014). The first reintroduction effort in New Mexico occurred at a private ranch west of the White Sands Missile Range in 2006; however, despite several attempts to reintroduce the bird into New Mexico, all the birds that FWS tracked were determined to be deceased by January 2013. There are no records of this species occurring within Lea County or within the southeastern quadrant of New Mexico (BLM, 2018b; FWS, 2014). However, the FWS identifies the very southern edges of Lea and Eddy Counties as part of the species' historical habitat range, but not within its current habitat range (FWS, 2014). The FWS also identifies the proposed CISF project area as providing low to moderate suitable habitat for the Northern aplomado falcon (FWS, 2014). There is no FWS-designated critical habitat for this species (FWS, 2014). The FWS identified no other Federally listed threatened or endangered plant or animal species, candidate species, or proposed species that are known to potentially occur at or that the proposed CISF project may affect (FWS, 2019b; FWS, 2018b). In April 2019, the NRC staff accessed the NMDGF Environmental Review Tool website and generated a site-specific report that contains an initial list of NMDGF recommendations regarding potential impacts to SGCN wildlife or wildlife habitats from the proposed CISF project (NMDGF, 2019b). The NMDGF report identified 17 State-designated SGCN that could occur at or within 1.6 km [1 mi] of the proposed CISF project. Of the 17 SGCNs, 7 identified in the NMDFG report are the State of New Mexico listed as threatened or endangered, and 9 BLM designated as special status species, including the yellow-billed cuckoo (*Coccyzus americanus occidentalis*), which the FWS also designated as a Federally listed, threatened species under the ESA, but is not identified by FWS as potentially occurring in the proposed CISF project area (FWS, 2019b; 2018c). A list of the 17 New Mexico SGCN and their respective Federal status is provided in EIS Table 3.6-3. Previous ecological surveys conducted at the proposed CISF project area or at Laguna Gatuna that NRC reviewed and described in the introductory portion of EIS Sections 3.6 and also EIS Section 3.6.3 did not identify any of the species listed in EIS Table 3.6-3 at or near the proposed CISF project.

No New Mexico State plant species designated as threatened or endangered species have been reported during ecological surveys conducted on the proposed CISF project area, and none are expected to occur in Lea County (New Mexico State Forestry, 2018; New Mexico Rare Plant Technical Council, 2018). There are no important plant areas (IPAs) that occur in Lea County; the nearest IPA is approximately 29 km [18 mi] southwest of the proposed CISF project (New Mexico State Forestry, 2017). IPAs are places that support either a high diversity of sensitive plant species or are the last remaining locations of New Mexico’s most endangered plants. According to the BLM’s environmental review for a pipeline project located less than 3.2 km [2 mi] from the proposed CISF, there are no BLM-listed sensitive plant species known to occur in the general region (BLM, 2018b). In addition, there are no Federally threatened, endangered, or candidate plant species or critical habitats that the proposed CISF project could affect, according to FWS staff (FWS, 2019b).

The yellow-billed cuckoo is designated as a Federally listed threatened species under the ESA with a current habitat identified by FWS west of the Pecos River in Eddy County and Culberson County, Texas (FWS, 2018c). This species’ preferred habitat is dense understory vegetation (i.e., a layer of vegetation beneath the main canopy) in riparian zones along major drainages, which has experienced significant declines in recent decades, particularly in the western United States, and is not present within the proposed CISF project area (FWS, 2018c; Holtec, 2019a). The yellow-billed cuckoo is vulnerable to loss, fragmentation, and degradation of riparian habitat, and to broad-scale clearing of exotic vegetation such as salt cedar (i.e., tamarisk) along the Pecos River where the species often nests (78 FR 61622; NMDGF, 2016). As discussed previously, almost no vegetation exists around the edges of Laguna Gatuna where riparian habitat would be expected. This species is identified by NMDGF as potentially occurring within 0.6 km [1 mi] of the proposed CISF project area, and has been reported at locations greater than 16 km [10 mi] from the proposed CISF project area, roughly between Lovington and Carlsbad (NMED, 2004). However this species has not been observed within the proposed CISF project area and is not known to occur in Lea County (FWS 2018c; Holtec, 2019a; NMDGF, 2019a). As previously noted, FWS has not identified this species as potentially occurring in the proposed CISF project area (FWS, 2019b).

Table 3.6-3 Special Status Animal Species That Could Occur Within 0.6 km [1 mi] of the Proposed CISF Project Area According to the New Mexico Game and Fish Department

Common Name	Scientific Name	US Fish and Wildlife Management Status	Bureau of Land Management Status	New Mexico Management Status
Sprague's pipit	*Anthus spragueii*	BMC	SSS	SGCN
American bittern	*Botaurus lentiginosus*	BMC		SGCN
Yellow-billed cuckoo	*Coccyzus americanus*	T, BMC	SSS	SGCN
Black-tailed prairie dog	*Cynomys ludovicianus*		SSS	SGCN
(Northern) aplomado falcon	*Falco femoralis septentrionalis**	BMC	SSS	E, SGCN
Peregrine falcon	*Falco peregrinus*	BMC		T, SGCN
Bald eagle	*Haliaeetus leucocephalus*	BMC	SSS	T, SGCN
Loggerhead shrike	*Lanius ludovicianus*	BMC		SGCN
Lewis's Woodpecker	*Melanerpes lewis*	BMC		SGCN
Varied bunting	*Passerina versicolor*	BMC		T, SGCN
Eared grebe	*Podiceps nigricollis*	BMC		SGCN
Bank swallow	*Riparia riparia*			SGCN
Dunes sagebrush lizard	*Sceloporus arenicolus*		SSS	E, SGCN
Pygmy nuthatch	*Sitta pygmaea*			SGCN
Lesser prairie-chicken	*Tympanuchus pallidicinctus*	BMC	SSS	SGCN
Bell's vireo	*Vireo bellii*	BMC	SSS	T, SGCN
Gray vireo	*Vireo vicinior*	BMC	SSS	T, SGCN

T = Threatened, E = Endangered, SSS = Special Status Species, SGCN = Species of Greatest Conservation Need, BMC = Bird of Management Concern
* This species may be referred to as both aplomado falcon and Northern aplomado falcon in literature.
Source: NMDGF, 2019b; BLM, 2018b; FWS, 2011

Although the dunes sagebrush lizard is not a Federally listed or candidate species under the ESA, it is a New Mexico endangered species and SGCN (EIS Table 3.6-3). The FWS proposed the dunes sagebrush lizard to be listed as an endangered species under the ESA in December 2010, but withdrew the proposal in June 2012 (FWS, 2018d). In May 2018, the Center for Biological Diversity and Defenders of Wildlife petitioned the Department of Interior to list the dunes sagebrush lizard as a threatened or endangered species. According to the NMDGF, suitable habitat for the dunes sagebrush lizard is not present within the proposed CISF project area (NMDGF, 2018c). Based on available habitat mapping models for the dunes sagebrush lizard, the nearest suitable dunes sagebrush lizard habitat from the proposed CISF project is located approximately 4.8 km [3 mi] to the east and approximately 3.2 km [2 mi] north of the proposed CISF project boundary where sandy shinnery shrubland vegetation type is present (BLM, 2018a). New Mexico, along with other states and the FWS, have established multi-state efforts to conserve this species in the Western United States through a combined Candidate Conservation Agreement (CCA) for Federally administered land, and CCA with Assurances (CCAA) for privately-owned land for the dunes sagebrush lizard (FWS, 2018e). The monitoring and reporting of the land enrolled in these programs in New Mexico is conducted and administered by the Center for Excellence in Hazardous Materials Management (CEHMM) (FWS, 2018e).

Research about and monitoring of the Lesser prairie-chicken has occurred in the region for concerns about impacts to this species caused by habitat loss and fragmentation. Impacts to this species include historical habitat loss and fragmentation and ongoing and probable future habitat loss and fragmentation because of conversion of grasslands to agricultural uses, encroachment by invasive woody plants, wind and petroleum energy development, and presence of roads and man-made vertical structures in the region (Wolfe et al., 2018). Currently, the FWS is conducting a species status assessment that was expected to be completed in the summer of 2017, but has been delayed (FWS, 2016). The Kansas Biological Survey maintains the Southern Great Plains Crucial Habitat Assessment Tool (SGP CHAT), which is a spatial model that designates Lesser prairie-chicken habitat and prioritizes conservation activities (KBS, 2018). The tool classifies crucial Lesser prairie-chicken habitat and important connectivity areas. The SGP CHAT identifies the proposed CISF project area located within the Lesser prairie-chicken's estimated occupied range, but not located within a designated focal area or connectivity zone, which are areas of the greatest importance to the Lesser prairie-chicken (Wolfe et al., 2018). According to the NMDGF, suitable habitat for the Lesser prairie-chicken is not present within the proposed CISF project area (NMDGF, 2018c). The nearest active Lesser prairie-chicken lek, (i.e., the area where males gather to compete for females) is approximately 18.5 km [11.5 mi] north of the proposed CISF project area (Figure 3.6-5).

The BLM identifies the proposed CISF project area as being located within an isolated population area for Lesser prairie-chicken (BLM, 2018a). The BLM Carlsbad Field Office has proposed timing and development restrictions (i.e., timing limitation stipulations) on land leased from the BLM as a management strategy for portions of the Lesser prairie-chicken habitat. The proposed CISF project area is located within the boundary of BLM's Lesser prairie-chicken timing limitation stipulation; however, the rail spur is not (Figure 3.6-5). Because the proposed CISF is on private property, the BLM timing limitation stipulations would not apply.

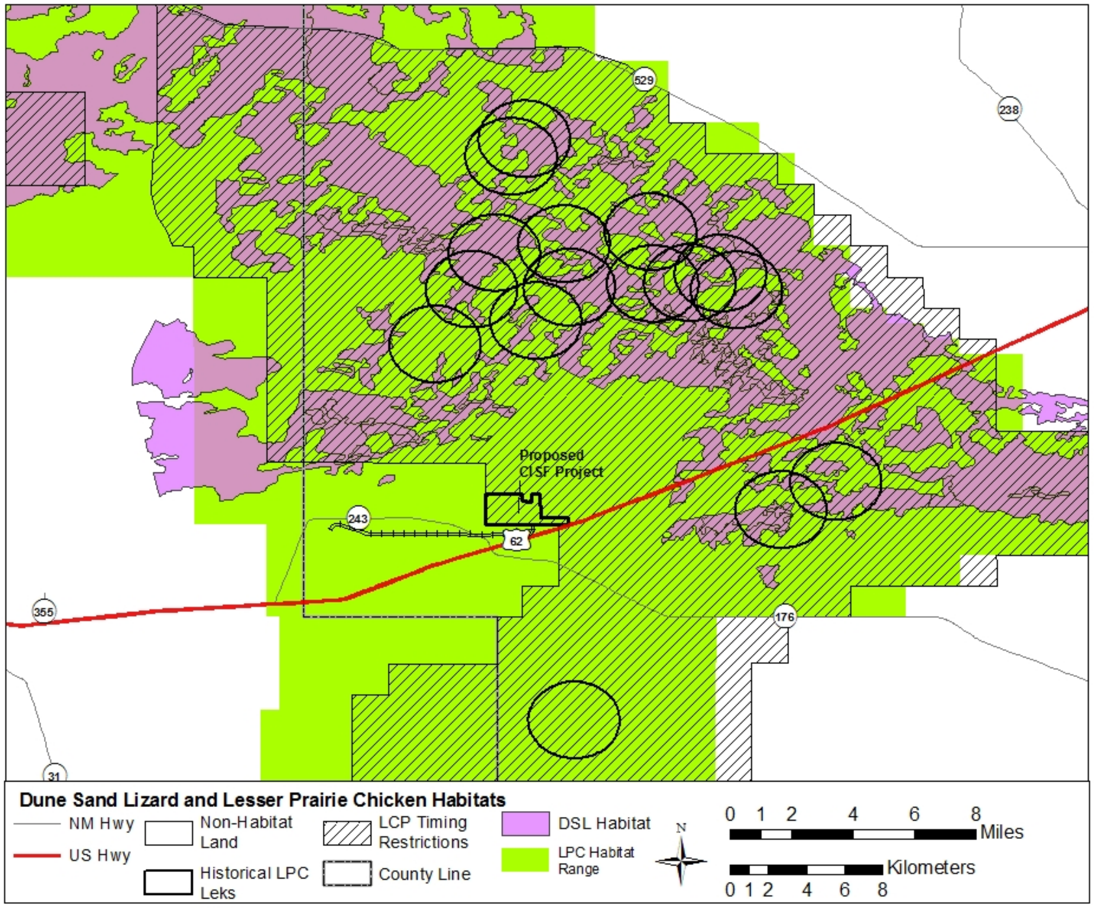

Figure 3.6-5 BLM Timing Limitation Stipulation Area for the Lesser Prairie-Chicken (LPC) and Dunes Sagebrush Lizard (DSL)

3.7 Meteorology and Air Quality

3.7.1 Meteorology

3.7.1.1 Climate

The proposed CISF project area has a semi-arid climate characterized by low precipitation, abundant sunshine, low relative humidity, and a relatively large annual and diurnal temperature range. In New Mexico, elevation rather than latitude is a greater factor in determining the temperature of specific locations. During the summer, the preponderance of clear skies and low relative humidity often permit rapid cooling, resulting in lower temperatures at night. Annual precipitation totals for semi-arid regions such as the proposed CISF project area can vary over the years. Winter precipitation is normally attributed to moisture from the Pacific Ocean as it moves across the country from west to east. Summer rains usually occur during brief but frequently intense thunderstorms caused by moisture from the Gulf of Mexico. These thunderstorms can cause local flash floods. When the occasional tornado occurs, it is usually in the summertime (NOAA, 2018a).

Currently there is no onsite weather station at the proposed CISF project area. Meteorological data from Lea County Regional airport, located about 48.3 km [30 mi] east of the proposed CISF project area, was used because onsite data is not currently available. EIS Table 3.7-1 contains temperature and precipitation data collected from 1941 to 2016. The monthly mean daily temperatures range from 5.5°C [41.9°F] in January to 26.8°C [80.2°F] in July (Holtec, 2019a). The annual mean daily temperature was 16.2°C [61.2°F] (Holtec, 2019a). The monthly mean rainfall totals range from 0.61 cm [0.24 in] in March to 4.57 cm [1.80 in] in September (Holtec, 2019a). The annual mean rainfall was 25.81 cm [10.16 in] (Holtec, 2019a). EIS Figure 3.7-1 contains a wind rose for data collected from 1972 to 2017. Winds are predominantly from the south and the average annual wind speed is 20.3 km/hr [12.6 mi/hr] (Holtec, 2019a).

Lea and Eddy counties experience a variety of severe weather events. As documented in the National Centers of Environmental Information storm event database, EIS Table 3.7-2 describes the types and number of severe weather events occurring in these two counties from 1950 to 2017. Of the 150 tornados in the two-county area over the 77-year time period, 111 were included in the lowest severity category on the Fujita or Enhanced Fujita Tornado Damage Scale (the Enhanced Fujita scale replaced the old Fujita scale in 2007). Larger Fujita Tornado Damage Scale numbers represent greater tornado severity. Tornados with Fujita or Enhanced Fujita values from F2 to F5 are considered strong to violent. The most severe tornado was an F3 that occurred in Lea County in 1954 (NOAA, 2018b).

Table 3.7-1 Temperature and Precipitation Data Collected from 1941 to 2016 at the Lea County Regional Airport

	Temperature (°C)*			Precipitation (cm)†				
				Rain			Snow	
Month	Mean Daily	Mean Daily Min	Mean Daily Max	Average Total	Minimum Total	Maximum Total	Average Total	Maximum Total
January	5.5	−2.4	13.5	0.79	0.00	5.31	2.69	22.86
February	7.7	−0.7	16.2	0.81	0.00	2.59	4.67	53.85
March	10.8	2.0	19.6	0.61	0.00	3.58	2.46	33.02
April	15.4	6.8	23.9	1.65	0.00	5.74	0.13	2.03
May	20.5	12.1	28.9	3.63	0.00	12.75	0.00	0.00
June	25.7	17.6	33.8	1.90	0.00	8.10	0.00	0.00
July	26.8	19.3	34.2	2.97	0.00	8.86	0.00	0.00
August	26.1	18.6	33.6	3.35	0.10	10.36	0.00	0.00
September	22.4	14.6	30.3	4.57	0.13	14.83	0.00	0.00
October	16.5	8.8	24.3	3.86	0.00	9.68	0.00	0.00
November	9.6	1.2	18.0	0.66	0.00	2.72	1.12	17.78
December	6.6	−1.8	15.0	1.42	0.00	15.77	1.55	21.08
Annual	16.2	8.0	24.5	25.81	7.18	47.40	13.03	73.66

*To convert Celsius (°C) to Fahrenheit (°F), multiply by 1.8 and add 32.
†To convert centimeters (cm) to inches (in), multiply by 0.3937
Source: Modified from Holtec (2019a)

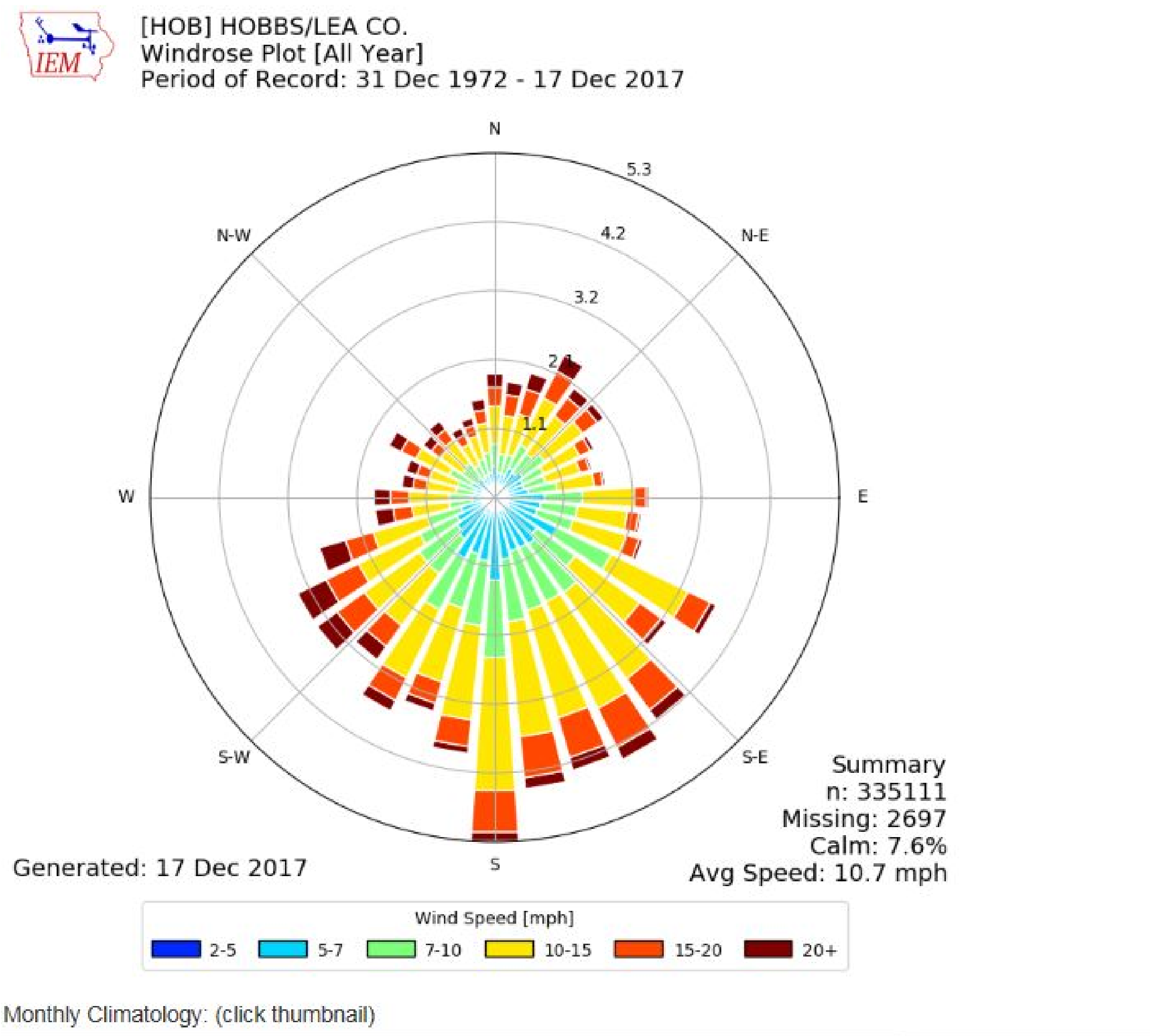

Figure 3.7-1 Wind Rose from the Lea County Regional Airport for Data Collected from 1972 to 2017 (Iowa State University, 2017)
***To convert miles per hour to kilometers per hour, multiple by 1.609**

3.7.1.2 Climate Change

Temperature and precipitation are two parameters that can be used to characterize climate change. Average annual temperatures increased by 1.0°C [1.8°F] for the contiguous United States over the time period 1901 to 2016, and temperatures are expected to continue to rise (GCRP, 2017). From 1986 to 2016, the average temperature in the region where the proposed CISF project is located increased by approximately 0.83°C [1.5°F] compared to the 1901 to 1960 baseline (GCRP, 2017). The average temperature in New Mexico is projected to increase between 2.22 and 4.44°C [4 and 8°F] by mid-century (2036–2065) compared to the 1976 to 2005 baseline (GCRP, 2017).

Table 3.7-2 Severe Weather Event Data for Lea and Eddy Counties from 1950 through 2017			
	Number of Events*		
Type of Event	**Lea County**	**Eddy County**	**Description of Event†**
Drought	14	30	A protracted period of deficient precipitation that results in adverse impacts on people, animals, or vegetation over a sizeable area
Flash Flood	81	181	A rapid and extreme flow of high water into a normally dry area or a rapid water level rise in a stream or creek above a predetermined flood level
Hail	416	481	Hail 1.9 cm [¾ in] or larger or hail accumulations of smaller size which cause property and/or crop damage or casualties
Heavy Snow	21	38	Snow accumulation meeting or exceeding locally/regionally defined 12 and/or 24 hour warning criteria.
High Wind	55	170	Sustained non-convective winds of 35 knots [40 mph] or greater lasting for 1 hour or longer, or gusts of 50 knots [58 mph] or greater for any duration (or otherwise locally/regionally defined).
Thunderstorm Wind	200	178	Winds, arising from convection (occurring within 30 minutes of lightning being observed or detected), with speeds of at least 50 knots (58 mph), or winds of any speed producing a fatality, injury, or damage
Tornado	93	57	A violently rotating column of air, extending to or from a cumuliform cloud or underneath a cumuliform cloud, to the ground, and often (but not always) visible as a condensation funnel.

*Severe weather events are included in Table 3.7-2 if one of the counties experienced a particular event a minimum 25 times from 1950 through 2017
†Description of the event as defined in National Weather Service Instruction 10-1065
Source: National Oceanic and Atmospheric Administration (NOAA, 2018b) I Storm Events Database – New Mexico

Average U.S. precipitation has increased by 4 percent since 1901; however, some regions experienced increases greater than the national average, while other regions experienced decreased precipitation levels (GCRP, 2017). From 1986 to 2015, the annual precipitation totals in the region where the proposed CISF project is located increased between 0 and 10 percent compared to the 1901 to 1960 baseline (GCRP, 2017). By the latter part of the 21st century, U.S. Global Change Research Program forecasts that precipitation levels in the region of New Mexico where the proposed CISF project is located will decrease between 0 to 10 percent during the summer and fall and decrease between 10 to 20 percent during the winter and spring (GCRP, 2017).

The following list identifies additional climate change projections for the State of New Mexico as the National Ocean and Atmospheric Administration identified (NOAA, 2017).

- An increase in drought intensity.
- An increase in the number of extremely hot days, most prominently in the eastern plains of New Mexico.
- An increase in the frequency and severity of wildfires.
- No increase or upward trend in the frequency of extreme precipitation events, which is in contrast to many areas of the United States.

3.7.2 Air Quality

3.7.2.1 Non-Greenhouse Gases

The EPA has set National Ambient Air Quality Standards (NAAQS) in the *Code of Federal Regulations* (40 CFR Part 50), which specifies maximum ambient (outdoor air) concentration levels for the following six criteria pollutants: sulfur dioxide, nitrogen dioxide, carbon monoxide, ozone, lead, and particulate matter (both PM_{10} and $PM_{2.5}$). Particulate matter PM_{10} refers to particles that are 10 micrometers [3.9×10^{-4} inches] in diameter or smaller, and $PM_{2.5}$ refers to particles that are 2.5 micrometers [9.8×10^{-5} inches] in diameter or smaller. Primary NAAQS are established to protect health, and secondary NAAQS are established to protect welfare by safeguarding against environmental and property damage. States may develop standards that are stricter or supplement the NAAQS. New Mexico has promulgated both stricter and supplemental ambient air standards. EIS Table 3.7-3 contains the Federal and New Mexico ambient air standards.

EPA requires States to monitor ambient air quality and evaluate compliance with the NAAQS. Based on the results of these evaluations, EPA assigns areas to various NAAQS compliance classifications (e.g., attainment, nonattainment, or maintenance) for each of the six criteria air pollutants. An attainment area is defined as a geographic region that EPA designates that meets the NAAQS for a pollutant. A nonattainment area is defined as a geographic region that EPA designates does not meet the NAAQS for a pollutant or that contributes to the ambient pollutant levels in a nearby area that does not meet the NAAQS. A maintenance area is defined as any geographic region previously designated nonattainment and subsequently redesignated by EPA to attainment. These EPA classifications characterize the air quality within a defined area, which can range in size from portions of cities to large Air Quality Control Regions (AQCR) comprising many counties. An AQCR is a Federally designated area for air quality management purposes.

The proposed CISF project area is located in the Pecos-Permian Basin Intrastate Air Quality Control Region, which comprises the following seven counties in New Mexico: Chaves, Curry, De Baca, Eddy, Lea, Quay, and Roosevelt (40 CFR 81.242). This AQCR is classified as an attainment area for each criteria pollutant (40 CFR 81.332). Based on this attainment classification, the air quality at the proposed CISF project area is considered good. The nearest nonattainment area is El Paso County in Texas, located about 225.3 km [140 mi] southwest of the proposed CISF project area. A portion of that county is in nonattainment for particulate matter PM_{10} (40 CFR 81.344). The only nonattainment area in New Mexico is Dona Ana County located about 247.8 km [154 mi] west of the proposed CISF project area (Dona Ana

County in New Mexico and El Paso County in Texas share a border). A portion of that county is nonattainment for both particulate matter PM_{10} and ozone (40 CFR 81.332 and 83 FR 25776). New Mexico contains several maintenance areas; however, none are located in the Pecos-Permian Basin Intrastate Air Quality Control Region (EPA, 2018a).

Table 3.7-3 National (NAAQS) and Applicable* State (NMAAQS) Ambient Air Quality Standards for the Proposed CISF*

Pollutant	Averaging Time	Standards[†]	
		National (NAAQS)[‡]	**New Mexico (NMAAQS)[§]**
Carbon Monoxide	1 hour	35 ppm	13.1 ppm
	8 hours	9 ppm	8.7 ppm
Hydrogen Sulfide	½ hour	na	0.100 ppm
Nitrogen Dioxide	1 hour	100 ppb	same
	24 hours	na	0.10 ppm
	Annual	53 ppb	50 ppb
Ozone	8 hours	0.070 ppm	same
Particulate Matter $PM_{2.5}$	24 hours	35 $\mu g/m^3$	same
	Annual	12 $\mu g/m^3$	same
Particulate Matter PM_{10}	24 hours	150 $\mu g/m^3$	same
Sulfur Dioxide	1 hour	75 ppb	same
	3 hours[‖]	0.5 ppm	same
	24 hours	na	0.10 ppm
	Annual	na	0.02 ppm
Total Reduced Sulfur	½ hour	na	0.010 ppm

*State standards for hydrogen sulfide (1 hour), sulfur dioxide (24 hour and annual), and total reduced sulfur (½ hour) vary depending on the location within the State. The State standards in this table apply to the location of the proposed CISF.

[†]ppm means parts per million, ppb means parts per billion, and to convert $\mu g/m^3$ to oz/yd^3 multiply by 2.7×10^{-8}

[‡]na stands for not applicable meaning the State has a supplemental standard without a national standard counterpart

[§]same means there is no difference between the State and national standards

[‖]The sulfur dioxide 3 hour standard is a secondary standard (safeguard the environment and property damage) whereas the other standards in this table are primary standards (protect public health).

Sources: EPA (2016 l NAAQS Table) for NAAQS; 20 New Mexico Administrative Code, Chapter 2, Section 3 for NMAAQS

EIS Table 3.7-4 contains air pollutant emission levels for Lea and Eddy Counties as documented in EPA's National Emission Inventory. The emissions in EIS Table 3.7-4 include both stationary and mobile sources. EIS Table 3.7-4 provides pollutant levels that characterize the existing ambient air conditions.

EIS Figure 3.7-2 shows the proximity of various receptors to the proposed CISF project area as well as the proposed rail spur. The nearest resident to the proposed CISF project area is the Salt Lake Ranch located about 2.4 km [1.5 mi] to the north; however, U.S. Highway 62 would be located closer to the proposed CISF project area than the nearest resident. U.S. Highway 64

Table 3.7-4 Annual Air Pollutant Emissions in Metric Tons* from the U.S. Environmental Protection Agency's 2014 National Emission Inventory for Eddy and Lea Counties

County	Pollutant						
	Carbon Monoxide	Hazardous Air Pollutants	Nitrogen Oxides	Particulate Matter PM_{10}	Particulate Matter $PM_{2.5}$	Sulfur Dioxide	Volatile Organic Compounds
Lea	27,698	10,959	15,626	13,104	2,029	5,037	88,614
Eddy	31,213	13,558	9,767	14,832	2,446	1,631	111,389
Both	58,911	24,517	25,393	27,936	4,475	6,668	200,003

*To convert metric tons to short tons, multiply by 1.10231
Sources: EPA (2018a) and SwRI (2019)

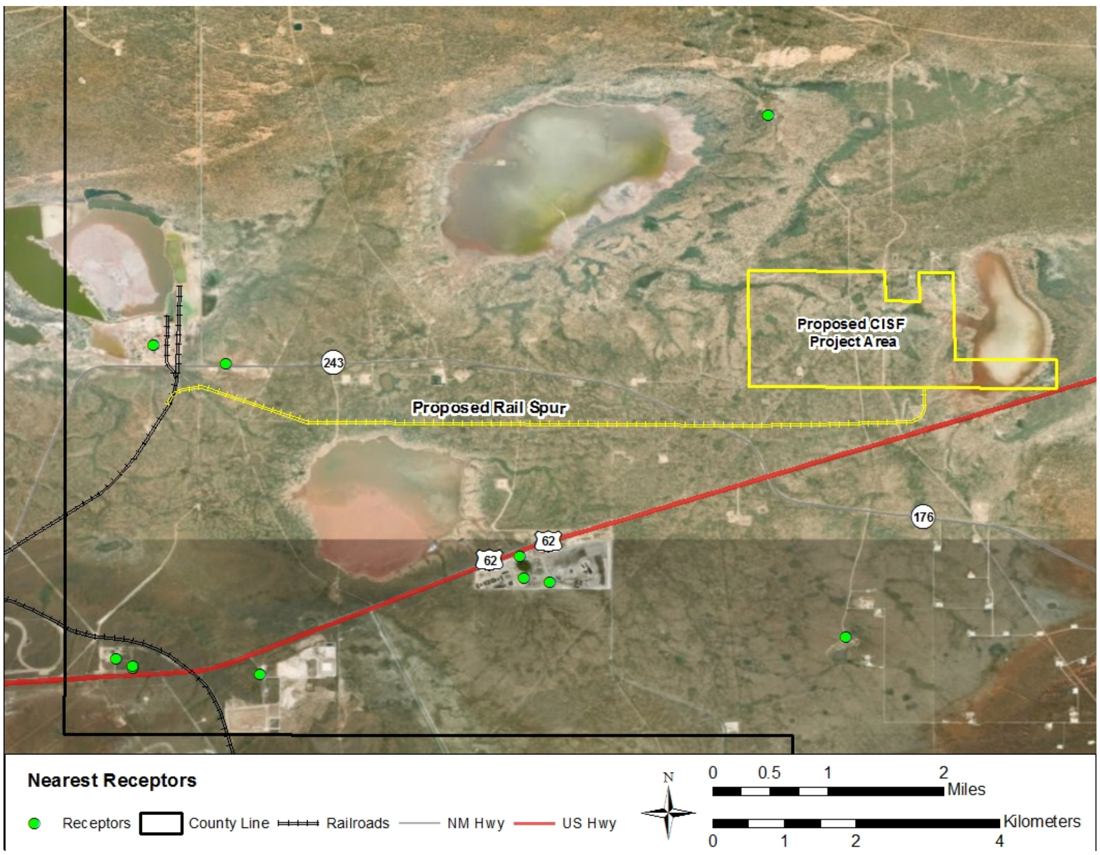

Figure 3.7-2 Figure Showing Residences and Other Receptors Around the Proposed CISF Project Area and Rail Spur (Source: Holtec, 2019a)

would be adjacent to the southeast corner of the proposed CISF project area; however, this highway would be about 0.7 km [0.43 mi] from the proposed concrete batch plant, which would be the nearest air emission source within the proposed CISF project area (EIS Figure 2.2-2). The nearest residence to the proposed rail spur would be located about 2.92 km [1.81 mi] to the south; however, another facility would be located closer to the proposed rail spur than the nearest residence. The Intrepid Potash North offices would be located about 0.7 km [0.43 mi] from the western end of the proposed rail spur and would be the nearest facility the NRC staff consider regularly occupied. U.S. Highway 62 would pass within about 0.18 km [0.11 mi] from the eastern end of the proposed rail spur, and New Mexico State Road 243 actually crossed the proposed rail spur near the southwest corner of the proposed CISF project.

EPA also established Prevention of Significant Deterioration (PSD) standards that set maximum allowable concentration increases for particulate matter, sulfur dioxide, and nitrogen dioxide pollutants above baseline conditions in attainment areas. In part, the purpose of this requirement is to ensure that air quality in attainment areas remains good. The PSD program designated three different classes or groups of areas with different standards or levels of protection established for each class. Class I areas have the most stringent requirements.

Federally designated Class I areas include national parks, wilderness areas, and monuments, as specified in 40 CFR Part 81. Areas not designated as Class I are, by default, classified as Class II areas because EPA has not designated any Class III areas in the U.S. The proposed CISF project area is located in a Class II area. The closest Class I area near the proposed CISF project area is Carlsbad Caverns National Park, located in Eddy County, approximately 75.0 km [46.6 mi] to the southwest. The only other Class I site in the Pecos-Permian Basin Intrastate Air Quality Control Region is the Salt Creek Wilderness, located in Chaves County, approximately 126.5 km [78.6 mi] to the northwest of the proposed CISF project area.

In addition to PSD standards, potential impacts to Class I areas also consider air quality related values such as visibility. Impact to visibility occurs when the pollution in the air either scatters or absorbs the light. Both natural and man-made sources contribute to air pollution, which may impair visibility. Natural sources include windblown dust and smoke from fires, while man-made sources include electric utilities (i.e., power plants), oil and gas development, and motor vehicles (NMED, 2014).

3.7.2.2 Greenhouse Gases

Greenhouse gases (GHGs), which can trap heat in the atmosphere, are produced by numerous activities, including the burning of fossil fuels and agricultural and industrial processes. GHGs include carbon dioxide, methane, nitrous oxide, and certain fluorinated gases. These gases vary in their ability to trap heat and in their atmospheric longevity. GHG emission levels are expressed as carbon dioxide equivalents (CO_2e), which is an aggregate measure of total GHG global warming potential described in terms of carbon dioxide and accounts for the heat-trapping capacity of different gases. Present-day carbon dioxide concentrations in the atmosphere are around 400 parts per million, and by the end of the century, these levels are estimated to range somewhere between 450 and 936 parts per million (GCRP, 2017).

In 2010, EPA promulgated the Tailoring Rule to address GHG emissions under the Clean Air Act permitting programs. As initially constituted, the Tailoring Rule specified that new sources, as well as existing sources with the potential to emit 90,718 metric tons [100,000 short tons] per year of CO_2e, were subject to EPA PSD and Title V requirements. Modifications at existing facilities that increase GHG emissions by at least 68,039 metric tons [75,000 short tons] per year of CO_2e were also subject to Title V requirements. Revisions to the rule have not resulted in different numerical values associated with greenhouse gas emission evaluations (EPA, 2016).

3.8 <u>Noise</u>

Noise associated with the proposed action is considered because it may interfere with people and wildlife present in the surrounding area. This section provides a description of existing noise sources within the proposed CISF project area and surrounding area and other resources that noise generated from the proposed CISF project could affect. The definition of noise is "unwanted or disturbing sound." Sound measurements are described in terms of frequencies and intensities. The decibel [(dB(A)] is used to describe the sound pressure level. The A-scale on a sound level meter best approximates the audible frequency response of the human ear and is commonly used in noise measurements. Sound pressure levels measured on the A-scale of a sound meter are abbreviated dB(A). In noise measurements, sound pressure levels are typically averaged over a given length of time because instantaneous levels can vary widely. The intensity of sound decreases with increasing distance from the source. Typically, sound levels for a point source will decrease by 6 dB(A) for each doubling of distance. This may vary depending on the terrain, topographical features, and frequency of the noise source. Generally, sound level changes of 3 dB(A) are barely perceptible, while a change of 5 dB(A) is readily noticeable by most people. A 10 dB(A) increase is usually perceived as a doubling of loudness. Sound levels can vary for indoor and outdoor noise sources. For example, a jet flying overhead at 0.3 km [1,000 ft] will produce a sound level of 100 dB(A), the same as an inside subway train. A typical outdoor commercial area is equivalent to a normal speech conversation indoors, at 65 dB(A), and a quiet rural nighttime environment will mimic an empty concert hall, at 25 dB(A). A list of typical community sound levels and noise levels of common sources is shown in EIS Table 3.8-1.

Because of the rural location of the proposed CISF project, the most significant ambient noise (i.e., background noise) is from traffic on U.S. Highway 62 and State Highway 243 (EIS Figure 3.2-4) and from operating oil pump jacks located in the surrounding area (Holtec, 2019a). The location of the proposed CISF storage pad that would be constructed within the property boundary is approximately 0.8 km [0.5 mi] from State Highway 62. The nearest residents to the proposed CISF project area are located 2.4 km [1.5 mi] from the proposed CISF project (Holtec, 2019a). The nearest receptor to noise from the potential rail spur is located 0.70 km [0.43 mi] away.

Although abundant recreational opportunities exist in the area, recreational activities at the proposed CISF project area are limited because the land is privately owned and would require permission from the landowner. Laguna Plata, a playa lake located 1.6 km [1 mi] northwest of the proposed CISF project area, is on BLM-owned land and is the closest potential recreational area to the proposed CISF project area with the potential to be sensitive to noise impacts.

Noise level standards are established by Federal agencies, including the U.S. Department of Housing and Urban Development (HUD) (24 CFR Part 51), the EPA (EPA, 1974), Federal Highway Administration (23 CFR Part 772), and the Occupational Safety and Health Administration (OSHA) (29 CFR Part 1910). There are no Federally recognized Native American lands within 153 km [95 mi] of the proposed CISF project area (Holtec, 2019a). Neither Lea County nor New Mexico have ordinances or regulations governing noise, although a majority of the proposed project is within a BLM Isolated Population Area and Timing and Noise Restriction Zone (Holtec, 2019a). Therefore, the facility is not subject to State, Tribal, or local noise ordinances other than BLM restrictions that limit the timing of certain activities to between 3:00 AM and 9:00 AM from March 1 to June 15 on land in BLM jurisdiction. The EPA has defined a goal of 55 dB(A) for average day-night sound levels in outdoor spaces (EPA, 1974).

Table 3.8-1	Noise Abatement Criteria: 1-Hour, A-Weighted Sound Levels in Decibels (dBA)	
Activity Category	**L_{eq}(h)***	**Description of Activity Category**
A	57 (Exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purposes.
B	67 (Exterior)	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals.
C	72 (Exterior)	Developed lands, properties, or activities not included in Categories A or B above.
D	--	Undeveloped lands.
E	52 (Interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.

*Leq(h) is an energy-averaged, 1-hour, A-weighted sound level in decibels.
Source: 23 CFR Part 772

3.9 Historical and Cultural Resources

Historic property means any prehistoric or historic district, site, building, structure, or object included on, or eligible for inclusion on, the National Register of Historic Places (NRHP), including artifacts, records, and material remains relating to the district, site, building, structure, or object. The criteria for eligibility are listed in 36 CFR 60.4 and include (a) association with events that have made a significant contribution to our broad patterns of history; (b) association with the lives of persons significant in our past; (c) embodiment of distinctive characteristics of type, period, or methods of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or (d) resources that have yielded or are likely to yield information important in prehistory or history [Advisory Council on Historic Preservation (ACHP), 2012]. The National Park Service also requires that a property has integrity, or the ability of a property to convey its significance, to be listed in the NRHP (National Park Service, 2014).

The historic preservation review process, NHPA Section 106, is outlined in regulations the ACHP issued in 36 CFR Part 800. As allowed under 36 CFR 800.8, the NRC staff is conducting the Section 106 review process in coordination with the NEPA review for this proposed CISF project. The NRC staff will consult with the NM SHPO, interested Tribes, BLM, and Holtec when making preliminary determinations on the identification of historic properties and effects to those properties by the proposed CISF project. Under the assumption that the EIS would be issued in 2020, and because most historic properties that are less than 50 years old are not considered eligible for the NRHP, anticipating a maximum of five years until project construction, cultural resources that will be 45 years or older by 2020 should be evaluated for listing in the NRHP as part of the identification of historic properties.

Cultural resources investigations for the proposed CISF project included a review of available archaeological literature, a search and evaluation of archaeological records and collections maintained by the NM SHPO and BLM, archaeological field investigations, and Tribal consultation. Based on these reviews and through the Section 106 consultation process, this EIS section provides a description of historic and cultural resources within and surrounding the proposed CISF project area, considering the direct and indirect area of potential effects (APE), described in EIS Section 3.9.2, that could be affected by earthmoving activities, visual effects, and noise generated from the proposed CISF project.

3.9.1 Cultural History

The proposed CISF project would be located in Lea County, New Mexico. This location falls near the boundary of the High Plains (also referred to as the Llano Estacado or Staked Plains) and Pecos Valley within the Great Plains physiographic province in southeastern New Mexico. The physiographic subregion is the Mescalero Plain of the Chihuahuan Desert. The Chihuahuan Desert, which has formed in this region over the last 8,000 years and consists of desert scrub plants such as mesquite, creosote bush, and ocotillo, is the major landform of this area and has impacted human settlement of the area. Prior to the formation of the Chihuahuan Desert, the region was somewhat wetter, cooler, and covered mainly in semi-desert and plains grasslands with forests on the highest elevations (Ballou, 2018).

The earliest identifiable cultural period in the Mescalero Plain is the Paleoindian [11,500 to 8,000 years before present (BP)] (Murrell et al. 2016). The earliest distinctive tool type of this period is the large fluted Clovis spearpoint. This culture-defining projectile point is named after the town of Clovis, New Mexico, where fluted points were documented in associated extinct Pleistocene megafauna at the Blackwater Draw site in the early 20th century. Clovis tools either evolved into or were supplanted by the smaller fluted Folsom point, presumably a dart point used with the atlatl (i.e., handled long spear). Both tool traditions included large prismatic blades and fluted, lanceolate spear points made from high quality cryptocrystalline silicates, while the late Paleoindian period favored unfluted lanceolate forms (Collins, 1999; Green, 1963; Hester, 1972; Stanford, 1991; Turner and Hester, 1993). Paleoindian groups were highly mobile, as demonstrated by the use of both non-local and local sources for lithic tool manufacture (Condon 2006). The economy of the Paleoindian period arguably focused on hunting late Pleistocene megafauna but also surely incorporated hunting smaller mammals and gathering other plant and animal resources (Boyd et al., 1989; Godwin et al., 2001). Though bison hunting was still prominent during the late Paleoindian period, evidence suggests that subsistence patterns gradually shifted to a more generalized resource strategy.

By the Archaic period (8,000 to 1,800 BP), populations in southeastern New Mexico adapted to a changing climate that created drier and warmer conditions and the modern desert grassland and scrub environment. The changing climate resulted in a shift to a larger and more generalized resource base for subsistence. Late Pleistocene megafauna were extinct, and hunting necessarily focused on smaller game, such as bison; however, bison herds would have likely been fewer, smaller, and more mobile than those in the central and northern plains. Two features that are commonly associated with Archaic occupations in the region are caliche hearths and arroyo bed wells, both are which have been extensively reported at sites firmly dated to the Archaic period (Evans, 1951; Main, 1992; Meltzer and Collins, 1987; Railey and Whitehead, 2017; Smith et al., 1966). A wider variety of dart points has been dated to the Archaic period, suggesting the development of distinct cultural groups, and there is evidence of greater use of traps and nets. Archaic populations in southeast New Mexico continued to be highly mobile, with a shift to a more expedient core/flake lithic technology (Vierra, 2005; Parry and Kelly, 1987; Railey 2016).

The Archaic period gave way to the Formative or Ceramic Period (1,800 BP to 650 BP) and is generally marked by the appearance of ceramic vessels and lithic points associated with the bow and arrow in the material record. Some local phase sequences, each associated with specific ceramic assemblages, lithic tool kits, and structure types, have also been developed for southeastern New Mexico, these are of limited applicability to the project area, but include the Late Hueco Phase, the Querecho Phase, the Maljamar Phase, and the Ochoa Phase (Murrell et al., 2016.) During the earlier Formative subperiods, populations in southeast

New Mexico developed a ceramic material culture while continuing to practice Archaic methods of subsistence and settlement. The mid-to-late Formative subperiods saw an increase in the introduction of exotic ceramics across southern New Mexico and northern Chihuahua (Haskell, 1977; Speth, 2004). Late Prehistoric groups generally continued in the mold of a hunting and gathering way of life (Boyd et al., 1989; Godwin et al., 2001), though there is evidence for the introduction of corn horticulture in the region at some sites after 1,000 BP, particularly at sites associated with playa lakes (Brown et al., 2010a; Laumbach et al, 1979; Main, 1992).

The mobility of local populations over large areas continued throughout the Formative period, as the recovery of undecorated ceramics made from non-local clays in the sand hills of southeast New Mexico demonstrated (Hill, 2014). During the last Formative subperiod, many local populations shifted back to a subsistence strategy based around bison hunting, supplemented by corn-based horticulture. Though they were adapting a highly mobile subsistence strategy, late Formative populations were consolidating at some locations, as shown by the construction of pueblo-style structures and crop irrigation features at some sites, particularly the Merchant site (Speth, 2004; Miller et al., 2016).

The Protohistoric period (700/650 BP-300 BP) is not well documented or defined in the southwest region (Baugh and Sechrist, 2001). Occupation sites are much more ephemeral than those of preceding periods, and in the case of post-Spanish contact sites, the indigenous population likely deliberately hid camps and other occupations (Wilson, 1984). This period saw a decrease in overall population, and the abandonment of horticulture practices for a subsistence strategy based solely around hunting and gathering. Most researchers have attributed this shift to deteriorating environmental conditions that required a shift away from agricultural practices and more permanent settlements (Speth and Perry, 1978, 1980). The lithic assemblages from this period are similar in type to those of Archaic Period sites, but also include artifact types from the Formative period, making dating Protohistoric sites difficult and necessitating a reliance on absolute dating methods (Seymour, 2004; Seymour et al., 2002). The most common feature associated with this period are circles of rocks, sometimes referred to as “tipi rings,” which are generally correlated with the presence of the Mescalero Apache. This group moved into the region during the late Formative and early Protohistoric periods and may have absorbed or displaced earlier cultural groups. By the end of the Protohistoric, the Apache dominated the indigenous population of the region (Brown et al. 2010b).

The boundary between the Protohistoric and Historic periods in southern New Mexico is not sharply delineated. The Historic period (circa 450 BP) began with Spanish explorations of the region as early as 1535, when de Vaca’s shipwrecked expedition crossed through in route to Mexico. The explorer Coronado traveled through the Plains region in 1541; his ventures into this region were limited. Other explorers, such as Antonio de Espejo in 1583 and those sent by Gaspar Castano de Soa in 1590 traveled along the Pecos River, but they failed to encounter any indigenous groups, despite their presence in the region (Hammond, 1929; Schroeder and Matson, 1965; Pratt et al., 1989). That the Spanish did not encounter Apaches may have been because of a seasonal exploitation strategy that was focused on non-riverine resources during the timeframe of the various expeditions, or because of the Apache deliberately avoiding the Spanish. Evidence that the Apache still occupied the area is demonstrated by ephemeral occupation sites with both tipi rings and historic-period Pueblo ceramics (Stuart et al., 1986). Military expeditions conducted between 1650 and 1800 focused on both commercial trading pursuits and slave raids on the local groups, and historic records from that period describe encounters with the indigenous populations (Pratt et al., 1989).

In 1850, Captain Henry B. Judd traveled and mapped the length of the Pecos River, following a similar route to the previous Spanish expeditions. Prior to his survey, there had been little development in the region by non-Native groups, though Euromerican sheepherders had occupied some of the Middle Pecos drainage basin (Jelinek, 1967). A cattle trail was created along the Pecos River in 1866 by Charlie Goodnight and Oliver Loving. This trail, which extended from Texas to Fort Sumner and Santa Fe, remained in use for approximately twenty years, when horseback cattle drives were largely replaced by the shipment of livestock on the newly built railroad lines (Sebastian and Levine, 1989). Settlers attracted by available grazing land migrated into southeastern New Mexico and had established livestock ranches in the area by the mid-nineteenth century. Under the Homestead Act of 1862, a quarter section of land was guaranteed to citizens if it was settled and improved. In 1909, the allowable acreage was increased to 320 acres, and again increased to 640 acres in 1916.

By the 1880s, the Eddy brothers and Joseph S. Stevens had established the Pecos Irrigation and Investment Company to irrigate the Pecos River valley in order to supply water for farming in the area. In 1891, a rail line was established, running from what was then called the town of Eddy to Pecos. The residents of Eddy voted to change the name of their town to Carlsbad in 1899, with the hopes of attracting tourists to local hot springs. Potash mining became a prominent industry in the area during the 1920s and continues into the present day. The Carlsbad area became the focus of oil and gas development with the establishment of the El Paso Natural Gas Company in 1928, and an emphasis on mining activities has remained a mainstay of the local economy for almost a century. Historic archaeology conducted in the region has been limited and has primarily focused on individual homestead sites, with less attention paid to military sites or other site types than in other regions, with the exception of Fort Sumner (Pangburn and Therriault, 2019a).

3.9.2 Area of Potential Effect

The area the proposed activity may directly or indirectly impact represents the area of potential effect, or APE. The indirect APE for the proposed CISF project would consist of visual effects and noise sources arising from the project. The direct APE would coincide with the footprint of ground disturbance for the construction stage (e.g., cask transfer building, storage pads, access roads, rail spur) with the potential for additional ground disturbance to occur during decommissioning activities. The NRC staff anticipates that because of construction activities, the largest area would be disturbed during the construction stages of Phases 1-20. Therefore, the land disturbed during the construction stage represents the upper bound of potential effects to the direct APE.

The fenced, secured area totals 116.78 ha [288.56 ac]. The direct APE also includes a proposed access road east of the proposed CISF, which is a total of 60.9 m [200 ft] wide for 2.57 km [1.6 mi], totaling 15.62 ha [38.59 ac] of additional disturbed land. The APE for direct effects also includes a proposed rail spur connecting the proposed CISF with existing lines approximately 7.24 km [4.5 mi] to the west. The APE for the railroad spur includes a 60.9-m [200-ft] wide corridor for 11.38 km [7.07 mi], totaling an area of 69.11 ha [170.78 ac]. The total combined APE for direct effects is 201.51 ha [497.93 ac].

Due to the low profile of the proposed project, the extent of the visual APE (indirect APE) includes areas within a 1.6-km [1-mi] radius extending from the proposed project boundary, including from the rail spur. The proposed CISF project would alter the natural state of the landscape, and the cask transfer building would be the tallest building constructed at the proposed CISF project location at approximately 18 m [60 ft] high. The APE for indirect effects includes an area of 4589.14 ha [11,340 acres]. As described below, multiple historic and cultural resources investigations have covered all of the area in the direct and indirect APEs.

Historic and Cultural Resources Investigations

The NRC staff reviewed three cultural resources investigations prepared on behalf of Holtec for the proposed CISF project. Multiple investigations occurred because the project design was altered after the initial study, resulting in the need to survey new areas. A review of archival data (Class I cultural resource inventory) was conducted on behalf of Holtec by Statistical Research, Inc. (SRI), under contract with Tetra Tech, Inc. The Class I inventory also included a review of the environmental setting, prehistoric and historic contexts, and BLM General Land Office (GLO) survey plats. A records search of both the direct and indirect APEs was conducted on November 30, 2016, by SRI using the New Mexico Cultural Resources Information System (NMCRIS), a digital repository of the Archaeological Records Management Sections (ARMS) of the New Mexico Historic Preservation Division (NMHPD). The area for this search was determined from the proposed layout documentation Holtec provided at the time (2016) and consisted of the 117 ha [290 ac] that includes the proposed CISF facility, rail spur, and access road. The 2016 records search also added a 1.6-km [1-mi] buffer around the proposed project footprint, totaling 4,407 ha [10,891 ac]. Additional record searches of BLM files at the Carlsbad Field Office (BLM-CFO), and online GLO and ARMS data were performed on February 5, 2019 and April 18, 2019 by archaeological consulting firm APAC, under contract with the Center of Excellence for Hazardous Materials Management, as part of the two more recent cultural resource surveys to cover additional survey areas that are now included in the final APE.

A total of 97 previous cultural investigations had taken place within the areas of the combined record searches in 2016 and 2019 (Murrell et al. 2016; Pangburn and Therriault, 2019a,b). SRI found that a total of 42 previously identified cultural resources had been identified within the areas of the 2016 records search, of which two were located within the assumed area of direct effects at the time: Site LA 89676 and HCPI 42196 (Site LA 149299) (Murrell et al., 2016). During the 2019 records searches, APAC identified eight sites that were located within 0.4 km [0.25 mi] of the proposed project area. Of these, Site LA 149299 (Pangburn and Therriault, 2019a,b) was the only site located within the final direct APE being considered in this EIS (EIS Table 3.9-1).

Site LA 89676 is a diffuse prehistoric artifact scatter, consisting of a few flaked artifacts and thermally altered caliche, covering an area of approximately 41,892 m^2 [450,922 ft^2]. The site was identified in 1992 by James Hunt, who recommended that the site had the potential to yield buried cultural materials and was therefore eligible for listing in the NRHP (Hunt 1992), and that recommendation was maintained by Murrell et al. (2016). Site LA 149299 was recorded as a historic period site consisting of a segment of railroad line with four distinct surface features. This site was originally identified in 2005 by Marron and Associates, at which time the NRHP eligibility of the Site LA 149299 was left undetermined as a result of an agreement between the NM SHPO and BLM (Murrell et al., 2016). In their report, Murrell et al. (2016) recommend Site LA 149299, now recorded as historic resource HCPI 42196, as not eligible for the NRHP.

Three Class III cultural resources surveys, which are intensive-level systematic field investigations, have been conducted within varying portions of the APE of the proposed CISF (Murrell et al., 2016; Pangburn and Therriault, 2019a,b). A Class III cultural resources survey was conducted between December 6 and 9, 2016, by SRI of a 117.40 ha [290.11 ac] survey

Table 3.9-1 Cultural Resources Documented Within the Direct APE During Class III Surveys

Site No.	Temporal Affiliation	Site Type	Recorded By	NRHP Eligibility	Note
LA 89676	Prehistoric Unknown	Artifact Scatter	Hunt, 1992; Murrell et al., 2016; Pangburn and Therriault, 2019a	Recommended Eligible	No longer within direct APE
LA 187010	Prehistoric unknown	Artifact scatter	Murrell et al., 2016	Recommended Not Eligible	Recommended Not Eligible as a result of the Section 106 site visit
HCPI 42195	1920s-1950s	2-track road	Murrell et al., 2016	Recommended Not Eligible	
HCPI 42196	1956+	Railroad Line	Marron and Associates, 2005; Murrell et al., 2016	Recommended Not Eligible	Includes former sites LA 149299 and 170340

area, covering both BLM and privately owned lands. Two additional pedestrian surveys were conducted on March 8, 2019, and April 22, 2019, by APAC (Pangburn and Therriault, 2019a,b). These surveys were conducted to align with alterations made to the CISF project and cover the entirety of the final APE.

The Class III survey SRI conducted in 2016 featured a pedestrian survey using transects spaced at 15-m [49-ft] intervals and maintained through the use of a Trimble GeoXH Global Positioning System (GPS) unit. Subsurface testing methods were applied during site investigations, where appropriate. SRI excavated three shovel tests measuring 50 × 50 cm [19.6 × 19.6 in] within the boundaries of each identified site or historic property to determine the site's stratigraphy, geomorphic context, level of integrity, and potential for intact buried cultural materials (Murrell et al., 2016).

The 2016 cultural resource survey SRI conducted resulted in identifying or resurveying the location of twenty cultural resources. These resources include: one previously recorded archaeological site (Site LA 89676), one newly recorded archaeological site (Site LA 187010), one previously documented historical period site (Site LA 149299), one newly documented historic cultural property (HCPI 42195), and 16 isolated occurrences (IOs) also labeled as Isolated Manifestations by the BLM (Murrell et al., 2016). As defined by BLM guidelines, an IM is distinguished from an archaeological site by containing fewer than 10 artifacts or one undatable feature. IOs should not be related to other nearby resources and are typically redeposited materials lacking significant context.

Per updates to the State of New Mexico standards and the BLM-CFO (2012c) guidelines, historical period linear resources such as roads and rail lines are formally designated as parts of the historical-period built environment; as such, SRI documented such properties using the New Mexico State Historic Preservation Division's Historic Cultural Property Inventory (HCPI) forms and requested HCPI designations rather than continuing to use archaeological site numbers for historic railroad resources. The HCPI forms have replaced the older Historic Building Inventory forms, expanding the range and variety of documentation of the built environment in the State. Based on the updated guidelines, Site LA 149299 was re-recorded using HCPI documentation and was assigned a new HCPI number (HCPI 42196). Two additional pedestrian surveys were conducted on March 8, 2019, and April 22, 2019, by APAC (Pangburn and Therriault, 2019a,b).

The March 2019 survey covered alterations to the 2016 CISF footprint of the proposed rail spur, access road, and fence locations, including an area located between the double fences on the north side of the facility, and covered 71.58 ha [176.9 ac] of BLM and privately owned lands, with transects spaced at 15 m [49 ft] intervals. This survey resulted in the recording of one previously recorded site (Site LA 149299/HCPI 42196) and three IOs. The three IOs consist of a prehistoric lithic flake and two historic isolated artifacts (Pangburn and Therriault, 2019a).

The April 2019 survey covered the northern portion of the secure area of the Holtec site that had not been included in the 2016 survey, an area of 18.39 ha [45.45 ac]. Nine IOs and no archaeological sites or HCPI properties were identified as a result of this survey. The nine IOs include six isolated non-diagnostic historic artifacts, two single-episode modern trash dumps, and one scatter of non-diagnostic aqua glass (Pangburn and Therriault, 2019b).

Historic Resources

Two historic resources have been identified during the surveys within the APEs. These resources are HCPI 42196 (first recorded as Site LA 149299) and HCPI 42195. HCPI 42196 consists of a segment of railroad line dating between 1935 and 1960. The line runs north-south, and portions of it are still in use for the Intrepid Potash Mine North operations. SRI noted that the active portion of the line had been recently repaired or replaced, while the spur line was in poor condition and deemed the overall site to be 51-75 percent intact. As SRI recorded, the site consists of four features: the mainline track, the earthworks for the non-functional spur line, a repaired trestle, and a section of siding paralleling the main line. The spur line rails and ties had been removed, along with portions of the embankment. No artifacts were observed in association with the features. SRI recommended that HCPI 42196 was not eligible under any of the four NRHP criteria and therefore recommended it as ineligible for listing in the NRHP (Murrell et al., 2016).

During APAC's March 2019 survey, it was determined that Site LA 149299 (HCPI 42196) extended into the new survey area under the previously recorded Site LA 170340, but that both sites are components of the same railroad spur line. APAC therefore suggested that the two sites be combined as one site, under the first assigned number of Site LA 149299. As modified, Site LA 149299 now extends along the existing railroad main line to the Intrepid Potash Mine North facility and encompasses all of the formerly designated Site LA 170340 portion of the line (approximately three total miles). That segment of the line was identified in June 2011 by Escondia Research Group, LLC (ERG). Based on archival research, ERG determined that this rail line, the National Main Spur was constructed in 1956 to provide access from the main branch of the Atchison, Topeka, and Santa Fe (AT&SF) railroad to the National Potash Company's milling operations. APAC's 2019 assessment of the site found it to be in the same general condition as previous surveys and still receiving routine maintenance as an active line. APAC recommended that Site LA 170340 (now Site LA 149299) was not eligible for the NRHP, based on the previous recommendation made by ERG and BLM's concurrence. ERG's recommendation was based on the research potential of the site being exhausted, as additional archaeological or archival investigations would not yield new or additional knowledge concerning the region's mining operations and railroad development (Pangburn and Therriault, 2019a).

HCPI 42195 consists of a segment of earthen and caliche gravel, 2-track road identified during the SRI survey in 2016. The road dates between 1920 and 1954, and crosses southwest-northeast through the project area north of Hydra Lane and west of County Road 28. Though it is still in active use by oilfield workers and ranchers, the road remains between 51–75 percent intact, with a few diversions due to seasonal flooding. The road consists of two features, the 2-track, which is sometimes underlain by a man-made, prism-shaped earthen roadbed, and a concrete box culvert. A former utility line associated with the road is no longer extant. The artifacts located near the road were generally recorded as IOs and included bottle glass, car parts, insulator fragments, metal cans, tobacco tins, metal fragments, and a 1954 New Mexico license plate. Though SRI excavated three shovel tests along the 2-track, no buried artifacts or cultural deposits were discovered in association with this historic property before the excavators encountered sterile hardpan. As early-to-mid-20th century 2-track roads such as HCPI 42195 are commonly found within this region, and as this individual road segment does not satisfy any of the four criteria for eligibility under the NRHP, SRI recommended that it was not eligible for listing in the NRHP (Murrell et al., 2016).

Prehistoric Archaeological Resources

Two prehistoric sites (Site LA 89676 and Site LA 187010) and 28 IOs have been identified during the field investigations of the three surveys conducted for the proposed CISF and associated facilities. The IOs include 21 historic and seven prehistoric manifestations. Site LA 89676, first recorded by James Hunt in 1992, consists of a diffuse surface lithic scatter consisting of thermally altered (burned) caliche and a few lithic flaked materials covering an area of 30,000 m^2 [322,917 ft^2] at the time of initial identification. Located within a series of terrace-line landforms descending to the west side of Laguna Gatuna, the site is covered by desert scrubland vegetation but has high (76-99 percent) ground visibility. During the revisit, SRI observed that the site has been heavily impacted by grazing and sheetwash erosion events and retains less than 26 percent of its originally estimated integrity. The resurvey of the area resulted in the expansion of the site boundaries to cover 42,264 m^2 [454,926 ft^2]. SRI observed no recognizable surface features but noted that approximately 500 pieces of disarticulated, burned caliche are present, with the densest concentrations found on the eastern edges. The lithic assemblage included seven flaked lithic debitage (four chert and three quartzite core flakes), one chalcedony core, and one chert scraper, with the lithic materials reflecting a focus on lithic reduction activities. SRI excavated three shovel tests across the site and encountered numerous caliche nodules in one shovel test, burned caliche between 10 and 20 centimeters below surface (cmbs) {3.9 and 7.8 inches below surface (inbs)} in one shovel test, and eight pieces of burned caliche and one chert flake between 20 and 30 cmbs [7.9 and 12 inbs] in the third shovel test. SRI interpreted the site as a temporary camp dating to an unknown prehistoric period. Though it lacked diagnostic materials and has been subjected to heavy surficial erosion and artifact migration, SRI found that the site had good potential to contain additional buried deposits with datable materials that could provide answers to several current research questions on prehistoric activities in this area of New Mexico. Therefore, SRI agreed with the previous recommendation, and recommended Site LA 89676 as eligible for listing in the NRHP under Criterion D (Murrell et al., 2016). Because of changes to the proposed rail spur design between the 2016 and 2019 surveys, Site LA89676 is no longer within the direct APE.

Site LA 187010, as described by the 2016 SRI survey, consists of a small prehistoric camp dating to an unknown temporal period. The site covers an area of 1,312 m^2 [14,122 ft^2] and consists of one feature (a burned caliche concentration) and a diffuse artifact scatter. Located within a series of terrace-line landforms descending to the west side of Laguna Gatuna, the site is covered by desert scrubland vegetation but has high (76-99 percent) ground visibility. The site has been impacted by fence construction, utility line installation, and livestock grazing, and its integrity as of 2016 is estimated to be 51–75 percent. The artifact scatter consisted of approximately 100 pieces of burned caliche, two lithic artifacts, a quartzite tested cobble, and a chert core flake. The 50 × 100-cm [19.6 × 39.9-in] caliche concentration extended to a depth of

10 cmbs [3.9 inbs], and was considered to be relatively intact below surface, though it was highly disturbed at the surface. SRI excavated three shovel tests but observed no artifacts or buried deposits in any of the tests, which terminated around 15 cmbs [5.9 inbs] at a calcrete substrate. SRI interpreted the site as a temporary camp focused on resource procurement activities around Playa Gatuna. Though the site has been disturbed at the surface and currently lacks temporally diagnostic artifacts, SRI noted that the feature contained intact, datable ash deposits, and as such could provide answers to several current research questions on prehistoric activities in this area of New Mexico. Therefore, SRI recommended Site LA 187010 as eligible for listing in the NRHP under Criterion D (Murrell et al., 2016). However, on February 4, 2020, the NRC staff, the NRC's archeological expert, Tribal representatives, and Holtec's archeological contractor visited the proposed project area to inspect and assess the sites identified in the Class III survey (ADAMS Accession No. ML20055E102). During the site visit, the NRC and Holtec staffs and Tribal representatives noted that Site LA 187010 consisted only of two surface finds and a presumed thermal feature, most likely a hearth. The only evidence of the thermal feature that could be identified during the site visit were approximately six pieces of thermally altered stone. No sign of burned caliche or ash was visible. The involved staffs and Tribal representatives noted that such a light scatter of artifacts, without an associated datable feature, would not meet BLM criteria for definition as an archaeological site, and could be more accurately recorded as an IM. Therefore, the consensus among all parties in attendance at the visit was that Site LA 187010 should not be recommended eligible for listing on the NRHP. The NRC staff has requested that Holtec conduct additional fieldwork to document the current condition of Site LA 187010 and amend the Class III report and site files to note the site recommendation change of Site LA 187010. The updated Class III report, along with the NRC staff recommendations, will be submitted to the NM SHPO for concurrence prior to finalization of this EIS. Consultation under NHPA Section 106 is ongoing.

Isolated Occurrences (Manifestations)

The 16 isolated occurrences, or isolated manifestations as labeled by BLM, identified by SRI (numbered as 1001–1008 and 1010–1017) include both historic and prehistoric artifacts. The six prehistoric isolates include two chert core flakes and four clusters of burned caliche fragments. The 10 historic IOs include one 1954 New Mexico license plate, one insulator fragment, one tobacco tin, two bottle breaks with multiple glass fragments each, and five episodes of dumping of multiple historic materials that included glass, metal cans, metal fragments, bridge ties, metal wire, and car parts from a single car (Murrell et al., 2016).

The three IOs (numbered as 1–3) APAC identified during the March 2019 survey include one prehistoric IO and two historic IOs. The prehistoric IO consists of one quartzite core reduction flake with cortex. The two historic IOs consist of two USGS brass cap markers, both dating to 1943, with one marking a quarter section and the other marking a section (Pangburn and Therriault, 2019a). The nine IOs (numbered as 1–9) recorded during APAC's April 2019 survey all date to the historic period. These IOs include one beer bottle, one 55-gallon metal drum, one toy pistol, one dark purple glass fragment, one soda bottle glass fragment, multiple glass fragments from a single source, and two single episode modern trash dumps containing multiple historic artifacts each (Pangburn and Therriault, 2019b). Isolated occurrences are not considered significant enough to warrant eligibility in the NRHP and therefore are not considered under the four NRHP criteria.

Paleontology

No paleontological finds have been identified in the proposed project area. However, east of the proposed project area is a geologic unit categorized by BLM as a potential fossil yield classification 4 (PFYC 4) that in other locations within New Mexico has contained fossils.

3.9.3 Tribal Consultation

Cultural resources that are considered sensitive and potentially sacred to modern Indian Tribes include burials, rock art, rock features and alignments (such as cairns, medicine wheels, and stone circles), American Indian trails, and certain religiously significant natural landscapes and features. Some of these resources may be formally designated as Traditional Cultural Property (TCPs) or sites of religious or cultural significance to Indian Tribes. A TCP is a site that is eligible for inclusion on the NRHP because of its association with cultural practices or beliefs of a living community, which are (i) rooted in that community's history and (ii) important in maintaining the continuing cultural identity of the community and meets the other criteria in 36 CFR 60.4.

The NRC staff identified 11 Tribes that may attach religious and cultural significance to historic properties in the area of potential effects and invited them to be consulting parties. The NRC staff sent letters to each Tribal representative on April 2, 2018 (EIS Appendix A). The letters included a brief description of the proposed undertaking, a site location map, an invitation for the Tribe to participate as a consulting party, and a response form. Four Tribes responded with interest to continue the consultation process, including Kiowa Tribe on August 20, 2018, and the Navajo Nation on September 14, 2018. The Ysleta del Sur Pueblo responded on August 21, 2018 that while they did not have any comments and that the project would not affect traditional, religious or culturally significant sites to their Pueblo, they requested consultation should any human remains or artifacts unearthed during this project be determined to fall under the Native American Graves Protection and Repatriation Act (NAGPRA) guidelines. Information regarding prior surveys of the proposed project area was sent on August 29, 2019 (ADAMS Accession No. ML19003A176) to interested Tribes: the Hopi Tribe, the Kiowa Tribe of Oklahoma, the Navajo Nation, and the Pueblo of Tesuque. Tribal consultation with the four Tribes will continue.

3.10 Visual and Scenic

The proposed CISF project is located in the Querecho Plains of southeastern New Mexico. The landscape is characterized by flat topography with vast areas of both stabilized and drifting dune sand. The ground surface in this area of barren land is characterized by a whitened caliche. Natural features visible from the proposed CISF project area include some incised runoff gullies and Laguna Gatuna to the east (Holtec, 2019a). Man-made structures currently located on the land surrounding the proposed CISF project area include a communications tower in the southwest corner of the proposed CISF project area, a producing well located near the communications tower, a small livestock water drinker, an aqueduct running along the northern half of the property, an abandoned oil recovery facility (including tanks and associated hardware) in the northeast corner, and another oil recovery facility (including tanks and associated hardware) in the far southeast corner (Holtec, 2019a).

Visual resources consist of landscape or visual character and visual sensitivity and exposure. The Visual Resource Management (VRM) Manual 8410 that BLM produced provides a means for determining visual values. The evaluation consists of three determinations: (i) scenic quality, (ii) sensitivity-level analysis, and (iii) delineation of distance zones. Based on these categories, the BLM places land into one of four visual resource inventory classes (i.e., Class I – IV). Additionally, four management objectives have been established based on scenic quality, visual sensitivity, and distance from key observation points for each of the classes. These management objectives for the classes describe the different degrees of modification allowed in the basic elements of the landscape. Classes I and II are the most valued, Class III is of moderate value, and Class IV is of least value.

BLM has determined visual resource management objectives for all public lands in the Carlsbad Resource Area (BLM, 1986). These management objectives were derived from previous land use planning and visual resource inventories for lands west of the Pecos River. The proposed CISF project area has been determined to be in the range of a Class IV (BLM, 1986), which means that the amount of change allowable to the characteristic landscape can be high, and that these changes may dominate the view and be the major focus of viewer attention.

Scenic quality is a measure of the visual appeal of a tract of land. In the visual resource inventory process, lands are given an A, B, or C rating based upon the apparent scenic quality, which is determined using seven factors. These factors include landform, vegetation, water resource features, color, adjacent scenery, scarcity, and cultural modifications (that either add to or detract from visual quality) (BLM, 1986). Based upon the BLM criteria, the proposed CISF project area received the lowest scenic quality rating. This rating means that the level of change to the characteristic landscape can be high and allows for the greatest level of landscape modification (ELEA, 2007).

Sensitivity levels are a measure of public concern for scenic quality. Public lands (which surround the proposed CISF project area) are assigned high, medium, or low sensitivity levels by analyzing the various indicators of public concern. Indicators of public concern include type of users, amount of use, public interest, adjacent land use, special areas, and other factors specific to the location. As described in EIS Section 3.2 (Land Use), because the proposed CISF project area and surrounding area are located in a sparsely populated area that is inclined to be used for cattle grazing or oil and gas exploration and production, the sensitivity level analysis for this location was determined to be low (ELEA, 2007).

Landscapes are subdivided into three distance zones, based on relative visibility from travel routes or observation points. These three zones are foreground, middleground, background, and seldom seen. The proposed CISF project area is not visible from any city, township, borough, or identifiable population center, and the property boundary is located 0.8 km [0.5 mi] north of U.S. Highway 62/180. Half of the proposed CISF project area lies within the foreground-middleground because of a slight crest or rise in the center of the proposed CISF project area. The remaining half of the proposed CISF project area lies in the seldom-seen zone on the opposite side of the crest from the highway (Holtec, 2019a).

3.11 Socioeconomics

This section describes the context of the proposed CISF project and the socioeconomic resources that have the potential to be directly or indirectly affected as a result of the proposed action. The following subsections summarize the affected socioeconomic environment for five primary topic areas: (i) demography (i.e., population characteristics), (ii) employment structure and personal income, (iii) housing availability and affordability, (iv) tax structure and distribution, and (v) community services. These subsections include discussions of spatial (e.g., regional, vicinity, and proposed CISF project area) and temporal considerations, where appropriate.

The NRC staff collected and analyzed regional socioeconomic data the U.S. Census Bureau (USCB) provided, including 5-year estimates that the USCB collects for commuting workers. The NRC staff considered the points of origin and destination of commuting workers within the 10 counties that fully or partially fell within an 80-km [50-mi] radius of the proposed CISF project as an influencing factor for determining the appropriate socioeconomic region of influence (ROI). Of the 10 counties, 3 are in New Mexico (Chaves, Eddy County, and Lea County), and 7 counties are in Texas (Andrews, Culberson, Gaines, Loving, Reeves, Winkler, and Yoakum). Four of the 10 counties have a large population of workers that could commute to Lea County, and those counties are: Lea and Eddy counties in New Mexico, and Andrews and Gaines counties in Texas. The socioeconomic ROI is larger than for some other resource areas because of the potential for commuting workers, jobs, and social resources to be impacted in nearby communities that are further from the proposed project location.

The NRC staff reviewed commuting worker flow data for the years 2011 through 2015 that the USCB provided (USCB, 2015). Commuting patterns of working residents 16 years old and older in Lea County demonstrate a preference for a work site in Lea and Eddy counties. Approximately 94 percent of Lea County commuting workers (approximately 27,650 individuals) worked in Lea County. Approximately 1,800 Lea County commuting workers work in other counties. The highest percentage of Lea County commuting workers that work outside of the county travel to Eddy County (about 27 percent). The existing National Enrichment Facility (NEF) and WIPP facilities are located within 64 km [40 mi] of the proposed CISF project area in Lea and Eddy counties, respectively. Also, the largest population centers within 80 km [50 mi] of the proposed CISF are the cities of Hobbs and Carlsbad, located in Lea and Eddy counties, respectively. The WCS facility is in Andrews County, Texas, which is within 80 km [50 mi] of the proposed CISF project area. Based on the 2011–2015 worker commute estimates the USCB provided (2015), approximately 15 percent of the residents from Andrews County, Texas, that work outside of Andrews County, and approximately 20 percent of the residents from Gaines County, Texas, that work outside of Gaines County, commuted to Lea County. The NRC staff anticipates that because of these statistics and preferences, some residents with the appropriate skill set for the proposed action may commute from Eddy, Andrews, and Gaines counties to the proposed CISF for work. Thus, it is reasonable to assume that most of the direct workforce and induced population would reside in Lea or Eddy County in New Mexico, or Andrews or Gaines County in Texas. Therefore, those four counties are considered the socioeconomic ROI for the proposed CISF.

3.11.1 Demography

3.11.1.1 Population Distribution in the Socioeconomic ROI

The proposed CISF project would be located in unincorporated Lea County, approximately halfway between the cities of Hobbs and Carlsbad. The average population density of the four counties within the socioeconomic ROI (Lea and Eddy counties in New Mexico, and Andrews and Gaines counties in Texas) is between 30.3 and 38.1 persons per km^2 [11.7 and 14.7 persons per mi^2]. The average State population density of New Mexico and Texas as of July 1, 2017, was about 6.6 and 41.9 persons per km^2 [17.3 and 108.4 persons per mi^2], respectively (USCB, 2018a,b).

The major communities and transportation routes within the 4-county ROI are depicted in EIS Figure 3.11-1. Estimated populations for counties and communities in the ROI, as determined by the USCB 2013–2017 5-year American Community Survey (ACS), are provided in EIS Table 3.11-1. The USCB 2013–2017 population estimates indicate that slightly more than

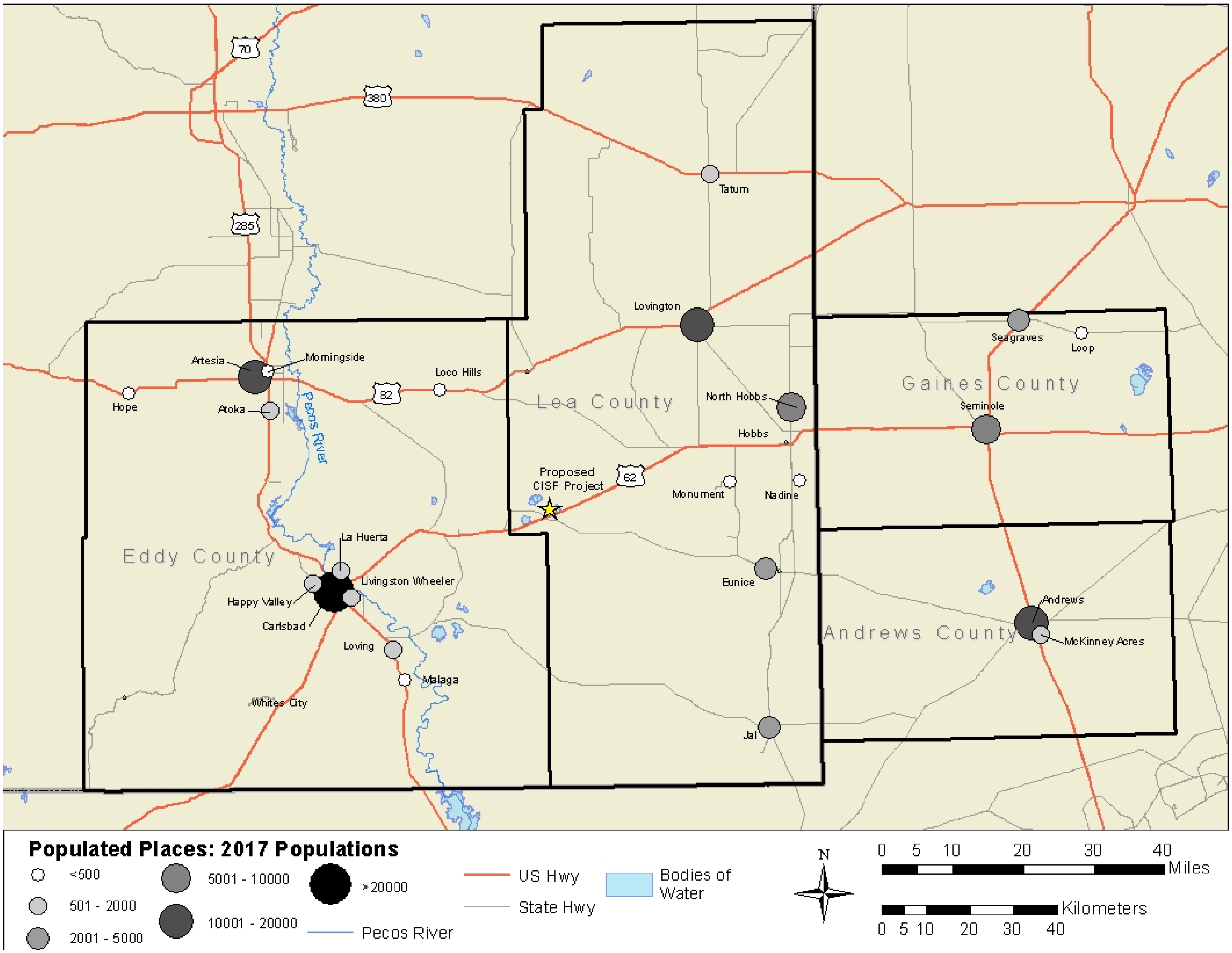

Figure 3.11-1 USCB Designated Places Within the Socioeconomic Region of Influence (Source: USCB, 2017)

Table 3.11-1 USCB Designated Places in the Socioeconomic Region of Influence	
Geographic Areas	**2013–2017 Population Estimate**
Lea County, New Mexico	69,505
Eunice	3,065
Hobbs	37,427
Jal	2,071
Lovington	11,558
Monument	104
Nadine	380
North Hobbs	6,083
Tatum	664
Eddy County, New Mexico	56,793
Atoka	948
Artesia	11,842
Carlsbad	28,393
Happy Valley	687
Hope	79
La Huerta	1,359
Livingston Wheeler	499
Loco Hills	21
Loving	1,331
Malaga	117
Morningside	983
Whites City	147
Andrews County, Texas	17,577
Andrews	13,333
McKinney Acres	1,033
Gaines County, Texas	19,889
Loop	427
Seagraves	2,737
Seminole	7,327
Source: USCB, 2017	

half of Lea County's population resided in Hobbs, the largest municipality in the county (USCB, 2017). Hobbs is the largest city in southeastern New Mexico and serves as a commercial center for the population within the 80-km [50-mi] radius of the proposed CISF project. The 2017 population estimates for Eddy County show that approximately half the county residents lived in Carlsbad, the county seat and the largest city in the county. The largest populated area in Andrews County is the city of Andrews, and the largest populated area in Gaines County is the city of Seminole, which are both located just outside the 80-km [50-mi] radius surrounding the proposed CISF project considered in this EIS. The majority of the population in Gaines County live in the cities of Seagraves and Seminole.

In addition to the population that resides in the ROI, approximately 7,000 people visit the Carlsbad market area each year. As described in EIS Section 3.11.2 (employment and income), some workers in the ROI, particularly in the oil and gas industry, may not reside in the ROI. Based on the U.S. census records and data collected from the New Mexico Environment Department's Drinking Water Bureau and New Mexico State Engineer Records, the City of Carlsbad estimates that the estimated daily population for the area including the City of Carlsbad and an approximately 32-km [20-mi] radius is as high as 74,279 people (Consensus Planning, 2019).

Because of the rapid rise and fall of populations in response to the oil and gas industry boom and bust cycles since the 1920s (Rhatigan, 2015), population centers have expanded to accommodate greater populations. The annual growth rates of the four counties between 2010 and 2017 were between 1.1 percent (Eddy County) and 3.6 percent (Andrews County) (USCB, 2018a). The percent of population change between 2010 and 2017 in each of the four counties is provided in EIS Figure 3.11-2.

This population trend is also anticipated to occur in other communities within the ROI and may continue through the term of the license of the proposed CISF project. For these reasons, population growth experienced in the socioeconomic ROI cannot be reasonably predicted, because of the oil and gas boom and bust cycles. Therefore, NRC staff does not provide population projections for the socioeconomic ROI for the proposed license term of the project in this EIS.

Localized Population Distribution

Several small communities of 500 people or less are present within the ROI (EIS Figure 3.11-1). In addition, about 27,000 people in the ROI live outside of USCB designated populated areas. Therefore, the NRC staff also looked at 13 Census County Divisions (CCDs) within the socioeconomic ROI to analyze population characteristics on a smaller scale than the county level, but that also includes people who do not live within a USCB-designated area (EIS Figure 3.11-3). A CCD is an area within a county established by the USCB and local and State officials that provide a useful set of information that can be analyzed for planning purposes (USCB, 1994). Select information for the CCDs is provided in this section of the EIS as a comparison to other geographic areas, such as counties.

The community of Monument is the closest USCB-designated place to the proposed CISF project area (Figure 3.11-1). The cities of Hobbs and Carlsbad are the closest commercial centers to the CISF project area and will supply the majority of retail and housing needs during the license term of the proposed project. Hobbs is located in the Hobbs CCD, and Carlsbad is located within the Carlsbad CCD. The population within these two CCDs represent approximately 65 percent of all people living in Eddy and Lea counties (EIS Figure 3.11-3 and EIS Table 3.11-1).

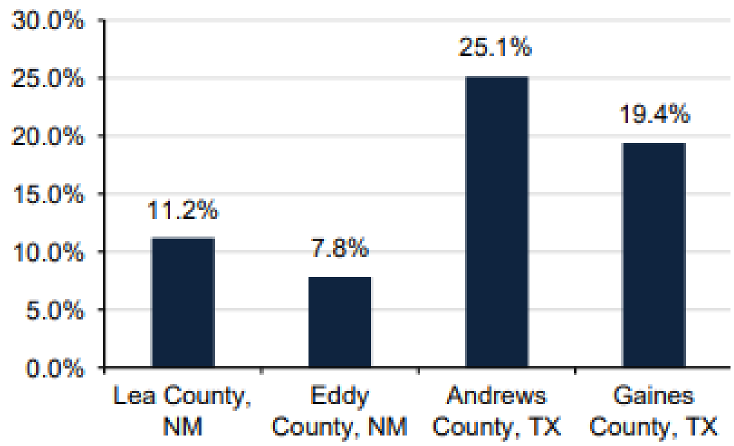

Figure 3.11-2 Percent of Total Population Change by County Between 2010 and 2017 in the Socioeconomic Region of Influence (Source: Modified from Economic Profile System, 2019a)

3.11.1.2 Select Population Characteristics in the Socioeconomic ROI

EIS Table 3.11-2 lists selected population characteristics of the counties in the socioeconomic ROI and in, for comparison, New Mexico and Texas. EIS Table 3.11-3 lists selected population characteristics of the CCDs in the ROI. Population characteristics, including race and ethnicity, of the counties in the ROI broadly reflect those same characteristics in New Mexico and Texas.

Race and ethnicity characteristics of the CCDs generally reflect the same range of characteristics compared to their respective counties and States, with a couple exceptions. The percentage of African Americans in the Hobbs CCD is slightly higher than Lea County and New Mexico. The percentage of individuals of Hispanic ethnicity in the Loco Hills CCD is the highest of all the CCDs and higher than both Eddy County and New Mexico. The percentage of individuals of Hispanic ethnicity in the Seagraves CCD is the highest of the four Texas CCDs and higher than that of Gaines County and Texas. The average of all populations with Hispanic ethnicity that reside in the 13 CCDs is 51.1 percent.

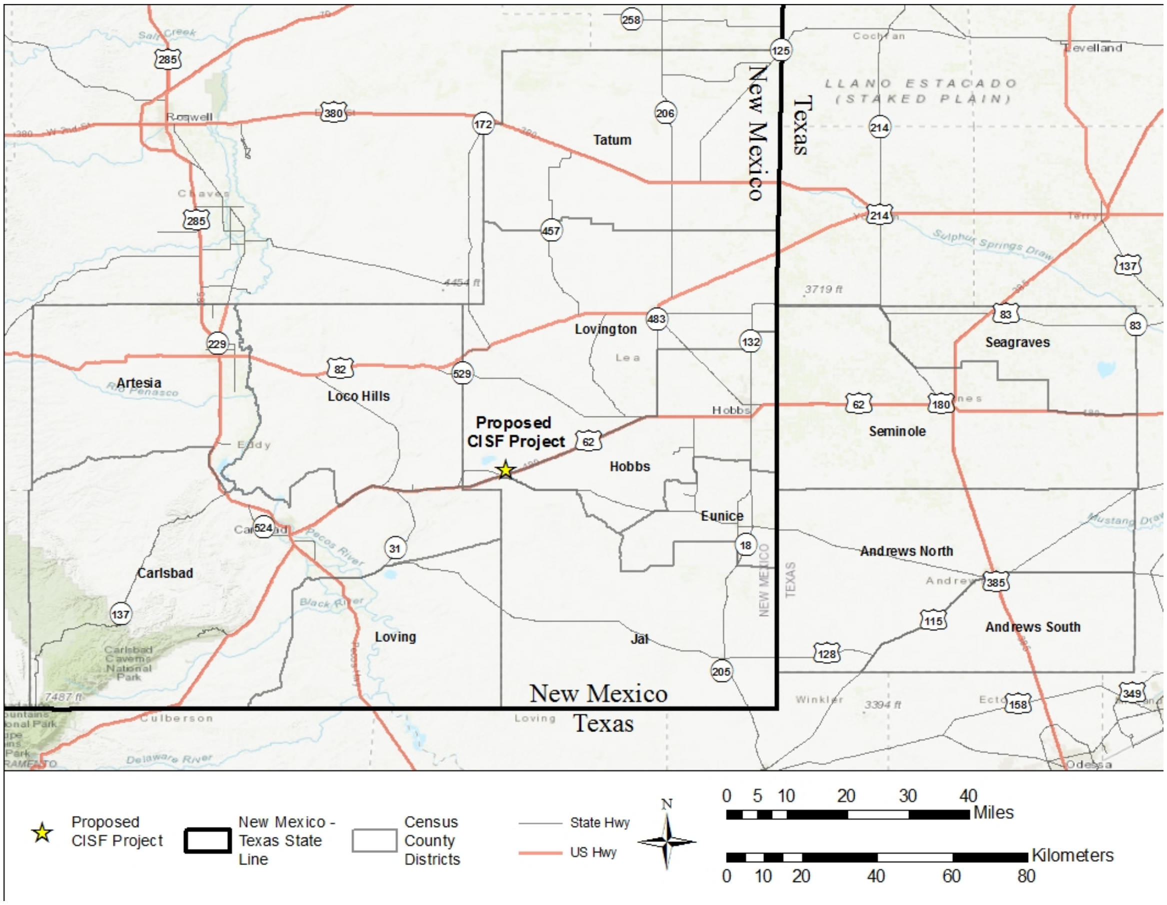

Figure 3.11-3 Census County Districts in the Socioeconomic Region of Influence (Source: Modified from USCB, 2017)

Table 3.11-2 Select Population Characteristics of Counties Within the ROI and the States of New Mexico and Texas							
State/County	**African American (%)**	**American Indian and Alaskan Native (%)**	**Asian (%)**	**Native Hawaiian or Other Pacific Islander (%)**	**Some Other Race (%)**	**Two or More Races (%)**	**Hispanic Ethnicity (%)**
New Mexico (State)	1.8	8.7	1.3	0.0	0.2	1.6	48.2
Eddy County	1.4	1.3	0.5	0.0	0.1	0.7	47.5
Lea County	3.6	0.7	0.0	0.0	0.2	1.4	56.8
Texas (State)	11.7	0.2	4.5	0.1	0.1	1.6	38.9
Andrews	1.5	0.1	0.2	0.1	0.0	1.6	55.4
Gaines	2.3	0.1	0.5	0.0	0.2	0.1	40.6
Source: USCB, 2017							

Table 3.11-3 Select Population Characteristics of Census County Districts Within the ROI							
Census County District	**African American (%)**	**American Indian and Alaskan Native (%)**	**Asian (%)**	**Native Hawaiian or Other Pacific Islander (%)**	**Some Other Race (%)**	**Two or More Races (%)**	**Hispanic Ethnicity (%)**
Artesia CCD, Eddy County, New Mexico	1.1	1.6	0.8	0.0	0.0	0.1	50.6
Carlsbad CCD, Eddy County, New Mexico	1.6	0.8	0.3	0.1	0.1	1.0	45.0
Loco Hills CCD, Eddy County, New Mexico	0.0	0.0	0.0	0.0	0.0	0.0	80.8
Loving CCD, Eddy County, New Mexico	0.0	7.3	0.0	0.0	0.0	1.1	60.2
Eunice CCD, Lea County, New Mexico	0.0	0.2	0.0	0.0	0.0	0.0	52.1
Hobbs CCD, Lea County, New Mexico	0.0	0.5	0.4	0.0	0.0	1.1	54.4
Jal CCD, Lea County, New Mexico	0.7	0.1	0.0	0.0	0.2	0.6	66.4

Table 3.11-3	Select Population Characteristics of Census County Districts Within the ROI						
Lovington CCD, Lea County, New Mexico	0.0	1.0	0.0	0.0	0.0	0.6	47.6
Tatum CCD, Lea County, New Mexico	1.3	0.1	0.3	0.1	0.0	2.0	56.9
Andrews North CCD, Andrews County, Texas	2.7	0.0	0.0	0.0	0.0	0.0	48.3
Andrews South CCD, Andrews County, Texas	2.3	0.0	0.0	0.0	0.0	0.1	75.6
Seagraves CCD, Gaines County, Texas	2.3	0.2	0.6	0.1	0.2	0.1	31.5
Seminole CCD, Gaines County, Texas	0.0	0.5	0.4	0.0	0.0	1.1	54.4
Source: USBC, 2017							

3.11.1.3 Environmental Justice: Minority and Low-Income Populations

Methodology

A minority or low-income community may be considered as either a population of individuals living in geographic proximity to one another or a dispersed/transient population of individuals (e.g., migrant workers) where either type of group experiences common conditions of environmental exposure (NRC, 2003). NUREG–1748 defines minority categories as: American Indian (not of Hispanic or Latino origin) or Alaskan Native, Asian, Native Hawaiian or other Pacific Islander, African American, some other race, and Hispanic or Latino ethnicity (of any race) (NRC, 2003). The 2000 Census introduced a multiracial category. Anyone who identifies themselves as white and a minority is counted as that minority group. Individuals that identify themselves as more than one minority are counted in a “two or more races” group (NRC, 2003). Low income is defined as being below the poverty level, as the USCB defined (NRC, 2003). The NRC recommended area for evaluating census data is the census block group, which is delineated by the USCB and is the smallest area unit for which race and poverty data are available (NRC, 2003). The NRC staff used ESRI ArcGIS® online and the USCB website to identify block groups within 80 km [50 mi] of the proposed CISF project area. This radius was selected to be inclusive of (i) locations where people could live and work in the vicinity of the proposed project and (ii) of other sources of radiation or chemical exposure. The NRC staff included a block group if any part of the block group was within 80 km [50 mi] of the proposed CISF project area; 115 block groups were identified as being within, or partially within, the

80-km [50-mi] radius. The NRC guidance in NUREG–1748 (NRC, 2003) indicates that a potentially affected environmental justice population exists if at least one of these conditions exists: either the minority or low-income population of the block group is more than 50 percent of the entire block group population; or the minority or low-income population percentage of the block group is significantly, or meaningfully, greater (typically by at least 20 percentage points) than the minority or low-income population percentage in the geographic areas chosen for comparative analysis.

Minority Populations

Using the USCB annual surveys conducted during 2013–2017 that represent characteristics during this period (American Community Survey 5-year estimates), the NRC staff calculated (i) the percentage of each block group's population represented by each minority category for each of the 115 block groups within the 80-km [50-mi] radius, (ii) the percentage that each minority category represented of the entire populations of New Mexico and Texas, and (iii) the percentage that each minority category represented for each of the counties that has some land within the 80-km [50-mi] radius of the proposed CISF project area. If the percentage meets one of the above-stated thresholds, then that block group was identified as a potentially affected environmental justice population. If a block group met one or both of the criterion for either the State or the county, it was not double-counted. In light of high minority populations in New Mexico and to better meet the spirit of the NRC guidance to identify minority populations, the NRC staff included census block groups with a percentage of Hispanics or Latinos at least as great as the statewide average. According to the USCB, the percent of people who self-identify as Hispanic or Latino in the 2013–2017 period in Texas is 38.9 percent, and 48.2 percent in New Mexico.

Out of the 115 block groups located completely or partly within 80 km [50 mi] of the proposed CISF project area, there are 64 block groups that meet at least one of the two NRC guidance criteria previously described in this section, or the more inclusive definition applied to this analysis (i.e., including census block groups with a percentage of Hispanics or Latinos at least as great as the statewide average). All of the 64 block groups have Hispanic populations that exceed one of these criteria. Two of the 64 block groups also have black populations that exceed one of these criteria. EIS Figure 3.11-4 provides a graphical representation of the block groups with potentially affected minority populations. Appendix B provides additional detail about the minority populations in the 115 block groups.

Low-Income Populations

The NRC guidance defines low-income households based on statistical poverty thresholds (NRC, 2003), which is consistent with the Council on Environmental Quality's (CEQ) recommendation for Federal agencies in assessing environmental justice (CEQ, 1997). The NRC staff applied the 50 percent or greater than 20 percent standard in NUREG–1748 Appendix C to compare the low-income population in the block groups to the statewide percentage.

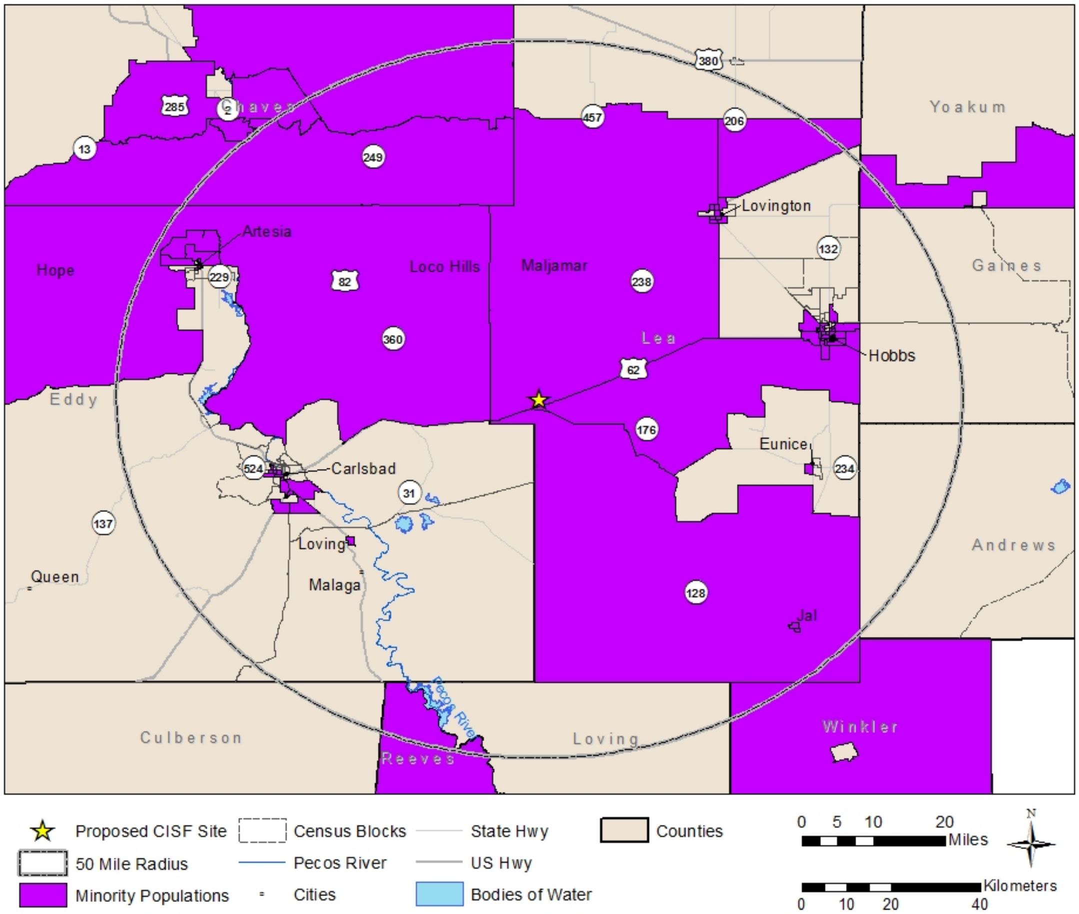

Figure 3.11-4 Block Groups with Potentially Affected Minority Populations Within 80 km [50 mi] of the Proposed CISF Project Area (Source: Modified Using ArcGIS and Data Collected from USCB, 2017)

Of the 115 block groups located completely or partly within 80 km [50 mi] of the proposed CISF project area, there are 8 block groups with low-income families that meet one of the previously described criteria used in this EIS to identify potentially affected environmental justice populations. There are also 8 block groups with low-income individuals in the region that meet one of the criteria. Although New Mexico and Texas are both above the national average for percentage of low-income individuals, about 90 percent of the block groups within the 80-km [50-mi] region are within 20 percentage points of the national average of 14.6 percent (USCB, 2017). EIS Figure 3.11-5 provides a graphical representation of the block groups with potentially affected low-income populations.

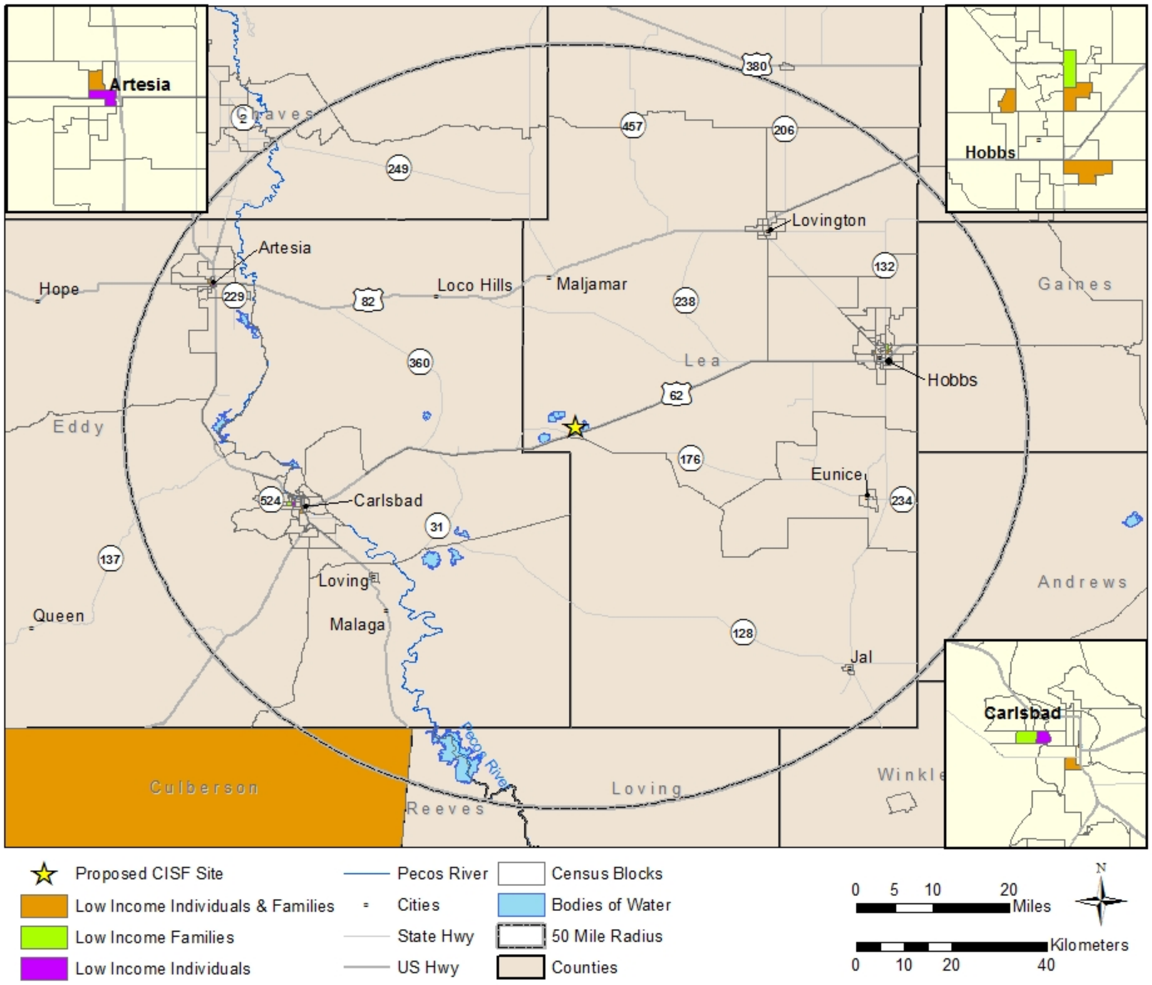

Figure 3.11-5 Block Groups with Potentially Affected Low-Income Populations Within 80 km [50 mi] of the Proposed Holtec CISF (Source: Modified using ArcGIS and data collected from USCB, 2017)

The estimated percentages of New Mexico families and individuals that live below the 2017 poverty level (i.e., the poverty rate) are 15.6 percent and 20.6 percent, respectively. The estimated poverty rates in Texas for families and individuals are 12.4 percent and 16.0 percent, respectively (USCB, 2017). EIS Figure 3.11-6 provides a comparison of low-income families and individuals by county. The described poverty rates of the four counties within the region are below their respective State poverty rates. Appendix B provides additional detail about the low-income populations in the 115 block groups.

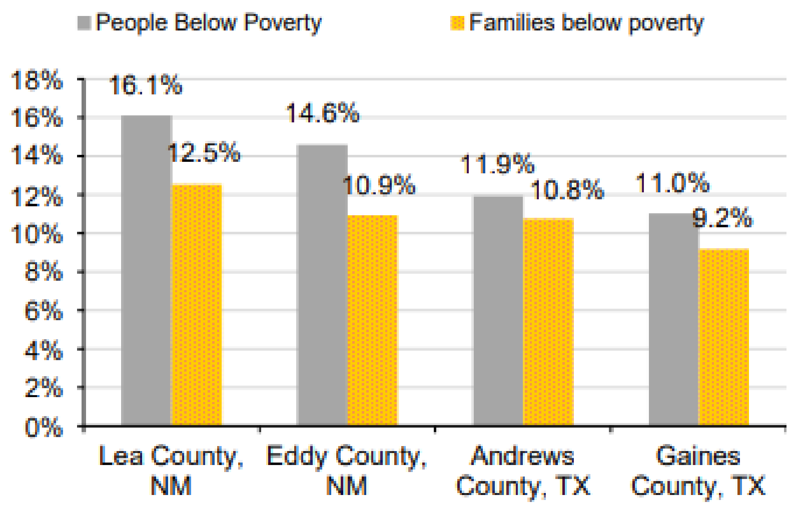

Figure 3.11-6 Percent of Individuals and Families Below Poverty Level by County (Source: Modified from Economic Profile System, 2019a)

3.11.2 Employment and Income

Employment

Employment by economic sector in the socioeconomic ROI over the 15-year period between 2001 and 2017 is provided in EIS Table 3.11-4. The total number of jobs in the ROI has increased approximately 39.7 percent. As demonstrated in EIS Table 3.11-4, the mining industry provides more jobs and has experienced the largest growth (over 5,500 jobs) than any other source of employment in the ROI over the last 17 years (Economic Profile System, 2019b). In response to the NRC staff's request for supplemental information, Holtec contacted all employers within 8 km [5 mi] of the proposed CISF project area and reported that about 303 people are employed within 8 km [5 mi] of the proposed CISF project area. No transient workers were reported (Holtec, 2017, 2019a).

The 2017 average wage estimates for the industries listed in EIS Table 3.11-5 ranges from approximately $17,458 (leisure and hospitality) to $83,624 (Federal government). The estimated 2017 average wage in the mining industry in the ROI is $76,871. The median income for workers in each county are less than the average wage by industry but higher than the median income for workers in New Mexico and Texas (USCB, 2017). Median income is the amount that divides the income distribution into two equal groups, half having income above that amount, and half having income below that amount. The estimated median worker income within the ROI ranges from $34,584 to $45,553. The median worker income in New Mexico is $27,254, and $31,494 in Texas (USCB, 2017).

The average monthly unemployment rate for the four counties within the socioeconomic ROI between 2013 and 2017 ranged from 3.4 to 8.2 percent (Economic Profile System, 2018). For comparison, the estimated unemployment rate for 2017 for the 13 CCDs within the ROI ranged from 0 percent in Loco Hills CCD to 13.8 percent in Tatum CCD (USCB, 2017). The estimated 2017 unemployment rate was 7.7 percent in New Mexico and 5.8 percent in Texas.

	2001	2010	2017	Change 2010-2017
Total Employment (number of jobs)	68,146	80,746	95,212	14,466
Non-services related	~21,836	~28,087	~36,309	~8,222
Farm	3,674	2,554	2,669	115
Forestry, fishing, & ag. services	~1,231	~1,158	~1,481	~323
Mining (including fossil fuels)	10,332	15,265	21,056	5,791
Construction	4,721	6,810	8,561	1,751
Manufacturing	1,878	2,300	2,542	242
Services related	~34,332	~42,182	~49,337	~7,155
Utilities	515	662	820	158
Wholesale trade	2,259	2,289	2,618	329
Retail trade	7,441	7,201	8,591	1,390
Transportation and warehousing	2,445	2,968	4,466	1,498
Information	696	~751	668	-~83
Finance and insurance	1,804	2,478	2,549	71
Real estate and rental and leasing	1,568	2,057	2,490	433
Professional and technical services	~1,475	~2,399	2,496	~97
Management of companies	~173	~317	420	~103
Administrative and waste services	~3,332	~4,115	3,932	-~183
Educational services	~272	~716	~783	~67
Health care and social assistance	~3,642	~6,259	~6,900	~641
Arts, entertainment, and recreation	~473	~778	~982	~204
Accommodation and food services	~3,896	~4,890	6,810	~1,920
Other services, except public admin.	4,341	4,302	4,812	510
Government	9,785	10,667	10,842	175

All employment data are reported by *place of work*. Estimates for data that were not disclosed are indicated with tildes (~).

Table 3.11-4 Employment by Industry in ROI in 2001, 2010, and 2016 (Source: Modified from Economic Profile System, 2019b)

Employment and Wages in 2016	Avg. Annual Wages (2017 $s)
Total	$51,472
Private	$52,087
Non-Services Related	$68,563
Natural Resources and Mining	$72,014
Agriculture, forestry, fishing & hunting	$35,994
Mining (incl. fossil fuels)	$76,871
Construction	$55,934
Manufacturing (Incl. forest products)	$76,308
Services Related	$41,069
Trade, Transportation, and Utilities	$44,694
Information	$43,337
Financial Activities	$52,271
Professional and Business Services	$60,013
Education and Health Services	$39,985
Leisure and Hospitality	$17,458
Other Services	$37,940
Unclassified	$65,814
Government	$48,113
Federal Government	$83,624
State Government	$44,101
Local Government	$45,216

Table 3.11-5 Average Wages by Industry in the ROI (Source: Modified from Economic Profile System, 2018)

According to the information provided in EIS Table 3.11-4, the farm, forestry, fishing, and agriculture industries employed approximately 4,150 workers in the ROI, which is about 4.4 percent of workers in the ROI, in 2017. According to the most recent agricultural census the United States Department of Agriculture (USDA, 2019) conducted in 2017, the majority of farms in New Mexico are located in the western half of the State, while the majority of Texas farms are located in the eastern half of the State (USDA, 2019). Approximately 4 percent of all farms in New Mexico are located in Eddy and Lea Counties, and approximately 0.3 percent of all farms in Texas are located in Andrews and Gaines Counties. Some of the agricultural products from this region include sorghum, cotton, pecan, and dairy (USDA, 2018, 2019).

3.11.3 Housing

A comparison of the USCB 2013–2017 estimates for occupied and vacant housing for Lea County, Eddy County, Gaines County, and Andrews County is provided in EIS Figure 3.11-7. During the 2013–2017 period, Lea County had the highest estimated percent of vacant housing (15.1 percent), and Gaines County had the lowest (10.9 percent). The median monthly costs for owner-occupied mortgages and rent during the same period are provided in EIS Figure 3.11-8. In the 2013–2017 period, Andrews County had the highest estimated monthly mortgage costs and monthly rent in the ROI, and Gaines County had the lowest estimated monthly owner-occupied mortgage costs and monthly rent.

As previously described, because of the current upswing in oil and gas production, population surges have occurred in the ROI. According to the CDD's 2015 housing report (CDD, 2015), residential occupancy rates and hotel and housing prices increased because of the need for more housing in the Carlsbad area. The housing report indicated that the existing housing did not adequately meet the needs of households where (i) the primary wage earner makes $10 per hour or less, (ii) the general workforce earns between $10 and $16 an hour, and (iii) households who can afford the market area prices cannot find housing suitable to rent or buy. The report also indicates that to meet the demand of the temporary oil and gas industry workforce, many workers live in motels, RV parks, or impromptu camper settlements during the week and return to homes outside of Eddy County on the weekends because they cannot relocate their families because of the lack of housing or cannot afford the increased housing costs. Monthly building activity reports for the City of Carlsbad indicate that construction permits for a variety of housing arrangements are issued on a regular basis (City of Carlsbad, 2018). Lea County has experienced similar housing constraints since oil prices began to increase in 2013 (Rhatigan, 2015; State of New Mexico Interstate Stream Commission Office of the State Engineer, 2016).

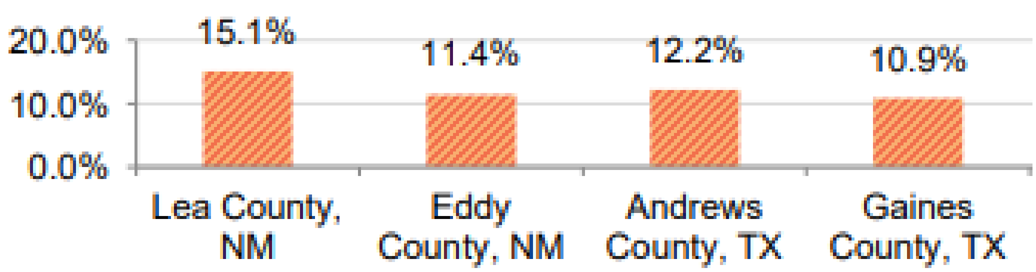

Figure 3.11-7 Estimated Percent of Vacant Housing in the 2013-2017 Period (Source: Modified from Economic Profile System, 2019a)

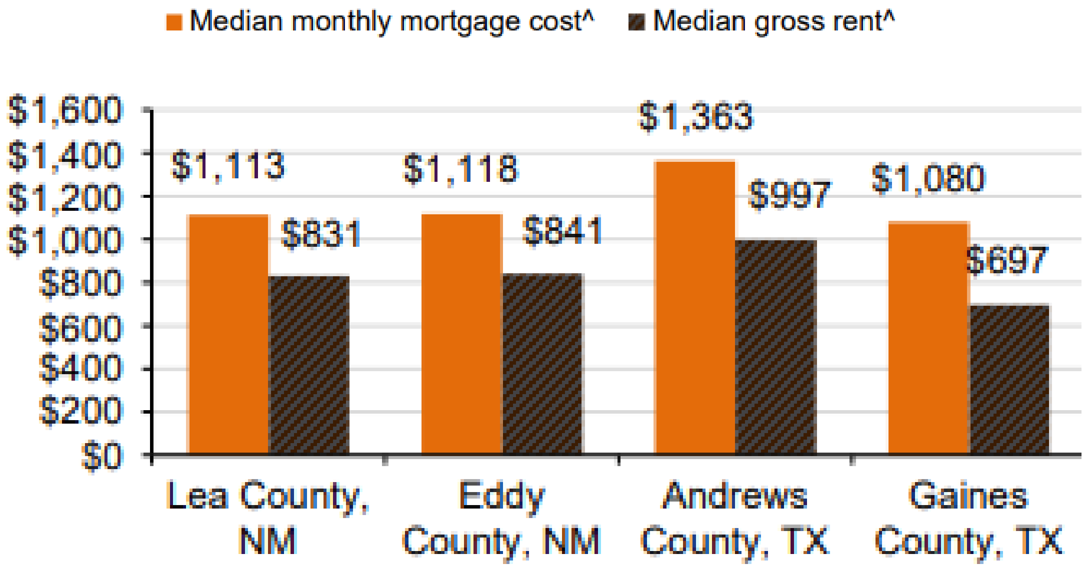

Figure 3.11-8 Median Monthly Mortgage Costs and Gross Rent in the 2013-2017 Period (Source: Modified from Economic Profile System, 2019a)

The City of Andrews, Texas, has experienced growth since 2003 and completed a comprehensive plan in 2013 to guide the city's growth and development (City of Andrews, 2019). A statewide Texas housing analysis conducted in 2011 and 2012 evaluated housing in rural counties, including Andrews and Gaines Counties (Bowen National Research, 2012). The report indicated that in the West Texas region, including Andrews and Gaines Counties, the housing stock was old and substandard, and the greatest demand was for affordable one- through three-bedroom, single-family homes or apartments.

The cost of building housing is very high, particularly in rural areas, and developers worry about the "boom and bust" nature of the oil and gas industry; however, new residential projects are being planned by Lea and Eddy Counties and the Cities of Carlsbad and Hobbs that would increase housing capacity to meet the demands of the population growth (Consensus Planning, 2019; State of New Mexico Interstate Stream Commission Office of the State Engineer, 2016).

According to the HUD, families who pay more than 30 percent of their income for housing are considered cost burdened (HUD, 2018). In the 2013–2017 period, between 17.4 and 19.8 percent of home owners in the ROI spent more than 30 percent of their income on housing, and between 15.2 and 33.0 percent of renters spent more than 30 percent of their income on housing. The percent of owners and renters that spent more than 30 percent of their income on housing by each county in the ROI is provided in EIS Figure 3.11-9. For comparison, in the 2013–2017 period, approximately 22 percent of homeowner-occupied units in New Mexico and 20.8 percent in Texas cost more than 30 percent of occupant income on housing, and approximately 44.6 percent of renters in New Mexico and 44.3 percent of renters in Texas spent more than 30 percent of their income on housing (USCB, 2017).

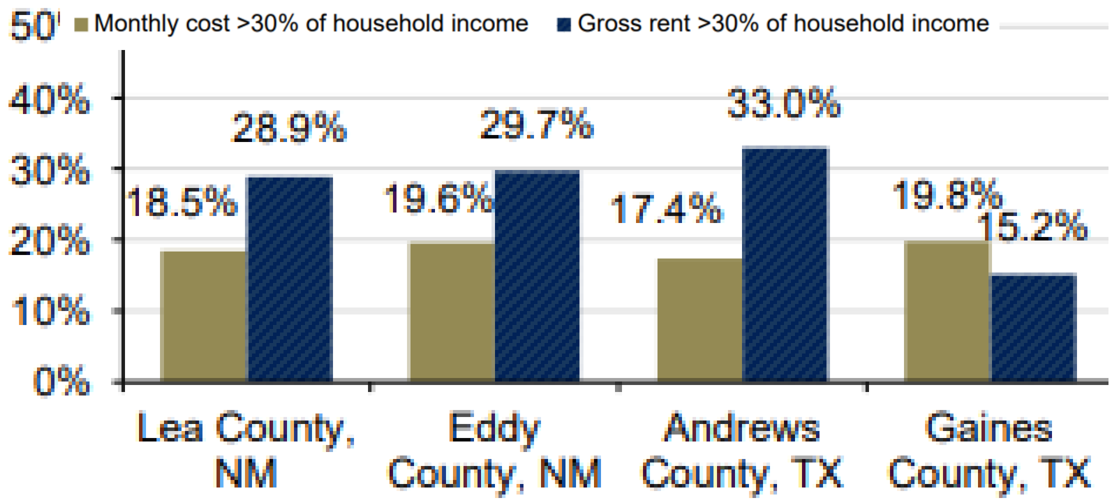

Figure 3.11-9 Housing Costs as a Percent of Household Income in the 2013-2017 Period (Source: Modified from Economic Profile System, 2019a)

3.11.4 Local Finance

Corporate Income Taxes

According to the New Mexico Taxation and Revenue Department (NMTRD), New Mexico imposes a corporate income tax on the total net income (including New Mexico and non-New Mexico income) of every domestic and foreign corporation doing business in or from the State, or which has income from property or employment within the State. The percentage of New Mexico income is then applied to the gross tax. For the taxable years beginning on or after January 1, 2018, corporations with a total net income exceeding $500,000 annually, corporate income tax is $24,000 plus 5.9 percent of net income over $500,000. Corporations with a total net income below $500,000 are taxed at 4.8 percent of net income. New Mexico also levies a corporate franchise tax of $50 per year. (NMTRD, 2017a).

Individual Income Taxes

New Mexico imposes an individual income tax on the net income of every resident and nonresident employed or engaged in business in or from the State or deriving any income from any property or employment within the State. The rates vary depending upon filing status and income. The top tax bracket is 4.9 percent (NMTRD, 2017b). Texas does not impose an individual income tax.

Sales and Gross Receipts Tax

New Mexico has a gross receipts tax structure instead of a sales tax structure. This tax is mostly passed onto the consumer through the increases in the cost of goods. The State gross receipts tax rate through June 2019 is 5.125 percent. The gross receipts tax rate varies throughout the State from 5.125 percent to 9.25 percent, depending on the location of the business. It varies because the total rate combines rates imposed by the State, counties, and, if applicable, municipalities where the businesses are located. The business pays the total gross receipts tax to the State, which then distributes the counties' and municipalities' portions to them

(NMTRD, 2018a). The total gross receipts tax is paid to the State. The State keeps its portion and distributes the counties' and municipalities' portions to them. The State's portion of the gross receipts tax, which is also the largest portion of the tax, is determined by State law. Changes to the State rate occur no more than once a year, usually in July. The gross receipts taxes effective between July and December 2018 for communities in Lea County range from 5.5 to 7.4375 percent, and gross receipts taxes for communities in Eddy Counties range from 5.9583 to 7.8958 percent (NMTRD, 2018b).

According to the Texas Comptroller of Public Accounts (TCPA), Texas imposes a State sales and use tax of 6.25 percent on all retail sales, leases and rentals of most goods, as well as taxable services. Local taxing jurisdictions (cities, counties, special purpose districts and transit authorities) can also impose up to 2 percent sales and use tax for a maximum combined rate of 8.25 percent (TCPA, 2018a). Texas imposes a franchise tax on applicable taxable entities that provide goods and services. The franchise tax rate is based on an entities' profit margin as determined by a formula based on gross receipts (TCPA, 2018b). In addition, Texas imposes a miscellaneous gross receipts tax on utilities. The rates of the miscellaneous gross receipt tax is based on the population of the incorporated area where business is done (TCPA, 2018c).

Property Taxes

Property taxes in New Mexico are among the lowest in the United States. Four governmental entities within New Mexico are authorized to impose property taxes—the State, counties, municipalities, and school districts. Property assessment rates are 33.3 percent of the property value (Holtec, 2019a). The tax applied to property is a composite of State, county, municipal, and school district levies. Millage or mill rate is a term municipalities use to calculate property taxes. The amount of municipal tax payable by a property owner is calculated by multiplying the mill rate by the assessed value of a property and dividing by 1,000. New Mexico distributes revenues from property tax rate totals as follows: 11.85 mills to counties, 7.65 mills to municipalities, and .5 mills to school districts. Eddy and Lea Counties have a large concentration of mineral extraction properties but very small portions of the State's residential property tax base. In 2017, *ad valorem* production and equipment represented 45.7 percent of net taxable property value in Eddy County and 50.7 percent in Lea County (NMDFA, 2017).

In Texas, property taxes are based on the most current year's market value. For year 2017, Andrews County, Texas, had a county property tax rate of $0.6007 per $100 assessed value, a school district tax of $1.2 per $100 assessed value, and a municipal rate for the City of Andrews of $0.189 per $100 assessed value (TCPA, 2017a,b). The county tax rate for Gaines was $0.593967, with municipal and school district rates of $0.5402 and $0.320325, respectively (TCPA, 2017a,b). A summary of 2018 taxable values for the four counties within the socioeconomic ROI for the proposed CISF is provided in EIS Table 3.11-6.

Table 3.11-6 2018 Tax Values in the Socioeconomic Region of Influence

County	Total ($)
Lea County, New Mexico	4,865,047,771
Eddy County, New Mexico	4,552,534,501
Andrews County, Texas	4,330,418,573
Gaines County, Texas	3,261,062,984

Sources: Andrews County, 2018; Gaines CAD, 2019; NMDFA, 2018

3.11.5 Community Services

Similar to the ongoing regional housing planning and development efforts described in Section 3.11.3 (Housing), community infrastructure projects such as water and electrical utility expansions, roadway expansions, a new fire station in south Carlsbad, and Carlsbad main street enhancements are planned in the ROI (City of Carlsbad, 2018; State of New Mexico Interstate Stream Commission Office of the State Engineer, 2016).

Andrews, Texas, is positioned to support community initiatives in the next several years, including further developing the downtown streetscape and business parks and securing long-term water needs (City of Andrews, 2019). Gaines County continues to heavily invest in its agribusiness, and the City of Seminole is considering transportation improvements for truck traffic (Seminole Economic Development Board, 2018; Permian Basin Regional Planning Commission, 2015).

Education

For the 2014–2015 school year, the total enrollment in early childhood education public schools for children age 3 through Grade 12 in the ROI was 32,669 students (Holtec, 2019a). The student-to-teacher ratio in the ROI is between 12:1 and 17:1 (Holtec, 2019a). There were also 4 private schools in the ROI in the 2015–2016 school year (NCES, 2018). In addition, New Mexico Junior College, University of the Southwest, and New Mexico State University Carlsbad are located in the ROI. Additionally, Andrews County, Texas, hosts a business and technology center. However, the closest universities and other post-secondary schools in Texas are located in Midland-Odessa and Lubbock, Texas, which are outside the ROI.

Hospitals

The proposed CISF project area is located approximately 58 km [36 mi] east of the Carlsbad Medical Center in Carlsbad and approximately 61 km [38 mi] west of the Lea Regional Medical Center in Hobbs, which are the closest hospitals to the proposed CISF with emergency services (Holtec, 2019a). The Artesia General Hospital in Artesia; Memorial Hospital in Seminole, Texas; and Permian Regional Medical Center in Andrews, Texas, also provide emergency services. The Nor-Lea Hospital District supports medical clinics in Tatum and Lovington. Medical clinics also provide health care services in the towns of Jal and Eunice (EDCLC, 2018).

Fire and Police

According to Holtec's ER, 18 police departments and 22 fire departments serve the four counties in the ROI, the vast majority of which are located in Eddy and Lea Counties (Holtec, 2019a). Because of the presence of the WIPP facility located in Eddy County, local fire fighters, law enforcement, and emergency medical staff have been trained to respond to emergencies that involve radioactive materials. Mutual-aid agreements also exist with all of the county fire and police departments. If additional fire or police services are required, nearby counties can provide additional response services. In particular, members of the proposed CISF emergency response team can provide information and assistance in instances where radioactive/hazardous materials are involved (Holtec, 2019a).

3.12 Public and Occupational Health

This section summarizes the sources of radiation and chemical exposure and baseline health conditions at the proposed CISF project area and in the region surrounding the site {defined as land within an 80-km [50-mi] radius}, including natural background radiation levels. The radius was selected to be inclusive of (i) locations where people could live and work in the vicinity of the proposed project and (ii) other sources of radiation or chemical exposure in the region than those present in the CISF project area. Applicable radiation dose limits that have been established for the protection of public and occupational health and safety, potential exposure pathways and receptors, and available occupational and public health studies are described.

3.12.1 Sources of Radiation Exposure

Sources of radiation exposure in the proposed CISF project area and in the region surrounding the facility include background radiation and radiation from other sources such as nearby facilities or transportation.

3.12.1.1 Background Radiological Conditions

Radiation dose is a measure of the amount of ionizing energy that is deposited in the body. Ionizing radiation is a natural component of the environment and ecosystem, and members of the public are exposed to natural radiation continuously. Radiation doses to the general public occur from radioactive materials found in the Earth’s soils, rocks, and minerals. Radon (Rn-222) is a radioactive gas that escapes into ambient air from the decay of uranium (and its progeny, radium-226) found in most soils and rocks. Naturally occurring low levels of uranium and radium are also found in drinking water and foods. Cosmic radiation from outer space is another natural source of exposure and ionizing radiation dose. In addition to natural sources of radiation, there are artificial or human-made sources that contribute to the dose the general public receives. Medical diagnostic procedures using radioisotopes and x-rays are a primary human-made radiation source. The National Council on Radiation Protection and Measurements (NCRP) (2009) estimates that the annual average dose to the public from all natural background radiation sources (radon and thoron, terrestrial, cosmic, internal) is {3.1 millisieverts (mSv) [310 millirem (mrem)]}. Because of the increase in medical imaging and nuclear medicine procedures, the annual average dose to the public from all sources (natural and human-made) is 6.2 mSv [620 mrem] (NCRP, 2009). Because the proposed CISF project area has no history of activities involving radioactive materials (Holtec, 2019a), the NRC staff consider the national background radiation estimates to be a reasonable approximation of the background radiological conditions.

3.12.1.2 Other Sources of Radiation Exposure

The region surrounding the proposed CISF includes several other projects that involve radioactive materials, including WIPP, NEF, and a potential International Isotopes Incorporated Fluorine Extraction Process and Depleted Uranium De-conversion Plant (FEP/DUP) (Holtec, 2019a). In addition, Waste Control Specialists operates a low-level radioactive waste storage and disposal site in Andrews County, Texas, approximately 63 km [39 mi] from the proposed CISF project area. The estimated or measured maximum operational radiological doses to the public from these facilities are described in the following paragraphs.

WIPP is located approximately 26 km [16 mi] southwest of the proposed CISF project (Holtec, 2019a). WIPP is the nation’s first underground repository permitted to safely and permanently dispose of transuranic radioactive waste (TRU) and transuranic mixed waste (MTRU) generated through defense activities and programs. The facility has been operational since 1999 storing these wastes in underground salt caverns approximately 2,150 feet deep. From 1999 through 2014, 90,983 m^3 [3,213,031 ft^3] of waste was shipped to and disposed of at the WIPP facility. The environmental impacts of the WIPP are described in the Waste Isolation Pilot Plant Disposal Phase Final Supplemental Environmental Impact Statement (DOE 1997), as well as the Waste Isolation Pilot Plant Annual Site Environmental Report for 2017 (DOE, 2018). For 2017, the DOE estimated the annual dose to an individual at the fence line was 1.04×10^{-6} mSv [1.04×10^{-4} mrem] (DOE, 2018).

NEF is located approximately 61 km [38 mi] southeast of the proposed CISF project (Holtec, 2019a). NEF enriches uranium using a gas centrifuge process. The enriched uranium is used in the manufacture of nuclear fuel for commercial nuclear power reactors. The environmental impacts of the NEF are documented in NUREG–1790 (NRC, 2005). Impacts related to radiation exposure include small public and occupational health and transportation impacts during normal operations and small to moderate public and occupational health and transportation impacts under evaluated accident conditions. In that analysis, the highest estimated annual public dose from normal facility operations was 0.019 mSv [19 mrem] (NRC, 2005).

FEP/DUP is expected to be located approximately 37 km [23 mi] northeast of the proposed CISF project (Holtec, 2019a). The FEP/DUP plans to de-convert depleted uranium hexafluoride into fluoride products for commercial resale and uranium oxides for disposal. An NRC license was granted in 2012, but construction of the facility has been deferred pending improvements in market conditions. The environmental impacts of the FEP/DUP are documented in NUREG–2113 (NRC, 2012). The highest annual public dose from proposed operations considering airborne emissions and direct exposure at the facility boundary was estimated to be 0.21 mSv [20.8 mrem] (NRC, 2012).

WCS operates two facilities authorized to dispose of Class A, B, and C low-level radioactive waste (LLRW) within the existing WCS site, located 63 km [39 mi] to the southeast of the proposed CISF project area. The two facilities are referred to as the Compact Waste Disposal Facility (CWF) and Federal Waste Disposal Facility (FWF). The CWF serves the Texas LLRW Compact (Texas and Vermont) and the FWF serves the DOE. WCS also operates a facility authorized to dispose of Atomic Energy Act Section 11e.(2) byproduct material. Annual radiological doses to the public from existing WCS facility operations are documented every 6 months in a semi-annual Radiological Environmental Monitoring Plan (REMP) Report to the Texas Commission on Environmental Quality (TCEQ). The WCS REMP report for year 2014 operations documented the annual estimated public dose for the year 2014 operations at 0.027 mSv [2.7 mrem] (WCS, 2015).

3.12.2 Pathways and Receptors

Under normal operations, the use of NRC-certified storage casks at the proposed CISF project would fully contain the stored radioactive material. Under these circumstances, the only applicable exposure pathway is individual workers and members of the public at or near the facility being exposed to direct radiation. Because direct radiation decreases with distance from the source, the level of exposure would vary based on the distance between the source and the receptor and the duration of the exposure (and, for workers, the amount of shielding during transfers). Therefore, the workers involved in canister transfers and the residents nearest the facility would be the individuals expected to receive the highest radiation exposures from the proposed CISF project. The nearest residents to the proposed CISF project are located at the Salt Lake Ranch, 2.4 km [1.5 mi] north of the proposed CISF project (Holtec, 2019a). Additional residences exist at the Bingham Ranch 3.2 km [2 mi] south and at the R360 complex, 3.2 km [2 mi] southwest.

3.12.3 Radiation Protection Standards

The NRC has a statutory responsibility, pursuant to the Atomic Energy Act of 1954, as amended, to protect worker and public health and safety. The NRC's regulations in 10 CFR Part 20 specify annual worker dose limits, including 0.05 Sv [5 rem] total effective dose equivalent (TEDE) and dose limits to members of the public, including 1 mSv [100 mrem] TEDE with no more than 0.02 mSv [2 mrem] in any 1-hour period from any external sources. Additionally, 10 CFR Part 72 includes an annual public dose limit of 0.25 mSv [25 mrem] committed dose equivalent to the whole body. These public dose limits from NRC-licensed activities are a fraction of the background radiation dose, as discussed in EIS Section 3.12.1.1.

Exposure to radiation presents an additional risk of cancer or a severe hereditary effect. The annual dose limit the International Atomic Energy Agency (IAEA), as well as the NRC, set to protect members of the public from the harmful effects of radiation is 1 mSv [100 mrem]. The additional risk of fatal cancer associated with a dose of 1 mSv [100 mrem], calculated using the scientific methods of the International Commission on Radiological Protection (ICRP, 2007) and applying a linear-no-threshold dose response assumption, is on the order of 1 in 20,000. This small increase in lifetime risk can be compared to the baseline lifetime risks of 1 in 3 for anyone developing a cancer and 1 in 5 for anyone developing a fatal cancer (ACS, 2018).

3.12.4 Sources of Chemical Exposure

Activities in the region surrounding the proposed CISF project area that may result in limited chemical exposure include oil and gas exploration and production, oil and gas related service industries, mineral extraction, livestock grazing, and agriculture (Holtec, 2019a). Nearby industrial operations include a potash mine, an oilfield waste treatment facility, and an industrial landfill. Within the proposed CISF project boundary but outside of the planned SNF storage area, there is an abandoned oil recovery facility and a producing well and recovery facility. The potential for hydrocarbon contamination from past practices exists within the proposed CISF project boundary (Holtec, 2019a). The oilfield waste treatment facility and industrial landfill within 4.8 km [3 mi] of the proposed CISF project area (Holtec, 2019a) are the local industrial operations in closest proximity to the proposed CISF project area.

3.12.5 Health Studies

Health studies characterize baseline health conditions applicable to the region where the proposed CISF project would be located. This includes occupational safety studies and public health evaluations.

3.12.5.1 Occupational Health

The New Mexico State Department of Health (NMDOH) evaluated workplace injuries and illnesses and found that the rate of work-related fatalities in New Mexico appeared to be declining, as are rates for the U.S., but New Mexico's occupational fatality rate remains well above the U.S. rate (NMDOH, 2018). They noted the top two areas of concern for occupational health in New Mexico are the high rates of transportation-related injuries and fatalities in two industries, oil and gas and construction.

In 2016, there were 41 workplace fatalities, of which 56.1 percent were transportation related (NMDOH, 2018). From 2011 through 2016, New Mexico's occupational transportation fatality rates were considerably higher (two to three times) than the comparable nationwide fatality rates. NMDOH noted that seat belt usage is low in the transportation industry. Out of the 31 occupational-related transportation fatalities in 2014, 63 percent of the decedents were not wearing their seat belts at the time of the accident. The second highest cause of death (17 percent) was contact with objects and equipment. Falls were noted as the cause in 7.3 percent of deaths.

Mining, quarrying, and oil and gas extraction was the single industry with the largest percentage of fatalities with 31.9 percent of deaths (NMDOH, 2018). Oil and gas-related fatalities are also among the most common in the State, occurring most frequently as a result of motor vehicle accidents, falls, struck-by-object injuries, or electrocutions. The crude fatality rate for the oil and gas industry in New Mexico for 2016 was 31.9 per 100,000 full-time equivalents (FTE) (ages 16 and over) – over three times the U.S. rate of 10.1 per 100,000 FTEs.

3.12.5.2 Public Health

Baseline health conditions have been evaluated by the NMDOH (NMDOH, 2018). For the three leading causes of death, New Mexico has lower death rates than the U.S. overall for heart disease and cancer, but much higher rates for unintentional injuries including drug overdose, motor vehicle injuries, and older adult falls. New Mexico also has substantially higher death rates than those of the U.S. for suicide and for cirrhosis and chronic liver disease, which is primarily because of alcohol use. Life expectancy from age 65 was reported for New Mexico at 20.7 years in 2016, compared with 19.4 years in the U.S. NMDOH reported years of life expectancy from age 65 was lower in southeastern New Mexico and generally higher in northern counties. Relative to the U.S., the New Mexico State Department of Health characterized New Mexico as having a low population with complex public health challenges.

3.13 <u>Waste Management</u>

This section describes the environment that the disposition of liquid and solid waste streams the proposed CISF generates could potentially affect. EIS Section 2.2.1 describes the types and volumes of liquid and solid waste that operation of the proposed CISF project could generate.

3.13.1 Liquid Wastes

Liquid wastes or effluents generated from the proposed CISF project are limited to stormwater, hazardous waste, and sanitary wastewater. Detailed descriptions of the liquid wastes the proposed CISF project generated and Holtec's proposed disposition are provided in EIS Section 2.2.1 and are briefly summarized here. The Solid Waste Disposal Act defines hazardous waste as a subset of solid waste; therefore, disposition of hazardous waste is addressed in EIS Section 3.13.2.

The affected environment for stormwater runoff includes drainages adjacent to the site that terminate in the Laguna Plata to the northwest and Laguna Gatuna to the east. There are no potable surface water resources within these stormwater drainages of the proposed CISF (Holtec, 2019a). These surface water features are designated as Surface Waters of the State and are described in more detail in EIS Section 3.5.1.1. To protect these waters from pollutants that could be conveyed in stormwater runoff, separate National Pollutant Discharge Elimination System (NPDES) stormwater permits from EPA are required for construction and operation of facilities such as the proposed CISF.

Sanitary wastes generated during the term of the license of the proposed CISF project would not produce effluents based on the proposed use of portable toilets or sewage collection tanks, which, as described in EIS Section 2.2.1.6 would be designed and operated in accordance with all applicable NMED and Federal standards (Holtec, 2019a). During operation of the proposed CISF, Holtec would dispose of sanitary wastewater using sewage collection tanks and underground digestion tanks similar to septic tanks, but with no leach field. As described in EIS Section 2.2.1.6, after testing the waste in the collection tanks to ensure 10 CFR Part 20 release criteria and applicable State of New Mexico requirements are met, the resulting sewage would be removed from the tanks and disposed at an off-site treatment facility (Holtec, 2019a).

3.13.2 Solid Wastes

Solid wastes generated from the proposed CISF project would include nonhazardous solid waste, LLRW, and hazardous waste. Additionally, the SNF stored at the proposed CISF project would be removed and shipped to an NRC-licensed geologic repository when one becomes available.

All proposed phases of the proposed CISF project would generate nonhazardous solid waste. Nonhazardous solid waste would be disposed offsite in an NMED-permitted municipal landfill. The nearest municipal solid waste facility is the Sandpoint Landfill that is located 40 km [25 mi] west of the proposed CISF project area (Holtec, 2019a). Another landfill, the Lea County Solid Waste Authority landfill, is located east of Eunice. The Lea County landfill serves Eddy County and is jointly owned by Eddy County and the City of Carlsbad. The Sandpoint landfill has the capacity to dispose of nonhazardous solid waste and construction and demolition waste for approximately 30 years after year 2018 (NMED, 2010). The projected life of the Lea County landfill is 37 years (NMED, 2010). The annual waste received at these facilities is evaluated in EIS Section 4.14 to show how the proposed CISF project generation rate compares with the regional generation from other sources.

Holtec proposes that LLRW the proposed CISF project generated would be sent to licensed facilities for disposal (Holtec, 2019a). LLRW is managed under regional disposal compacts among States that provide for disposal and regulate some aspects of disposal for their member States. New Mexico is a member of the Rocky Mountain compact with Colorado and Nevada (RMLLWB, 2018). Generators of LLRW in the compact States can access disposal facilities in Richland, Washington, Clive, Utah, and Andrews, Texas.

The US Ecology LLRW disposal facility located in Richland, Washington, is approximately 2,607 km [1,619 mi] from the proposed CISF project and is accessible by both rail and highway. The State of Washington licensed US Ecology to dispose of Class A, B, and C waste (NRC, 2018). In 2017, the US Ecology facility disposed of 393.9 m^3 [13,910 ft^3] of LLRW (NRC, 2018). The facility is expected to operate until 2056 (WDOE, 2015).

The Energy*Solutions* facility in Clive, Utah, is licensed by the State of Utah to receive byproduct material, Class A LLRW, mixed waste (combined radioactive and hazardous wastes), and naturally occurring radioactive material. The Energy*Solutions* facility is the largest commercial LLRW disposal facility, and it accepts waste for disposal from all regions in the United States

(NRC, 2018). The facility is accessible by both rail and highway and is located approximately 129 km [80 mi] west of Salt Lake City, Utah, and approximately 1,610 km [1,000 mi] from the proposed CISF project. In 2017, the Energy*Solutions* facility disposed of 142,009.7 m^3 [5,014,929 ft^3] of LLRW (NRC, 2018). An application for renewal of the LLRW disposal license is under review by the State of Utah.

WCS also operates a LLRW facility in Andrews County, Texas, that accepts compact waste (i.e., compressed to reduce the volume) as well as non-compact waste, if approved by the compact. The WCS facility is licensed to accept LLRW for disposal (NRC, 2018). The WCS facility is located approximately 120 km [72 mi] from the proposed CISF project area and is accessible by both rail and highway. In 2017, the WCS facility disposed of 326.64 m^3 [11,535 ft^3] of LLRW (NRC, 2018). The current license term expires in 2024, with provision for 10-year renewals (TCEQ, 2018).

Estimates of hazardous wastes the proposed CISF project generated would be less than 220 pounds per month and therefore would qualify the proposed CISF project as a Conditionally Exempt Small Quantity Generator (CESQG) (Holtec, 2019a). Holtec proposes to comply with all Federal and State requirements applicable to CESQGs. The proposed CISF project design does not include underground storage tanks. A spill prevention, control, and countermeasures plan may need to be developed because all diesel fuel storage tanks at the proposed CISF would be above ground. Although Holtec does not anticipate generating mixed waste, if any mixed waste were generated, it would be handled and stored in accordance with a 10 CFR Part 20 radiation protection plan and applicable hazardous waste requirements and would be sent to a licensed facility for disposal (Holtec, 2019a).

The SNF stored at the proposed CISF project would eventually be transported to an offsite geologic repository, in accordance with the national policy for SNF disposal established in the Nuclear Waste Policy Act of 1982, as amended. The affected environment for transportation of SNF is described in EIS Section 3.3. The affected environment for geologic disposal of SNF and high-level radioactive waste at Yucca Mountain has been described and evaluated in DOE's Final Supplemental Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada (DOE, 2008) and supplemented by NRC's Supplement to the U.S. Department of Energy's Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada (NRC, 2016).

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4 ENVIRONMENTAL IMPACTS OF CONSTRUCTION, OPERATION, AND DECOMMISSIONING AND MITIGATIVE ACTIONS

4.1 Introduction

This chapter provides the U.S. Nuclear Regulatory Commission (NRC) staff's evaluation of the potential environmental impacts that could occur during all three stages of the license term (construction, operation, and decommissioning) of the proposed Holtec consolidated interim storage facility (CISF) project (hereafter referred to as the proposed CISF project or proposed facility) under the proposed action and the No-Action alternative for all resource areas and for accidents. As discussed in detail in Chapter 1 of this Environmental Impact Statement (EIS), Holtec has submitted a license application to the NRC requesting authorization for an initial phase (Phase 1) of the project to store up to 8,680 metric tons of uranium (MTUs) [9,568 short tons] in 500 canisters for a license period of 40 years (Holtec, 2019a). Holtec plans to subsequently request amendments to the license to store an additional 500 canisters for each of 19 expansion phases of the proposed CISF project (a total of 20 phases) to be completed over the course of 20 years, expanding the proposed facility to eventually store up to 10,000 canisters of spent nuclear fuel (SNF) (Holtec, 2019a). Holtec's expansion of the proposed project (i.e., Phases 2-20) is not part of the proposed action currently pending before the NRC. However, the NRC staff will consider these expansion phases in its impact determination in this EIS, where appropriate, when the environmental impacts of the potential future expansions could be determined so as to conduct a bounding analysis for the proposed project. The NRC staff conducted this analysis as a matter of discretion because Holtec provided the analysis of the environmental impacts of the anticipated expansion of the proposed facility as part of its license application (Holtec, 2019a,b). For the bounding analysis, the NRC staff assume the storage of up to 10,000 canisters of SNF. A connected action to the proposed CISF project includes construction and operation of a rail spur on land leased from the Bureau of Land Management (BLM) to transport SNF from the main rail line to the proposed facility.

The construction stage of the proposed CISF project would include the construction of the proposed facility and associated buildings and infrastructure as well as the construction of infrastructure that would support the proposed rail spur for transporting SNF to and from the proposed CISF project. Construction activities affecting each resource area are discussed within the resource specific section. The operations stage of the proposed action would include operation of the proposed facility and also removal of the SNF inventory (defueling) for transport to a final repository. This EIS chapter will analyze the impacts from the construction and operation stages of the proposed action (Phase 1), as well as subsequent phases of the proposed CISF project (i.e., Phases 2-20). For additional information on the stages and phases of the proposed action, see EIS Chapter 2, Section 2.2.1. As explained in that section, the land areas discussed in this evaluation include the proposed project area, which is defined as the land included in entire licensed area {421 hectares (ha) [1,040 acres (ac)]}; the storage and operations area, which includes storage pads and associated facilities and infrastructure (discussed further in EIS Section 4.2.1); and the protected area, where access is restricted by fencing (discussed further in EIS Section 4.2.1.1).

As described in EIS Section 2.2.1.4, decommissioning and reclamation of the proposed facility would include the dismantling of the proposed facility and rail spur. At the end of the license term of the proposed CISF project, once the SNF inventory is removed, the facility would be decommissioned such that the proposed project area and remaining facilities could be released and the license terminated. Decommissioning activities, in accordance with Title 10 of the *Code* *of Federal Regulations* (10 CFR) Part 72 requirements, would include conducting radiological surveys and decontaminating, if necessary. Holtec has committed to reclamation of the proposed project area (Holtec, 2019a). Reclamation would include dismantling and removing equipment, materials, buildings, roads, the rail spur, and other onsite structures; cleaning up areas; waste disposal; erosional control; and restoring and reclaiming disturbed areas. The decommissioning evaluation in this EIS is based on currently available information and plans. Because decommissioning and reclamation is likely to take place well into the future, all technological changes that could improve the decommissioning and reclamation processes cannot be predicted. As a result, the NRC requires that licensees applying to decommission an Independent Spent Fuel Storage Installation (ISFSI) (such as the proposed CISF project) submit a Decommissioning Plan. The requirements for the Final Decommissioning Plan are delineated in the *Code of Federal Regulations* (CFR) 72.54(d), 72.54(g), and 72.54(i). The NRC staff would undertake a separate evaluation and National Environmental Policy Act (NEPA) review and prepare an environmental assessment or EIS, as appropriate, at the time the Decommissioning Plan is submitted to the NRC.

This chapter also evaluates the potential impacts from the No-Action alternative. Under the No-Action alternative, Holtec would not construct or operate a CISF at the proposed location. SNF is assumed to remain at the nuclear power plants and ISFSIs until a means of disposal or an alternative means of storage is available. The rail spur also would not be built.

The resource areas evaluated in this section of this EIS include land use, transportation, geology and soils, water resources, ecology, noise, air quality, historic and cultural resources, visual and scenic resources, socioeconomics, environmental justice, public and occupational health, and waste management. This section of the EIS also evaluates the environmental impacts of accidents. The environmental impacts are based on information provided in Holtec's Environmental Report (ER) (Holtec, 2019a), Safety Analysis Report (SAR) (Holtec, 2019b), responses to NRC requests for additional information (RAIs) (Holtec, 2019c), and additional information the NRC staff identified.

As described in EIS Section 1.2.2, BLM (NRC, 2018) and the New Mexico Environment Department (NMED) (NRC, 2019) are cooperating agencies consistent with Memoranda of Understanding (MOU) signed with the NRC. The proposed rail spur connecting the main rail line to the proposed CISF project is on BLM land and requires BLM permits. Therefore, a MOU with BLM was established with the goal to develop one EIS that provides all of the environmental information and analyses needed for the NRC to make a licensing decision, as well as the information needed for the BLM to perform analyses, draw conclusions, and make permitting decisions. The NMED MOU allows the NRC staff to incorporate into the EIS NMEDs special expertise and information on water resources impacts directly related to the proposed CISF.

The NRC staff will use the Council on Environmental Quality (CEQ) regulations-based standard of significance for assessing environmental impacts, as described in the NRC guidance in NUREG–1748 (NRC, 2003) and summarized as follows:

SMALL: The environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource.

MODERATE: The environmental effects are sufficient to alter noticeably, but not destabilize, important attributes of the resource.

LARGE: The environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

4.2 Land Use Impacts

This section describes the potential environmental impacts on land use associated with the proposed action (Phase 1), Phases 2-20, and the No-Action alternative. Impacts on land use result from commitment of the land for the proposed CISF project and therefore its potential exclusion from other possible uses.

4.2.1 Impacts from the Proposed CISF

As described in EIS Section 2.2.1.1, the proposed CISF project would be situated on approximately 421 ha [1,040 ac] of land (herein referred to as the proposed project area) in Lea County, New Mexico (EIS Figure 2.2-1). At full build-out, which would include all Phases (1-20), the facilities and infrastructure associated with the proposed CISF project would be located on approximately 133.5 ha [330 ac] (the storage and operations area) within the larger 421-ha [1,040-ac] proposed project area (EIS Figure 2.2-2). Land would be converted from its primary use as rangeland for cattle grazing to use for the proposed CISF project during its license term. The primary land use impact, besides limiting its use for grazing, would be land disturbance during construction and operation. As described in EIS Section 2.2.1, the proposed CISF project would be constructed in 20 phases (Phases 1-20) over a 21-year period (Holtec, 2019a). As discussed in EIS Section 3.2.1, the Eddy-Lea Energy Alliance (ELEA) currently owns the proposed project area but it has been approved for sale to Holtec (Holtec, 2019c). The State of New Mexico owns the subsurface property (or mineral) rights within the proposed project area (EIS Figure 3.2-2).

The following sections discuss the potential environmental impacts on land use from the construction, operation, and decommissioning stages of the proposed CISF project.

4.2.1.1 Construction Impacts

The proposed action (Phase 1) construction would disturb approximately 48.3 ha [119.4 ac] and would include: 2.5 ha [6.2 ac] for a site access road; 15.9 ha [39.4 ac] for the railroad spur; and 0.57 ha [1.4 ac] for the security building, administration building, parking lot, and concrete batch plant/laydown area (Holtec, 2019a). The remaining land disturbance {approximately 29.3 ha [72.4 ac]} would be associated with constructing the initial SNF storage modules and pad, cask transfer building, and associated infrastructure. Additional overhead power lines to serve the proposed CISF project would be constructed during the proposed action (Phase 1) and extend 1.6 km [1 mi] to the south from the center of the proposed CISF project (Holtec, 2019a). The land clearances for these lines are included in the total land disturbance areas (Holtec, 2019a).

Construction of Phases 2-20 would disturb an additional 85.2 ha [210.6 ac] of land for constructing additional SNF storage modules and pads. Within the protected (fenced) area, Holtec estimates that the construction of the concrete pads when all 20 phases are completed would disturb approximately 44.5 ha [110 ac] (Holtec, 2019a). At full build-out, the approximate 133.5 ha [330 ac] of disturbed land from construction would be approximately one-third of the 421-ha [1,040-ac] proposed project area.

During construction of all phases of the proposed CISF project, Holtec has committed to use the following mitigation measures to reduce the impacts of surface disturbance: (i) minimize the construction footprint to the extent practicable; (ii) stabilize disturbed areas with natural and low-water maintenance landscaping; and (iii) protect undisturbed areas with silt fencing and straw bales, as appropriate (Holtec, 2019a).

As described in EIS Section 3.2, existing land uses within and surrounding the proposed project area include cattle grazing, underground potash mining, oil and gas exploration and development, access to and maintenance of pipeline right-of-ways, and recreational activities (Holtec, 2019a,b). At full build-out, the 114.5-ha [283-ac] protected area containing the SNF storage pads and cask transfer building would be enclosed by security fencing to restrict and control access (Holtec, 2019a).

Construction of the proposed CISF project would modify the current land use by eliminating cattle grazing on the 133.5 ha [330 ac] of land (the storage and operations area) used for the full build-out of the proposed CISF project facilities and infrastructure. Grazing would be allowed to continue on the remaining 287.5 ha [710 ac] of the 421 ha [1,040 ac] proposed project area. Approximately 93 percent of land in Lea County is used as rangeland for grazing {approximately 1.05 million ha [2.6 million ac]} (NRC, 2012). Eliminating grazing on 133.5 ha [330 ac] of land would result in a loss of 0.01 percent of the land available for grazing.

As described in EIS Section 3.2.4, mineral extraction activities in the vicinity of the proposed project consist of underground potash mining and oil and gas extraction. The proposed project area is in an area of known potash leasing. As described in EIS Section 3.2.1, the State of New Mexico and the BLM, respectively, own the subsurface property (mineral) rights within and surrounding the proposed project area, and these rights are leased to production companies for development. Potash beneath the proposed project area is leased to Intrepid Mining LLC (Intrepid), while underground potash surrounding the proposed project area is leased to various potash production companies, including Intrepid, Mosaic Potash, and Western Ag-Minerals. As further described in EIS Section 3.2.4, Intrepid operates two underground potash mines within 9.6 km [6 mi] of the proposed project area (EIS Section 3.2.4) (ELEA, 2016; Holtec, 2019a,b). As noted in the Holtec RAI responses, "[t]he New Mexico State Land Office is currently in discussions with Holtec International regarding an agreement in principle to retire any potash, unencumbered by regulatory restrictions, in perpetuity" (Holtec, 2019c). In addition, Holtec has entered into an agreement with Intrepid to relinquish certain potash mineral rights to the State of New Mexico (Holtec, 2019c).

As discussed further in EIS Section 3.2.4, the proposed project area is in a region of active oil and gas exploration and development. One operating gas well is present within the proposed project area along with numerous plugged and abandoned wells (Holtec, 2019a,b). None of these oil and gas wells are located within the 133.5-ha [330-ac] storage and operation area or where any land would be disturbed by construction activities. Therefore, construction of the proposed CISF would not have an effect on oil and gas operations within the proposed project area (Holtec, 2019a). In addition, Holtec has stated that it has no plans to use any of the plugged and abandoned wells (Holtec, 2019b). All of the plugged and abandoned wells are located in the eastern portion of the proposed project area. The closest plugged and abandoned well to the storage and operations area is approximately 0.65 km [0.4 mi] to the east.

As described in EIS Section 3.2.4, all oil and gas production zones in the area of the proposed CISF occur beneath the Salado Formation at depths greater than 914 m [3,000 ft] (Cheeseman, 1978; Holtec, 2019b). Furthermore, oil and gas exploration targets within and surrounding the proposed project area range from relatively shallow oil and gas at approximately 930 to 1,524 m

[3,050 to 5,000 ft] in upper to middle Permian formations to deep gas targets in middle Paleozoic formations in excess of 4,877 m [16,000 ft] deep (ELEA, 2007). Future oil and gas development (e.g., drilling and fracking) beneath the proposed project area will likely continue to occur at depths greater than 930 m [3,050 ft].

Because of potential conflicts between oil and gas production and potash mining in southeastern New Mexico, the Federal and New Mexico governments have issued requirements for implementing administrative controls to minimize conflict between the industries and ensure the safety of operations (Holtec, 2019c). In December 2012, the U.S. Secretary of the Interior issued Order 3324, "Oil, Gas, and Potash Leasing and Development Within Designated Potash Area of Eddy and Lea Counties, NM" (77 FR 71814). This order provides procedures and guidelines for orderly co-development of oil and gas and potash resources within the Designated Potash Area (DPA) in southeastern New Mexico (which includes the proposed CISF project area). Under this order, the oil and gas industry uses drilling islands that BLM established, from which all new drilling of vertical, directional, and horizontal wells that penetrate potash formations are allowed, to manage the impact on potash resources. As described in EIS Section 3.2.4, the Belco Tetris Shallow and Belco Deep drill islands are located approximately 0.4 km [0.25 mi] and 0.8 km [0.5 mi] west of the proposed project area, respectively, and the Anise Tetris drill island to the south of the proposed project area. These drill islands would be used for any future drilling and would ensure that construction and operation of the proposed CISF would not have an impact on oil and gas exploration activities.

In addition, the State of New Mexico promulgated Order R-111 to govern oil and gas drilling and plugging activities on State land within the DPA. The BLM adopted similar guidelines in its management of oil and gas exploration and development on Federal land within the DPA (51 FR 39425; October 28, 1986). Order R-111 underwent numerous revisions in response to changing conditions and relationships within the oil and gas and potash industries. Most recently, the State of New Mexico Oil Conservation Commission (NMOCC) rescinded and replaced the order with R-111-P, on April 21, 1988 (NMOCC, 1988).

As discussed in EIS Section 3.2.5, three natural gas pipelines and one potable water pipeline currently cross the proposed project area. The three natural gas pipelines are located east of the proposed 133.5-ha [330-ac] storage and operations area, and the change in land use from construction of the proposed CISF project would not limit access to or maintenance of their right-of-ways. The potable water pipeline that traverses the proposed storage and operations area is owned by Intrepid and services the Intrepid East Mine facility (Holtec, 2019a). Holtec has committed to coordinate with Intrepid to relocate the potable water pipeline so that it would not interfere with construction and operation activities associated with the proposed CISF project (Holtec, 2019a). Because the existing pipeline runs along the surface, relocation of the pipeline would result in minimal additional land disturbance. The City of Carlsbad Water Department would provide potable water for the proposed CISF project from the Double Eagle water system. A new water supply pipe from the Double Eagle system to the proposed CISF project would share the majority of the proposed rail spur right-of-way and, therefore, no notable additional construction would be required to provide water to the proposed facility (Holtec, 2019a).

Currently, recreational activities at and in the vicinity of the proposed project area include big and small game hunting, camping, horseback riding, hiking, bird watching, and sightseeing (Holtec, 2019a). However, the proposed project area is currently private property owned by ELEA and would continue to be private property if purchased by Holtec. Holtec has stated that if purchased for use as a CISF, the property would be designated “Off-Limits” to prevent accidental public use and that “No Trespassing” signs would be posted along the property boundary, in accordance with State and Federal requirements for posting real estate property (Holtec, 2019a). Consistent with current access allowances on public and private lands, the public would have access to open, unfenced lands for recreational activities on public and some privately-owned land surrounding the proposed project area.

In summary, the approximate 48.3 ha [119.4 ac] of disturbed land that would occur under the proposed action (Phase 1) and the approximate 133.5 ha [330 ac] of disturbed land for full build-out (Phases 1-20) from construction would be relatively small compared to the 421-ha [1,040-ac] proposed project area. For all phases, Holtec has committed to mitigation measures, such as stabilizing disturbed areas with natural landscaping and protecting undisturbed areas with silt fencing and straw bales to reduce the impacts of surface disturbance during construction. Prohibiting grazing within the fenced 114.5-ha [283-ac] protected area would have a minor impact on local livestock production because there would be abundant open land available for grazing around the storage and operations area and surrounding the proposed project area. Likewise, because there would be abundant open land available around the proposed project area, impacts to recreational activities would be minor. The proposed CISF may reduce the total amount of potash mining in the region; however, this impact would be minor considering the expansive potash leasing area surrounding the proposed project area. The proposed CISF would have no impact on oil and gas exploration and development in the proposed project area because extraction will continue to occur at depths greater than 930 m [3,050 ft]. Therefore, the NRC staff concludes that the land use impacts during the construction stage for the proposed action (Phase 1) would be SMALL, and potential impacts for Phases 2-20 would also be SMALL.

4.2.1.1.1 Rail Spur

The rail spur would be constructed to connect the proposed CISF project to an industrial railroad that lies 6.1 km [3.8 mi] to the west. The disturbed land area for the rail spur would be 15.9 ha [39.4 ac] of BLM-managed land. The rail spur would be routed across relatively flat BLM-managed land west of the proposed CISF project and would not cross any major highways (Holtec, 2019a). A site access road would also be constructed across relatively flat BLM-managed land from the proposed CISF project southward to U.S. Highway 62/180 and would be approximately 1.6 km [1 mi] in length. Construction of the rail spur and site access road would require right-of-way approval on Federal lands from BLM. Therefore, due to the small amount of disturbed land, relatively flat terrain, lack of highway crossing, and joint location of the access road along the rail spur right-of-way, the NRC and BLM staff conclude that impacts from construction of the rail spur on land use would be SMALL.

4.2.1.2 Operations Impacts

For the proposed action (Phase 1), there are no activities that would require additional ground-disturbing activities. Similar to the construction stage, cattle grazing would be prohibited within the storage and operations area. The primary changes to land use during the operations stage of the proposed action (Phase 1) would be land disturbance associated with construction of SNF storage pads and modules for additional phases, because the applicant intends to operate each existing phase concurrently with construction of new phases.

For subsequent phases of the proposed CISF project (Phases 2-20), the primary changes to land use during the operations stage of each of those phases would continue to be land disturbance associated with construction of additional SNF storage pads and modules for subsequent phases. As described previously, construction of Phases 2-20 would require an additional 85.2 ha [210.6 ac] of land to the proposed action (Phase 1). To ensure that construction of additional SNF storage pads would not adversely impact operations, Holtec would maintain an adequate buffer distance between operational and construction areas (Holtec, 2019a). Furthermore, during operations the current primary land use (cattle grazing) would be prohibited on 133.5 ha [330 ac] of land. As described previously, approximately 93 percent of land in Lea County is used as rangeland for grazing {approximately 1.05 million ha [2.6 million ac]} (NRC, 2012). Restricting grazing on the 133.5-ha [330-ac] storage and operations area at full build-out would result in a loss of 0.01 percent of the land available for grazing. Due to the abundance of surrounding land for grazing, this impact on land use would not be significant. As previously mentioned, except for the 133.5-ha [330-ac] storage and operations area, the remainder of the 421-ha [1,040-ac] proposed project area would remain largely undeveloped and open to grazing.

As described in the previous section on construction impacts, plugged and abandoned oil and gas wells within the proposed project area are located in areas that would not be impacted by operation of the proposed CISF. Operation impacts on oil and gas and potash operations would be the same as those of the construction phase. The CISF would have no impact on oil and gas exploration and development in the proposed project area because oil and gas extraction will continue to occur at depths greater than 930 m [3,050 ft]. The proposed CISF may reduce the total amount of potash mined in the region; however, this impact would be minor given the expansive potash leasing area surrounding the site. Operation of the proposed CISF project would not prohibit access to right-of-ways for maintenance of existing gas pipelines within the proposed project area. Because abundant land surrounding the proposed project area would be available for grazing and because land outside the 133.5-ha [330-ac] full build-out storage and operations area would remain largely undeveloped, the NRC staff concludes that land use impacts associated with the operations stage for the proposed action (Phase 1) and for Phases 2-20 of the proposed CISF project would be similar to construction and would be SMALL.

Defueling

Defueling the CISF would involve removal of SNF from the proposed CISF. Because similar equipment is used to remove the SNF canisters from the storage facility as for emplacement, and because no new construction is anticipated, defueling would have land use impacts similar to the emplacement of SNF earlier in the operations stage. For example, the previously constructed cask transfer building would be utilized and maintained, but no additional land use impacts would be anticipated. Therefore, the NRC staff concludes that the land use impacts from defueling the proposed CISF project during operations would be SMALL.

4.2.1.2.1 Rail Spur

The potential environmental impacts on land use would include operation of the rail spur that would be constructed to connect existing rail lines to the proposed CISF project. Operation of the rail spur would be consistent with the local industrial uses of the land in the vicinity of the proposed project area, which supports potash mining, oil and gas exploration and development, and oil and gas service industry facilities (EIS Section 3.2), many of which make use of existing rail lines for materials transportation. Maintenance of the rail spur is anticipated during the operations stage. This may require use of limited equipment for repairs but is not anticipated to require land disturbance beyond that experienced during construction of the rail spur. For these reasons, the NRC and BLM staffs conclude that impacts from operation of the rail spur on land use would be SMALL.

4.2.1.3 Decommissioning and Reclamation Impacts

At the end of the license term of the proposed CISF project, once the SNF inventory is removed, the facility would be decommissioned such that the proposed project area and remaining facilities could be released and the license terminated. Decommissioning activities, in accordance with 10 CFR Part 72 requirements, would include conducting radiological surveys and decontaminating, if necessary. Decommissioning activities for the proposed action (Phase 1) and for Phases 2-20 would involve the same activities, but the activities would be scaled to address the overall size of the CISF (i.e., the number of phases completed).

Holtec has committed to reclamation of nonradiological-related aspects of the proposed project area (Holtec, 2019a). Reclamation would include dismantling and removing equipment, materials, buildings, roads, the rail spur, and other onsite structures; cleaning up areas; waste disposal; erosional control; and restoring and reclaiming disturbed areas. EIS Sections 2.2.1.4 and 2.2.1.7 describe the decommissioning and reclamation activities. These activities would have land use impacts similar in scale to the construction stage.

At the end of reclamation, all lands would be returned to their preoperational land use of livestock grazing (Holtec, 2019a). Any remaining infrastructure would constitute a small portion of the area returned to pre-project conditions. Because the land use impacts for decommissioning and reclamation do not exceed those for construction or operation of the proposed CISF and would decrease as vegetation is reestablished in reclaimed areas, the NRC staff concludes that the land use impact associated with the decommissioning stage for the proposed action (Phase 1) and for Phases 2-20 of the proposed CISF project would be SMALL.

4.2.1.3.1 Rail Spur

Decommissioning of the rail spur and associated access road would occur at the discretion of the land owner (BLM). As part of the rail spur permit application, BLM would define activities necessary to complete decommissioning per their authority and guidelines. The NRC and BLM staff anticipate that decommissioning activities would be similar to those used to decommission the proposed CISF (e.g., dismantling and removing materials and roads; restoring and reclaiming disturbed areas) and would have impacts similar in scale to the construction stage of the rail spur. At the end of decommissioning, the land would be returned to its preoperational land use of livestock grazing, etc. Because the land use impacts for decommissioning do not exceed those for construction or operation of the proposed CISF and would decrease as vegetation is reestablished in reclaimed areas, the NRC and BLM staffs conclude that the land use impact for the rail spur would be SMALL. As stated under the construction stage, because of the small amount of disturbed land, the relatively flat terrain, lack of highway crossing, and joint location of the access road along the rail spur right-of-way, the NRC and BLM staff conclude that if the rail spur is left in place (i.e., not dismantled) impacts would be SMALL.

4.2.2 No-Action Alternative (Alternative 2)

Under the No-Action alternative, the NRC would not license the proposed CISF project. Therefore, impacts such as land disturbance and access restrictions on current land use would not occur. Construction impacts would be avoided because SNF storage pads, buildings, and transportation infrastructure would not be built. Operational impacts would also be avoided because no SNF canisters would arrive for storage. Impacts to land use from decommissioning activities would not occur, because unbuilt SNF storage pads, buildings, and transportation infrastructure require no decontamination and land surfaces need no reclamation. The current land uses on and near the project, including grazing and natural resource extraction, remain essentially unchanged under the No-Action alternative. No concrete storage pad or infrastructure (e.g., rail spur or cask-handling building) for transporting and transferring SNF to the proposed CISF would be constructed. SNF destined for the proposed CISF would not be transferred from commercial reactor sites (in either dry or wet storage) to this proposed facility. In the absence of a CISF, the NRC staff assumes that SNF would remain onsite in existing wet and dry storage facilities and be stored in accordance with NRC regulations and be subject to NRC oversight and inspection. Site-specific impacts at each of these storage sites would be expected to continue as detailed in generic (NRC, 2013, 2005a) or site-specific environmental analyses. In accordance with current U.S. policy, the NRC staff also assumes that the SNF would be transported to a permanent geologic repository, when such a facility becomes available.

4.3 <u>Transportation Impacts</u>

The potential transportation impacts during the construction, operations, and decommissioning stages of the proposed action (Phase 1) and Phases 2-20 of the CISF project are detailed in the following sections.

4.3.1 Impacts from the Proposed CISF

As discussed throughout this section, potential transportation impacts may occur during all life cycle stages of the proposed CISF project. Impacts such as increases in traffic, potential changes to traffic safety, and increased degradation of roads would result from the use of roads for shipping equipment, supplies, and produced wastes, as well as because of commuting workers during the lifecycle of the proposed CISF project. Other impacts, including radiological and nonradiological health and safety impacts under normal and accident conditions, could result from the proposed use of national rail lines to transport shipments of SNF to and from the proposed CISF project. Where onsite rail access is limited, these rail shipments of SNF could include relatively short segments of barge or heavy-haul truck transportation, as needed, to move SNF from nuclear power plants and ISFSIs to the nearest rail line. The following sections describe the potential transportation impacts for the proposed action (Phase 1), Phases 2-20, and the No-Action alternative.

4.3.1.1 Construction Impacts

During the construction stage of the proposed CISF, trucks would be used to transport construction supplies and equipment to the proposed project area. The use of an onsite concrete batch plant would limit the shipment of large premanufactured concrete structures during construction. The regional and local transportation infrastructure that would serve the proposed CISF project is described in EIS Section 3.3. Access to the proposed CISF project from nearby communities would be from U.S. Highway 62/180, which traverses the proposed project area.

The NRC staff's construction traffic impact analysis considered the volume of estimated construction traffic from supply shipments, waste shipments, and workers commuting (EIS Section 2.2.1.7) and determined the estimated increase in the applicable annual average daily traffic counts on the roads used to access the proposed project area. The ER did not provide estimates of construction supply shipments, so the NRC staff estimated the number of annual shipments during construction based on the volume of demolition waste materials that would need to be shipped offsite during site reclamation. The NRC staff consider this approach reasonable because the volume of materials used to construct the proposed facility is expected to be approximately the same as the amount of demolition waste produced when the facility is decommissioned.

The NRC staff estimated a total of 70 daily construction supply and waste shipments from Table 2.2-4. Accounting for the effect of travel in both directions for each shipment, this amount of shipping would increase the existing volume of daily truck traffic on U.S. Highway 62/180 (EIS Section 3.3) of 2,449 trucks per day by 5.6 percent. Based on this analysis, the supply and waste shipments for the construction stage of the proposed action (Phase 1) would have a minor impact on daily traffic on U.S. Highway 62/180 near the proposed CISF project. Further away from the proposed project area, near Carlsbad, the existing truck traffic is higher because of the confluence of major roadways and increased commercial activity, and the proposed CISF project shipments would be more dispersed and therefore represent a smaller percentage of existing traffic and would be less noticeable. For construction stages Phases 2-20, the approximate volume of construction supplies and wastes would be less than that required for construction of the proposed action (Phase 1) because the proposed facilities and infrastructure would already be built; however, the construction would occur in 1 year instead of 2 and; therefore, the number of supply shipments and the resulting truck traffic would double, resulting in a change of 11 percent from the existing traffic conditions. The NRC staff concludes this increase in traffic would result in a minor impact to existing traffic conditions during the construction stage of Phases 2-20.

In addition to construction supply shipments, an estimated peak construction work force of 80 workers would commute to and from the proposed CISF project construction site using individual passenger vehicles and light trucks on a daily basis (Holtec, 2019a). These workers could account for an increase of 160 vehicles per day (80 vehicles each way) on U.S. Highway 62/180 during construction. This amounts to an approximate 5 percent increase in daily car traffic on U.S. Highway 62/180 from the proposed CISF project construction. Based on this analysis, the construction stage of the proposed action (Phase 1) would have a minor impact on the daily Highway 62/180 traffic near the proposed CISF project site. Further away from the proposed project area, for example, near Carlsbad, the existing car traffic is higher, and the proposed CISF shipments would represent a smaller percentage of existing traffic and therefore would be less noticeable. This minor increase in car traffic for local and regional car traffic would not significantly increase traffic safety problems or road degradation relative to existing conditions. For the construction stage of Phases 2-20, buildings and infrastructure would already be constructed, so the same or a smaller construction worker commuting volume would occur as described previously for the construction phase of the proposed action (Phase 1) and would contribute the same or less transportation impacts. Considering the combination of both the transportation impacts from the preceding analysis of construction supply shipments and workers commuting, the NRC staff concludes that the transportation impacts from the construction stage of the proposed action (Phase 1) and Phases 2-20 would be SMALL.

4.3.1.1.1 Rail Spur

Construction of the rail spur that connects the existing rail line to the proposed CISF project could result in transportation impacts. Construction of the rail spur would occur during the construction stage of the proposed action (Phase 1). The workforce required to construct the rail spur was included in the analysis of commuter impacts to transportation. The additional construction supplies necessary to build the rail spur would be significantly less than that required for construction of the proposed CISF. Therefore, the addition of supplies and supply shipments would be less than those for the construction stage of the proposed action (Phase 1) and minor. The rail spur would be a non-carrier private spur routed across BLM-managed land west of the proposed CISF project and would travel approximately 8 km [5 mi] and would not cross any major highways (Holtec, 2019a). A site access road would also be constructed across BLM-managed land from the proposed CISF project southward to U.S. Highway 62/180 and would be approximately 1.6 km [1 mi] in length. Construction of the rail spur and site access road would require right-of-way approval on Federal lands from BLM. Based on the minor changes proposed to the existing transportation infrastructure, the NRC and BLM staff conclude that impacts on transportation from construction of the rail spur during the construction stage of the proposed action (Phase 1) would be SMALL. During the construction stage of Phases 2-20, no additional construction of the rail spur would occur and therefore there would be no further rail spur construction impacts on transportation beyond those from the proposed action (Phase 1).

4.3.1.2 Operations Impacts

Similar to the construction stage, during operation of the proposed CISF, Holtec would continue to use roadways for supply and waste shipments in addition to workforce commuting. Additionally, Holtec proposes using the national rail network for transportation of SNF from nuclear power plants and ISFSIs to the proposed CISF and eventually from the CISF to a geologic repository, when one becomes available. The regional and local transportation infrastructure that would serve the proposed CISF is described in EIS Section 3.3. The operations impacts the NRC staff evaluated include traffic impacts from shipping equipment, supplies, and produced wastes, and from workers commuting during CISF operations. Other impacts evaluated included the radiological and non-radiological health and safety impacts to workers and the public under normal and accident conditions from the proposed nationwide rail transportation of SNF to and from the proposed CISF.

4.3.1.2.1 Transportation Impacts from Supply Shipments and Commuting Workers

The NRC staff's traffic impact analysis for the operations stage of the proposed CISF considered the volume of estimated operations traffic from supply shipments, waste shipments, and workers commuting (Table 2.2-4), then determined the estimated increase in the applicable annual average daily traffic counts on the roads used to access the proposed project area. Assuming a hauling capacity of 15 m^3 [20 yd^3] per truck, the NRC staff estimated 73 waste shipments would occur during operations per year or about 1 shipment every 5 days. Other wastes would be generated in much smaller quantities during operations and would therefore not contribute significantly to shipping traffic. Based on this information, the NRC staff concludes that supply and waste shipments during the operations stage of the proposed action (Phase 1) and during Phases 2-20 would not noticeably contribute to traffic impacts and therefore the impacts would be minor.

Holtec estimated that the operations workforce would include 40 regular employees and 15 security staff at full build-out. This workforce would commute to and from the proposed CISF project using individual passenger vehicles and light trucks on a daily basis (Holtec, 2019a). These workers could account for an increase of 110 vehicles per day (55 vehicles each way) on U.S. Highway 62/180 during the operations stage of the proposed action (Phase 1). This increase amounts to an approximate 3 percent increase in daily car traffic on

U.S. Highway 62/180 from the operation of the proposed CISF project. Based on this analysis, the operations stage of the proposed action (Phase 1) would have a minor impact on the daily U.S. Highway 62/180 traffic near the proposed CISF project site. Further away from the proposed project area, for example, near Carlsbad, the existing car traffic is higher, and the proposed CISF commuter traffic would represent a smaller percentage of existing traffic and therefore would be less noticeable. This minor increase in car traffic for local and regional car traffic would not significantly increase traffic safety problems or road degradation relative to existing conditions.

During the operations stage of Phases 2-20, construction of additional phases would occur concurrently with operations; therefore, up to an additional 80 construction workers would be commuting during the same time period. Therefore, the total workforce commuting during operations (combined with the construction of next phases) could add 270 vehicles per day (135 vehicles each way) to the existing U.S. Highway 62/180 traffic during operations, representing an 8 percent increase in daily car traffic on U.S. Highway 62/180. Based on this analysis, the proposed traffic from the operations stage of Phases 2-20 when construction and operation are occurring concurrently would have a minor impact on daily traffic on U.S. Highway 62/180 near the proposed CISF project site and would be less for operation of Phase 20 (e.g., at full build-out). Further away from the proposed CISF project area, for example, near Carlsbad, the existing car traffic is higher because of the confluence of major roadways and increased commercial activity, and the proposed CISF project traffic would represent a smaller percentage of existing traffic and therefore would be less noticeable. This minor increase in local and regional car traffic would not significantly increase traffic safety problems or road degradation relative to existing conditions. Considering the combined transportation impacts from the preceding analysis of operations supply and waste shipments and worker commuting, including during concurrent construction and operation, the NRC staff concludes that the traffic impacts from the operations stage of the proposed action (Phase 1) and the operations stage of Phases 2-20 would be minor.

4.3.1.2.2 Transportation Impacts from Nationwide SNF Shipments to and from the CISF

During operation of any project phase (Phase 1 or Phases 2-20), SNF would be shipped from existing storage sites at nuclear power plants or ISFSIs to the proposed CISF. These shipments must comply with applicable NRC and U.S. Department of Transportation (DOT) regulations for the transportation of radioactive materials in 10 CFR 71 and 73 and 49 CFR 107, 171–180, and 390–397, as appropriate to the mode of transport. These regulations comprehensively address several aspects of transportation safety, including testing and approval of packaging, proper placarding and labeling of packages and shipments, limiting the dose rate from packages and conveyances, approved routing for shipments of spent fuel, safeguards, and incident reporting.

The radiological impacts on the public and workers of spent fuel shipments from a reactor have been previously evaluated in several NRC assessments and were found to be negligible (NRC, 2014; 2001; 1977). Because operation of the proposed CISF project would involve shipping SNF from reactors across the U.S. and eventually to a repository after storage, the radiological and nonradiological health impacts to workers and the public from this project-specific transportation, considering both incident-free and accident conditions, are evaluated in greater detail in this section.

The following analysis of SNF transportation impacts focuses on the proposed use of rail transportation. The NRC staff are aware that some existing reactors lack direct rail access and would need to use supplemental transportation involving heavy-haul truck or barge (for those with water access) from the reactor site to the nearest rail access. The impacts of using these other modes to supplement rail transportation of SNF was previously evaluated by DOE (DOE, 2008; 2002) and found to not significantly change the minor radiological impacts from a national mostly-rail SNF transportation campaign and therefore are not evaluated further in this impact analysis. This DOE analysis evaluated the differences in estimated impacts of using barge to transport SNF from 17 of 24 reactor sites (that did not have direct rail access but were located along waterways) to the nearest barge dock with rail access. The estimated incident-free radiological and nonradiological impacts for 24 years of national SNF transportation under the mostly-rail with barge transportation scenario were the same or less than the minor impacts DOE estimated for the mostly rail scenario (for example, 1.7 latent cancer fatalities for involved workers; 0.7 latent cancer fatalities for the public). DOE also found minor radiological and nonradiological accident impacts that were the same or not notably different between the mostly rail and mostly rail with barge transportation scenarios.

Some reactor sites, in particular those that have been shut down or decommissioned but continue to store SNF in dry storage casks, may require local transportation infrastructure upgrades to remove the SNF from the site (DOE, 2014). These upgrades, for example, could include installing or upgrading rail track, roads, or barge slips necessary to transfer SNF offsite. Because these infrastructure upgrades would be needed (regardless of whether the proposed CISF project is approved) to allow shipment of SNF from reactor sites to a repository in accordance with the Nuclear Waste Policy Act of 1982 (NWPA), these enhancements are beyond the scope of the proposed action and are therefore not evaluated further. Additionally, because these infrastructure improvements are expected to be small construction projects limited to preexisting, previously disturbed, and previously evaluated reactor sites that are dispersed throughout the U.S., the environmental impacts are expected to be minor and are not evaluated further for cumulative impacts in Chapter 5 of this EIS.

4.3.1.2.2.1 Radiological Impacts to Workers from Incident-Free Transportation of SNF

The potential radiological health impacts to workers from incident-free transportation of SNF to and from the proposed CISF project would occur from exposures to the normal radiation emitted from the loaded transportation casks that is within specified regulatory limits. The highest occupational exposures would occur to workers who spend the most time within close proximity to loaded SNF transportation casks. This includes the transportation crew, escorts, inspectors, and rail yard workers. Holtec's analysis of the incident-free radiological impacts to workers involved in transportation of SNF assumed that DOE would administratively control occupational exposures to an annual dose of 5 mSv [500 mrem], based on information from a prior DOE analysis (DOE, 2008), which is a fraction of the 10 CFR Part 20 annual occupational dose limit of 0.05 Sv [5 rem] (Holtec, 2019a). The NRC staff found this assumption reasonable if DOE were to ship the SNF from reactor sites to the proposed CISF. If the SNF were shipped by an NRC licensee, then the occupational doses to workers would be required to be limited to the 10 CFR Part 20 standard of 0.05 Sv [5 rem].

The NRC staff estimated the potential radiological impacts to workers from the proposed transportation of SNF from nuclear power plants and ISFSIs to the proposed CISF based on prior NRC transportation risk estimates in NUREG–2125, "*Spent Fuel Transportation Risk Assessment*" (NRC, 2014). In the NUREG–2125 analysis, the NRC staff executed the RADTRAN 6 transportation risk assessment code (Weiner et al., 2014) to calculate worker and public doses and risks from the transportation of SNF along various representative national routes under incident-free and accident conditions. In that analysis, the NRC staff calculated occupational doses for groups of workers, including rail crew, escorts in transit, and railyard workers, as well as crew and escorts at stops. Because the resulting dose estimates were presented for single shipments and for each kilometer traveled and for each hour of transportation, the NRC staff scaled the results by these variables (e.g., number of shipments, distance, and time) to generate estimates that were applicable to the proposed CISF project. The NRC staff selected a representative route that was bounding for the proposed shipments of SNF to the proposed CISF and scaled the calculated doses to match the number of proposed shipments and, as applicable, the shipment distance and time.

The representative route selected from NUREG–2125 for the NRC staff's CISF analysis was rail transport from the Maine Yankee nuclear power plant to the town of Deaf Smith, Texas. The reported distance for this shipment was 3,362 km [2,101 mi] (NRC, 2014). This route was selected as bounding for this EIS because most of the potential origins (U.S. nuclear power plants) for shipments destined for the proposed CISF are located east of the proposed CISF, and the distance of the selected representative route is larger than the actual distances that would be traveled from most U.S. nuclear power plants to the proposed CISF. Furthermore, the transportation characteristics along the route from Maine to Texas would be diverse and include several rural small towns as well as suburban and urban areas that would have dose and risk-related conditions that are representative of conditions on railways that could be potentially used for the proposed project. Railways across the nation also share consistent characteristics, including minimum rail setbacks from public buildings and other publicly accessible areas. Because dose estimates increase with shipment distance, selecting a route with a larger distance than that actually expected is bounding. Additionally, NUREG–2125 included separate dose calculations for two types of NRC-certified rail casks (characterized as rail-lead and rail-steel). For the proposed CISF incident-free dose analyses, the NRC staff selected dose results for the rail-lead cask because the external dose rate was set at the regulatory maximum and was therefore a bounding incident-free dose rate for any NRC-certified transportation cask that might be used for future shipments of SNF of various specifications (including, for example, high-burnup fuel).

To estimate the potential radiological impacts to workers from the proposed transportation of SNF from nuclear power plants and ISFSIs to the proposed CISF, the NRC staff scaled single-shipment dose estimates [for the in-transit train crew and escorts and the railyard workers and inspectors at stops based on dose results in NUREG–2125 (NRC, 2014)] by the number of shipments (500 Phase 1 shipments; 10,000 full-buildout shipments). The NRC staff scaled reported rail crew and escort in-transit doses from NUREG–2125 (NRC, 2014) by the distance traveled and shipment duration, respectively, to derive the single-shipment in-transit dose estimates for these groups of workers. The NRC staff calculated the shipment duration by dividing the reported distances traveled on the representative route in rural, suburban, and urban population zones by the applicable train speeds in those zones. The single-shipment railyard worker dose estimates were the sum of the origin and destination rail classification stop doses in NUREG–2125. The single-shipment dose-to-rail inspectors at stops was estimated by scaling the one-hour SNF truck inspection dose in NUREG–2125 by the duration and number of in-transit rail inspections per shipment that were described in NUREG–2125 (i.e., three 4-hour inspections). All single-shipment doses were summed and then scaled by the number of shipments to calculate an incident-free occupational population dose that was converted to health effects by applying a current cancer risk coefficient assuming a linear, no-threshold dose response. A linear, no-threshold dose response assumes, for radiation protection purposes, that any increase in dose, however small, results in an incremental increase in health risk. The cancer risk coefficient is 5.7×10^{-2} health effects per person-Sv [5.7×10^{-4} per person-rem] (ICRP, 2007), where the health effects include fatal cancers, nonfatal cancers, and severe hereditary effects. The NRC staff's calculated incident-free dose and health effects risk results for the proposed CISF SNF transportation are provided in Table 4.3-1. An estimate of the expected non-project baseline cancer that would occur in a population of comparable size to the exposed population (that does not include the estimated health effects from the proposed transportation) is also provided in EIS Table 4.3-1 for comparison. Both the National Council on Radiation Protection and Measurements (NCRP) and the International Commission on Radiological Protection (ICRP) suggest that when the collective (population) dose is less than the reciprocal of the risk coefficient (i.e., less than $1/5.7 \times 10^{-2}$ health effects per person-Sv or 17.54 person-Sv) the assessment should find that the most likely number of excess health effects is zero. Based on this consideration, the occupational health effects estimates for the proposed action (Phase 1) are most likely zero, and, for all phases (full build-out), 1.4 health effects. The estimate of excess occupational health effects for all phases (full build-out) of 1.4 is a small fraction of the estimated 250 non-project baseline health effects within the same population.

Considering the low calculated doses, estimated relative health effects, and radiation dose limits, the radiological impact to workers from incident-free transportation of SNF to and from the proposed CISF project during the operations stage of the proposed action (Phase 1) and the operations stage of Phases 2-20 would be minor. This conclusion applies regardless of which radiation dose limits are applied (e.g., the DOE administrative limit or the NRC standard).

Table 4.3-1 Comparison of Estimated Population Doses and Health Effects from Proposed Transportation* of SNF to the Proposed CISF Along a Representative Route with Non-Project Baseline Cancer

	Incident-Free			Accident (No Release)		
Exposed Population	**Population Dose (person-Sv)**	**Health Effects†**	**Non-Project Baseline Cancer‡**	**Population Dose (person-Sv)**	**Health Effects†**	**Non-Project Baseline Cancer‡**
Occupational						
Phase 1	1.3	0.07	250	Emergency Responder (consequence) 0.92 mSv [92 mrem]		
All Phases	25	1.4	250			
Public						
Phase 1	0.18	0.01	440,000	0.03	0.002	440,000
All Phases	3.6	0.21	440,000	0.66	0.04	440,000

*500 shipments of SNF (Phase 1) occurring over an approximated 2.5 year operational period; 10,000 shipments of SNF (All Phases) occurring over an approximated 20 years of operational periods within a 40 year license term.

†Health effects includes fatal cancer, nonfatal cancer, and severe hereditary effects. Estimated by multiplying the population dose by the health risk coefficient of 5.7×10^{-2} health effects per person-Sv.

‡Non-project baseline cancer is estimated by multiplying the exposed population by the U.S. risk of getting a cancer (1/3) (EIS Section 3.12.3). Estimated occupational population (748 total) includes 3 crew and 1 escort on each of 12 trains (48 total), and 2 rail yard workers at each of 2 classification stops per shipment at 100 different rail yards (400 total) to account for dispersed actual routes, and 1 inspector at 3 stops per shipment at 100 different rail yards (300 total). Public population is based on NUREG–2125 reported population along representative route of 1,321,024.

To convert Person-Sv to Person-Rem, multiply by 100.

4.3.1.2.2.2 Radiological Impacts to Members of the Public from Incident-Free Transportation of SNF

The potential radiological health impacts to the public from incident-free transportation of SNF to and from the proposed CISF project would occur from exposures to the normal radiation emitted (during transportation) from the loaded transportation casks that is within specified regulatory limits. Because the applicable gamma and neutron radiation fields associated with a loaded SNF transportation cask naturally attenuate with distance from the source, past analyses of the doses received by members of the public from transportation of SNF indicate low doses that are well below regulatory limits and are a small fraction of the annual dose attributable to naturally occurring background radiation (DOE, 2008; NRC, 2014, 2001). The highest accumulated exposures over time to this low level of radiation to members of the public would occur to those individuals who spend the most time within close proximity to the rail lines used for SNF transportation. This includes individuals who may live or work adjacent to rail lines used for SNF transportation.

Holtec's analysis of the incident-free radiological impacts to the public from SNF transportation to and from the proposed CISF project was based on an analysis Interim Storage Partners (ISP) submitted for a separate CISF licensing action that NRC staff is currently reviewing. Therefore, the NRC staff performed an independent analysis of the potential radiological impacts to the public from the proposed incident-free transportation of SNF from nuclear power plants and ISFSIs to the proposed CISF based on an approach similar to the approach applied in the preceding analysis of the occupational radiological impacts. This approach involves scaling prior NRC transportation risk estimates in NUREG–2125 (NRC, 2014) by the number of proposed shipments. NUREG–2125 includes calculations of in-transit incident-free public doses to residents along the route, to occupants of vehicles sharing the route, and to residents near SNF transportation stops. The resulting incident-free doses and health effects for the proposed CISF SNF transportation are provided in Table 4.3-1. All of the estimated public health effects from the proposed incident-free SNF transportation during the operations stage of the proposed action (Phase 1) and the operations stage of Phases 2-20 are below the aforementioned NCRP and ICRP non-zero health effects threshold (EIS Section 4.3.1.2.2.1) and therefore are most likely to be zero.

The NRC staff also evaluated the radiological impact of the proposed SNF transportation on a maximally exposed individual member of the public, based on the transportation risk analysis provided in NUREG–2125 (NRC, 2014). The maximally exposed individual in this calculation is the member of the public that could receive a much higher dose from passing SNF shipments relative to other members of the public based on their close proximity to the rail track and the number of shipments to which they are exposed. In this calculation, the maximally exposed individual is located 30 m [98 ft] from the rail track and is exposed to the direct radiation emitted from all 10,000 passing rail shipments of SNF at full build-out under normal operations. The resulting accumulated dose is 0.06 mSv [6 mrem]. For comparison, the NRC limits annual public doses from licensed facility operations to 1.0 mSv [100 mrem] (10 CFR Part 20), and limits individual does form an operating ISFSI to 0.25 mSv [25 mrem], and the average annual background radiation exposure in the U.S. is 6.2 mSv [620 mrem] (EIS Section 3.11.1.1).

Based on the preceding analysis of the potential radiological impacts under incident-free conditions, the NRC staff concludes that the radiological impacts to the public from proposed SNF transportation during the operations stage of the proposed action (Phase 1) and the operations stage of Phases 2-20 would be minor.

4.3.1.2.2.3 Radiological Impacts to Workers and the Public from SNF Transportation Accidents

The potential radiological health impacts to workers and the public from SNF transportation to and from the proposed CISF under accident conditions would occur from exposures to the radiation emitted from the loaded transportation casks after an accident has occurred and during the time when emergency response actions are taken to address the accident scene. Under some accident conditions, the radiation shielding on the transportation cask can be damaged, causing the radiation dose in the proximity of the package to increase. Under rare severe accident conditions, the potential for breaching a transportation cask and releasing a fraction of the radioactive contents is possible and has been considered in past SNF transportation risk assessments (NRC, 2014, 2001; DOE, 2008). These prior assessments conservatively modeled accidental releases of radioactive material during transportation and did not specifically account for the added containment provided by canisters. All SNF proposed to be transported to and from the proposed CISF would be shipped in canisters that are placed in NRC-certified transportation casks. In the most recent analysis (NRC, 2014), as described in more detail in this section, the NRC staff concluded that an accidental release of canistered fuel during transportation did not occur under the most severe impacts studied, which encompassed all historic or realistic accidents.

The NRC staff evaluated the potential public and occupational impacts of the proposed SNF transportation under accident conditions. NUREG–2125 reports an average freight rail accident frequency of 1.32×10^{-7} per railcar-mile based on DOT historic accident frequencies from 1991 to 2007 (NRC, 2014). This frequency broadly applies to all accidents ranging from minor to severe. The frequency further decreases by orders of magnitude when the focus narrows to specific less-frequent accident scenarios, such as severe accidents. While the actual rail configurations and routes that would be used to ship SNF to the proposed CISF would be determined prior to shipping and are currently unknown, considering the previously described bounding representative route with a distance of 3,362 km [2,101 mi] and assuming a 3-car train, after 10,000 shipments, eight accidents would be expected to occur over a 20-year period.

In NUREG–2125, the NRC staff conducted detailed engineering analyses of transportation accident consequences including cask and SNF responses to severe accident conditions involving impact force and fire (thermal effects) within and beyond the hypothetical accident conditions found in 10 CFR 71.73 (NRC, 2014). The results of the study concluded that no SNF releases would occur from a severe long-lasting fire. Additionally, for the evaluation of impact accidents, the steel shielded cask with inner welded canister (i.e., rail-steel cask) had no release and no loss of gamma shielding effectiveness under the most severe impacts studied, which encompassed all historic or realistic accidents. Because the proposed design of the CISF would require SNF to be contained within inner welded canisters, the transportation of the SNF to the proposed CISF would also require SNF to be in canisters that would be shipped in transportation casks similar to the configuration evaluated in NUREG–2125. Therefore, the NRC staff considers the conclusion in NUREG–2125 regarding the resiliency of the rail-steel cask to severe accident conditions (resulting in no release under severe accident conditions) applicable to the evaluation of potential CISF SNF transportation impacts under accident conditions. Under accident conditions with no release, NUREG–2125 evaluated the dose consequence to an emergency responder that spends 10 hours at an accident site at an average distance of 5 m [16 ft] from the cask, 0.69 mSv [69 mrem] for the rail-steel cask, and 0.92 mSv [92 mrem] for the rail-lead cask (NRC, 2014). The exposure time of 10 hours is a conservative assumption based on a prior DOE study (DOE, 2002) that indicated first responders would take about an hour to secure the vehicle and the accident scene. These same consequences would apply for an accident during any phase of the proposed CISF project. For comparison, the NRC annual public dose limit applicable to licensed operating facilities in 10 CFR Part 20 is 1 mSv [100 mrem]. Based on this information, the NRC staff concludes that the occupational radiological impacts from the proposed SNF transportation under accident conditions during the operations stage of the proposed action (Phase 1) and the operations stage of Phases 2-20 would be minor.

The NRC staff also evaluated the potential radiological impacts to the public from the proposed SNF transportation under accident conditions. As with the preceding analysis of occupational radiological impacts from accidents, based on the analyses in NUREG–2125 (NRC, 2014), the NRC staff considers the conclusion in NUREG–2125 regarding the resiliency of the rail-steel cask to severe accident conditions (resulting in no release under severe accident conditions) applicable to the evaluation of potential CISF SNF transportation impacts under accident conditions. Under accident conditions with no release, NUREG–2125 estimated the dose-risk to the public as a population dose that accounts for the accident probability. The accident scenario involves a 10-hour delay in movement of the cask at the accident scene where members of the public in the surrounding area (800 m [2,625 ft] in all directions) are exposed to direct radiation from the cask. The NRC staff used the same NUREG–2125 representative route as described previously for the occupational dose impact analysis and scaled the resulting population dose by the number of shipments and converted the population dose to health effects using the same cancer risk coefficient. The public dose-risk and health effects from proposed CISF SNF transportation under accident conditions are provided in Table 4.3-1. All of the estimated radiological health effects to the public from the proposed SNF transportation under accident conditions are below the aforementioned ICRP threshold and are therefore likely to be zero.

Based on the preceding analysis, the NRC staff concludes that the radiological impacts to workers and the public from the proposed SNF transportation under accident conditions during the operations stage of the proposed action (Phase 1) and the operations stage of Phases 2-20 would be minor.

4.3.1.2.2.4 Non-Radiological Impacts to Workers and the Public from SNF Transportation

Nonradiological impacts to workers and the public from incident-free SNF rail transportation and from rail accidents would also occur during the period of operations. The nonradiological impacts associated with incident-free SNF transportation include typical occupational injuries and diesel emissions such as typical air pollutants and greenhouse gas emissions. The potential impacts of the air emissions are evaluated in EIS Section 4.7.1.1.1. The occupational impacts associated with transportation of SNF by rail under both normal and accident conditions include injuries and fatalities. Considering the occupational fatality and injury rates for workers involved in transportation and warehousing in EIS Table 4.13-1, and assuming 24 additional workers to operate 12 locomotives for the single year of the operations stage of the proposed action (Phase 1), the NRC staff estimated that there would be 1.1 additional injuries and 3.1×10^{-3} fatalities. For the operations stage of Phases 2-20, the same estimated annual injuries and fatalities would apply. If all operation stages for the full build-out were conducted over a period of 20 years, the cumulative total injuries would be 22 injuries and 6.2×10^{-2} fatalities.

The potential nonradiological impacts to the public from transportation accidents include traffic fatalities (e.g., accidents at rail crossings) and fatalities involving individuals trespassing on railroad tracks. The potential fatalities to members of the public from any rail accidents was estimated conservatively for the operations stage of the proposed action (Phase 1) by taking the product of the fatalities (worker and public) per distance traveled by rail (2.27×10^{-8} fatalities per railcar-km) (NRC, 2001) and a bounding estimate of the total rail distance associated with SNF transportation of 3.4×10^6 km [2.1×10^6 mi]. The total rail distance was estimated by assuming each of the 500 canisters was shipped the distance from Maine Yankee to Deaf Smith, Texas {3,362 km [2,100 mi]} (NRC, 2014) and the result was doubled to address two-way travel. This resulted in an estimated 0.08 fatalities for shipping 500 canisters of SNF from reactors to the proposed CISF. During the operations stage of Phases 2-20, an additional 500 canisters would be shipped to the proposed CISF per phase with an estimated number of fatalities equal to the proposed action (Phase 1) estimate, until the maximum of 10,000 canisters has been shipped. At full build-out, the estimated distance for shipping 10,000 canisters would be 6.7×10^7 km [4.2×10^7 mi], resulting in an estimated 1.5 fatalities for shipping all SNF from reactors to the proposed CISF over the duration of the proposed SNF shipping campaign.

Based on the preceding analysis, the NRC staff concludes that the nonradiological impacts to workers and the public from SNF transportation to the CISF project during the operations stage of the proposed action (Phase 1) and during the operations stage of Phases 2-20 would be minor.

4.3.1.2.2.5 Defueling

When a geologic repository becomes available, the SNF stored at the proposed CISF would be removed and sent to the repository for final disposal. Removal of the SNF from the proposed CISF, or defueling, would contribute to additional transportation impacts that would be similar in nature to the impacts evaluated for shipping SNF from nuclear power plants and ISFSIs to the proposed CISF project that were described in EIS Sections 4.3.1.2 with workforce commuter traffic impacts similar to those discussed under the emplacement activities earlier in the operations stage. These additional shipments of SNF to a repository would involve different routing and shipment distances than from the nuclear power plants and ISFSIs to the proposed CISF project. Therefore, this section includes additional impact analyses of the radiological and nonradiological health and safety impacts to workers and the public under normal and accident conditions from the national rail transportation of SNF from the proposed CISF project to a repository.

The NRC staff estimated the potential radiological impacts to workers and the public from the transportation of SNF from the proposed CISF to a geologic repository under incident-free and accident conditions based on an approach similar to the approach applied in the preceding analysis of the public and occupational radiological impacts of SNF shipments to the proposed CISF project. This approach involved selecting a representative route from the prior NRC transportation risk assessment in NUREG–2125 (NRC, 2014) that adequately bounded the distance of the proposed shipments and then scaling the NUREG–2125 dose results for that route by the number of proposed shipments and, as applicable, the shipment distance, duration, and the number and duration of inspections. As before, the population dose results were converted to health effects using the same ICRP cancer risk coefficient.

The assumed route of SNF shipments would travel from the proposed CISF to the proposed repository at Yucca Mountain, Nevada. The representative route selected from NUREG–2125 for the NRC staff's CISF defueling analysis travels by rail from the town of Deaf Smith, Texas, to the Idaho National Engineering Laboratory. The reported distance for this shipment was 1,913 km [1,196 mi] (NRC, 2014). This route was selected because the distance was bounding and the varied conditions (e.g., population characteristics) were considered by NRC staff to be adequate to represent the routes that would be taken by actual SNF shipments from the proposed CISF for the purpose of evaluating the potential radiological impacts of the proposed SNF transportation.

The occupational and public radiation dose and health effects estimates from the proposed CISF SNF transportation to a repository under incident-free and accident conditions are provided in EIS Table 4.3-2. An estimate of the expected non-project baseline cancer that would occur in a population of comparable size to the exposed population (that does not include the estimated health effects from the proposed transportation) is also provided in EIS Table 4.3-2 for comparison.

All of the estimated radiological health effects to workers and the public from the proposed SNF transportation under incident-free and accident conditions are below the aforementioned ICRP threshold and are therefore likely to be zero. These results are within expectations because the methods applied are similar to the preceding analysis of SNF shipments from reactors to the CISF but with a shorter route distance, which reduces the estimated doses and health effects. Additionally, because the nonradiological impacts associated with these SNF shipments would be similar to the nonradiological impacts evaluated for the incoming SNF shipments to the CISF but would scale lower with the reduced shipment distance, the nonradiological impacts for the repository shipments would be less than the incoming shipment impacts previously evaluated in this EIS section.

Table 4.3-2 Comparison of Estimated Population Doses and Health Effects from the Proposed Transportation of SNF Along a Representative Route to a Repository with Non-Project Baseline Cancer

Exposed Population	Incident-Free			Accident		
	Population Dose (person-Sv)	Health Effects*	Non-Project Baseline Cancer†	Population Dose (person-Sv)	Health Effects*	Non-Project Baseline Cancer†
Occupational						
Phase 1	0.50	0.03	10	Emergency Responder (consequence) 0.92 mSv [92 mrem]		
All Phases	10	0.57	10			
Public						
Phase 1	0.09	0.005	99,530	0.03	0.002	99,530
All Phases	1.8	0.10	99,530	0.66	0.04	99,530

*Health effects includes fatal cancer, nonfatal cancer, and severe hereditary effects. Estimated by multiplying the population dose by the health risk coefficient of 5.7×10^{-2} health effects per person-Sv.

†Non-project baseline cancer is estimated by multiplying the exposed population by the U.S. risk of getting a cancer (1/3) (EIS Section 3.12.3). Estimated occupational population (29 total) for single point-to-point route includes 3 crew and 1 escort on each of 6 trains (24 total), 1 inspector at 1 stop, plus 2 railyard workers at 2 assumed classification stops (4 total). Public population is based on NUREG–2125 reported population along representative route of 298,590.

To convert Person-Sv to Person-Rem multiply by 100.

Based on the preceding analysis, the NRC staff concludes that the radiological and nonradiological impacts to workers and the public from SNF transportation from the CISF project to a geological repository during the defueling activities of the operations stage of the proposed action (Phase 1) and during the defueling activities of the operations stage of Phases 2-20 would be minor.

4.3.1.2.3 Rail Spur

The potential environmental impacts from transportation associated with the rail spur would include operation of the rail spur that connects the existing rail line to the proposed CISF. The short distance, lack of road crossings, and remote and sparsely populated location of the proposed rail spur would not significantly add to the impacts from the CISF project operations that were described in EIS Section 4.3.1.2. This includes minor changes to impacts associated with road traffic and the radiological and nonradiological health and safety impacts to workers and the public under normal and accident conditions from the proposed national rail transportation of SNF to and from the proposed CISF. For these reasons, the NRC and BLM staff conclude that impacts on transportation from operation of the rail spur during the operations stage of the proposed action (Phase 1) and during the operations stage of Phases 2-20 would be minor.

4.3.1.2.4 Overall Summary of Operations Impacts

The detailed operations stage impact analyses are documented in the foregoing EIS sections (4.3.1.2.1 through 4.3.1.2.3). Considering the minor transportation impact conclusions from these impact analyses of the proposed operations stage activities, including supply shipment and commuting worker traffic, the radiological and nonradiological impacts of nationwide SNF shipments to and from the CISF, and the operation of the proposed rail spur, the NRC staff concludes that the overall transportation impacts from the operations stage of the proposed action (Phase 1) and the operations stage of Phases 2-20 would be SMALL.

4.3.1.3 Decommissioning and Reclamation Impacts

At the end of the license term of the proposed CISF project, once the SNF inventory is removed, the facility would be decommissioned such that the proposed project area and remaining facilities could be released and the license terminated. Decommissioning activities, in accordance with 10 CFR Part 72 requirements, would include conducting radiological surveys and decontaminating, if necessary. Decommissioning activities for the proposed action (Phase 1) and for Phases 2-20 would involve the same activities, but the activities would be scaled to address the overall size of the CISF (i.e., the number of phases completed).

Holtec has committed to reclamation of nonradiological-related aspects of the proposed project area (Holtec, 2019a). Reclamation would include dismantling and removing equipment, materials, buildings, roads, the rail spur, and other onsite structures; cleaning up areas; waste disposal; erosional control; and restoring and reclaiming disturbed areas. EIS Sections 2.2.1.4 and 2.2.1.7 describe the decommissioning and reclamation activities.

During the decommissioning and reclamation stage of the proposed CISF project, the primary transportation impacts would be traffic impacts from the use of trucks to transport reclamation waste materials to a disposal facility and from the commuting workforce (EIS Section 2.2.1.7). Based on the low levels of decommissioning-related transportation (EIS Section 2.2.1.7), the NRC staff concludes that the decommissioning transportation impacts during the decommissioning and reclamation stage would be negligible and are not evaluated further in this section. The regional and local transportation infrastructure that would serve the proposed CISF project is described in EIS Section 3.3. Access to the proposed CISF project from nearby communities would be from U.S. Highway 62/180, which traverses the proposed project area.

The NRC staff's decommissioning and reclamation traffic impact analysis considered the volume of estimated traffic from reclamation waste shipments and worker commuting (EIS Table 2.2-4) and determined the estimated increase in the applicable annual average daily traffic counts on the roads used to access the proposed project area. The NRC staff's estimated number of annual reclamation waste shipments as 18,950 or approximately 52 trucks per day. This estimate assumes a waste-hauling capacity of 15 m^3 [20 yd^3], which is applicable to a typical roll-off container. For the decommissioning and reclamation stage of Phases 2-20, this same waste volume estimate would also apply to the reclamation of any individual phase; however, the number of shipments could double if these phases were reclaimed within a year's time (comparable to the duration of construction).

Under the current application, decommissioning and reclamation would occur at the end of the 40-year license term. Therefore, the NRC staff adjusted the current truck traffic taking into account future economic growth. Considering the past 15 years of job growth in the socioeconomic region of influence (ROI) of 35 percent (EIS Section 3.11.2), the NRC staff annualized the reported historical job growth rate at 2.0 percent and assumed the truck traffic would increase at the same rate over the next 40 years. Accounting for the effect of compounding, the existing truck traffic on Highway 62/180 (EIS Section 3.3) of 2,449 trucks per day would increase to 5,452 trucks per day after 40 years. Based on this 40-year adjusted baseline daily truck traffic and the estimated daily truck traffic from reclamation waste shipments, the NRC staff calculated a 2 percent increase in truck traffic from shipping the nonhazardous reclamation waste from the proposed action (Phase 1). For any other single phase (Phases 2-20) a shorter assumed duration of reclamation (1 year) could double this estimated increase in traffic. Based on this analysis, the nonhazardous demolition waste for the decommissioning and reclamation stage of the proposed action (Phase 1) or any other single phase (Phases 2-20) would have a minor impact on daily truck traffic on U.S. Highway 62/180 near the proposed CISF project.

The NRC staff estimated the volume of nonhazardous demolition waste from reclamation of the full build-out (Phases 1-20) of the proposed project in EIS Section 2.2.1.7. Assuming this volume of waste material would need to be shipped during a reclamation period of approximately 10 years for the proposed CISF project, the NRC staff's estimated number of annual shipments during reclamation of full build-out was 75,900 or approximately 208 trucks per day. This estimate assumes a truck capacity of 15 m^3 [20 yd^3], which is applicable to a typical roll-off container. Considering the aforementioned 40-year adjusted baseline daily truck traffic and the estimated annual truck traffic from reclamation waste shipments, the NRC staff calculated an annual 8 percent increase in truck traffic from shipping the proposed CISF full build-out nonhazardous reclamation waste. If the proposed reclamation took less than 10 years, the projected annual increase in truck traffic would increase proportionately (e.g., 16 percent increase in traffic if reclamation occurred over a 5-year period). Based on this analysis, the nonhazardous reclamation waste shipments during the decommissioning and reclamation stage of the proposed CISF at full build-out would have a minor impact, if the reclamation occurs over a period greater than 5 years.

In addition to the reclamation waste shipments, during the decommissioning stage of the proposed action (Phase 1) and during the decommissioning and reclamation stage of

Phases 2-20, the NRC staff assume that a reclamation work force (similar to the construction workforce) of 80 workers (Holtec, 2019a) would commute to and from the proposed CISF using individual passenger vehicles and light trucks on a daily basis. This reclamation worker commuting would occur for the duration of demolition and removal activities. These workers could account for an increase of 160 vehicles per day (80 vehicles each way) on Highway 62/180 during the decommissioning and reclamation stage. This amounts to a 4 percent increase in the current daily car traffic on Highway 62/180. Based on this analysis, the proposed CISF commuting worker traffic would have a minor impact on the daily Highway 62/180 traffic near the proposed CISF project during the decommissioning and reclamation stage of the proposed action (Phase 1) and during the decommissioning and reclamation stage of Phases 2-20. Further away from the proposed project area, for example, near Carlsbad, the existing car traffic is greater, and the proposed CISF project shipments would represent a smaller percentage of existing traffic and therefore would be less noticeable. The NRC staff concludes that this small increase in car traffic would not significantly increase traffic safety problems or road degradation relative to existing conditions.

4.3.1.3.1 Rail Spur

The potential environmental impacts from the rail spur on transportation would result from decommissioning and reclamation of the rail spur that connects the existing rail line to the proposed CISF project. Decommissioning and reclamation of the rail spur would consist of conducting radiological surveys, dismantling the rail line and hauling the waste to a licensed facility, if the landowner (BLM) determines not to keep the infrastructure in place. There would be a small increase in traffic because of workers dismantling the rail line and a limited amount of materials that would need to be disposed, but the NRC and BLM staff anticipate the increase in traffic from these activities to be equal to or less than the traffic increase associated with construction impacts. Therefore, because it is not anticipated to impact traffic conditions beyond those experienced during the construction stage of the rail spur, the NRC and BLM staff conclude that impacts on transportation from decommissioning the rail spur would be minor during the decommissioning stage of the proposed action (Phase 1) and during the decommissioning stage of Phases 2-20 or at full build-out.

4.3.1.3.2 Summary of Overall Decommissioning and Reclamation Impacts

Based on the preceding analysis, the NRC staff concludes that the transportation impacts from reclamation waste shipments and commuting workers and during the decommissioning and reclamation stage of the proposed action (Phase 1) and during the decommissioning and reclamation stage of Phases 2-20 would be SMALL. Impacts to truck traffic would be SMALL from reclamation of the proposed CISF at full build-out, if the reclamation occurs over a 10-year period.

4.3.2 No-Action Alternative

Under the No-Action alternative, the NRC would not license the proposed CISF project. Therefore, transportation impacts such as increased traffic from proposed transportation and radiation exposures to workers and the public from the transportation of SNF to and from the proposed CISF project would not occur. Construction impacts would be avoided, because SNF storage pads, buildings, and transportation infrastructure would not be built. Operational impacts would also be avoided, because no SNF transportation to and from the proposed CISF would occur. Transportation impacts from the proposed decommissioning and reclamation activities would not occur, because unbuilt SNF storage pads, buildings, and transportation infrastructure require no decommissioning and reclamation. The current transportation conditions on and near the project would remain unchanged by the proposed CISF under the No-Action alternative. In the absence of a CISF, the NRC staff assumes that SNF would remain onsite in existing wet and dry storage facilities and be stored in accordance with NRC regulations and be subject to NRC oversight and inspection. Site-specific impacts at each of these storage sites would be expected to continue as detailed in generic (NRC, 2013, 2005a) or site-specific environmental analyses. In accordance with current U.S. policy, the NRC staff also assumes that the SNF would be transported to a permanent geologic repository, when such a facility becomes available.

4.4 Geology and Soils Impacts

This section describes the potential environmental impacts to geology and soils for the proposed action (Phase 1), Phases 2-20, and the No-Action alternative.

4.4.1 Impacts from the Proposed CISF

As described in EIS Section 3.4.2, the ground surface at the proposed project area is covered by a laterally extensive veneer of Quaternary alluvial deposits ranging in thickness from 7.6 to 12.2 m [25 to 40 ft]. The alluvial deposits consist of (from top to bottom): (i) 0 to 0.6 m [0 to 2 ft] of surface soil (topsoil) consisting of varying amounts of sand and clay; (ii) 0.6 to 4.1 m [2 to 13.5 ft] of caliche (referred to as the Mescalero Caliche); and (iii) 5.2 to 8.5 m [17 to 28 ft] of residual soil consisting of sand, clay, and gravel. The alluvial deposits are underlain by bedrock of the Triassic Dockum Group consisting of shale, siltstone, and sandstone of the Santa Rosa Formation and the overlying Chinle Formation. The Triassic Dockum Group is about 183 m [600 ft] thick beneath the proposed project area (EIS Figure 3.4-7). As described in EIS Section 3.4.2, site topography ranges in elevation from 1,073 to 1,079 m [3,520 to 3,540 ft] above mean sea level and slopes gently northward and eastward across the proposed project area.

4.4.1.1 Construction Impacts

Construction for the proposed action (Phase 1) and for Phases 2-20 of the proposed CISF project would require an area of flat terrain; therefore, cut and fill would be required on some portions of the proposed CISF project. To minimize the impacts of cut and fill, Holtec would use materials from higher portions of the site for fill at the lower portions of the site, to the extent possible (Holtec, 2019a).

Excavation and grading for the proposed CISF project would disturb soils to a depth of approximately 7.6 m [25 ft] below grade (Holtec, 2019a). Holtec estimates that approximately 135,517 m^3 [177,250 yd^3] of soil would be excavated for each phase (1-20) of the proposed CISF project (Holtec, 2019a). The proposed action (Phase 1) would also include excavation of approximately 61,547 m^3 [80,500 yd^3] of soil for construction of the site access road, railroad spur, security building, administration building, and parking lot. Excavated soil would be stockpiled inside the 421-ac [1,040-ac] proposed project area, but outside the 114.5-ha [283-ac] protected area. Holtec estimates that approximately 10 percent of the stockpiled soils would be used for backfill and site grading (Holtec, 2019a). The remaining stockpiled soils would be stored onsite or disposed of at an approved offsite disposal facility. Because excavation depth is limited to near-surface geology, construction activities are not expected to cause seismic or fault-related impacts.

Clearing and grading of soils may result in soil erosion from wind and water. The proposed project area would be situated primarily in the Simona fine sandy loam and Simona-Upton association (EIS Figure 3.4-8), which are slightly susceptible to water erosion and somewhat susceptible to wind erosion (Holtec, 2019a). Stormwater runoff could also potentially impact nearby drainages and playa lakes (e.g., Laguna Plata and Laguna Gatuna) by increasing the sediment load to these surface water features. Holtec would implement several types of mitigation measures to limit soil loss and reduce stormwater runoff impacts. To control soil erosion because of site clearing and grading, Holtec has committed to applying the following best management practices (BMPs): (i) using acceptable methods to stabilize disturbed soils; (ii) using earthen berms, dikes, and sediment fences to limit suspended solids in runoff; (iii) stabilizing cleared areas not covered by pavement or structures as soon as practicable; (iv) reusing excavated materials whenever possible; and (v) stockpiling soil using techniques to reduce erosion (Holtec, 2019a). To control soil erosion because of stormwater runoff, Holtec has committed to applying the following BMPs, which would be performed through compliance with a Stormwater Pollution Prevention Plan (SWPPP): (i) stabilizing drainage culverts and ditches by lining them with rock aggregate/riprap and (ii) creating berms with silt fencing/straw bales to reduce flow velocity and prohibit scouring (Holtec, 2019a). These mitigation measures would be implemented starting with the proposed action (Phase 1) and would continue through subsequent phases (Phases 2-20).

Leaks and spills of oil and hazardous materials from construction equipment could also impact soils. Holtec has committed to implementing a Spill Prevention, Control, and Countermeasures (SPCC) Plan to minimize the impacts of potential soil contamination (Holtec, 2019a). Spills of oil or hazardous materials could also run off into nearby drainages during storm events. As described in EIS Sections 2.2.1.6 and 4.5.1, stormwater runoff during construction and operations would be regulated under National Pollutant Discharge Elimination System (NPDES) permit requirements. These permits and mitigation measures would be implemented starting with the proposed action (Phase 1) and would continue through subsequent phases (Phases 2-20).

Impacts to geology and soils during construction would be limited to soil disturbance, soil erosion, and potential soil contamination from leaks and spills of oil and hazardous materials. Holtec would implement mitigation measures, BMPs, NPDES permit requirements, and the SPCC Plan to limit soil loss, avoid soil contamination, and minimize stormwater runoff impacts. Therefore, the NRC staff concludes that the potential impacts to geology and soils associated with the construction stage for the proposed action (Phase 1) and for Phases 2-20 of the proposed CISF project would be SMALL.

4.4.1.1.1 Rail Spur

Similar to impacts to geology and soils during the construction stage, the impacts from the construction of the rail spur would be limited to soil disturbance, soil erosion, and potential soil contamination from leaks and spills of oil and hazardous materials. The disturbed land area for the rail spur would be 15.9 ha [39.4 ac] of BLM-managed land. Holtec would implements the same mitigation measures, BMPs, NPDES permit requirements, and spill prevention and cleanup plans as for the proposed CISF, to limit soil loss, avoid soil contamination, and minimize stormwater runoff impacts. Therefore, due to the small amount of disturbed land area and similar mitigation measures to those implemented under the construction stage, the NRC and BLM staff conclude that the potential impacts to geology and soils from construction of the rail spur would be SMALL.

4.4.1.2 Operations Impacts

Operation of the proposed action (Phase 1) and Phases 2-20 of the proposed CISF project would not be expected to impact underlying bedrock, because storage structures are passive (i.e., they have no moving parts). The SNF canisters and storage systems are designed to robustly contain radiological materials. Holtec would conduct routine monitoring and inspections during all phases to verify that the proposed CISF project is performing as expected (Holtec, 2019a). Leaks and spills of oil and hazardous materials from equipment and vehicles used to operate the facility could contaminate soils or runoff into nearby drainages during storm events. As in the construction stage, Holtec would continue to implement the SPCC Plan to minimize the impacts of potential soil contamination, and stormwater runoff would continue to be regulated under NPDES permit requirements. Holtec would also continue to implement mitigation measures for stormwater management through its SWPPP.

Operation of the proposed action (Phase 1) and Phases 2-20 would not be expected to impact the potential for seismic events, sinkhole development, or subsidence. The proposed CISF project would be located in an area of southeastern New Mexico that has low seismic risk. The proposed CISF would have a total depth of 7.6 m [25 ft] and would not intersect any active faults. The NRC's safety review will determine whether the proposed CISF project would be constructed in accordance with 10 CFR 72.122, General Design Criteria, Overall Requirements, which requires that structures, systems, and components important to safety be designed to withstand the effects of natural phenomena such as earthquakes without impairing their capability to perform safety functions. Therefore, the NRC staff does not anticipate that the proposed CISF would impact seismic activity at the proposed project location nor be impacted by seismic events.

As described in EIS Section 3.4.5, sinkholes and karst features formed in evaporite and gypsum bedrock are common features of the lower Pecos region of west Texas and southeastern New Mexico. A number of these features are of anthropogenic (man-made) origin and are associated with improperly cased abandoned oil and water wells, or with solution mining of salt beds in the shallow subsurface (Land, 2009, 2013). As described in EIS Section 4.2.1.1, numerous plugged and abandoned oil and gas wells are present within the proposed project area (Holtec, 2019a,b). However, none of these oil and gas wells are located within the 133.5-ha [330-ac] storage and operation area or where any land would be impacted by construction and operation activities. Holtec has stated that it has no plans to use any of the plugged and abandoned wells (Holtec, 2019b). In addition, the subsurface geologic conditions at the proposed project area are not conducive to karst development or subsidence. No thick sections of soluble rocks are present at or near the land surface. The shallowest formation containing relatively thick soluble materials (i.e., gypsum and halite) is the Rustler Formation, which is located at least 335 m [1,100 ft] below ground surface, which is over 305 m [1,000 ft] below the depth of the CISF facility design and is unlikely to be impacted by the proposed CISF project. Therefore, because the subsurface geologic conditions and because the proposed CISF project operations do not produce any liquid effluent that could facilitate dissolution of halite and gypsum, the NRC staff does not anticipate that the proposed CISF would lead to the development of sinkholes or subsidence. Information on regional subsidence is in EIS Section 5.4.

In summary, operation of the proposed action (Phase 1) and Phases 2-20 would not be expected to impact underlying bedrock, because storage structures are passive and designed to robustly contain radiological materials. Holtec would continue to implement the SPCC Plan to minimize the impacts of potential soil contamination, and stormwater runoff would continue to be regulated under NPDES permit requirements. Holtec would implement mitigation measures for stormwater management through its SWPPP. Operation of the proposed CISF project would not be expected to impact or be impacted by seismic events, subsidence, or sinkhole development. The facility must meet specific design and operational criteria to ensure that it can safely withstand seismic events, such as earthquakes. The potential for sinkhole development or subsidence is low because (i) plugged and abandoned wells within the proposed project area are located outside the 133.5 ha [330 ac] storage and operations area, (ii) the proposed CISF project does not produce any liquid effluent that could facilitate dissolution, and (iii) no thick sections of soluble rocks are present at or near the land surface. Therefore, the NRC staff concludes that the impacts to geology and soils associated with the operations stage for the proposed action (Phase 1) and for Phases 2-20 of the proposed CISF project would be SMALL and that the potential impacts to the proposed CISF project from seismic events, subsidence, or sinkhole development would be SMALL.

Defueling

Defueling the CISF for the rail spur would involve removal of SNF from the proposed CISF. Because activities for defueling are similar to those during the emplacement of SNF, defueling is not anticipated to result in the usage of any additional geology or soil resources. Impacts to geology and soils for defueling would be minimal, and less than those evaluated under the construction stage. Permits and mitigation measures applied during earlier activities of the operations stage would continue. Therefore, the NRC staff concludes that the geology and soil impacts from defueling the proposed CISF project would be SMALL.

4.4.1.2.1 Rail Spur

Impacts to geology and soils from operation of the rail spur would be minimal. Minimal, if any, additional geologic resources would be needed beyond those associated with construction of the rail spur. Mitigation measures, BMPs, NPDES permit requirements, and spill prevention and cleanup plans implemented to avoid and reduce impacts to geology and soils during the construction stage would apply to operation of the rail spur. Maintenance activities on the rail spur would not be likely to create significant soil disturbances, and impacts would be less significant than during construction of the spur. As for the proposed project area, impacts from subsidence are not anticipated in the rail spur area. Shaking or vibratory motion from natural or induced seismicity is unlikely to be significant enough to affect the rail spur infrastructure. Transportation impacts on rail, including potential accident scenarios, are discussed in EIS Section 4.3.1.2. Therefore, the NRC and BLM staff conclude that the potential impacts to geology and soils from operation of the rail spur would be SMALL.

4.4.1.3 Decommissioning and Reclamation Impacts

At the end of the license term of the proposed CISF project, once the SNF inventory is removed, the facility would be decommissioned such that the proposed project area and remaining facilities could be released and the license terminated. Decommissioning activities, in accordance with 10 CFR Part 72 requirements, would include conducting radiological surveys and decontaminating, if necessary. Decommissioning activities for the proposed action (Phase 1) and for Phases 2-20 would involve the same activities, but the activities would be scaled to address the overall size of the CISF (i.e., the number of phases completed).

Holtec has committed to reclamation of nonradiological-related aspects of the proposed project area (Holtec, 2019a). Reclamation would include dismantling and removing equipment, materials, buildings, roads, the rail spur, and other onsite structures; cleaning up areas; waste disposal; erosional control; and restoring and reclaiming disturbed areas. EIS Sections 2.2.1.4 and 2.2.1.7 describe the decommissioning and reclamation activities.

Contaminated soils would be disposed of at approved and licensed waste disposal facilities. During dismantling of the proposed CISF project, soil disturbance would occur from the use of heavy equipment, such as bulldozers and graders, to demolish SNF storage facilities, buildings, and associated infrastructure. This soil disturbance would be limited to areas previously disturbed during the construction and operation stages. Mitigation measures used to reduce soil impacts during construction (EIS Section 4.4.1.1) would be applied during decommissioning. After project facilities and infrastructure are removed, disturbed areas would be regraded with fill from stockpiles, covered with topsoil, contoured, and reseeded with native vegetation (Holtec, 2019a). After decommissioning and reclamation activities are complete, the site would be released. Therefore, the NRC staff concludes that the potential impact on geology and soils associated with the decommissioning and reclamation stage for the proposed action (Phase 1) and Phases 2-20 of the proposed CISF project would be SMALL.

4.4.1.3.1 Rail Spur

Decommissioning of the rail spur would occur at the discretion of the land owner (BLM). Similar to the impacts to geology and soils described for the construction stage, the impacts of decommissioning the rail spur would be limited to soil disturbance, soil erosion, and potential soil contamination from leaks and spills of oil and hazardous materials. Holtec would implement mitigation measures, BMPs, NPDES permit requirements, and spill prevention and cleanup plans, to limit soil loss, avoid soil contamination, and minimize stormwater runoff impacts. Therefore, the NRC and BLM staff conclude that the potential impacts to geology and soils from decommissioning of the rail spur would be SMALL. If the rail spur is not decommissioned, potential impacts to geology and soils are anticipated to be minor, resulting from soil contamination from rail use, soil disturbance, and erosion.

4.4.2 No-Action Alternative

Under the No-Action alternative, the NRC would not license the proposed CISF project. Therefore, impacts such as soil disturbance or contamination would not occur. Construction impacts would be avoided because SNF storage pads, buildings, and transportation infrastructure would not be built. Operational impacts would also be avoided because no SNF canisters would arrive for storage. Impacts to geology and soils from decommissioning activities would not occur, because unbuilt SNF storage pads, buildings, and transportation infrastructure require no decontamination and undisturbed soils need no reclamation. The current geology and soil conditions on and near the project would remain essentially unchanged under the No-Action alternative. In the absence of a CISF, the NRC staff assumes that SNF would remain onsite in existing wet and dry storage facilities and be stored in accordance with NRC regulations and be subject to NRC oversight and inspection. Site-specific impacts at each of these storage sites would be expected to continue as detailed, in generic (NRC, 2013, 2005a) or site-specific environmental analyses. In accordance with current U.S. policy, the NRC staff also assumes that the SNF would be transported to a permanent geologic repository, when such a facility becomes available.

4.5 Water Resources Impacts

This section describes the potential impacts to water resources (surface water and groundwater) for the proposed action (Phase 1), Phases 2-20, and the No-Action alternative.

4.5.1 Surface Water Impacts

Impacts to surface waters and wetlands at the proposed project area may result from erosion runoff, spills and leaks of equipment fuels and lubricants, and stormwater discharges.

4.5.1.1 Impacts from the Proposed CISF

As described in EIS Section 3.5.1, no perennial streams are located within the proposed project area. Surface drainage at the site flows into two ephemeral playa lakes having no external drainage: Laguna Gatuna to the east and Laguna Plata to the northwest (EIS Figure 3.5-2). Potable water for construction and operation of the proposed CISF project would be provided from the Double Eagle Water System by City of Carlsbad Water Department through the existing water supply pipeline, owned by Intrepid Mining LLC, currently in place at the proposed CISF project (Holtec, 2019a; Holtec, 2019c). A new water supply pipe from Double Eagle Water System may be installed as well, sharing the majority of the rail spur right-of-way (Holtec, 2019a).

Holtec would need to obtain a NPDES permit for construction and for operations (EIS Section 2.2.1.6), as well as associated Section 401 certifications, if required, to address potential impacts on water and provide mitigation as needed to maintain water quality standards and avoid degradation of water resources at or near the proposed CISF project. As part of the NPDES permits, Holtec would develop a SWPPP that would prescribe BMPs to be employed to reduce impacts to water quality during the license term. EPA Region 6 would issue the NPDES permits, with NMED oversight review. If Holtec does not qualify for general NPDES permits, site-specific NPDES permits would be required, including Section 401 certification from NMED. The NPDES permits, associated Section 401 certifications (if required), and the SWPPP would be required to remain valid throughout all phases of the proposed project.

4.5.1.1.1 Construction Impacts

During the construction stage of the proposed action (Phase 1), grading and clearing of the proposed project area for the SNF storage structures, site access road, security building, administration building, parking lot, concrete batch plant, laydown area, and associated infrastructure would cause surface disturbance, resulting in soil erosion and sediment runoff into nearby drainages. Holtec has committed to erosion and sediment control BMPs (e.g., sediment fences) to minimize any adverse effects, such as erosion and sedimentation on surface water resources. Leaks and spills of fuels and lubricants from construction equipment and stormwater runoff from impervious surfaces resulting from the proposed facility construction and concrete batch plant installation could impact surface water quality. Implementation of a SPCC Plan and a SWPPP would minimize the adverse effects of any leaks or spills of fuels and lubricants.

As described in EIS Section 3.5.1.4, no floodplains are located within or in the vicinity of the proposed project area. The topography of the proposed project area slopes gently northward toward two drainages, one leading to Laguna Plata to the northwest and the other to Laguna Gatuna to the east. Based on a flooding analysis for full build-out (Phases 1-20), Holtec stated that both Laguna Plata and Laguna Gatuna would be able to accept runoff from a 24-hour/19 cm [7.5 in] storm event with excess freeboard (Holtec, 2019a).

As described in EIS Section 3.5.1.5, Holtec states that there are no wetlands within or in the immediate vicinity of the proposed project area. Conditions in playa lakes that could potentially receive surface runoff from the proposed CISF project (i.e., Laguna Plata and Laguna Gatuna) are not favorable for the development of aquatic or riparian habitat (Holtec, 2019a). Furthermore, soils and water (when present) in Laguna Plata and Laguna Gatuna are highly mineralized. Holtec is required to obtain a Section 401 certification from NMED for any discharge to Waters of the United States (WOTUS), including jurisdictional wetlands. A Section 401 certification confirms compliance with State water quality standards (EIS Section 1.7.3.2). Obtaining a Section 401 certification requires an NPDES permit. The State of New Mexico has a cooperative agreement and joint application process with the EPA relating to NPDES permits and Section 401 certifications and would be involved in the identification of any potentially impacted wetlands and issuance of permits required to protect these wetlands.

In summary, Holtec would: (i) implement mitigation measures to control erosion and sedimentation; (ii) develop and comply with a SPCC Plan; (iii) obtain a required NPDES construction permit to address potential impacts from discharge to surface water, including playas, and provide mitigation as needed to maintain water quality standards; and (iv) obtain and comply with Section 401 certifications, if required. Therefore, the NRC staff concludes that the potential impacts to surface waters, including jurisdictional wetlands, during the construction stage for the proposed action (Phase 1) would be SMALL.

For the construction stages of Phases 2-20, additional land would be disturbed and converted to storage facility pads, resulting in additional impervious cover. Surface disturbance would result in additional soil erosion and sediment runoff into nearby drainages. Holtec would continue to implement erosion and sediment control BMPs as directed in applicable permits and certifications, as during the construction stage of the proposed action (Phase 1). Holtec would continue to mitigate the potential for leaks and spills of fuels and lubricants from construction equipment by implementing BMPs (e.g., earthen berms, sediment fences) and would continue to abide by the requirements of applicable permits and certifications. As additional phases are added, Holtec would implement BMPs appropriate for each size increase in the footprint of the proposed facility and would implement storage pad designs that would adequately direct drainage over impervious surfaces during each phase addition up to full build-out. Holtec's flood analysis included the full build-out of the proposed facility (i.e., including Phases 2-20), so the addition of these phases is unlikely to cause additional flooding at Laguna Gatuna or Laguna Plata. Therefore, the NRC staff concludes that the impacts to surface water and wetlands from Phases 2-20 would be SMALL.

4.5.1.1.1.1 Rail Spur

Construction of the rail spur would disturb an additional 15.9 ha [39.4 ac] of BLM-managed land. The NRC and BLM staff anticipate that impacts to surface water would be limited to soil disturbance and soil erosion associated with the land disturbance, as well as potential soil contamination from leaks and spills of oil and hazardous materials from construction equipment. Similar to those implemented for construction of the CISF, mitigation measures, BMPs, NPDES construction permit requirements, Section 401 certification conditions (if required), and spill prevention and cleanup plans would be implemented by Holtec to limit soil loss, avoid soil contamination, and minimize stormwater runoff impacts. Therefore, the NRC and BLM staff conclude that the potential impacts to surface waters and wetlands from the construction of the rail spur would be SMALL.

4.5.1.1.2 Operations Impacts

For the proposed action (Phase 1) operation stage, the primary impact to surface water would be from runoff. The impervious SNF storage pad would be the primary source of runoff. The robust design and construction of the SNF storage systems and environmental monitoring measures (EIS Chapter 7) make the potential for a release of radiological material from the proposed CISF project unlikely. The SNF canisters do not contain any material in liquid form, and the SNF transportation and storage canisters are sealed to prevent any liquids from contacting the SNF assemblies (Holtec, 2019a). Therefore, there is no potential for a liquid pathway (such as runoff) to contaminate nearby surface waters with radioactive materials (for information about accident events, see EIS Section 4.15). Furthermore, Holtec's environmental program would include a two-step process to detect any potential radiological contamination in surface water runoff (Holtec, 2019a). First, all casks would be checked weekly for surface contamination and all storage pads would be checked monthly for surface contamination. Second, soil samples would be collected on a quarterly basis at culverts leading to the proposed CISF project outfalls (i.e., discharge points). If radioactive contaminants exceeding the action levels detailed in the environmental program are detected, an immediate investigation and corrective action would be required, as established in Holtec's written procedures, to protect human health and the environment and prevent future occurrences (Holtec, 2019a).

Holtec would also be required to continue to implement erosion and sediment control BMPs, as well as any BMPs addressing potential leaks or spills of fuels or lubricants from equipment, as directed by applicable permits, plans, and certifications associated with construction. For operation of the proposed CISF project, Holtec would be required to obtain a NPDES permit for industrial stormwater for point-source discharge of stormwater runoff from industrial or commercial facilities to the Waters of the State. As part of the NPDES industrial stormwater permit, Holtec would develop a SWPPP for operations that would prescribe BMPs to be employed to reduce impacts to water quality from point-source discharges of stormwater during operations. The NPDES industrial stormwater permit and associated SWPPP would cover all operation activities, including those of the concrete batch plant.

As previously discussed, based on a flooding analysis, Holtec stated that both Laguna Plata and Laguna Gatuna would be able to accept runoff from a 24-hour/19 cm [7.5 in] storm event total with excess freeboard (Holtec, 2019a). The natural drainage at the proposed CISF project directs runoff to Laguna Plata and Laguna Gatuna, both of which serve as retention areas during severe storm events.

In summary, for the proposed action (Phase 1) the design and construction of the SNF storage systems and environmental monitoring measures make the potential for a release of radiological material from the proposed CISF project very low during operations. To minimize potential impacts to surface water from stormwater runoff, Holtec would (i) implement mitigation measures to control erosion, stormwater runoff, and sedimentation; (ii) develop and comply with a SPCC Plan; (iii) obtain a required NPDES permit and Section 401 certification, if required, to address potential impacts of point-source stormwater discharge to surface water; and (iv) develop a SWPPP prescribing mitigation, as needed, to maintain water quality standards. Nearby playa lakes have adequate capacity to accept runoff from severe 1-day storm events, and conditions in these playa lakes are not favorable for development of aquatic or riparian habitat (Holtec, 2019a). Therefore, the NRC staff concludes that the potential impacts to surface waters and wetlands during the operations stage of the proposed action (Phase 1) would be SMALL.

The NRC staff anticipates that Holtec would continue to implement the mitigation measures used in the proposed action (Phase 1) throughout Phases 2-20. Although the amount of impervious surface would increase and would thereby increase surface runoff, the NRC staff expects that the design of the proposed facility is such that the mitigation measures would be scaled appropriately, as would be required by an NPDES permit. Therefore, the NRC staff concludes that the potential impacts to surface waters and wetlands during the operation of Phases 2-20 would be SMALL.

Defueling

Defueling the proposed CISF project would involve removal of SNF from the proposed CISF. Defueling would not result in utilization of any additional surface water resources. Impacts to surface water would be bounded by those evaluated under the construction stage and earlier activities during the operations stage. Therefore, the NRC staff concludes that the surface water impacts from defueling the proposed CISF project would be SMALL.

4.5.1.1.2.1 Rail Spur

During operation of the proposed CISF, the primary impact to surface water from the rail spur would be potential runoff from disturbed areas or from leaks or spills from equipment. To minimize any adverse impacts of runoff during operation of the rail spur, Holtec would implement mitigation measures to control erosion and sedimentation, develop and comply with a SPCC Plan, and develop a SWPPP prescribing mitigation, as needed, to maintain water quality standards. As described previously, the SNF canisters do not contain any material in liquid form, and the SNF transportation and storage canisters are sealed to prevent any liquids from contacting the SNF assemblies (Holtec, 2019a). Thus, there is no potential for a liquid pathway from the SNF (such as runoff from the rail spur) to contaminate nearby surface waters. Based on this, the NRC and BLM staff conclude that the potential impacts to surface waters and wetlands during operation of the rail spur would be SMALL.

4.5.1.1.3 Decommissioning and Reclamation Impacts

At the end of the license term of the proposed CISF project, once the SNF inventory is removed, the facility would be decommissioned such that the proposed project area and remaining facilities could be released and the license terminated. Decommissioning activities, in accordance with 10 CFR Part 72 requirements, would include conducting radiological surveys and decontaminating, if necessary. Decommissioning activities for the proposed action (Phase 1) and for Phases 2-20 would involve the same activities, but the activities would be scaled to address the overall size of the CISF (i.e., the number of phases completed).

Holtec has committed to reclamation of nonradiological-related aspects of the proposed project area (Holtec, 2019a). Reclamation would include dismantling and removing equipment, materials, buildings, roads, the rail spur, and other onsite structures; cleaning up areas; waste disposal; erosional control; and restoring and reclaiming disturbed areas. EIS Sections 2.2.1.4 and 2.2.1.7 describe the decommissioning and reclamation activities. Holtec has committed to revegetating all of the proposed CISF site (Holtec, 2019a). These activities would have surface water impacts similar in scale to the construction phase, particularly until disturbed areas are revegetated.

During the decommissioning and reclamation stage for the proposed action (Phase 1) and Phases 2-20, Holtec would implement the mitigation measures described in EIS

Section 4.5.1.1.1 to control erosion, stormwater runoff, and sedimentation. Holtec's required NPDES permit and SWPPP would ensure that stormwater runoff would not contaminate surface water. In addition, Section 401 certification conditions, if required, would ensure that proposed CISF activities would not adversely impact New Mexico surface waters, including jurisdictional wetlands. Therefore, the NRC staff concludes that the potential impacts to surface waters and wetlands during decommissioning and reclamation for the proposed action (Phase 1) and Phases 2-20 would be SMALL.

4.5.1.1.3.1 Rail Spur

Decommissioning and reclamation of the rail spur would include dismantlement of rail spur at the discretion of the land owner (BLM). Decommissioning would be based on an NRC-approved decommissioning plan, and all decommissioning activities would be carried out in accordance with 10 CFR Part 72 requirements. In addition, a Section 401 certification, if required, would ensure that proposed CISF activities would not adversely impact New Mexico surface waters, including jurisdictional wetlands. Therefore, the NRC and BLM staff conclude that the potential impacts to surface waters and wetlands during decommissioning of the rail spur would be SMALL. If the rail spur is not decommissioned, the potential continued impact to surface water would be primarily from potential runoff from disturbed areas or from leaks or spills from equipment that remains in use.

4.5.1.2 No-Action Alternative

Under the No-Action alternative, the NRC would not license the proposed CISF project. Therefore, impacts to surface water such as erosion, stormwater runoff, sedimentation, and other contamination would not occur. Construction impacts would be avoided because SNF storage modules, buildings, and transportation infrastructure would not be built. Operational impacts would also be avoided because no SNF canisters would arrive for storage. Impacts to surface water and wetlands from decommissioning activities will not occur, because unbuilt SNF storage structures, buildings, and transportation infrastructure require no decontamination and undisturbed areas need no reclamation. The current surface water and wetland conditions on and near the proposed project area would remain essentially unchanged under the No-Action alternative. In the absence of a CISF, the NRC staff assumes that SNF would remain on-site in existing wet and dry storage facilities and be stored in accordance with NRC regulations and be subject to NRC oversight and inspection. Site-specific impacts at each of these storage sites would be expected to continue as detailed in generic (NRC, 2013, 2005a) or site-specific environmental analyses. In accordance with current U.S. policy, the NRC staff also assumes that the SNF would be transported to a permanent geologic repository, when such a facility becomes available.

4.5.2 Groundwater Impacts

Impacts to groundwater at the proposed project area may result from pumping water (i.e., use of groundwater resources) to meet required consumptive water demands or from potential contamination because of leaks and spills of fuels and lubricants. Discharges to groundwater could impact groundwater quality; however, as described later in this section, the NRC staff does not anticipate that any groundwater discharges from the CISF project would occur. The SNF contains no liquid component and the SNF storage canisters are sealed to prevent any liquids from contacting the SNF assemblies (Holtec, 2019a). Therefore, there is no potential for radiological contamination of underlying groundwater or aquifers via a liquid pathway (such as a leaking canister).

4.5.2.1 Impacts from the Proposed CISF

As described in EIS Section 3.5.2, major aquifers in the area of the proposed CISF project include the Permian Capitan Aquifer, Permian Rustler Formation, Triassic Dockum Group (Santa Rosa Formation), Tertiary Ogallala Aquifer, and Quaternary alluvial deposits (Quaternary alluvium). As further described in EIS Section 3.5.3, no potable groundwater is known to exist within or in the immediate vicinity of the proposed project area. Potable water for domestic use and stock watering in the vicinity of the site is generally obtained from pipelines that convey water to area potash refineries from the Ogallala Aquifer on the High Plains area of eastern Lea County.

Holtec may need to obtain a groundwater discharge permit from NMED {which has jurisdiction over groundwater with total dissolved solids concentration less than 10,000 mg/L [10,000 ppm]} for any discharges from the proposed CISF that could directly or indirectly impact groundwater (NMAC 20.6.2). The discharge permit, if applicable, would require the proposed CISF to remain in compliance with all criteria of the permit throughout all phases of the proposed project.

4.5.2.1.1 Construction Impacts

As described in EIS Section 3.2.5, the City of Carlsbad Water Department would supply potable water for construction and operation of the proposed CISF project and the concrete batch plant through the existing water supply pipeline currently in-place at the proposed project area or via a new water line installed along the rail spur right-of-way (Holtec, 2019a). More specifically, it would be supplied by the City of Carlsbad Water Department's Double Eagle facility, which withdraws water from the Ogallala Aquifer. For the construction stage of the proposed action (Phase 1), the peak potable water requirements for construction activities of the proposed CISF project would be 76 Lpm [20 gpm] (Holtec, 2019a). Consumptive water use during construction of all phases would result primarily from cement mixing for construction of SNF storage modules and supporting facilities, for dust control, and for workers' consumption {38 Lpm [10 gpm]}, for a peak consumptive use of 114 Lpm [30 gpm] (Holtec, 2019a). Per the Holtec RAI response (Holtec, 2019a,c), this peak water usage accounts for the overlap between operation of initial phases and construction of subsequent phases. Construction of the proposed action (Phase 1) would require the largest volume of water [i.e., maximum use for construction, and maximum workforce (135 workers)] for the proposed CISF project. The bounding value for the total volume of water that may be consumed was calculated by extrapolating over the 2-year construction stage for the proposed action (Phase 1) and is 119,376,746 L [31,536,000 gal]. Holtec received a letter from the Double Eagle potable water system stating that their system has a supply capacity greater than 7,570 Lpm [2,000 gpm], which more than exceeds the expected construction stage water demands of all support buildings, along with the concrete batch plant (Holtec, 2019a).

As described in EIS Section 3.5.2.2, groundwater was encountered in two of the three monitoring wells [B101(MW) and B107(MW)] drilled within the proposed project area. Groundwater was observed in B101(MW), which was screened in the Santa Rosa Formation, at depths ranging from 77.2 to 80.4 m [253.4 to 263.7 ft] (GEI Consultants, 2017). Groundwater was observed in B107(MW), which was screened in the shallow Chinle Formation, at depths ranging from 28.4 to 30 m [93.1 to 100 ft] (GEI Consultants, 2017). These groundwater depths are relatively deep in comparison to the maximum depth of excavation of 7.6 m [25 ft] for the proposed SNF storage modules (EIS Section 4.4.1.1). Thus, the NRC staff does not expect that excavation of site soils and alluvium for construction of the SNF storage modules would encounter groundwater.

Two other monitoring wells [B106(MW) and ELEA-1] installed in the proposed project area did not encounter groundwater (EIS Section 3.5.2.2). B106(MW) was screened in the deeper Chinle Formation at depths ranging from 53.1 to 61.9 m [174.3 to 203 ft] (GEI Consultants, 2017). ELEA-1 was screened at depths ranging from 6.1 to 15.2 m [20 to 50 ft] at the alluvium-Dockum Group interface (Holtec, 2019a). The absence of groundwater in these wells indicates that saturated zones in the alluvium and the Chinle Formation beneath the proposed project area are laterally discontinuous.

The shallowest groundwater within the proposed project area (but outside the footprint of excavation) was encountered in monitoring well ELEA-2 located in the eastern portion of the site (EIS Section 3.5.2.2). ELEA-2 is screened at depths ranging from 17.7 to 29.9 m [58 to 98 ft] in the Dockum Group. Groundwater in ELEA-2 has been measured at depths ranging from 10.4 to 11.49 m [34 to 37.7 ft] indicating that the groundwater is under enough subsurface pressure to produce a water level of about 12.2 m [50 ft] above the ground surface (Holtec, 2019a; GEI Consultants, 2017). Because groundwater in ELEA-2 is highly saline {TDS concentration of 83,000 mg/L [83,000 ppm] (EIS Table 3.5-1)} and because of its proximity to Laguna Gatuna, it has been hypothesized that the water level in the playa lakes controls the near surface water table at the proposed project area (ELEA, 2007; Holtec, 2019a).

During construction of the proposed action (Phase 1), infiltration of stormwater runoff and leaks and spills of fuels and lubricants can potentially affect the groundwater quality of near-surface aquifers. Holtec's required NPDES permit and Section 401 certification conditions, if required, would set limits on the amounts of pollutants entering ephemeral drainages that may be in hydraulic communication with alluvial aquifers at the proposed project. To minimize and prevent spills, Holtec would develop and abide by a SPCC Plan. The NPDES permit, Section 401 certification conditions (if required), and associated SWPPP would specify additional mitigation measures and BMPs that Holtec would implement to prevent and clean up spills. If required, the groundwater discharge permit would further limit the amounts of pollutants allowed to infiltrate into groundwater.

In summary, for the construction stage of the proposed action (Phase 1), potable water would be supplied by a new water line that is capable of supporting the water demands of all support buildings and the concrete batch plant. Excavation of site soils and alluvium for construction of the SNF storage modules is not expected to encounter groundwater, because groundwater is not encountered consistently within the proposed project area and is therefore discontinuous and at sufficient depth below the excavation depth. The NPDES construction permit requirements, Section 401 certification conditions (if required), groundwater discharge permit requirements (if required), and implementation of the required BMPs would protect groundwater quality in shallow aquifers. Specifically, the NPDES permit requirements would provide controls on the amount of pollutants entering ephemeral drainages and specify mitigation measures and BMPs to prevent and clean up spills. Therefore, the NRC staff concludes that the impacts to groundwater during the construction stage of the proposed action (Phase 1) would be SMALL.

Construction of Phases 2-20 requires less water than construction of the proposed action (Phase 1) because all facilities and infrastructure for the proposed CISF project would already have been built. In addition to consumptive use for construction, concurrent operations consume a small amount of water. This combined demand would not exceed the peak consumptive water demand of 114 Lpm [30 gpm] (Holtec, 2019a). The existing water pipeline has a capacity of over 7,570 Lpm [2,000 gpm], which greatly exceeds the estimated peak water demand. Like the proposed action (Phase 1), the excavation of soils and alluvium to construct Phases 2-20 would not be expected to encounter groundwater or discharge to groundwater, and the NPDES permit, Section 401 certification (if required), and other applicable permits and plans required for the proposed action (Phase 1) would continue to protect the groundwater quality. Therefore, based on the currently applicable requirements and restrictions, the NRC staff concludes that the impacts to groundwater during construction of Phases 2-20 would be SMALL.

4.5.2.1.1.1 Rail Spur

During construction of the rail spur, the use of potable water would be limited to consumptive water for dust control. Holtec stated that use of potable water for the construction of the rail spur was included in the estimated peak water requirements for Phase 1, 76 Lpm [20 gpm], and would be adequately supplied by the existing or replaced water pipeline (Holtec, 2019a). The NRC staff does not expect that excavation of soils and alluvium for construction of the rail spur for SNF transfer would encounter groundwater. The aquifers present in the area where the proposed rail spur would be built are the same as those underneath the proposed CISF project area, and excavation for the rail spur would be less than that of the storage pads and modules.

During construction, infiltration of stormwater runoff and leaks and spills of fuels and lubricants could potentially affect the groundwater quality of near-surface aquifers. Holtec's required NPDES construction permit and associated Section 401 certification, if required, would set limits on the amounts of pollutants entering ephemeral drainages that may be in hydraulic communication with alluvial aquifers at the site of the rail spur. To minimize and prevent spills, Holtec would develop and abide by a SPCC Plan. The NPDES permit, Section 401 certification (if required), and associated SWPPP would specify additional mitigation measures and BMPs to prevent and clean up spills. Holtec would implement all BMPs the SWPPP required and other applicable permits and plans.

Because (i) potable water for the construction of the rail spur would be supplied by an existing water pipeline or by a new water line, both of which would be capable of meeting the expected peak water demands; (ii) the rail spur construction is not anticipated to encounter or discharge to groundwater; (iii) construction of the rail spur the would be under similar permit restrictions as the construction of the proposed action (Phase 1); and (iv) no new construction would be required for Phases 2-20, the NRC and BLM staff conclude, based on the currently applicable requirements and restrictions, that the impacts to groundwater resources from the construction of the rail spur would be SMALL.

4.5.2.1.2 Operations Impacts

During the combined operations stage of the proposed action (Phase 1) and the construction of Phases 2-20, the consumptive water use would be similar to that calculated under the construction stage. However, for the operations stage without overlap of the construction stage, consumptive water use would be considerably less than the construction stage because a limited amount of concrete would be produced and is assumed to be less than that used for the construction of the proposed facility. Therefore, Holtec estimates that the peak potable water requirements would not exceed approximately 114 Lpm [30 gpm] (Holtec, 2019a).

During operation of the proposed action (Phase 1), impacts to groundwater from potential radiological contamination is unlikely because of the design and construction of the SNF storage systems and the geohydrologic conditions of the proposed project area. The SNF canisters do not contain any material in liquid form, and the SNF transportation and storage canisters are sealed to prevent any liquids from contacting the SNF assemblies (Holtec, 2019a). Therefore, there is no potential for radiological contamination of underlying groundwater or aquifers via a liquid pathway (such as a leaking canister).

As previously described, major aquifers in the proposed project area include the Permian Capitan Aquifer, Permian Rustler Formation, Triassic Dockum Group (Santa Rosa Formation), Tertiary Ogallala Aquifer, and Quaternary alluvium. As described in EIS Section 4.5.2.1.1, monitoring wells installed in the proposed action (Phase 1) project area did not encounter groundwater in Quaternary alluvium. The Tertiary Ogallala Aquifer is not present beneath the proposed project area and is not hydraulically connected to groundwater or aquifers beneath the proposed project area (Holtec 2019a; Nicholson and Clebsch, 1961).

As discussed in EIS Section 4.5.2.1.1, hydrologic information collected from monitoring wells at the proposed project area indicates that saturated zones in the alluvium and Chinle Formation of the Triassic Dockum Group beneath the proposed project are laterally discontinuous (Holtec, 2019a; GEI Consultants, 2017). Groundwater observed in well B101(MW), which was screened in the Santa Rosa Formation at depths from 77.2 to 80.4 m [253.4 to 263.7 ft], is interpreted to be the first primary (i.e., laterally continuous) groundwater aquifer beneath the proposed project area (GEI Consultants, 2017).

During operations, infiltration of stormwater runoff and leaks and spills of fuels and lubricants are the primary impacts to groundwater quality of near-surface aquifers. Holtec's required NPDES industrial stormwater permit and Section 401 certification, if required, would set limits on the amounts of pollutants entering ephemeral drainages that may be in hydraulic communication with alluvial aquifers at the site. To minimize and prevent spills, Holtec would develop and implement a SPCC plan. The SPCC Plan, NPDES permit, Section 401 certification, if required, and associated SWPPP would specify additional mitigation measures and BMPs to prevent and clean up spills. If required, the groundwater discharge permit would further limit the amounts of pollutants allowed to infiltrate into groundwater.

For the proposed action (Phase 1) operations stage, because of the design and construction of the SNF storage systems, the SNF being composed of dry material, geohydrologic conditions, and the depth of groundwater, potential radiological contamination of groundwater is unlikely during operations. NPDES industrial stormwater permit requirements, Section 401 certification conditions (if required), groundwater discharge permit (if required), and implementation of BMPs would protect groundwater quality in shallow aquifers. Specifically, the NPDES permit requirements and Section 401 certification conditions (if required) provide controls on the amount of pollutants entering ephemeral drainages and specifies mitigation measures and BMPs to prevent and clean up spills. Therefore, based on the currently applicable requirements and restrictions, the NRC staff concludes that the impacts to groundwater during the operation of the proposed action (Phase 1) would be SMALL.

The operations stage of Phases 2-20 would have the same impacts and mitigation measures as the operations stage of the proposed action (Phase 1) and have approximately the same consumptive use water demand. Similarly, because of the design and construction of the SNF storage systems, geohydrologic conditions, and the depth of groundwater, potential radiological contamination of groundwater is unlikely during any phase of the operations stage. The requirements of the NPDES permit, Section 401 certification (if required), SWPPP, SPCC Plan, groundwater discharge permit (if required), and other necessary plans and permits would protect groundwater quality in shallow aquifers by restricting the amount of pollutants entering ephemeral drainages and specifying mitigation measures and BMPs to prevent and clean up spills. Therefore, the NRC staff concludes, based on the currently applicable requirements and restrictions, that the impacts to groundwater during the operations stage of Phases 2-20 would be SMALL.

Defueling

Defueling the CISF would involve removal of SNF from the CISF. Defueling would not result in using any additional groundwater resources. Impacts to groundwater would be bounded by those resources evaluated under the construction stage or earlier activities of the operations stage. Therefore, the NRC staff concludes that the groundwater impacts from defueling the proposed CISF project would be SMALL.

4.5.2.1.2.1 Rail Spur

Use of the rail spur to transfer SNF to the proposed CISF project from the main rail line would require no further excavation of the surface, and the primary impact to groundwater would be from potential radiological contamination. Because of the design and construction of the SNF transportation casks and the geohydrologic conditions in the proposed project area, potential radiological contamination of groundwater is unlikely. The SNF canisters do not contain any material in liquid form, and the SNF transportation and storage canisters are sealed to prevent any liquids from contacting the SNF assemblies (Holtec, 2019a). Therefore, there is no potential for radiological contamination of underlying groundwater or aquifers via a liquid pathway.

As with the construction stage of the proposed action (Phase 1), infiltration of stormwater runoff and leaks and spills of fuels and lubricants during operations can potentially affect the groundwater quality of near-surface aquifers. Holtec's required NPDES industrial stormwater permit, Section 401 certification (if required), and groundwater discharge permit (if required) would set limits on the amounts of pollutants entering ephemeral drainages that may be in hydraulic communication with near-surface aquifers.

Therefore, impacts from the operations stage of the rail spur are bound by the impacts of the construction stage; thus, the NRC and BLM staff conclude, based on the currently applicable requirements and restrictions, that the impacts to groundwater during the operations stage for the rail spur would be SMALL.

4.5.2.1.3 Decommissioning and Reclamation Impacts

At the end of the license term of the proposed CISF project, once the SNF inventory is removed, the facility would be decommissioned such that the proposed project area and remaining facilities could be released and the license terminated. Decommissioning activities, in accordance with 10 CFR Part 72 requirements, would include conducting radiological surveys and decontaminating, if necessary. Decommissioning activities for the proposed action (Phase 1) and for Phases 2-20 would involve the same activities, but the activities would be scaled to address the overall size of the CISF (i.e., the number of phases completed).

Holtec has committed to reclamation of nonradiological-related aspects of the proposed project area (Holtec, 2019a). Reclamation would include dismantling and removing equipment, materials, buildings, roads, the rail spur, and other onsite structures; cleaning up areas; waste disposal; erosional control; and restoring and reclaiming disturbed areas. EIS Sections 2.2.1.4 and 2.2.1.7 describe the decommissioning and reclamation activities.

As with the construction stage, during decommissioning and reclamation, infiltration of stormwater runoff and leaks and spills of fuels and lubricants could potentially affect the groundwater quality of near-surface aquifers. Holtec's required NPDES industrial stormwater permit, Section 401 certification (if required), and groundwater discharge permit (if required) would set limits on the amounts of pollutants entering ephemeral drainages that may be in hydraulic communication with alluvial aquifers at the site. The NRC staff anticipates that to minimize and prevent spills, Holtec would develop and implement a SPCC Plan. The NPDES permit, SWPPP and, if required, Section 401 certification, would specify additional mitigation measures and BMPs to prevent and clean up spills. Therefore, the NRC staff concludes, based on the currently applicable requirements and restrictions, that the potential impacts to groundwater during the decommissioning stage for the proposed action (Phase 1) and Phases 2-20 would be SMALL.

4.5.2.1.3.1 Rail Spur

Dismantling of the rail spur may occur at the discretion of the land owner (BLM) and would be based on an NRC-approved decommissioning plan and BLM requirements. All decommissioning activities would be carried out in accordance with 10 CFR Part 72 requirements. These activities would have groundwater impacts similar in scale to the construction stage.

Similar to both the construction and operation stages, during decommissioning and reclamation, infiltration of stormwater runoff and leaks and spills of fuels and lubricants could potentially affect the groundwater quality of near-surface aquifers. Holtec's required NPDES permit, Section 401 certification (if required), and groundwater discharge permit (if required) would set limits on the amounts of pollutants entering ephemeral drainages that may be in hydraulic communication with alluvial aquifers. The NRC staff anticipates that to minimize and prevent spills, Holtec would develop and implement a SPCC Plan. Therefore, the NRC and BLM staff conclude, based on the currently applicable requirements and restrictions, that the potential impacts to groundwater during decommissioning of the rail spur would be SMALL.

If the rail spur is not dismantled, potential impacts would be similar to those of the operations stage. However, with no SNF transport along the rail spur, the potential for radiological contamination, leaks, and spills would be reduced.

4.5.2.2 No-Action Alternative

Under the No-Action alternative, the NRC would not license the proposed CISF project. Therefore, impacts to groundwater such as stormwater runoff and potential radiological contamination would not occur. Construction impacts would be avoided because SNF storage modules, buildings, and transportation infrastructure would not be built. Operational impacts would also be avoided because no SNF canisters would arrive for storage. Impacts to groundwater from decommissioning activities would not occur, because unbuilt SNF storage modules, buildings, and transportation infrastructure require no decontamination, and undisturbed areas need no reclamation. The current groundwater conditions on and near the project would remain essentially unchanged under the No-Action alternative. In the absence of a CISF, the NRC staff assumes that SNF would remain on-site in existing wet and dry storage facilities and be stored in accordance with NRC regulations and be subject to NRC oversight and inspection. Site-specific impacts at each of these storage sites would be expected to continue, as detailed in generic (NRC, 2013, 2005a) or site-specific environmental analyses. In accordance with current U.S. policy, the NRC staff also assumes that the SNF would be transported to a permanent geologic repository, when such a facility becomes available.

4.6 Ecological Impacts

4.6.1 Impacts from the Proposed CISF

This section discusses the potential impacts for the proposed action (Phase 1), Phases 2-20, and No-Action alternative from the proposed CISF project. Field studies conducted at the proposed CISF project and the results of consultation activities with the U.S. Fish and Wildlife Service (FWS), BLM, and the New Mexico Game and Fish Department (NMGFD), described in EIS Section 3.6, indicate that no FWS-designated critical habitat for any Federal threatened or endangered plant or animal species is expected to occur at the proposed CISF project area (Holtec, 2019a; FWS, 2018a; FWS, 2019; NMDGF, 2018a). Additionally, the proposed CISF project area is not located in a natural vegetation community of concern, according to the New Mexico Crucial Habitat Assessment Tool (NMDGF, 2018a). Based on information the FWS provided, one bird species listed under the Endangered Species Act (ESA), the Northern aplomado falcon (*Falco femoralis septentrionalis)* is potentially present in the proposed project area or could potentially be impacted by actions occurring in the project vicinity (FWS, 2019). The Northern aplomado falcon is listed as an experimental non-essential population in New Mexico, and based on the information provided in EIS Section 3.6.3, the NRC staff determines that this species would not occur at the proposed CISF project. EIS Section 3.6.5 explains that the yellow-billed cuckoo (*Coccyzus americanus occidentalis*), which the FWS also designated as a Federally listed threatened species under the ESA, is not identified by FWS as potentially occurring in the proposed CISF project area or in Lea County (FWS, 2019), but NMED did identify it as potentially occurring within 0.6 km [1 mi] of the proposed CISF project areas. The habitat requirements of the yellow-billed cuckoo are not present in the proposed project area (EIS Section 3.6.5). In the unlikely event of this species visiting Laguna Gatuna when water is present after rain events, the proposed project would not affect this species, because no project disturbances are planned within 400 m [0.25 mi] of Laguna Gatuna (Holtec, 2019a).

As previously noted, the proposed project does not occur on FWS-designated critical habitat for any Federally listed threatened or endangered plant or animal species. Therefore, all stages and phases of the proposed CISF project (Phases 1-20) would have “No Effect” on experimental or Federally listed species and “No Effect” on any existing or proposed critical habitats.

The ER states that there is no viable aquatic habitat or aquatic life at the proposed CISF project area (Holtec, 2019a). As mentioned in EIS Section 3.6.3, studies were conducted during the 1990s at the playa lakes in Eddy and Lea Counties after bird deaths were observed at the playa lakes. One of the more recent studies was conducted in spring 1992 (Davis and Hopkins, 1993), which noted that a small amount of biomass was observed in the sediment at Laguna Gatuna. There is no viable aquatic habitat or aquatic life such as fish or macroinvertebrates in the proposed CISF project area for the facility to impact (Holtec, 2019a). The lack of aquatic invertebrates in Laguna Gatuna eliminates the potential impacts to animals that rely on them for food, such as wintering birds. Holtec proposes to obtain potable water for the proposed CISF project from the City of Carlsbad Water Department, and thus no water depletion impacts would occur to surface water features within or near the proposed CISF project area (Holtec, 2019a).

The NRC staff previously noted that, according to the NMDGF, ephemeral saline lakes provide shoreline habitat for some birds, especially when water is present (NMDGF, 2018b). However, proposed CISF project activities are not planned within 400 m [0.25 mi] of Laguna Gatuna (Holtec, 2019a). Because virtually no vegetation was observed on the portion of the shore of Laguna Gatuna that is included as part of the proposed CISF project area (EIS Section 3.6.2), and because there is no commercial agriculture within 10 km [6 mi] of the proposed CISF project area (EIS Section 3.2.2), it is unlikely that invertebrates such as insects are present in sufficient numbers within the proposed CISF project that could support wintering bird migration populations. In addition, seven species of waterfowl were observed during the spring migration at Laguna Gatuna either flying over, loafing, or on the shore. Davis and Hopkins (1993) recorded 49 individual dead and salt-encrusted waterfowl representing 6 species at Laguna Gatuna that were examined by FWS pathologists. The dead waterfowl species that were observed are identified in EIS Table 3.6-2. The FWS pathologists strongly suspected that the cause of death for the waterfowl was salt poisoning (sodium ion toxicosis). Because the proposed CISF project would not disturb the shoreline of Laguna Gatuna, and because there is no riparian habitat present at Laguna Gatuna and no agricultural fields within 10 k [6 mi] of the proposed CISF project, the NRC staff anticipates that no phase of the proposed project would affect shoreline bird habitat at Laguna Gatuna (Phase 1) or from full build-out (Phases 1-20). Further, because of the short periods of time that water is present in Laguna Gatuna and the high salinity of the water, the NRC staff anticipates that waterfowl would stop over at Laguna Gatuna for short periods and would not take up residency at Laguna Gatuna on a regular basis.

The NMDGF recommended (and the NRC concurred) that this EIS should evaluate potential impacts from the proposed CISF project on the dunes sagebrush lizard (*Sceloporus arenicolus*), a NMDGF-designated endangered species, and the Lesser prairie-chicken (*Tympanuchus pallidicinctus*), a NMDGF-designated species of greatest conservation need (SGCN) (NMDGF, 2019; NMDGF, 2018b). Loss of shinnery oak habitat complexes, the construction of overhead power lines, and other human activities could impact the viability of these species where the species are present. The following sections provide an analysis of potential impacts on these and other species from the proposed CISF project and associated infrastructure.

The potential environmental impacts and related mitigation measures for ecological resources for the proposed project and alternative are discussed in the following sections.

4.6.1.1 Construction Impacts

The most significant construction impacts would occur during the construction stage of the proposed action (Phase 1) when the first storage pad, the site access road, security building, administrative building, parking lot, concrete batch plant, and lay-down area are constructed. Ecological disturbances during construction of the proposed action (Phase 1) would affect approximately 48.3 ha [119.4 ac] of land, of which 15.9 ha [39.4 ac] would be associated with constructing a railroad spur (Holtec, 2019a). Potential ecological disturbances during construction of the proposed action (Phase 1) of the proposed CISF project could include habitat loss from land clearing, noise and vibrations from heavy equipment and traffic, fugitive dust, creation of open trenches and steep-sided pits, increased soil erosion from surface-water runoff, sedimentation of playa lakes and gullies, and the presence of construction personnel.

Construction of the proposed action (Phase 1) would include the excavation of approximately 135,517 m^3 [177,250 yd^3] of native fill material (Holtec, 2019a). Maintenance practices, such as the use of chemical herbicides and roadway maintenance would also disturb vegetative communities. Construction-related disturbances would remove approximately 48.3 hc [119.4 ac] of vegetation within the Apacherian-Chihuahuan mesquite upland scrub ecological systems and, to a lesser extent, other mixed desert and thorn scrub ecological systems (Southwest Gap Analysis Project, 2007). During the last century, the area these systems occupied has increased through conversion of desert grasslands as a result of drought, overgrazing by livestock, and/or decreases in fire frequency (Southwest Gap Analysis Project, 2007). The dominant shrub species associated with these systems at the proposed CISF project is honey mesquite and snakeweed (NMDGF, 2018b). These systems do not create a unique habitat in the proposed project area. In general, areas affected by construction could experience a loss of shrub species and an increase in annual species, and the colonization of reclaimed areas by species from nearby native communities in this area could be slow (BLM, 2017a). According to the BLM, establishment of mature, native plant communities may require decades. Further, BLM predicts that over the next 20 to 40 years, more plant species in the region will be replaced by species adapted to warmer and drier conditions (BLM, 2017a). A shift in the plant community could also lead to localized changes in the animal community that depends on the plant community for food and shelter.

Erosion of soil from construction activities may cause local changes in the channel morphology downstream of the access road through increased sedimentation or scouring. Holtec would use mitigation measures for soil stabilization and sediment control, including earthen berms, dikes, and silt fences, which would be built prior to land clearing (Holtec, 2019a). During construction of the proposed CISF, the potential exists for the introduction and spread of noxious weeds, particularly in areas where vegetation has been removed or disturbed. During the construction phase, the laydown area {less than the 0.57 ha [1.4 ac]} and other disturbed areas that are not developed by project facilities would be stabilized with native grass species, pavement, and crushed stone to control erosion, and eroded areas would be repaired (Holtec, 2019a).

Holtec would be required to comply with a SWPPP as part of the NPDES permitting process (Holtec, 2019a). These mitigation measures would also benefit ecological resources because they would reduce the potential impacts to surface-water runoff receptors, including Laguna Gatuna and Laguna Plata, by limiting channel siltation and silt deposition, and maintaining State water-quality standards.

Based on the most recent BLM maps (published in 2018), the Lesser prairie-chicken habitat range is present at the proposed CISF project, as shown in Figure 3.6-5 (BLM, 2018a). However, according to the NMGFD, suitable habitat for the Lesser prairie-chicken is not present at the proposed CISF project (NMDGF, 2018b). According to BLM, the last documented Lesser prairie-chicken lek sighting within the Carlsbad field office boundaries was on March 15, 2011 (BLM, 2017b; 2018b). As discussed in EIS Section 3.6, these species have not been reported at the proposed CISF project.

The Western snowy plover (*Charadrius alexandrines nivosus*) is a NMDGF-designated SGCN and a BLM-designated Special Status Species discussed further in EIS Section 3.6.5 that has been reported as nesting at Laguna Plata but has not been reported at the proposed project area (NMGFD, 2016; BLM, 2018a). Bitter Lake and Holloman Lake are the primary breeding areas for this species in New Mexico. The Western snowy plover could be vulnerable to the proposed action (Phase 1) construction activities, because of the potential for surface-water runoff that could change water levels and water quality in the playa lakes near the proposed CISF project and from increased siltation that could degrade nesting habitat around the edges of the playa lakes near the proposed CISF project (New Mexico Partners in Flight, 2007).

Although the western burrowing owl is not a State-listed species, the owl could be vulnerable to construction activities, because of the possibility that its burrows, or birds or eggs present in the burrows, may be destroyed by machinery or structures (Klute et al., 2003). The western burrowing owl is generally tolerant of human activity, provided it is not harassed. Burrowing owls are very site-tenacious, and burrow fidelity is a widely recognized trait of burrowing owls. Although this species was not observed during ecological surveys at the proposed project area, according to private birders that document their findings on the Cornell Lab of Ornithology eBird mapping tool, burrowing owls have been reported within the proposed project area and nearby (The Cornell Lab of Ornithology, 2018). While the proposed CISF project activities could create artificial burrows (i.e., cavities within the riprap material), burrowing owls are not easily attracted to artificial burrows.

EIS Table 3.6-3 identifies that the black-tailed prairie dog could occur within 0.6 km [1 mi] of the proposed project, which is a NMDGF-designated SGCN and a BLM-designated Special Status Species. The presence of the western burrowing owl is strongly associated with prairie dog towns (FWS, 2003) because prairie dogs are a food source for this raptor species, when present. Prairie dogs also serve as a food source for the bald eagle and peregrine falcon, which are State-listed raptor species that could occur in the project area, according to the NMDGF (NMDFG, 2019; Johnson et al., 2006). However, prairie dog towns have not been reported in the proposed project area (Johnson et al., 2006; Holtec, 2019a).

All migratory birds, their feathers and body parts, nests, eggs, and nestling birds are protected by the Federal Migratory Bird Treaty Act (MBTA), making it unlawful to hunt, shoot, wound, kill, trap, capture, or sell birds listed under this convention. With a few exceptions, all bird species that are native to the United States are protected by the MBTA. Eagles are additionally protected by the Bald and Golden Eagle Protection Act (BGEPA) (FWS, 2018b). Holtec would be responsible for complying with these acts during all of the proposed project, limiting potential effects on birds from the proposed project.

Overhead power lines to serve the proposed CISF project are expected to be constructed during the proposed action (Phase 1) and extend 1.6 km [1 mi] to the south from the center of the proposed CISF project (Holtec, 2019a). The construction of new overhead power lines could cause raptors to desert nests and cause reproductive failure. Power lines present the potential for collisions and could displace prey species, which may reduce food availability within the area. Migratory birds could temporarily use the proposed CISF project, Laguna Gatuna, and Laguna Plata for a resting ground and may also be vulnerable to proposed CISF project construction activities. The salinity of the playa lakes would limit waterfowl and other avian species, such as the State-listed species discussed in this section, from relying on the playa lakes as a long-term water source. Mitigation measures the NMGFD, FWS, and BLM recommended, described later in this section, would be considered to lessen impacts to avian species.

As noted in EIS Section 3.5.1.1, NMED identified the potential for intermittent circular non-saline playas within and surrounding the proposed project area. The ecological surveys reviewed by the NRC staff did not identify any playas or high concentrations of vegetation that would indicate a circular playa within the proposed project area. However, the ecological surveys characterized the surrounding land area as similar to that of the proposed project area. The NRC staff anticipates that avian or terrestrial species that would use any intermittent non-saline playas present in the proposed project area would migrate to nearby land with similar characteristics. Therefore, the NRC staff concludes that impacts to avian or terrestrial species that might be affected by the loss of these water locations and vegetation would be minor.

Many other species, such as rodents and some reptiles, are small, have limited mobility, occur in habitats that provide concealment, or spend at least a portion of their lives underground. During the proposed action (Phase 1), construction activities may disturb soils to depths of up to 7.6 m [25 ft] deep, and because of use of heavy equipment and excavation, some individuals of these species are likely to be killed, but not in sufficient numbers to affect the local populations of these species. Similarly, a limited number of rodents and larger mammals and reptiles may be killed along access roads by vehicles moving to and from the site. There are many square miles of undeveloped land surrounding the proposed project area, which have native vegetation and habitats suitable for native wildlife species. The proposed action (Phase 1) construction impacts would be expected to contribute to the change in vegetation species' composition, abundance, and distribution within and adjacent to disturbed areas. Per BLM, the establishment of mature, native plant communities may require decades. The construction of the proposed action (Phase 1) would remove about 11 percent of the vegetation within the proposed project area and would affect the ecosystem function of the vegetative communities within and around the proposed project areas due to the expected shift of plant communities and the potential introduction of weeds. Therefore, the NRC staff concludes that impacts to vegetation from the proposed action (Phase 1) for construction would be noticeable within the proposed project area, but would not destabilize the vegetative communities at the proposed CISF project, resulting in a MODERATE impact. However, the removal of 48.3 ha [119.4 ac] of vegetation within the regional Apacherian-Chihuahuan mesquite upland scrub ecological system would not be noticeable. The NRC staff anticipates that the ecosystem function of vegetative communities found at the proposed CISF project would not be sufficiently altered by the proposed action (Phase 1) construction impacts to destabilize wildlife populations. As discussed in EIS Section 3.6, the species of wildlife present or that could be present are typical of those found in the habitat in the surrounding area. Because (i) the area surrounding the proposed CISF project is largely undeveloped (EIS Section 3.2); (ii) there is abundant suitable habitat in the vicinity of the project to support displaced animals; (iii) the proposed action (Phase 1) construction activities would have "No Effect" on Federally listed species; and (iv) there are no rare or unique communities, habitats, or wildlife on the proposed CISF project, the NRC staff concludes that impacts to wildlife from the proposed action (Phase 1) for construction would be minor and would not noticeably change the population of any species.

Holtec has committed to implement mitigation measures that would further limit potential construction impacts on ecological resources (Holtec, 2019a). As previously discussed, Holtec would use mitigation measures for soil stabilization and sediment control, comply with a SWPPP, and revegetate disturbed areas with native plant species. Holtec has also committed to additional mitigation measures, to include monitoring leaks and spills of oil and hazardous material from operating equipment, minimizing fugitive dust, and conducting most construction activities during daylight hours (Holtec, 2019a). These mitigation measures would reduce impacts on ecological resources by limiting wildlife exposure to contaminants, limiting dust that may settle on forage and edible vegetation (rendering it undesirable to animals), and limiting the potential mortalities of nocturnal animals.

NMDGF recommends that Holtec conduct a more thorough biological survey of the project footprint and a 0.8-km [0.5-mi] buffer to better assess the range of wildlife species that may occur within the proposed project area (NMDGF, 2018b). NMDGF also suggests that Holtec consult the Baseline Wildlife Study Guidelines for conducting wildlife presence and diversity inventories (NMDGF, 2010). This guideline presents a matrix of published survey methods and protocols for specific habitats and species. The NRC staff reviewed this guideline and determined that the ecological surveys provided in Holtec's license application do not meet the NMDGF guidelines. For example, the frequency and timing of the surveys conducted for the proposed project do not meet the NMDGF recommended 1-year survey period. Further, the license application ER did not provide the location of raptor nests located within the project area and a 1.6-km [1-mi] buffer around the proposed project area and did not include live-trapping and capture of reptiles and amphibians. The NRC staff supports NMDGF's recommendation for a more thorough biological survey of the project footprint and a 0.8-km [0.5-mi] buffer be conducted for the proposed CISF project. The NRC staff further recommends that Holtec consult with NMDGF to develop an ecological baseline survey plan.

NMDGF also recommends that the playa lakes near the proposed CISF project be protected from disturbance and an adequate buffer zone established but did not specify the size of an appropriate buffer zone (NMDGF, 2018b). Wildlife that could occur at the proposed project area, as well as the BLM-managed land around the proposed facility, is under consideration by BLM for designation as the Salt Playas Area of Critical Environmental Concern (ACEC). The portion of the proposed Salt Playas ACEC that surrounds the proposed CISF project is shown in EIS Figure 4.6-1. The BLM's Draft RMP EIS that evaluates the Salt Playas ACEC identifies mitigations that could reduce potential adverse impacts to the Salt Playas ACEC (BLM, 2018a).

On BLM-managed land, BLM requires a buffer of 200 m [656 ft] from the edges of playas and floodplains where surface disturbances are not allowed as a mitigation measure to protect fish and wildlife resources. While BLM may not decide to designate the Salt Playas ACEC, the NRC staff agrees with establishing a 200 m [656 ft] buffer from the edges of playas and floodplains, and recommends that Holtec establish at least a 200 m [656 ft] buffer around Laguna Gatuna that would be protected from surface disturbances during construction activities. Given the location of the nearest planned disturbance within the proposed project area, which is the proposed rail spur, this buffer distance is reasonable and does not overlap the proposed construction activities.

The NMDGF recommended that this EIS discuss impacts to wildlife that could occur during the construction stage of the proposed project, including ground disturbance and vegetation removal activities that would impact migratory bird nests, eggs, or nestlings (as is NRC common practice). The NMDGF suggested that Holtec implement seasonal restrictions on ground disturbance activities between March 1 and September 1 (NMDGF, 2018b). The FWS further recommends that construction activities occur outside the general bird-nesting season from March through August (FWS, 2019). The NRC staff concurs with the NMDGF and FWS and recommends that Holtec avoid construction activities between March 1 and September 1 (EIS Chapter 6).

NMDGF recommends that the construction and abandonment of power lines follow the practices Avian Power Line Interaction Committee (APLIC) provided, to prevent or minimize risk of avian collision or electrocution of raptors (APLIC, 2006). For example, constructing new overhead power lines and retrofitting old power lines with a 150-cm [60-in] distance between energized conductors or hardware and grounded conductors or hardware limits the risk for birds to be electrocuted (NMDGF, 2007; APLIC, 2006). Holtec could further reduce effects on avian species from construction activities by following FWS's Nationwide Standard Conservation Measures and BLM's recommended disturbance-free dates and spatial buffers to protect raptors and songbirds (FWS, 2018c; BLM, 2018a). The NRC staff concurs with the NMDGF and FWS recommendations. Should Holtec choose to follow these additional NMDGF and FWS-recommended power line mitigations, in addition to avoiding construction activities between March 1 and September 1, effects on all birds would be reduced (EIS Chapter 6).

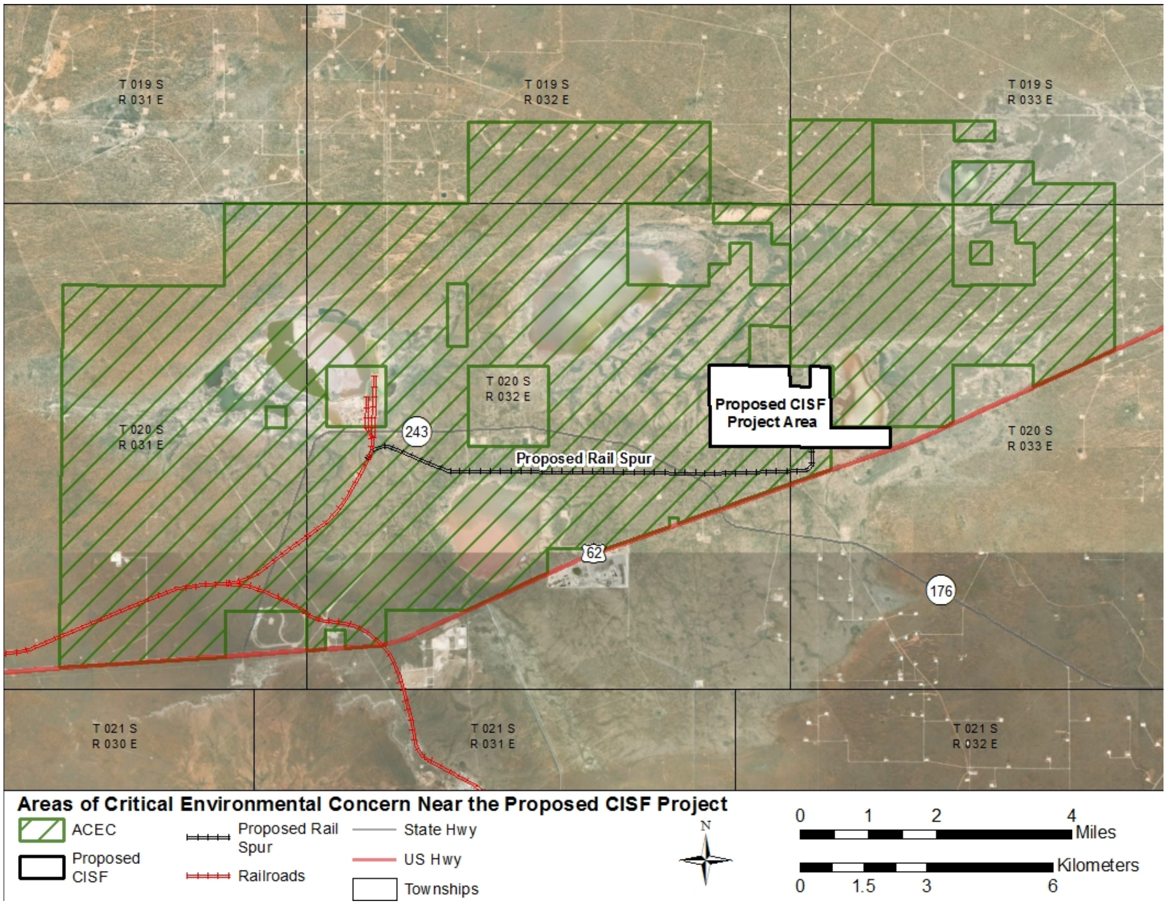

Figure 4.6-1 Proposed Salt Playas Area of Critical Environmental Concern. (Source: Modified from BLM, 2018a)

In response to additional NMDGF comments, the NRC recommends that during the construction stage, Holtec follow NMDGF's trenching guidelines to limit hazards to wildlife from open trenches and steep-sided pits (NMDGF, 2003). NMDGF guidelines recommend that project proponents (i) keep trenching and backfilling activities close together to limit the amount of open trenches at a given time, (ii) conduct trenching activities in cooler months (October to March), and (iii) install escape ramps at least every 90 m [295 ft] at less than a 45-degree slope (NMDGF, 2003). The NRC staff concurs with these NMDGF trenching guidelines and propose them as additional mitigation measures (EIS Chapter 6).

The NRC recommends that Holtec construct wildlife exclusion fencing around the areas under active construction to minimize impediments to game and avian movement that follow NMDGF-provided fence designs that NMDGF deems appropriate to use during the construction activities. NMDGF also recommends that exclusion fence designs be a minimum of 2.4 m [8 ft] high, constructed of chain link or woven or welded wire mesh, secured at the ground or preferably buried to prevent animals digging under, and should be wrapped around the base with a durable finer mesh material to deter small mammals and reptiles and amphibians. Livestock exclusion fences should be designed to minimize the potential for causing injury or death to large wildlife attempting to cross over or under (NMDGF, 2004). Should Holtec choose to follow these NMDGF fencing and trenching design recommendations (with which NRC concurs, per EIS Chapter 6), effects on all wildlife would be reduced.

As previously described in this section, Holtec has committed to mitigation measures, including using temporary sediment-control features during construction that would limit direct impacts, playa disturbances, and spills. EPA requires that Holtec follow provisions in a SWPPP as part of the NPDES permitting process that would address stormwater drainage impacts from erosion and sedimentation during construction activities.

Lastly, the NRC staff recommends that Holtec follow FWS recommendations to educate all employees, contractors, and/or site visitors of relevant rules and regulations that protect wildlife (FWS, 2018c).

Ecological disturbances during construction of Phases 2-20 would affect approximately 4.5 ha [11 ac] per year, resulting in the removal of approximately 85.2 ha [210.6 ac] of vegetation, in addition to that of the proposed action (Phase 1) disturbances and vegetation removal. Each subsequent phase of construction would disturb less land compared to the amount of land disturbed during the proposed action (Phase 1). Construction activities from Phases 2-20 would include the excavation of approximately 135,517 m^3 [177,250 yd^3] of native fill material during each phase (Holtec, 2019a). The potential impacts to vegetation and wildlife during each individual subsequent construction phase (2-20) at the proposed CISF project would be similar to or less than those described earlier for the construction of the proposed action (Phase 1) because of fewer earthmoving activities and a lower number of vehicles and people accessing the CISF (supporting buildings and infrastructure would already be in place).

Similar to the proposed action (Phase 1), to mitigate impacts to vegetation disturbance during construction of subsequent phases, Holtec proposes to minimize the construction footprint, to the extent practicable, and use mitigation measures for soil stabilization and sediment control, such as stabilizing disturbed areas with native grass species, pavement, and crushed stone to control erosion; stabilizing disturbed areas with natural and low-water maintenance landscaping; and protecting undisturbed areas with silt fencing and straw bales, as appropriate. During construction of Phases 2-20, Holtec would continue to monitor for and repair leaks and spills of oil and hazardous material from operating equipment, minimize fugitive dust, and conduct most construction activities during daylight hours (Holtec, 2019a). For construction of each individual subsequent phase, because (i) a smaller amount of land would be disturbed during each subsequent construction stage, (ii) fewer vehicles and workers would access the proposed project area, and (iii) Holtec has committed to mitigation measures, the potential impacts on wildlife and vegetation would be similar or less than those during the construction of individual Phases 2-20 compared to the proposed project (Phase 1). However, the combined area of removed vegetation from the construction of full build-out (Phases 1-20) would be approximately 133.5 ha [330 ac] of contiguous land, or about 32 percent of the proposed project area, resulting in a noticeable impact on vegetation. Because construction would occur over a number of years, and there would be abundant habitat available around the proposed facility to support the gradual movement of wildlife, and because the CISF would have no effect on Federally listed threatened or endangered species, the NRC staff concludes that overall ecological impacts during the construction stage for the proposed action (Phase 1) and Phases 2-20 would be SMALL for wildlife and MODERATE for vegetative communities. The removal of 133.5 ha [330 ac] of vegetation within the regional Apacherian-Chihuahuan mesquite upland scrub ecological system would not be noticeable.

Should Holtec choose to continue to follow the NRC staff recommendations during construction of Phases 2-20 that were made for reducing ecological impacts during the proposed action (Phase 1) construction to (i) conduct a more thorough biological survey of the project area and consult with NMDGF to develop an ecological baseline survey plan to better assess the range of wildlife species that may occur within the proposed project area (e.g., provide the location of raptor nests located within the project area and a 1.6-km [1-mi] buffer around the proposed project area, and include live-trapping and capture of reptiles and amphibians), (ii) avoid construction activities between March 1 and September 1, (iii) establish a buffer zone of 200 m [656 ft] around Laguna Gatuna that would not be disturbed by project activities, (iv) follow NMDGF and FWS guidance when constructing new overhead power lines and retrofitting old power lines, (v) follow NMDGF fencing and trenching design guidelines, and (vi) educate employees and visitors on relevant rules and regulations that protect wildlife, effects on ecological resources would continue to be reduced and would remain SMALL for wildlife and MODERATE for vegetative communities.

4.6.1.1.1 Rail Spur

Currently, the land where the proposed rail spur would be located is used for cattle grazing and oil and gas production (EIS Section 3.2). The disturbance of 15.9 ha [39.4 ac] of land would be associated with constructing a rail spur (Holtec, 2019a). Construction of a rail spur for SNF transfer from main rail lines to the proposed CISF project would include similar or fewer potential impacts on ecological resources (e.g., vegetation removal, wildlife displacement and disturbances) that were previously discussed for the construction Phase 1. Potential impacts to vegetation and wildlife from construction activities of the rail spur would result from habitat loss from land clearing, noise and vibrations from heavy equipment and traffic, fugitive dust, creation of open trenches and steep-sided pits, increased soil erosion from surface-water runoff, sedimentation of playa lakes and gullies, and the presence of construction personnel. The proposed rail spur, access road, and rail maintenance would predominantly affect the Apacherian-Chihuahuan mesquite upland scrub ecological system, similar to construction of other proposed action (Phase 1) facilities and infrastructure.

No Federal- or State-listed plant species are known to be present along the rail spur (FWS, 2019; NMDGF, 2018a) (EIS Section 3.6.5). As discussed in EIS Section 4.6.1, the Northern aplomado falcon is listed as an experimental nonessential population, and according to FWS, this species has not been reported in southeastern New Mexico or the local area of the proposed CISF project area (FWS, 2014).

According to BLM, no dunes sagebrush lizard habitat is present along the rail spur (BLM, 2018a). The proposed rail spur is not located within the BLM’s Lesser prairie-chicken timing restrictions area discussed in EIS Section 4.6.1.1 (BLM, 2018a). While the proposed rail spur area has a somewhat different proportion of vegetative communities than the proposed storage and operations area, the difference is minor, and the impacts on habitats from the construction of the rail spur would not significantly differ from the potential impacts on habitats from construction of the proposed CISF project. As during construction of the proposed CISF, the potential exists for the introduction and spread of noxious weeds and impacts from soil erosion and sedimentation in ditches along the proposed rail spur, especially during rain events while the rail spur is under construction.

In addition to displacing the animals that inhabit the land where the rail spur would be constructed, linear transportation routes contribute to habitat fragmentation by dividing larger landscapes into smaller patches and converting interior habitat into edge habitat and possibly isolating species within patches (NMDGF, 2005). For example, the reduction of big game use of habitats within 0.8 km [0.5 mi] from roads has been observed. The proposed rail spur would cross existing gravel roads. However, because the design of the proposed rail spur would not prevent wildlife from crossing from one side of the rail spur to the other, the likelihood of isolating wildlife on one side of the rail spur is low. Because the land within 3.2 km [2 mi] of the proposed rail spur is developed with several transportation corridors oil and gas companies use on a regular basis, the NRC staff determines that the potential impacts from the rail spur would not alter the use of habitats or isolate sensitive wildlife species.

Because the proposed rail spur is located on public land, Holtec would be required to comply with the requirements of a BLM permit, including BLM-required mitigation measures. In addition, the rail spur is located within the nominated Salt Playas ACEC previously described. The following proposed mitigations could be imposed for construction of the rail spur, should the BLM approve the Salt Playas ACEC in its final resource management plan EIS (BLM, 2018a). Mitigation measures could include noise level abatement during nesting season; sedimentation control to protect playas; establishing buffers to protect playas for surface-disturbing activities; avoiding Sheer's pincushion cactus (*Coryphantha robustispina* ssp*. scheeri*), if present; use leak detection for storage tanks; and long-term biological inventory and monitoring program.

In addition, BLM may require that raptor nest surveys be conducted, preferably during the same nesting season as construction activities. If nest surveys are not conducted in the same nesting season as construction activities, a pre-construction survey within 7 days of surface disturbance is recommended (BLM, 2019). Since the proposed rail spur will cross State Highway NM 243, a permit for a new railroad right-of-way crossing would be required from the NMDOT (Holtec, 2019a). NMDOT may require a biological report be conducted, and that a specific seed mixture be used for revegetation efforts along the rail spur (NMDOT, 2013; NMDOT, 2017). The NRC and BLM staffs assume that the same mitigation measures Holtec has committed to use for the proposed action (Phase 1) construction, such as soil stabilization and sediment control, use of native grass species to stabilize the ground surface, and use of pavement and stone to control erosion, will also be used for the rail spur area. The potential impacts from the construction of the rail spur are comparable or less than the impacts described for the construction impacts of the proposed action (Phase 1) (SMALL). Therefore, the NRC and BLM staffs conclude that the potential impacts to ecological resources from construction of the rail spur would be SMALL.

4.6.1.2 Operations Impacts

For the operations stage of the proposed action (Phase 1), fewer effects to vegetative communities would occur compared to the construction stage because the only planned land disturbance during the operations stage would be for movement of fences to support staggered construction of storage pads in later phases. Land available for ecological resources would be committed for use by the proposed CISF project for the license term (i.e., 40 years). No noxious weeds have been identified at the proposed storage and operations area; however, invasive plant species and noxious weeds may invade disturbed areas during the operations stage, but Holtec would control weeds with appropriate spraying techniques (Holtec, 2019a). Additionally, material spills from transportation vehicles, maintenance equipment, and gasoline and diesel storage tanks could also occur during the operations stage, which could kill or damage vegetation exposed to the spilled material; however, such spills are anticipated to be few, based on permit requirements and mitigation measures that would continue to be implemented. Thus, the potential impacts to vegetation during operation of the proposed action (Phase 1) for the proposed CISF project would be similar to or less than those described for the construction stage, with respect to earthmoving activities and traffic.

None of the wildlife species at the proposed CISF project discussed in EIS Section 3.6 have established migratory travel corridors, because they are not migratory in this part of their range. In addition, the installation of animal-friendly fencing around the proposed CISF project would minimize the potential for wildlife to access the storage and operations area. Because the operations stage does not require earthmoving activities or significant materials movement, there would be less noise and less traffic during the operations stage of the proposed action (Phase 1) when compared to the construction stage; therefore, the potential to disrupt wildlife populations would be reduced, along with a decrease in the probability of vehicular collisions (Holtec, 2019a). The area to be fenced for security purposes (the protected area) would account for 114.5 ha [283 ac] of the proposed CISF project at full build-out, which would prevent large wildlife such as antelope and cattle from accessing the proposed CISF project.

During the operation stage of the proposed action (Phase 1) and all subsequent phases, the SNF in loaded storage modules under normal operating conditions will emit gamma and neutron radiations to areas in and around the storage and operation area. Wildlife in and around the storage and operation area could be exposed to these types of radiation. Because radiation attenuates with distance, the level of exposure would depend on the proximity of wildlife to the storage modules. Birds and other small animals could find the proposed CISF project attractive during winter months because the proposed CISF project would be a source of heat. There are currently no Federal standards that directly limit radiation doses to wildlife, although related scientific research continues to develop the information base necessary to assess whether such standards are needed.

However, it is well understood that the biological effects of ionizing radiations depend on the intensity of the radiations (both magnitude and energy) and the accumulated dose received by the recipients. Considering available scientific information, the DOE has developed a technical standard that applies a graded approach for evaluating radiation doses to terrestrial biota (DOE, 2019). The DOE technical standard includes impact threshold levels for terrestrial wildlife exposed to continuous direct radiation that the NRC staff found applicable to the exposure conditions at the proposed CISF project. The DOE technical standard states that if the greatest dose rate in the field does not exceed 1 mGy/d [0.1 rad/d], the facility has demonstrated protection and no further action is required. DOE further states that if the greatest dose rate in the field exceeds 1 mGy/d [0.1 rad/d], it does not immediately imply non-compliance and indicates accounting for the possibility of non-continuous exposure and that the maximum dose rates should not exceed 100 mGy/d [10 rad/d] based on a prior International Atomic Energy Agency (IAEA) (1992) report. The IAEA report found that acute dose rates below this level {100 mGy/d [10 rad/d]} were unlikely to produce persistent and measurable deleterious changes in populations or communities of terrestrial plants or animals.

Based on the dose rate estimates documented in Holtec's shielding calculations (Holtec, 2019b), the highest human dose rate on the accessible surface of a loaded storage module was 0.172 mSv/hr [17.2 mrem/hr], or 4.13 mSv/d [0.413 rem/day] at the surface of the closure lid. The Holtec dose rate is a dose equivalent which is based on the product of absorbed dose and a quality factor that accounts for the effectiveness of different radiations in causing biological damage (ICRP, 2007). Considering this general relationship between dose equivalent and absorbed dose, the NRC staff conservatively estimated the absorbed dose (to compare with the DOE technical standard) by dividing the Holtec dose rate by the lowest quality factor of the applicable radiations (gamma radiation, which has a quality factor of 1), resulting in an absorbed dose of 4.13 mGy/d [0.413 rad/d]. Storage cask vents would be covered with appropriately-sized wire mesh to discourage wildlife use and habitation of these areas (Holtec, 2019a).

The NRC staff similarly estimated additional absorbed dose rates from Holtec's estimated human dose equivalent rates at the proposed controlled area boundary of the CISF at 400 m

[1300 ft] from the proposed storage pads. During the operation stage of the proposed action (Phase 1), this dose rate was 0.0961 mSv/yr [9.61 mrem/yr] or 0.26 μSv/d [0.026 mrem/d] which resulted in an NRC staff estimated absorbed dose rate of 0.26 μGy/d [0.026 mrad/d]. At full build-out, this boundary dose rate would be 0.532 mSv/yr [0.0532 rem/yr] or 1.46 μSv/d [146 μrem/d], which resulted in an NRC staff estimated absorbed dose rate of 1.46 μGy/d [146 μrad/d].

In comparing the estimated absorbed dose rates at the proposed CISF with the DOE technical standard, the NRC staff concludes that during any phase of the proposed project, the dose rate at the surface of the closure lid for a loaded storage module of 4.13 mGy/d [0.413 rad/d] exceeds the DOE initial threshold for demonstrated protection of wildlife but is below the DOE threshold of 100 mGy/d [10 rad/d] for persistent deleterious changes in populations or communities. Therefore, some individual organism impacts are possible if there is sustained exposure to wildlife within close proximity to a storage module, but the NRC staff expect this level of sustained close proximity of wildlife to storage modules would be unlikely; therefore, such effects would be minor. Additionally, the comparison to the DOE thresholds indicates that population effects would not be expected. The comparison of dose rates at the facility boundary for the proposed action (Phase 1) and full build-out (Phases 1-20) are below both of the DOE thresholds; therefore, the NRC staff concludes that radiation levels at the controlled area fence and beyond during any phase of the proposed CISF project would be generally protective of wildlife.

Holtec would continue the mitigation measures implemented during construction discussed in EIS Section 4.6.1.1; these would limit potential effects on wildlife during the proposed action (Phase 1) operations stage. These mitigations include revegetating disturbed areas and soil stockpiles with native vegetation species, monitoring leaks and spills of oil and hazardous material from operating equipment, placing fencing around the protected area, minimizing fugitive dust, and restricting the use of heavy trucks and earth-moving equipment during daylight hours (Holtec, 2019a). In addition to the mitigations that would be used during the construction stage, Holtec stated that security lighting for all ground-level facilities and equipment would be down-shielded to keep light within the boundaries of the proposed CISF project during the operations stage, helping to minimize the potential for impacts on wildlife (Holtec, 2019a). Due to the absence of an aquatic environment and Holtec's commitment to implement stormwater management practices, the impacts to aquatic systems would be limited. In addition, Holtec stated that above-ground storage tanks would be constructed with secondary containment structures (e.g., concrete berms and floor sumps) to stop fluids from spilling on the ground immediately around the tank or fuel pump, or potentially impacting downstream environments. The operations stage would continue to alter noticeably, but not destabilize, the vegetative communities within the proposed project area. However, effective wildlife management practices, additional surveys of the proposed CISF project, would identify the potential for long-term nesting, and mitigation would prevent permanent nesting and lengthy stay times of wildlife that may potentially attempt to reside at the proposed CISF project. Thus, the impacts to wildlife from the proposed action (Phase 1) operations would be minor and would not noticeably change the population of any species.

The NRC staff recommends, as an additional mitigation measure, that Holtec develop a wildlife inspection plan to identify animals that may be present at the proposed CISF project and take action to remove animals found within the proposed action (Phase 1) storage and operations area, if present. To prevent permanent nesting and lengthy stay times of wildlife that may potentially attempt to reside at the proposed CISF project, the NRC staff recommends that Holtec consult with BLM and NMDGF to determine appropriate mitigation measures to discourage wildlife use and habitation of the proposed project area for the proposed action (Phase 1), particularly near cask vents. If these additional mitigation measures are implemented, the impacts to wildlife from the proposed action (Phase 1) operations would continue to be minor and would not noticeably change the population of any species.

As for Phase 1, the operations stage of Phases 2-20 would not create additional vegetation or wildlife disturbances beyond those impacts experienced to vegetation and wildlife during construction of Phases 2-20. Although construction impacts of subsequent phases would occur concurrently with operation impacts of prior phases, operation impacts are not anticipated to significantly increase those experienced from construction. Once construction activities for all phases are complete, ecological impacts because of noise, vehicles, structures, and the presence of humans would be significantly reduced because limited or no earthmoving activities would occur. During the operations stage of Phases 2-20, as described in the preceding analysis, some individual organism impacts are possible from exposure to direct radiation if there is sustained exposure to wildlife within close proximity to storage modules, but this would not be expected to affect populations. The radiation levels at the controlled area fence and beyond during Phases 2-20 of the proposed CISF project would be generally protective of wildlife. Similar to the proposed action (Phase 1) operations stage, to mitigate impacts to vegetation and wildlife during operations, Holtec proposes to revegetate disturbed areas, control invasive plant species and noxious weeds, fence the protected area to prevent large animals such as antelope and cattle from accessing the proposed CISF project, use down-shielded lighting, cover cask vents with wire mesh, and implement stormwater management practices (Holtec, 2019a). Continued monitoring of leaks and spills of oil and hazardous material from operating equipment would reduce the potential impact to terrestrial species and stormwater receptors. Fencing the CISF would further limit large wildlife access to cask storage pads. Because no additional land would be disturbed during the operations stage of Phases 2-20 at the proposed CISF project, and because of Holtec's commitment to mitigation measures, the potential impacts on ecology would be SMALL to MODERATE during the operations stage of individual Phases 2-20.

The NRC staff anticipates that there would be essentially no detectible difference to impacts on ecology from the combined operations of the proposed action (Phase 1) and Phases 2-20; therefore, the NRC staff concludes that overall ecological impacts during operation of the fully built proposed CISF would be SMALL to MODERATE.

Defueling

Defueling the CISF would involve removal of SNF from the CISF. Activities would be similar in scale and nature to those earlier in the operations stage to emplace the fuel. Potential ecological impacts could include habitat fragmentation from presence of the rail spur; the potential for the establishment of invasive weeds along the disturbed edges of the rail spur; noise, lights, and vibrations of the trains that could disturb wildlife; and direct animal mortalities. However, removing the SNF would reduce the potential for wildlife to be exposed to radiation doses. Therefore, the NRC staff concludes that defueling would have SMALL to MODERATE impacts on ecological resources.

4.6.1.2.1 Rail Spur

For the rail spur, as with the construction stage, the primary impact to ecological resources would be from habitat fragmentation, the potential for the establishment of invasive weeds along the disturbed edges of the rail spur, and from the noise and vibrations of the trains. Lights on the trains at night could also disturb wildlife along the rail spur, and direct animal mortalities could also occur. Because of the design and construction of the SNF storage and transportation canisters, potential radiological exposure to wildlife is highly unlikely. The SNF canisters do not contain any material in liquid form, and the SNF transportation and storage canisters are sealed to prevent any liquids from contacting the SNF assemblies (Holtec, 2019a). Therefore, there is no potential for material releases, such as a leaking canister, to contaminate soil or vegetation along the rail spur.

Land within 3.2 km [2 mi] of the proposed rail spur has already been developed with several transportation corridors oil and gas companies use on a regular basis; therefore, the NRC staff anticipates that the potential impacts from operation of the rail spur would not alter the use of habitats near the rail spur or isolate sensitive wildlife species in the area. Holtec would be required to comply with the ESA, the MBTA, the BGEPA, the NPDES, and would follow mitigation measures BLM requires to limit potential effects on wildlife described for construction of the rail spur in EIS Section 4.6.1.1. To further limit the potential impacts on wildlife from the presence of the rail spur, the NRC staff recommends that Holtec (i) periodically inspect the rail spur, roads, and right-of-ways for invasion of noxious weeds; (ii) train maintenance staff to recognize weeds, and report locations to the local weed specialist; and (iii) maintain an inventory of weed infestations and schedule them for treatment on a regular basis. Therefore, the NRC and BLM staff conclude that the potential impacts from operation of the rail spur to ecological resources would be SMALL.

4.6.1.3 Decommissioning and Reclamation Impacts

At the end of the license term of the proposed CISF project, once the SNF inventory is removed, the facility would be decommissioned such that the proposed project area and remaining facilities could be released and the license terminated. Decommissioning activities, in accordance with 10 CFR Part 72 requirements, would include conducting radiological surveys and decontaminating, if necessary. During the decommissioning stage of the proposed action (Phase 1) and all subsequent phases, wildlife in and around the storage and operation area could be exposed to radiation at levels less than during the operations stage when SNF is emplaced at the proposed CISF. Decommissioning activities for the proposed action (Phase 1) and for Phases 2-20 would involve the same activities, but the activities would be scaled to address the overall size of the CISF (i.e., the number of phases completed).

Holtec has committed to reclamation of nonradiological-related aspects of the proposed project area (Holtec, 2019a). Reclamation would include dismantling and removing equipment, materials, buildings, roads, the rail spur, and other onsite structures; cleaning up areas; waste disposal; erosional control; and restoring and reclaiming disturbed areas. EIS Sections 2.2.1.4 and 2.2.1.7 describe the decommissioning and reclamation activities.

Replanting the disturbed areas with native species after completion of the decommissioning and reclamation activities would restore the site to a condition similar to the preconstruction condition. Impacts on vegetation during decommissioning and reclamation of the proposed CISF project would include removal of existing vegetation from the area required for equipment laydown and disassembly. However, the area disturbed would be bounded by the construction stage activities. While vegetation becomes established, potential impacts to surface-water runoff receptors, including Laguna Gatuna and Laguna Plata, could occur by channel siltation and silt deposition and could potentially impact the wildlife located in those areas. As is the case during operations, the playas are not expected to support permanent aquatic communities, because they do not permanently hold sufficiently deep water and maintain the quality of water to support aquatic species. Thus, there would not be aquatic communities present to impact during decommissioning.

Holtec would return the landscape to its natural gradient and would reduce the ecological impact by removing buildings and associated infrastructure (Holtec, 2019a). Holtec would use the same mitigation measures during dismantling activities as those used during construction, described in EIS Section 4.6.1.1.1, to limit impacts on ecological resources. These include soil stabilization and sediment control, use of native grass species to stabilize the ground surface, and use of pavement and crushed stone to control erosion, compliance with a SWPPP, minimizing fugitive dust, and restricting the use of heavy trucks and earth-moving equipment during daylight hours (Holtec, 2019a). Holtec would also have a continued legal obligation to comply with the ESA, the MBTA, and the BGEPA, as well as mitigation measures BLM and NMDOT require to limit potential effects on wildlife. For these reasons, the NRC staff concludes that the impact on ecological resources from decommissioning (Phase 1) would be MODERATE until vegetation is reestablished in reseeded areas and then would be SMALL thereafter.

Reclamation of the proposed facility for Phases 2-20 would include activities necessary to return the CISF to its previous land use. These activities would be similar to those activities undertaken for constructing the proposed CISF project for individual Phases 2-20, and dismantling buildings would have potential ecological impacts similar in scale to the construction stage for the proposed action (Phase 1) (e.g., vegetation removal, wildlife displacement, and disturbances). The amount of disturbed land that would require revegetation from dismantling all of Phases 2-20 would be larger compared to the amount of disturbed land that required revegetation from the construction stage of Phase 1, and there would be potential impacts to surface-water runoff receptors until vegetation is established in reseeded areas. The NRC staff anticipates that the same mitigation measures described for the dismantling of the proposed action (Phase 1) previously discussed would be used during dismantling for Phases 2-20. For these reasons, the NRC staff concludes that impacts on ecological resources from decommissioning for the proposed CISF project for Phases 2-20 would be MODERATE until vegetation is reestablished in reseeded areas. The establishment of mature, native plant communities may require decades. The NRC staff concludes that the impact on ecological resources from decommissioning Phases 2-20 would be MODERATE until vegetation is reestablished in reseeded areas and then would be SMALL thereafter.

4.6.1.3.1 Rail Spur

At the end of decommissioning, all lands associated with the rail spur would be returned to their preoperational land use, unless the landowner (BLM) approves an alternative use, and wildlife would be able to use the land. Dismantling the rail spur would have impacts on ecology similar in nature and scale to those impacts experienced during construction of the rail spur (e.g., vegetation removal, wildlife displacement and disturbances). The establishment of mature, native plant communities may require decades. However, due to the relatively small disturbed area of the rail spur and because Holtec commits to reseed all disturbed areas, the NRC and BLM staff conclude that ecological impacts on the rail spur area from decommissioning would be SMALL.

If the rail spur is not decommissioned, the rail spur would continue to be a source of habitat fragmentation and present the potential for establishment of invasive weeds along the disturbed edges of the rail spur. With no SNF shipments along the rail spur, there would no longer be disturbance to wildlife from these shipments or direct animal mortalities.

4.6.2 No-Action Alternative

Under the No-Action alternative, the NRC would not license the proposed CISF project, and the land would continue to be available for other uses. Therefore, impacts such as habitat loss from land clearing, noise and vibrations from heavy equipment and traffic, fugitive dust, creation of open trenches and steep-sided pits, increased soil erosion from surface-water runoff, sedimentation of playa lakes and gullies, and the presence of personnel would not occur. Construction impacts would be avoided because SNF storage modules, buildings, and transportation infrastructure would not be built. Operational impacts would also be avoided because no SNF canisters would arrive for storage. Impacts to ecological resources from decommissioning activities would not occur because there would be no facility to decommission. The proposed project areas would continue to support wildlife and habitats that occur on and near the proposed project area. In the absence of a CISF, the NRC staff assumes that SNF would remain on-site in existing wet and dry storage facilities and be stored in accordance with NRC regulations and be subject to NRC oversight and inspection. Site-specific impacts at each of these storage sites would be expected to continue, as detailed in generic (NRC, 2013, 2005a) or site-specific environmental analyses. In accordance with current U.S. policy, the NRC staff also assumes that the SNF would be transported to a permanent geologic repository, when such a facility becomes available.

4.7 Air Quality

This section considers the potential impacts to air quality, including non-greenhouse gases, greenhouse gases, and climate change, for the proposed action (Phase 1), Phases 2-20, and the No-Action alternative.

4.7.1 Non-Greenhouse Gas Impacts

Impacts from non-greenhouse gases to air quality from the proposed CISF project activities may result primarily from combustion emissions from mobile sources as well as fugitive dust.

4.7.1.1 Impacts from the Proposed CISF

The following sections assess the potential environmental impacts on air quality from construction, operation, and decommissioning of the proposed project. This section also addresses the environmental impacts from the peak year of activity, which accounts for when stages (i.e., construction, operation, and decommissioning) of various phases occur simultaneously or overlap. Peak-year emissions represent the highest emission levels associated with the proposed CISF project in any one year and therefore also represent the greatest potential impact to air quality.

The NRC staff characterizes the magnitude of air effluents from the proposed CISF project, in part, by comparing the emission levels to the State of New Mexico screening thresholds for determining whether an air permit is needed (i.e., thresholds for a “no permit required” status). These thresholds are 4.53 kilograms per hour [10 pounds per hour] (20 New Mexico Administrative Code Chapter 2 Part 72) and 9.07 metric tons per year [10 short tons per year] (20 New Mexico Administrative Code Chapter 2, Part 73) for any of the New Mexico or National Ambient Air Standards pollutants and are specific to stationary sources. The NRC’s analysis will (i) provide context for understanding the magnitude of the proposed CISF project air effluents, which are predominantly from mobile and fugitive dust rather than stationary sources; and (ii) identify what emissions the analysis in this EIS will focus on for evaluating potential environmental effects. The comparison of pollutant concentrations to thresholds in this EIS is for the NRC's impact evaluation only and does not document or represent a formal determination for air permitting or regulatory compliance.

4.7.1.1.1 Peak-Year Impacts

The peak-year emissions represent the highest emission levels associated with the proposed action (Phase 1) for each individual pollutant in any one year and therefore also represent the greatest potential impact to air quality. Specifically, peak-year emissions account for any overlap in stages (i.e., construction, operation, and decommissioning). For the proposed action (Phase 1) no stages overlap. This means the peak year for each pollutant occurs during the stage with the highest emission levels in tons per year for that pollutant. Details describing the emissions associated with each individual stage for the proposed action (Phase 1) are provided in the following subsections. For the proposed action (Phase 1), the construction and decommissioning stages generate the same emission levels (EIS Table 2.2-1). The proposed action (Phase 1) operations stage generates the peak-year emission levels for carbon dioxide, carbon monoxide, and hazardous air pollutants. For the proposed action (Phase 1), the individual construction and decommissioning stages generate the peak-year emission levels for nitrogen dioxide, particulate matter $PM_{2.5}$, particulate matter PM_{10}, sulfur dioxide, and volatile organic compounds.

Key factors in assessing impacts to air quality include the following: the existing air quality, the proposed action (Phase 1) peak-year emissions levels, and the proximity of the emission sources to the receptors. As described in EIS Section 3.7.2.1, the proposed facility would be located in a region characterized with good air quality. EIS Table 2.2-1 contains the estimated peak-year emission levels for Phase 1. Holtec stated that these emission estimates did not include any mitigation measures (Holtec, 2019d). The proposed action (Phase 1) peak-year emission levels for all of the pollutants are below the New Mexico "no permit required thresholds," except for particulate matter PM_{10}, which is about 1.7 times this threshold. The NRC staff concludes that pollutants with emission levels below this New Mexico "no permit required threshold" would be minor. Determination of the project-level PM_{10} impacts requires additional consideration by the last key factor: proximity between the emission sources and receptors. EIS Figure 3.7-2 shows the locations of nearby receptors to the proposed CISF project area. The nearest resident to the proposed CISF project area is located about 2.4 km [1.5 mi] to the north. U.S. Highway 62 would be located closer to the proposed CISF project area than the nearest resident. U.S. Highway 62 would be adjacent to the southeast corner of the proposed CISF project area; however, the key factor is the distance between an emission source and the receptor. This highway would be about 0.7 km [0.43 mi] from the proposed concrete batch plant which would be nearest air emission source within the proposed CISF project area (EIS Figure 2.2-2). In addition, heavier particles (i.e., the particulate matter PM_{10}) from the type of fugitive emissions the proposed action generated tend to settle out of the air quickly as the dust plume disperses from the source (Countess, 2001). The distance between the proposed CISF emission sources and these receptors, along with the nature of the PM_{10}, reduces the potential for impacts because pollutants disperse as distance from the source increases, and in the case of particulate matter PM_{10}, settle out of the air quickly. Therefore, the NRC staff concludes that the potential impacts to air quality from peak-year emission levels would be minor.

As described in EIS Section 3.7.2.1, the closest Class I area to the proposed project area is Carlsbad Caverns National Park, located about 75.0 km [46.6 mi] to the southwest. Federal land managers responsible for managing Class I areas developed guidance that recommends a screening test be applied to proposed sources greater than 50 km [31 mi] from a Class I area to determine whether analysis for air quality-related values (e.g., visibility and atmospheric deposition) is warranted (National Park Service, 2010). The screening test considers the project's distance to the Class I area and the project's emission levels. If the combined annual mass emission rate (i.e., tons per year) for nitrogen oxides, particulate matter PM_{10}, sulfur dioxide, and sulfuric acid divided by the distance in kilometers from the Class I area is 10 or less, then this source is considered to have negligible impacts with respect to air quality-related values, and further analysis is not warranted. Based on the proposed action (Phase 1) peak-year emission estimates in EIS Table 2.2-1, the screening test result is 0.3, which is well below the threshold of 10. Based on the screening test results, the estimated proposed action (Phase 1) peak-year emissions for the proposed CISF project would have negligible impacts on air quality-related values for Carlsbad Caverns National Park.

In summary, the proposed action (Phase 1) generates low levels of air emission criteria pollutants within an attainment area (40 CFR 81.332) with good existing air quality. In addition, the distance between the proposed CISF project area and the receptors reduces the potential for impacts because pollutants disperse with distance from the source or in the case of heavier fugitive dust (i.e., particulate matter PM_{10}), settle out of the air quickly. Therefore, the NRC staff concludes that the potential impacts to air quality from the peak-year emission levels for the proposed action (Phase 1) would be SMALL.

EIS Table 2.2-2 contains the Phases 2–20 estimated emission levels for the various project stages and the peak year. The peak-year emissions for Phases 2–20 account for when any stages (regardless of phase) overlap. None of the subsequent expansion phase construction stages overlap with the construction stage from other phases. Operations overlap with the construction stages of individual phases; however, the operations stage emissions are independent of the number of operating phases (Holtec, 2019a). For Phases 2-20, the overlapping construction and operation stages generate the peak-year emission levels for carbon dioxide, carbon monoxide, and hazardous air pollutants, and the decommissioning stage generates the peak-year emission levels for the other pollutants identified in EIS Table 2.2-2. The description of the key factors (existing air quality, project-level emissions, and proximity of emission sources to receptors) for Phases 2-20 peak-year impact assessment are comparable to the description of the key factors for the proposed action (Phase 1) peak-year impact assessment (SMALL); therefore, the impacts would also be the same. The NRC staff concludes that the potential impacts to air quality from the peak-year emission levels for Phases 2-20 (full build-out) would be SMALL.

The description of the key factors for Phases 1-20 peak-year impact assessment are the same as the description of the key factors for the Phases 2-20 peak-year impact assessment; therefore, the impacts would also be the same. The NRC staff concludes that the potential impacts to air quality from the peak-year emission levels for Phases 1-20 (full build-out) would be SMALL.

4.7.1.1.2 Construction Impacts

The proposed action (Phase 1) construction consists of building the storage modules and pad for 500 SNF canisters. In addition, the proposed action (Phase 1) construction includes building all of the infrastructure needed to support the proposed CISF, including a site access road, cask transfer building, security building, administration building, and parking lot. These activities primarily generate combustion emissions from mobile sources as well as fugitive dust from clearing and grading of the land, and vehicle movement over unpaved roads. The description of the key factors for the proposed action (Phase 1) construction stage are either the same as or bounded by the description of the key factors for the Phase 1 peak-year impact assessment (i.e., SMALL). Therefore, the NRC staff concludes that the potential impacts to air quality for the proposed action (Phase 1) construction would be SMALL**.**

Construction of Phases 2-20 consists of building the storage modules and concrete pad for each subsequent phase. Construction stage emission levels for Phases 2-20 are 15 percent of the proposed action (Phase 1) construction stage emission levels because emissions for Phases 2-20 do not include the emissions associated with building all of the infrastructure needed to support the proposed CISF project. The description of the key factors for Phases 2-20 construction stage are either the same as or bounded by the description of the key factors for the Phases 2-20 peak-year impact assessment (SMALL). Therefore, the NRC staff concludes that the potential impacts to air quality during Phases 2-20 construction would be SMALL**.**

For full build-out (i.e., Phases 1-20) construction, the key factors are the same as for the Phases 2-20; therefore, the NRC staff concludes that the potential impacts to air quality during Phases 1-20 would be SMALL.

4.7.1.1.2.1 Rail Spur

Construction of the rail spur would generate fugitive dust from disturbing the land and combustion emissions from equipment used to build the rail spur. For the rail spur, proximity of emission sources to receptors as well as the emission levels are different than those for the peak year proposed action (Phase 1) impact assessment.

Construction of the rail spur is included as part of the proposed action (Phase 1) construction stage. The rail spur is located closer to receptors than the proposed action (Phase 1) emission sources (i.e., the proposed CISF project facilities and SNF storage area). As depicted in EIS Figure 3.7-2, the nearest residence to the proposed rail spur would be located about 2.92 km [1.81 mi] to the south; however, another facility would be located closer to the proposed rail spur than the nearest residence. The Intrepid Potash North offices would be located about 0.7 km [0.43 mi] from the western end of the proposed rail spur and would be the nearest facility that NRC staff consider would be regularly occupied. U.S. Highway 62 would pass within about 0.18 km [0.11 mi] from the eastern end of the proposed rail spur, and New Mexico State Highway 243 actually crossed the proposed rail spur near the southwest corner of the proposed CISF project. EIS Table 2.2-1 contains the estimated emission levels for the proposed action (Phase 1) construction. Rail spur construction emissions composes only a portion of the total proposed action (Phase 1) construction emissions. The NRC and BLM staffs anticipate the rail spur construction emission levels to be below the thresholds identified in EIS Section 4.7.1.1. The NRC and BLM staffs conclude that the potential impacts to air quality during the rail spur construction would be SMALL because the of the low emission levels.

4.7.1.1.3 Operations Impacts

For the proposed action (Phase 1) operations stage, the primary activity is receiving and loading SNF into modules. Combustion emissions from equipment used to conduct this activity are the main contributors to air quality impacts. The description of the key factors for the Phase 1 operations stage are either the same as or bounded by the description of the key factors for the Phase 1 peak-year impact assessment (SMALL). Therefore, the NRC staff concludes that the potential impacts to air quality for the proposed action (Phase 1) operations stage would be SMALL.

Similar to the proposed action (Phase 1), the Phases 2-20 operations stage primarily consists of receiving SNF at the proposed CISF project and loading it into modules for each subsequent phase. Combustion emissions from equipment used to conduct this activity are the main contributors to air quality impacts. The description of the key factors for Phases 2-20 operations stage are either the same as or bounded by the description of the key factors for the Phases 2-20 peak-year impact assessment (SMALL). Therefore, the NRC staff concludes that the potential impacts to air quality during Phases 2-20 operation would be SMALL.

For the full build-out (i.e., Phases 1-20) operations stage, the key factors are the same as for Phases 2-20; therefore, the NRC staff concludes that the potential impacts to air quality during Phases 1-20 would be SMALL.

Defueling

Defueling the CISF would involve removal of SNF from the proposed CISF. Defueling activities would generate levels of combustion emissions on a scale similar to emplacement of the SNF earlier in the operations stage. In addition, the description of existing air quality, proximity of the emission sources to the receptors, and mitigation for emplacement of the SNF earlier in the operations stage also applies to defueling. Therefore, the NRC staff concludes that the potential impacts to air quality during defueling would be SMALL.

4.7.1.1.3.1 Rail Spur

The operations stage for the rail spur primarily consists of transferring SNF from the main rail line to the proposed CISF project. Combustion emissions from SNF transportation along the rail spur are the main contributors to air quality impacts. The rail spur is located closer to receptors than the proposed action (Phase 1) emission sources (i.e., the proposed CISF project facilities and SNF storage area). As depicted in Figure 3.7-2, the rail spur crosses State Highway 243. However, the nature of the air emissions associated with SNF transport along the rail spur is important when analyzing potential impacts. Transportation of SNF on the rail spur occurs intermittently over the 8.9 km [5.5 mi] length of the rail spur rather than continuously generating emissions from a specific stationary location, such as operation of the CISF. Because of the intermittent and widespread nature of these emissions, the NRC and BLM staffs conclude that the potential impacts to air quality during rail spur operations would be SMALL.

4.7.1.1.4 Decommissioning and Reclamation Impacts

At the end of the license term of the proposed CISF project, once the SNF inventory is removed, the facility would be decommissioned such that the proposed project area and remaining facilities could be released and the license terminated. Decommissioning activities, in accordance with 10 CFR Part 72 requirements, would include conducting radiological surveys and decontaminating, if necessary. Decommissioning activities for the proposed action (Phase 1) and for Phases 2-20 would involve the same activities but the activities would be scaled to address the overall size of the CISF (i.e., the number of phases completed).

Holtec has committed to reclamation of nonradiological-related aspects of the proposed project area (Holtec, 2019a). Reclamation would include dismantling and removing equipment, materials, buildings, roads, the rail spur, and other onsite structures; cleaning up areas; waste disposal; erosional control; and restoring and reclaiming disturbed areas. EIS Sections 2.2.1.4 and 2.2.1.7 describe the decommissioning and reclamation activities.

The NRC staff anticipates that if decommissioning activities generate any air emissions (e.g., combustion emissions from mobile sources associated with transporting people for conducting surveying), the levels would be much less than those Phases 2-20 construction stages generate. The description of the other key factors (air quality and proximity of emission sources to receptors) for decommissioning the proposed (Phase 1), Phases 2-20, and Phases 1-20 are the same as the description of the key factors for the Phases 2-20 construction impact assessment (i.e., SMALL); therefore, the impacts would also be the same. Similarly, the description of the key factors for reclamation for the proposed action (Phase 1), Phases 2-20, and full build-out (Phases 1-20) are comparable to the description of the key factors for the proposed action (Phase 1) construction impact assessment (i.e., SMALL); therefore, the impacts would also be the same. Therefore, the NRC staff concludes that the potential impacts to air quality from the decommissioning and reclamation stage for the proposed action (Phase 1), Phases 2-20, and Phases 1-20 would be SMALL.

4.7.1.1.4.1 Rail Spur

At the end of the license term, the proposed CISF project would be decommissioned such that the rail spur area could be released and the license terminated. Decommissioning activities, in accordance with 10 CFR Part 72 requirements, would include conducting radiological surveys and decontaminating (if necessary) (EIS Section 2.2.1.4). The NRC and BLM staff anticipate that if decommissioning activities generate any air emissions (e.g., combustion emissions from mobile sources associated with transporting people for conducting surveying), the levels would be much less than those generated by Phases 2-20 construction. The description of the other key factors (air quality and proximity of emission sources to receptors) for decommissioning the rail spur for Phase 1, Phases 2-20, and Phases 1-20 are the same as the description of the key factors for the Phases 2-20 construction impact assessment (SMALL); therefore, the impacts would also be the same. The NRC and BLM staffs conclude that the potential impacts to air quality from decommissioning the rail spur for the proposed action (Phase 1), Phases 2-20, and Phases 1-20 would be SMALL.

Reclamation activities would include the dismantling of the rail spur (EIS Section 2.2.1.4). The description of the key factors for reclamation of the rail spur area for Phase 1, Phases 2-20, and Phases 1-20 are the same as the description of the key factors for the construction of the rail spur (SMALL); therefore, the impacts would also be the same. The NRC and BLM staffs conclude that the potential impacts to air quality from reclamation of the rail spur for Phase 1, Phases 2-20, and Phases 1-20 would be SMALL.

4.7.1.2 No-Action Alternative

Under the No-Action alternative, the NRC would not license the proposed CISF project. Therefore, impacts on existing air quality would not occur because the generation of emissions from activities and sources associated with the proposed CISF project would not occur. Construction impacts would be avoided because SNF storage pads, buildings, and transportation infrastructure would not be built. Operational impacts would also be avoided because no SNF canisters would arrive for storage. Decommissioning impacts would be avoided because there are no facilities to dismantle or SNF to relocate to a permanent repository. Under the No-Action alternative, impacts to air quality at the proposed CISF site would be attributed to existing sources but would not include the proposed CISF project. In the absence of a CISF, the NRC staff assumes that SNF would remain onsite in existing wet and dry storage facilities and be stored in accordance with NRC regulations and be subject to NRC oversight and inspection. Site-specific impacts at each of these storage sites would be expected to continue, as detailed in generic (NRC, 2013, 2005a) or site-specific environmental analyses. In accordance with current U.S. policy, the NRC staff also assumes that the SNF would be transported to a permanent geologic repository, when such a facility becomes available.

4.7.2 Greenhouse Gas and Climate Change Impacts

4.7.2.1 Impacts from the Proposed CISF

Climate change effects are considered the result of overall greenhouse gas emissions from numerous sources rather than an individual source. In addition, there is not a strong cause-and-effect relationship between where the greenhouse gases are emitted and where the impacts occur. Because of these two factors, the NRC staff addressed the contribution of greenhouse gases from the proposed CISF project to the overall atmospheric greenhouse gas levels and the relevant climate change effects in EIS Section 5.7.2 on air quality cumulative effects rather than in this section, which addresses the air quality effects specifically attributed to the proposed CISF project.

4.7.2.2 No-Action Alternative

Under the No-Action alternative, the NRC would not license the proposed CISF project, and the CISF would not be constructed, operated, or decommissioned. Therefore, there would be no contribution from the proposed CISF project to the overall greenhouse gas levels and no need to assess the impacts of climate change to or in conjunction with the proposed CISF project. In the absence of a CISF, the NRC staff assumes that SNF would remain onsite in existing wet and dry storage facilities and be stored in accordance with NRC regulations and be subject to NRC oversight and inspection. Site-specific impacts at each of these storage sites would be expected to continue as detailed in generic (NRC, 2013, 2005a) or site-specific environmental analyses. In accordance with current U.S. policy, the NRC staff also assumes that the SNF would be transported to a permanent geologic repository, when such a facility becomes available.

4.8 Noise Impacts

This section considers the potential noise impacts from the construction, operation, and decommissioning of the proposed action (Phase 1), Phases 2-20, and the No-Action alternative.

4.8.1 Impacts from the Proposed CISF

Noise impacts would result from earthmoving activities and the associated machinery, as well as from additional traffic associated with the construction, operation, and decommissioning stages of the proposed CISF project and access roads.

4.8.1.1 Construction Impacts

Construction activities at the proposed CISF project would require the use of heavy equipment, such as excavators, front loaders, bulldozers, dump trucks, and materials-handling equipment (e.g., cement mixers and cranes). These activities can generate noise levels up to 95 decibels (dBA) and that typically range from 80–95 dBA at distances of approximately 15 m [50ft] from the source. Noise levels decrease by about 6 dBA for each doubling of distance from the source, although further reduction occurs when the sound energy has traveled far enough to have been appreciably reduced by absorption into the atmosphere (NRC, 2001). Most of the construction activities would occur during weekday daylight hours; however, construction could occur during nights and weekends, if necessary. Large trucks would produce noise levels around 85 dBA at approximately 15 m [50 ft] (Holtec, 2019a).

For the proposed action (Phase 1), the proposed CISF project would be built approximately 411 m [1,350 ft] from either U.S. Highway 62/180 or State Highway NM 243. As a result, the highest noise level predicted at either road during construction would be expected to be within the range of 44 dBA to 59 dBA. Additional noise would be created while constructing the associated building structures and is anticipated to decrease as buildings are nearing completion. Sound levels would be expected to dissipate to near-background levels by the time the sound reaches the proposed project area boundaries (Holtec, 2019a).

For the proposed action (Phase 1), some increased traffic associated with construction activities (EIS Section 4.3) could increase noise levels. While the proposed project area is undeveloped, the land is currently used for mineral extraction and grazing, and associated transportation activities are already occurring, particularly associated with oil and gas development. Additionally, there are no sensitive noise receptors located within the proposed project area (Holtec, 2019a), and the nearest resident is located approximately 2.4 km [1.5 mi] away. Due to the dissipation of sound with increasing distance, the current vehicular traffic rates, and the fact that construction activities would occur predominantly during the day, the NRC staff concludes that noise impacts from the proposed action (Phase 1) construction stage would be SMALL.

For Phases 2-20, there would be concurrent construction and operation stages. Construction noise for subsequent phases would not exceed the proposed action (Phase 1) construction noise because these phases would not include the construction of facility buildings and the access road. Therefore, the NRC staff concludes that noise impacts from Phases 2-20 would be less than the initial construction stage noise and would be SMALL.

4.8.1.1.1 Rail Spur

Construction for the rail spur option would disturb approximately 15.9 ha [39.4 ac] of BLM-owned land (Holtec, 2019a). Noise impacts associated with the construction of the rail spur and associated infrastructure would include similar construction activities as those described for the CISF pads and infrastructure, but on a smaller scale. Therefore, the NRC and BLM staff conclude that overall noise impacts during the construction stage of the rail spur would be SMALL.

4.8.1.2 Operations Impacts

For both the proposed action (Phase 1) and Phases 2-20, noise from the operation of the proposed CISF project would primarily be generated from the delivery of casks (train or truck); operation of cranes and other loading equipment; and site vehicles (e.g., commuter vehicles or supply transfers). In addition, noise point sources would include rooftop fans, air conditioners, and transformers, and other sources associated with the site infrastructure. Once each phase is complete and a pad is fully loaded, operation noise at the storage pad would be very limited because the pad is a passive system. The ambient background noise sources in the area would include vehicle traffic along U.S. Highway 62/180 and New Mexico State Highway 243, and low-flying aircraft from the Hobbs Regional Airport (Holtec, 2019a). As discussed in EIS Section 4.8.1.1, construction of Phases 2-20 would occur concurrently with operation of earlier phases (starting with Phase 1), but because the noise associated with operation is expected to be very limited, and construction of individual Phases 2-20 is less than that of Phase 1, the noise associated with full build-out of the proposed CISF is bounded by noise levels of the proposed action (Phase 1). Further, the noise impacts associated with the operations stage for all subsequent phases are anticipated to be less than those from the construction stage of the proposed action (Phase 1). Therefore, the NRC staff concludes that the noise impacts from operation of Phase 1, Phases 2-20, and at full build-out would be SMALL.

Defueling

Defueling the CISF under either the rail spur or heavy haul truck option would involve removal of SNF from the proposed CISF. With regard to noise levels, defueling would be similar to the loading of SNF canisters onsite under operations. Activities would include noise from machinery and transport trucks or rail cars. Because noise sources and levels would be similar to those of emplacement of the SNF earlier in the operations stage, the NRC staff concludes that noise impacts from defueling the proposed CISF project would be SMALL.

4.8.1.2.1 Rail Spur

During the operations stage of all phases of the CISF, use of the rail spur would generate noise from trains operating on the spur. For brief periods of train acceleration during movement of a cask, outdoor sound levels at distances of up to about 1.6 km [1 mi] might occasionally exceed the 55-dBA level the EPA recommended. Additionally, the train whistle from the onsite rail switch would be audible. However, due to the dissipation of sound with increasing distance, it is not expected that the outdoor noise would be typically noticeable at the nearest residence. These noise levels are not anticipated to exceed those generated during the construction stage of the rail spur and would be anticipated to be less than those experienced during the construction stage of the proposed CISF project. In addition, train traffic associated with the rail spur would be expected to operate only during the day and for a few hours per week (EIS Section 4.3). Therefore, due to the similarity with noise impacts with the proposed project and Holtec's commitment to operate only during daylight hours, the NRC and BLM staffs conclude that overall noise impacts during the operations stage for the rail spur would be SMALL.

4.8.1.3 Decommissioning and Reclamation Impacts

At the end of the license term of the proposed CISF project, once the SNF inventory is removed, the facility would be decommissioned such that the proposed project area and remaining facilities could be released and the license terminated. Decommissioning activities, in accordance with 10 CFR Part 72 requirements, would include conducting radiological surveys and decontaminating, if necessary. Decommissioning activities for the proposed action (Phase 1) and for Phases 2-20 would involve the same activities, but the activities would be scaled to address the overall size of the CISF (i.e., the number of phases completed).

Holtec has committed to reclamation of nonradiological-related aspects of the proposed project area (Holtec, 2019a). Reclamation would include dismantling and removing equipment, materials, buildings, roads, the rail spur, and other onsite structures; cleaning up areas; waste disposal; erosional control; and restoring and reclaiming disturbed areas. EIS Sections 2.2.1.4 and 2.2.1.7 describe the decommissioning and reclamation activities.

Noise sources (e.g., heavy equipment and trucks) and impacts would be similar to those associated with the construction stage; therefore, the NRC staff concludes that the noise impacts from the decommissioning stage for the proposed action (Phase 1) and Phases 2-20 would be SMALL.

4.8.1.3.1 Rail Spur

The rail spur would be dismantled at the discretion of the land owner (BLM). Noise sources and levels associated with the dismantling of the rail spur would be similar to those incurred during the construction stage of the rail spur. Activities would include removal of the rail line, grading the land surface, reestablishing vegetation, and removal of waste. Because these activities are similar in nature and noise level as those included under the construction stage, the NRC and BLM staffs conclude that the noise impacts from dismantling the rail spur would be SMALL.

4.8.2 No-Action Alternative

Under the No-Action alternative, the NRC would not license the proposed CISF project, and the CISF would not be constructed, operated, or decommissioned. Therefore, there would be no additional contribution from the CISF to the existing noise levels of the area. In the absence of a CISF, the NRC staff assumes that SNF would remain onsite in existing wet and dry storage facilities and be stored in accordance with NRC regulations and be subject to NRC oversight and inspection. Site-specific impacts at each of these storage sites would be expected to continue as detailed in generic (NRC, 2013, 2005a) or site-specific environmental analyses. In accordance with current U.S. policy, the NRC staff also assumes that the SNF would be transported to a permanent geologic repository, when such a facility becomes available.

4.9 Historical and Cultural Impacts

This section describes potential environmental impacts to historic and cultural resources at the proposed project during each phase of the facility lifecycle, for both the proposed action (Phase 1) and Phases 2-20. The impacts to historic and cultural resources associated with the No-Action alternative are also evaluated in this section.

4.9.1 Impacts from the Proposed CISF

Impacts to cultural and historic resources could result from the various stages of the proposed CISF. These impacts could result from the loss of or damage to eligible archaeological and cultural resources, as discussed throughout this section.

4.9.1.1 Construction Impacts

The construction of the proposed action (Phase 1) would include multiple areas where excavation would be required to accommodate and install the underground facilities. The proposed action (Phase 1) construction stage would disturb approximately 48.3 ha [119.4 ac], including approximately 2.5 ha [6.2 ac] for a site access road; 0.57 ha [1.4 ac] for the security building, administration building, parking lot, and concrete batch plant/laydown area; and 29.3 ha [72.4 ac] that would be associated with constructing the initial SNF storage modules and pad, cask transfer building, and associated infrastructure. For the proposed action (Phase 1), the CISF construction activities would include excavating a pit that would contain the SNF canisters in the vertical ventilated modules (VVMs) with a total excavation depth of approximately 7.6 m [25 ft].

The indirect APE for the proposed CISF project would consist of areas potentially impacted by visual effects and noise sources arising from the project. Due to the low profile of the proposed project, the extent of the visual APE (i.e., indirect APE) includes areas within a 1.6 km [1 mi] radius extending from the proposed project boundary. Temporary construction impacts would result from increased dust, noise, and traffic in the direct and indirect APEs.

As detailed in EIS Section 3.9, several surveys have been conducted over the proposed project area to investigate potential historic and cultural resources. Based on the information available to date (Holtec, 2019a,c,d), the NRC is recommending that Site LA 187010 is not eligible for listing in the NRHP. The information the NRC staff has gathered to date indicates that the site does not convey any historical or cultural value and integrity in sufficient quality to meet the eligibility criteria. The NRC staff will request the NM SHPO's concurrence on its eligibility determination. Because the NRC staff has found that site does not meet the eligibility criteria (and is requesting SHPO's concurrence), impacts from construction and operation of the proposed CISF and rail spur are not anticipated to be significant and, therefore, it is reasonable to anticipate that no historic properties will be affected in accordance with 36 CFR 800.4(d)(1). The NRC staff will continue the Section 106 consultation process to confirm that no historic properties will be affected. The direct APE is also devoid of any standing structures, so the proposed project would not result in a direct impact to any non-archaeological historic resources. There are no historic resources 45 years or older (dating to 1974 or earlier) within the 1.6-km [1-mi] indirect APE that will be recommended to the NM SHPO as potentially eligible for the NRHP. Because no historic resource is located within the direct APE, the NRC staff concludes that cultural and historic resources would not be impacted by the proposed action (Phase 1), and impacts would be SMALL. Pending completion of consultation under NHPA Section 106, the NRC staff's preliminary conclusion is that the construction of the proposed project would have no effect on historic properties.

Construction of Phases 2-20 would disturb an additional 85.2 ha [210.6 ac] of land for additional SNF storage modules and pads. Within the protected (i.e., fenced) area, Holtec estimates that construction of the concrete pads once all 20 phases are completed (i.e., full build-out), would disturb approximately 44.5 ha [110 ac] of land. Historic resources present within the APE for Phases 2-20 construction include HCPI 42195, the same segment of earthen and caliche gravel two-track road that the proposed action (Phase 1) construction would impact. However, as noted in EIS Section 3.9.2, the NRC staff will recommend that the resource is not eligible for the NRHP because it does not constitute a historic property. This property does not have any historic value or significance. In addition to the road segment, 17 isolated occurrences are located within the direct APE for Phases 2-20 of the proposed CISF; however, isolated occurrences do not constitute archaeological sites (as discussed in EIS Section 3.9), and, therefore, do not constitute historic properties. Because no historic or cultural resources of significance to the historic value of the area have been identified in the direct APE that the construction of the proposed Phases 2-20 could disturb, the NRC staff concludes that for the construction of Phases 2-20, impacts would be SMALL. Pending completion of consultation under NHPA Section 106, the NRC staff's preliminary conclusion is that the construction of the proposed project would have no effect on historic properties.

While the probability for encountering human remains in this area is low, the applicant should commit to an inadvertent discovery plan for human remains during construction as required by the Native American Graves Protection and Repatriation Act. Under such a plan, work would cease immediately upon discovery within an area of 30 m [100 ft], and the area would be protected from further disturbance. The appropriate agency, based on land ownership (either the local BLM field office or NM SHPO), would be notified within 24 hours. The agency would then determine how to treat the remains, and any necessary identification, consulting, and excavation would be completed to the agency requirements before construction could resume.

4.9.1.1.1 Rail Spur

Construction of the proposed action (Phase 1) would include ground disturbance over 15.9 ha [39.4 ac] for a railroad spur to connect the proposed project area to the main rail line, which is approximately 6.1 km [3.8 mi] west of the proposed project area with a length of 8 km [5 mi]. As discussed in EIS Section 3.9, one historic resource, HCPI 42196, is within the APE for direct effects associated with the western end of the proposed rail spur. HCPI 42196 is a mid-twentieth-century rail segment, portions of which are still in use. Both SRI and APAC recommended that HCPI 42196 (LA 149299) is not eligible for the NRHP and therefore would not constitute a historic property. The rail site does not offer any historic value to the area. At the eastern end of the rail spur, Site LA 89676 is no longer within the APE for direct effects because of design changes. Because no historic or cultural resources are being recommended as eligible within the direct APE for the rail spur and the rail site does not offer historic value, the NRC and BLM staffs conclude that the impacts from the construction of the rail spur on cultural and historic resources would be SMALL. Pending completion of consultation under NHPA Section 106, the NRC and BLM staffs' preliminary conclusion is that the construction of the proposed rail spur would have no effect on historic properties.

4.9.1.2 Operations Impacts

During operations, SNF in shipping casks would arrive at the proposed CISF via rail car, be transported into the cask transfer building for inspection, and then transferred to the proposed CISF storage pad. No new ground disturbance is anticipated during operations beyond that associated with maintenance and traffic around the facility. Because no ground-disturbing activities would occur and no recommended eligible historic or cultural resources are present within the direct APE of proposed action (Phase 1) or Phases 2-20, the NRC staff concludes that the impacts from the operation of the proposed CISF for either the proposed action (Phase 1) or Phases 2-20 on cultural and historic resources would be SMALL. Pending completion of consultation under NHPA Section 106, the NRC and BLM staffs' preliminary conclusion is that the operation of the proposed project would have no effect on historic properties.

4.9.1.2.1 Rail Spur

No additional ground-disturbing activities would occur and no historic or cultural resources are present within the APE of the rail spur for the operations stage of either the proposed action (Phase 1) or Phases 2-20. Therefore, the NRC and BLM staffs conclude that the impacts from operation of the rail spur for either the proposed action (Phase 1) or Phases 2-20 on cultural and historic resources would be SMALL. Pending completion of consultation under NHPA Section 106, the NRC and BLM staffs' preliminary conclusion is that the operation of the proposed rail spur would have no effect on historic properties.

4.9.1.3 Decommissioning and Reclamation Impacts

At the end of the license term of the proposed CISF project, once the SNF inventory is removed, the facility would be decommissioned such that the proposed project area and remaining facilities could be released and the license terminated. Decommissioning activities, in accordance with 10 CFR Part 72 requirements, would include conducting radiological surveys and decontaminating (if necessary). Decommissioning activities for the proposed action (Phase 1) and for Phases 2-20 would involve the same activities, but the activities would be scaled to address the overall size of the CISF (i.e., the number of phases completed).

Holtec has committed to reclamation of nonradiological-related aspects of the proposed project area (Holtec, 2019a). Reclamation would include dismantling and removing equipment, materials, buildings, roads, the rail spur, and other onsite structures; cleaning up areas; waste disposal; erosional control; and restoring and reclaiming disturbed areas. EIS Sections 2.2.1.4 and 2.2.1.7 describe the decommissioning and reclamation activities.

As previously noted in EIS Section 3.9, the NRC staff will not be recommending Site LA 187010 as eligible for listing on the NRHP. No additional land would be disturbed as a result of decommissioning and reclamation than that disturbed during the construction stage, so the proposed project would not result in a direct impact to any non-archaeological historic resources. Because no historic resource is located within the direct APE, the NRC staff concludes that cultural and historic resources impacts from decommissioning and reclamation of the proposed action (Phase 1) and Phases 2-20, would be SMALL.

4.9.1.3.1 Rail Spur

No historic or cultural resources that constitute historic properties are present within the direct APE for the rail spur on BLM-managed land; therefore, no historic and cultural impacts would result from decommissioning and reclamation of those areas. The NRC and BLM staffs conclude that decommissioning of the rail spur would not affect cultural and historic resources, and therefore, impacts would be SMALL.

4.9.2 No-Action Alternative

Under the No-Action alternative, the NRC would not license the proposed CISF project. Therefore, impacts such as damage to or destruction of cultural and historic resources would not occur. Construction impacts would be avoided because SNF storage pads, buildings, and transportation infrastructure would not be built. Operational impacts would also be avoided because no SNF canisters would arrive for storage. Impacts to cultural resources from decommissioning activities would not occur, because unbuilt SNF storage pads, buildings, and transportation infrastructure would require no decontamination, and land surfaces would need no reclamation. The current cultural and historic resources on and near the project, including archaeological sites and historic transportation features, remain essentially unchanged under the No-Action alternative. In the absence of a CISF, the NRC staff assumes that SNF would remain on-site in existing wet and dry storage facilities and be stored in accordance with NRC regulations and be subject to NRC oversight and inspection. Site-specific impacts at each of these storage sites would be expected to continue as detailed in generic (NRC, 2013, 2005a) or site-specific environmental analyses. In accordance with current U.S. policy, the NRC staff also assumes that the SNF would be transported to a permanent geologic repository, when such a facility becomes available.

4.10 Visual and Scenic Impacts

This section describes the potential impacts to visual and scenic resources associated with the proposed action (Phase 1), Phases 2-20, and the No-Action alternative.

4.10.1 Impacts from the Proposed CISF

Impacts to visual and scenic resources from the construction stage would be associated with the machinery used to excavate the site and to build the concrete pads, storage modules, and stockpiled material. Additional vehicle traffic and fugitive dust would occur during all stages of the proposed CISF project. In addition to the vehicle traffic and fugitive dust, the visual and scenic resource impacts during operations would include the buildings and pads that would have been constructed. Impacts to visual and scenic resources from the decommissioning stage to dismantle the proposed CISF would include similar activities and equipment as used during the construction stage.

4.10.1.1 Construction Impacts

As part of the proposed action (Phase 1), the most visible structure would be the cask transfer building constructed for the proposed project and would be approximately 18 m [60 ft] high. Because of the relative flatness of the proposed CISF project {i.e., within the proposed project area an elevation of approximately 12 m [20 ft]}, the structure may be observable from nearby highways and properties. For the remaining structures of the proposed CISF project, visibility would be restricted to east and west traffic on U.S. Highway 62/180. The proposed CISF project would not be visible to any city or township with an identifiable population center. Other than the support buildings (including the cask transfer building), the proposed facility is predominantly subgrade, meaning the majority of the storage structure would be below ground surface. The proposed CISF project has been determined to be in the Class IV BLM visual resource inventory class, which means that the level of change allowable to the characteristic landscape can be high (EIS Section 3.10). In addition, the proposed CISF project would be located in a sparsely populated area used predominantly for cattle grazing and oil and gas exploration. The commuting construction workforce (i.e., 80 workers) would add an increase of 160 vehicles per day (80 vehicles each way) along the 1.6-km [1-mi] site access road to the proposed CISF project (Holtec, 2019a). The addition of these workers along a gravel access road would increase the amount of fugitive dust in the viewshed. Holtec has committed to implementing dust suppression on the access road. Although the proposed CISF project would alter the natural state of the landscape, the NRC concludes that due to the absence of regional or local high quality scenic views in the area, lack of a unique or sensitive viewshed, the subgrade design of the facility, the remote locale, and the dust suppression mitigation, the impact to visual and scenic resources from the proposed action (Phase 1) would result in a SMALL impact.

For Phases 2-20, the additional impact to visual and scenic resources would be from the addition of storage modules and the equipment used to load the casks. Although the addition of storage pads would increase the footprint of the facility overall, the subgrade design of these pads is expected to result in lesser visual impacts than those under the proposed action (Phase 1). Therefore, the NRC staff concludes that the impact to visual and scenic resources as part of Phases 2-20 (and at full build-out) would be SMALL.

4.10.1.1.1 Rail Spur

Construction of the rail spur would include similar activities as those associated with construction of the proposed CISF project facility. For example, material would be stockpiled, the ground surface would be graded, and construction materials and equipment would be brought to the site. The rail spur is expected to be at or very near ground surface level and less visible than the other structures associated with the proposed CISF project. Because of the low profile of the rail spur, the visual and scenic impacts from construction of the rail spur would be less than those for the proposed CISF project. Therefore, NRC and BLM staffs conclude that visual and scenic resource impacts from the construction of the rail spur would be SMALL.

4.10.1.2 Operations Impacts

For both the proposed action (Phase 1) and Phases 2-20, the facilities built during the construction stage would continue to impact the visual and scenic resources, particularly the cask transfer building. The cask transfer building would be approximately 18 m [60 ft] high, and because of the relative flatness of the proposed CISF project, the structure may be observable from nearby highways and properties. The majority of the storage facility is subgrade and therefore would have only limited visibility from outside the proposed project area. However, the use of security lights at the proposed CISF project would create visual impacts at night because of the contrast with the darkness of the surrounding landscape. Holtec has committed to down-shielding all security lighting for all ground-level facilities and equipment to keep light within the proposed project area to help minimize the potential impacts (Holtec, 2019a). Additional impacts would occur because of the generation of fugitive dust from vehicle traffic from the operation workforce (i.e., 55 workers) as they commute to and from the proposed CISF project. Because buildings associated with the proposed CISF project would have already been constructed, the storage of SNF would be subgrade, and lighting associated with security would be mitigated to minimize impacts, the NRC staff concludes that the visual and scenic resource impacts from the operations stage of the proposed action (Phase 1) and Phases 2-20 would be SMALL.

Defueling

Defueling for the proposed action (Phase 1) and Phases 2-20 would include removal of SNF from the proposed CISF. The impacts to visual and scenic resources would be similar to those of loading SNF during the fuel emplacement operations at the proposed CISF project. Therefore, the NRC staff concludes that the impact to visual and scenic resources during defueling would be SMALL.

4.10.1.2.1 Rail Spur

The operation of the rail spur would result in minimal visual and scenic impacts. The impacts would be associated with rail shipments of SNF to and from the proposed CISF project and any associated vehicle traffic along the access road from rail maintenance. The presence of trains on the rail spur would create a temporary visual impact that is consistent with normal train operations, which already occurs in the area on the existing main rail line. Operation of the rail spur would occur further than the existing rail line to the nearest resident (Holtec, 2019a). Any additional visual and scenic impacts from the operation of the rail spur would be less than or similar to impacts associated with construction of the rail spur; therefore, the NRC and BLM staffs conclude that the impact to visual and scenic resources for the operations stage of the rail spur would be SMALL.

4.10.1.3 Decommissioning and Reclamation Impacts

At the end of the license term of the proposed CISF project, once the SNF inventory is removed, the facility would be decommissioned such that the proposed project area and remaining facilities could be released and the license terminated. Decommissioning activities, in accordance with 10 CFR Part 72 requirements, would include conducting radiological surveys and decontaminating, if necessary. Decommissioning activities for the proposed action (Phase 1) and for Phases 2-20 would involve the same activities, but the activities would be scaled to address the overall size of the CISF (i.e., the number of phases completed).

Holtec has committed to reclamation of nonradiological-related aspects of the proposed project area (Holtec, 2019a). Reclamation would include dismantling and removing equipment, materials, buildings, roads, the rail spur, and other onsite structures; cleaning up areas; waste disposal; erosional control; and restoring and reclaiming disturbed areas. EIS Sections 2.2.1.4 and 2.2.1.7 describe the decommissioning and reclamation activities.

Decommissioning and reclamation activities would be similar in impact to those occurring during the construction stage; therefore, the NRC staff concludes that impacts to visual and scenic resources from decommissioning for the proposed action (Phase 1) or Phases 2-20 (including at full build-out) would be SMALL.

4.10.1.3.1 Rail Spur

Dismantling of the rail spur would include similar activities as those associated with construction of the rail spur. Materials would be removed from the rail spur location, and stockpiled material would be used, as necessary, to return the land to preoperational conditions. Visual and scenic impacts would occur from vehicle traffic and waste hauling. Impacts would be anticipated to be similar to those evaluated as part of the construction stage. The land owner may determine to retain the rail spur, in which case the presence of rail cars would intermittently persist, as during the operations stage. Therefore, the NRC and BLM staffs conclude that visual and scenic resource impacts from the decommissioning of the rail spur would be SMALL.

4.10.2 No-Action Alternative

Under the No-Action alternative, the NRC would not license the proposed CISF project, and the proposed CISF project would not be constructed, operated, or decommissioned. Therefore, there would be no additional impacts from the proposed CISF project to the visual and scenic resources of the area. In the absence of a CISF, the NRC staff assumes that SNF would remain onsite in existing wet and dry storage facilities and be stored in accordance with NRC regulations and be subject to NRC oversight and inspection. Site-specific impacts at each of these storage sites would be expected to continue as detailed in generic (NRC, 2013, 2005a) or site-specific environmental analyses. In accordance with current U.S. policy, the NRC staff also assumes that the SNF would be transported to a permanent geologic repository, when such a facility becomes available.

4.11 Socioeconomic Impacts

This section presents the potential socioeconomic impacts from the construction, operation, and decommissioning of the proposed action (Phase 1), Phases 2-20, and the No-Action alternative on employment and economic activity, population and housing, and public services and finances within the 4-county ROI. The effects of the proposed project on land use, including use of public lands and right-of-ways, recreational and tourism sites, wilderness areas, and visual and scenic resources in the area are assessed in EIS Sections 4.2 and 4.10, respectively. The basis for NRC's selection of the socioeconomic ROI and the existing socioeconomic and community resources in the ROI are explained in EIS Sections 3.11 through 3.11.5 and in Appendix B.

4.11.1 Impacts from the Proposed Facility

4.11.1.1 Construction Impacts

Impacts to socioeconomic and community resources from the construction stage of the proposed action (Phase 1) are primarily associated with workers who might move into the area and tax revenues that the proposed project would generate, which would influence resources available for the community. The socioeconomic issues that fall within the scope of this socioeconomic analysis include the direct and indirect economic effects on employment, taxes, residential and commercial development, and public services in the ROI. EIS Table 4.11-1 describes the level of potential socioeconomic impacts that could be experienced from the proposed CISF project. These levels are based on the NRC's staff's past experience in evaluating the potential impacts to socioeconomic and community resources (NRC, 1996).

To fully evaluate the potential socioeconomic impacts, the NRC staff conducted a bounding analysis for the potential economic impact, which includes the NRC staff assumption that, for Phase 1, construction and operation stages are concurrent. Holtec estimates that the proposed action (Phase 1) construction activities would require up to 80 construction workers per year. Holtec also estimates that during the operations phase at full build-out, additional workforce of less than 40 workers and 15 security personnel per year would be needed (Holtec, 2019a). Therefore, the NRC staff conservatively assumes that for the concurrent construction and operation stages of the proposed action (Phase 1) that the peak number of workers would be 135 per year (i.e., 80 construction workers, 40 operations personnel, and 15 security guards). From this bounding assumption of 135 workers, EIS Table 4.11-2 depicts a range of the resulting workforce that the NRC staff anticipates would move into the ROI, as well as family and workforce retention characteristic assumptions. Appendix B provides additional details. These projections are used throughout this EIS analysis.

In 2017, construction and mining employment provided approximately 31 percent of all non-service employment in the ROI (EIS Table 3.11-4, "Employment by Industry"). These are two of the largest employment sectors in the ROI. As provided in EIS Table 4.11-2, the NRC staff estimates that between 30 to 57 new construction and non-construction (operation) workers would move into the 4-county ROI, which represents the peak employment that would occur with concurrent construction and operation stages. The precise distribution of workers

Table 4.11-1 Impact Definitions to Socioeconomic and Community Resources

Category and Significance Level of Potential Impact	Description of Affected Resources
Employment and Economic Activity Impacts	
Small	Less than 0.1 percent increase in employment
Moderate	Between 0.1- and 1.0-percent increase in employment
Large	Greater than 1 percent increase in employment
Population and Housing Impacts	
Small	Less than 0.1 percent increase in population growth and/or less than 20 percent of vacant housing units required to house workers moving into the ROI
Moderate	Between 0.1- and 1.0-percent increase in population growth and/or between 20 and 50 percent of vacant housing units required to house workers moving into the ROI
Large	Greater than 1 percent increase in population growth and/or greater than 50 percent of vacant housing units required to house workers moving into the ROI

Table 4.11-1 Impact Definitions to Socioeconomic and Community Resources	
Category and Significance Level of Potential Impact	**Description of Affected Resources**
Impacts on Public Services and Finances	
Small	Less than 1-percent increase in local revenues
Moderate	Between 1- and 5-percent increase in local revenues
Large	Greater than 5-percent increase in local revenues
Source: NRC,1996; NRC, 2005b	

Table 4.11-2 Assumptions for Workforce Characterization During Peak Employment (Concurrent Construction and Operation Stages)	
Peak number of onsite workers (80 construction workers, 40 operations personnel, 15 security guards)*	135
Percentage of construction workers who may move into the ROI[†‡§]	10-30%
Percentage of non-construction workers who may move into the ROI[†‡§]	40-60%
Range of construction workers that may move into the ROI during construction peak	8-24
Range of non-construction workers that may move into the ROI	22-33
Range of all workers moving into the ROI[‖]. This is also the range of new households.	30-57
Percentage of workers who are likely to bring families[† ‡§]	50-70%
Range of number of families moving into the ROI	15-40
Average family size in the ROI	3.3
Range of total number of workers and family members moving into ROI	64-148
Number of school-aged children per family (all workers) [†‡§]	0.8
Range of school-aged children of workers moving into ROI	12-32
Percentage of moved-in workers that may leave the ROI after the construction phase[†§]	50-60%
Range of moved-in workers that may leave the ROI post-construction	15-35
Range of moved-in workers and family members that may leave the ROI post-construction	30-57
Range of school-aged children of moved-in workers that may leave the ROI, post-construction phase	6-19
Employment multiplier for construction workers moving into the ROI (BEA, 2019)	1.5518
Range of indirect jobs resulting from construction workers moving into the ROI	5-14
Employment multiplier for non-construction workers moving into the ROI (BEA, 2019)	1.5453
Range of indirect jobs resulting from non-construction workers moving into the ROI	12-18

*Assumptions from Holtec's environmental report (Holtec, 2019a)
†Malhotra and Manninen, 1981
‡NRC, 2001
§NRC, 2012
‖USCB, 2010
Note: There are slight variations in the calculations because of rounding

moving into the ROI would be determined by a number of factors, including proximity to the proposed project area and the availability of housing and public services. The NRC staff estimates that the addition of 30 to 57 direct workers to the workforce within the ROI would result in less than a 0.1-percent increase in the workforce within the ROI. As provided in EIS Table 4.11-1, the NRC staff determines that a less than 0.1-percent increase in employment would result in a small impact.

New workers (i.e., workers moving into the ROI and those previously unemployed) would have an additional indirect effect on the local economy because these new workers would stimulate the regional economy by their spending on goods and services in other industries. The U.S. Department of Commerce Bureau of Economic Analysis (BEA), Economic and Statistics Division, uses an economic model called RIMS II. This modeling software incorporates buying and selling linkages among regional industries and uses a multiplier specific to an industry to estimate the economic impact within the region. The multiplier is the number of times that the final increase in consumption exceeds the initial dollar spent. In this analysis, the NRC staff uses BEA's Type II multiplier for the construction industry in the ROI to estimate the number of indirect jobs that would result from the new direct workers associated with the peak employment that would occur with concurrent construction and operation stages. According to the BEA, Type II multipliers not only account for the effects realized between all industries in the ROI, but they also account for the induced impacts within the region (BEA, 2013). Based on the RIMS II analysis and using the worker-characteristic assumptions provided in EIS Table 4.11-2, the NRC staff predict that the new direct workers associated with the peak employment that would occur during the overlapping construction and operation stages of the proposed action (Phase 1) would create between 17 and 32 indirect jobs (EIS Table 4.11-2). Indirect jobs are often non-technical and non-professional positions in the retail and service sectors. The NRC staff determines that the 17–32 indirect jobs that would be created would likely be filled by ROI residents. If the maximum number of indirect jobs (32) were filled by unemployed individuals in the ROI, those workers would represent less than 1 percent of the unemployed labor force in the ROI between the period of 2013 and 2017 (USCB, 2017) and less than 0.1 percent of the estimated 2017 employed persons provided in EIS Figure 3.11-5. A less than 0.1-percent increase in employment would result in a small impact. However, the combined maximum of up to 57 direct workers and 32 indirect workers (89 total) would represent less than 0.1 percent of the labor force within the ROI. As provided in EIS Table 4.11-1, the NRC staff determines that an increase of less than 0.1 percent in employment would result in a small impact.

The mining industry provides most of the jobs in the region, and less than 4.5 percent of jobs are related to agriculture and farming (EIS Section 3.11.1). A lease agreement between Holtec and Intrepid could be established that restricts potash mining beneath the footprint of the proposed CISF project area and a 305-m [1,000-ft] buffer, which is approximately 421 ha (1.6 mi^2). No mineral extraction or mining activities have occurred within this area (Intrepid, 2018). Currently, Intrepid employs approximately 450 people in the Carlsbad area for the operations at the West Mine and East Mine, and the Intrepid North storage and processing facility, which is located closest to the proposed CISF project area (Intrepid, 2018). Intrepid controls the rights to mine approximately 55,847 ha [138,000 ac] of land in the Carlsbad area (Intrepid, 2018). Prior to 2016, Intrepid employed almost 1,000 people, but in January 2014, the company undertook workforce reductions, and in May 2016, the Intrepid West Mine operations were put on hold, and 300 employees were laid off because of low potash mineral prices (Intrepid, 2014, 2018). While the NRC staff cannot predict potash commodity pricing and when activities at the West Mine could resume, Intrepid predicts that existing potash mineral reserve life of their mineral rights could extend up to 100 years (Intrepid, 2018). Further, the restriction of the minerals at the Holtec facility is a fraction of the potential reserves available from Intrepid leases. Therefore, the NRC staff concludes that the removal of the 421 ha (1.6 mi^2) of lease area associated with the proposed CISF project area would have a minor effect on the potential jobs and economic benefits in the region from this lease agreement. If no agreement is made, then Intrepid could potentially expand mining operations under the proposed CISF project area. However, because of the relatively small lease area, the socioeconomic impact from this mining activity would have a minor effect in the region.

As presented in EIS Section 3.11.1.1, the population in the ROI in 2017 was approximately 163,700 people. In EIS Table 4.11-2, the NRC estimates that between 64 and 148 new residents would move into the 4-county ROI, including 12 to 32 new school-age children, during the peak employment of the proposed CISF project [i.e., concurrent construction and operation stages for the proposed action (Phase 1)]. The precise distribution of workers moving into the ROI would be determined by a number of factors, including proximity to the site and the availability of housing and public services. The NRC staff estimates that the approximate 64 to 148 new residents would represent an increase of less than 0.1 percent to the 2017 population of approximately 163,700 in the ROI (EIS Table 3.11-1 and Appendix B [Socioeconomic Information]). As provided in EIS Table 4.11-1, the NRC staff determines that a less than 0.1-percent increase in population growth would result in a small impact.

Holtec estimates that it would spend approximately $233,719,816 as part of the proposed action (Phase 1) on capital construction costs (EIS Table 8.3-1). According to the RIMS II analysis, the NRC staff estimates that $233,719,816 of estimated construction expenditures would generate an annual output of $337,912,110 and labor earnings of $110,175,521 within the ROI (in 2019 dollars) (BEA, 2019). The estimate for the value added, or gross domestic product [GDP] in the region, is approximately $183,703,775. Real estate taxes on the proposed CISF would be determined based on the assessed value of the property, but Holtec has not provided an estimate for that value (Holtec, 2019a). Holtec's estimates include personal income taxes and New Mexico gross receipts taxes. Additionally, because Holtec would have an industrial revenue bond with Lea County, some expenditure would be exempt from gross receipts taxes. Compared to the combined tax revenues of the 4 counties within the ROI of approximately $16,977,062,729 [2018 dollars], $337,912,110 of estimated annual output represents an increase of approximately 2 to 3 percent. Although tax revenues may fluctuate year to year and may be distributed on the local level among municipalities in ways that cannot be easily quantified, the NRC staff determines that this example of comparing tax revenues on the county level is reasonable for estimating the potential impact on local revenues from peak employment of the proposed CISF project [i.e., concurrent construction and operation stages for the proposed action (Phase 1)]. As provided in EIS Table 4.11-1, the NRC staff determines that a 1- to 5-percent increase in local revenues would result in a moderate impact.

Expenditures for goods and services to support the peak employment of the proposed CISF project [i.e., concurrent construction and operation stages for the proposed action (Phase 1)] would occur both inside and outside the ROI. The NRC staff estimates that applicants purchase approximately 10 percent of their construction materials locally (NRC, 2016); however, Holtec did not provide a detailed estimate of the types and quantities of materials or where materials would be purchased or sourced; therefore, a detailed analysis of the sources for these materials and supplies has not been conducted, and the estimated tax implications from these purchases are not evaluated in this EIS. The NRC staff did contact the Lea County Economic Development Corporation (LCED) for information on local source materials (Gobat, 2019). The LCED provided the NRC staff with a list of development service providers and suggested that many of the materials needed for the proposed action (Phase 1) should be available for purchase within Lea County, including concrete, steel, gravel/sand, electrical components, and fencing (Gobat, 2019).

Direct and indirect workers would spend a portion of their earnings on housing, goods, and services within the ROI. Affordable housing and housing capacity in the ROI are discussed in EIS Section 3.11.3. The estimated median worker income within the ROI ranges from $34,584 to $45,553 (EIS Section 3.11.2). The median gross rent in the ROI between the period of 2013 and 2017 ranged between $697 and $997 (USCB, 2017). Based on the median gross rent and median worker income in the ROI, workers that earn $34,584 could spend less than 30 percent of their income on rental housing in the ROI. Compared to the vacancy of housing units for sale and for rent in the ROI between the period of 2013 and 2017, the 30 to 57 new households that would be added to the ROI during peak employment of the proposed CISF project [i.e., concurrent construction and operation stages for the proposed action (Phase 1)] would fill between 0.4 to 0.7 percent of the housing vacancies (Economic Profile System, 2019). The NRC staff expects that the housing market in the county would be able to absorb the influx of workers, and rental rates and housing prices would not suffer a perceptible increase because of this influx. As provided in EIS Table 4.11-1, because less than 20 percent of vacant housing units would be needed to house workers moving into the ROI, the impact on housing during peak employment with concurrent construction and operation stages of the proposed action (Phase 1) would be small.

In addition to the impacts from direct and indirect revenue and job generation, socioeconomic impacts may include impacts to existing resources. Comparing the estimated number of school-aged children that would move into the ROI (12–32 children as shown in Table 4.11-2) to the total amount of students in the ROI during the 2014–2015 school year (32,669 students, as discussed in EIS Section 3.11.5), the addition of up to 32 school-aged children in the ROI would represent an increase of 0.1 percent. The proposed CISF project would be located within the area served by the Hobbs Municipal School district. Given that the ROI includes 4 counties and that workers have the option to live in several communities in those counties, the NRC staff determines that it would be unlikely that all school-aged children who move into the ROI would attend schools of the same school district, or that the increase of school-aged children would exceed 0.1 percent in any school district within the 4-county socioeconomic ROI. As provided in EIS Table 4.11-1, the NRC staff determines that an increase of less than 0.1 percent population growth would result in a small impact. The NRC staff applied this concept to the school districts to estimate potential impact from the addition of new students moving into the ROI during peak employment with concurrent construction and operations for the proposed action (Phase 1), which would be small.

All potable, process, and fire-suppression water needed during the construction of the proposed CISF project would be provided by the City of Carlsbad that withdraws water from the Ogallala Aquifer. During peak employment of proposed action (Phase 1), up to 149 people (EIS Table 4.11-2) would relocate to the ROI and likely find housing within an area that a public water utility serves. Future water demand in the region is a concern that planners regularly assess and manage (State of New Mexico, 2016). No potable groundwater is known to exist within or in the immediate vicinity of the proposed CISF project (EIS Section 4.5.2). Potable water for domestic use and stock watering in the vicinity of the site is generally obtained from pipelines that convey water to area potash refineries from the Ogallala Aquifer on the High Plains area of eastern Lea County. An existing electrical service along the southern border of the proposed project location would be used to provide electrical power for the proposed CISF project (Holtec, 2019a). As provided in EIS Table 4.11-1, the NRC staff determines that a less than 1-percent increase in local revenue would result in a small impact on public services, and an increase of less than 0.1 percent of the population would also result in a small economic impact.

The NRC staff concluded in EIS Section 4.3.1.1 that the increase of traffic from the proposed CISF project construction would have a SMALL impact on daily traffic on U.S. Highway 62/180 near the proposed CISF project. Potential impacts to traffic further away from the proposed CISF, (e.g., near Carlsbad), would represent a smaller percentage of existing traffic in that area and thus, transportation impacts would be less noticeable and SMALL (EIS Section 4.3.1.1).

Impacts to other transportation routes should be minimal. Moreover, the impacts during subsequent construction stages would be less than during the proposed action (Phase I) (about 24 months), when most of the equipment and material and the largest number of construction workers would be using U.S. Highway 62/180. EIS Section 4.3.1.1 states that when added to traffic necessary for peak construction, [including traffic for transportation of materials, water, and construction workers (80 workers)], and traffic resulting from operations workers (40 workers), the total traffic during the peak period of construction would not adversely affect traffic safety or cause road degradation relative to existing conditions.

As stated in this section, up to 148 new residents in the ROI would increase the population in the ROI by less than 0.1 percent and would result in filling less than 1 percent of the housing vacancies. According to Holtec's ER, 18 police departments and 22 fire departments serve the 4 counties in the ROI, the vast majority of which are located in Eddy and Lea Counties (Holtec, 2019a). Therefore, the NRC staff expects that there would not be a detectable increase in the demand for fire protection or law enforcement services and that existing fire protection and law enforcement personnel, facilities, and equipment would be sufficient to support the population increase. Similarly, a ROI population increase of less than 0.1 percent would not measurably increase the demand for hospital and physician services. As provided in EIS Table 4.11-1, the NRC staff determine that a less than 1-percent increase in local revenue would result in a small impact on public services, and an increase of less than 0.1 percent of the overall population in the ROI would also result in a small economic impact.

In summary, the NRC staff concludes that economic impacts could be experienced throughout the 80-km [50-mi] ROI surrounding the proposed project area, as a result of peak employment of the proposed CISF project [i.e., concurrent construction and operation stages for the proposed action (Phase 1)]. While the NRC staff anticipates that impacts on population, employment, housing, and public services would be SMALL, and impacts on local finance would be MODERATE and beneficial, the NRC staff also recognizes that not all individuals in the ROI are likely to be affected equally. For instance, not all residents utilize community services such as schools, fire, police, and health benefits at the same rate. However, most community members would share, to some degree, in the economic growth expected the proposed CISF project would expect to generate. The NRC staff have not conducted additional analyses to determine how the benefits are likely to be distributed among persons or potential beneficiaries in the ROI.

As described at the beginning of this section, the NRC staff assume that peak employment with concurrent construction and operations of the proposed action (Phase 1) is 135 workers per year. Holtec anticipates that no additional construction or operations workers would be expected to be hired during Phases 2-20 (including full build-out) (Holtec, 2019a). Therefore, 135 workers per year represents the bounding potential economic impact from the proposed action (Phase 1) and Phases 2-20 (including full build-out). Based on the NRC assessments previously stated from the results of the bounding analysis, the NRC staff concludes that socioeconomic impacts resulting from construction of the proposed action (Phase 1) and Phases 2-20 (including full build-out) would be SMALL for population, employment, housing, and public services and MODERATE and beneficial for local finance.

4.11.1.1.1 Rail Spur

Construction of the rail spur will occur during construction of Phase 1, prior to any concurrent construction and operation. Thus, the NRC and BLM staffs assume that labor and costs to construct a rail spur to support the proposed action (Phase 1) would be significantly less than what would be required for peak employment of the proposed action (Phase 1). Specifically, no additional construction workers would be expected to be hired beyond those considered in EIS Section 4.11.1.1 (Holtec, 2019a). Because the peak employment (i.e., concurrent construction and operation) will not yet have occurred, the 40 operation workers and 15 security guards would not yet be hired during the construction of the rail spur, and, thus, the indirect jobs created from a smaller workforce that may move into the ROI would be less than the indirect jobs created during peak employment. The NRC and BLM staffs determine that the employment impacts from the rail spur construction would be less than those impacts previously summarized from peak employment during the concurrent construction and operation stages for the proposed action (Phase 1). Therefore, the NRC and BLM staffs conclude that the potential impacts to socioeconomics from construction of the rail spur would be SMALL.

4.11.1.2 Operations Impacts

Economic effects, such as job and income growth, were evaluated in the 4-county socioeconomic ROI. After peak employment, the workforce would decline, thereby producing a decline in related payrolls, leading to a corresponding decline in economic impacts. Once all concurrent construction and operation activities are complete, the fully constructed operating CISF would require the fewest number of workers. The loss of construction-related jobs would also lead to a decrease in indirect jobs through the "multiplier effect." Holtec estimates that the proposed action (Phase 1) operations stage of the proposed CISF project would require an estimated workforce of less than 40 personnel and less than 15 security force personnel (Holtec, 2019a). The NRC staff assumes that the proposed CISF project would directly employ 55 workers per year during the operations stage (Appendix B). Using the same assumptions for the workforce characteristics in EIS Table 4.11-2, the NRC staff assumes that up to 57 people, including workers and their families, would move out of the ROI during the operations stage when construction is complete (i.e., during operation only). Up to 32 of those 57 people would be school-aged children. Even with the decrease of jobs during the operations stage, there would also continue to be the presence of people that moved into the ROI during the previous construction stage but did not move out after construction was complete. Therefore, the operations stage would have a small impact on employment and population in the ROI.

There would be fewer remaining households in the ROI occupied by direct workers at the proposed CISF project during the operations stage. EIS Table 4.11-1 indicates that there would be a small impact on housing during peak employment when construction and operation stages overlap; therefore, the potential impact from remaining households to the ROI during the operations stage (with no overlap of stages) would have a small impact on housing. The continuation of the proposed action (Phase 1) operations stage jobs would require continued demands for public services such as police, fire, education, and health care. However, because there would be a smaller workforce than during the construction stage or peak of construction and operation, the NRC staff determine that there would not be a noticeable impact on public services during the operations stage. Water demand would decrease compared to the construction stage because it would not be needed for making concrete, and only a minimal amount would be needed for dust suppression and worker consumption. Because the proposed CISF is a passive system, electrical utility demand would also decrease compared to the construction stage. Thus, the overall amount of water and electricity consumption would be less during the operations stage of the proposed action (Phase 1) compared to the construction stage for proposed action (Phase 1), and the difference would therefore be minor.

Operations stage impacts would include traffic impacts from shipping equipment, supplies, and produced wastes, and from workers commuting while the proposed CISF project would be operating. Because there would be less traffic than when construction and operation stages overlap (i.e., at peak), the NRC staff determined that there would be a SMALL transportation impact during the operations stage (EIS Section 4.3.1.2).

Holtec estimates that the annual cost of operations and maintenance activities for the proposed action (Phase 1) would be $27,892,625 (EIS Section 8.3.2). Based on the RIMS II analysis (in 2019 dollars), the NRC staff estimates that the operations stage of the proposed CISF project would generate $39,903,189 of annual output and earnings of $15,940,635 within the ROI (BEA, 2019). During the operations stage, Holtec would expect to pay annuity payments in the range of $15 million to $25 million to Lea County, Eddy County, and the cities of Hobbs and Carlsbad (Holtec, 2019c). Based on the NRC staff's comparison of county financial reports against the tax values in the 4 counties in the ROI in fiscal year 2018, the proposed action (Phase 1) operations stage would generate a 0.2 percent increase in local revenues. The addition of the annuity payments to Lea County, Eddy County, and the cities of Hobbs and Carlsbad would result in an increase up to 0.38 percent. The NRC staff determines that it is reasonable that annual county tax revenues would increase over time based on new businesses and residents moving into the ROI, and that the percentage of revenues that the proposed action (Phase 1) would contribute to the ROI could potentially decrease to (i.e., an amount below 1 percent). As provided in EIS Table 4.11-1, the NRC staff determines that a less than 1-percent increase in local revenues would result in a small impact.

Although the NRC staff determines that the anticipated increase in population would result in a small impact on public services, as discussed in Section 4.11.1.2, the NRC staff also recognize that the presence of a facility that stores nuclear materials may require additional preparedness of first responders in the event of an incident requiring fire, law enforcement, and health service support. Holtec did not provide a detailed estimate of the additional training and equipment that would be necessary to respond to an incident at the proposed CISF project that are not currently available to first responders, and no studies have been conducted by local agencies or officials with this type of information. Therefore, a detailed analysis of the costs associated with these potential additional resources are not evaluated in detail in this EIS, but NRC has considered first-responder training further in the following paragraphs.

Carriers and shippers are required to prepare emergency response plans and provide assistance and information to emergency responders under ANSI N14.27-1986(R1993). The DOT, together with its counterparts in Canada and Mexico, published the "2016 Emergency Response Guidebook," (DOT, 2016) for carriers and State and local first responders to use during the initial phase of an accident involving hazardous materials. The guidebook sections that apply to SNF include instructions on potential hazards, public safety measures, and emergency response actions. Additionally, DOT requires driver training, including crew training for emergency situations and contacting and assisting first responders. States are recognized as responsible for protecting public health and safety during transportation accidents involving radioactive materials. Federal agencies are prepared to monitor transportation accidents and provide assistance, if States request them to do so. Eight Federal Regional Coordinating Offices, DOE-funded, are maintained throughout the U.S. Personnel in these offices, are on 24-hour call, and are capable of responding to such emergencies with equipment and experts that could advise on recovery and removal of the cask and site remediation (DOT, 2016). Additionally, any event involving NRC-licensed material that could threaten public health and safety or the environment would trigger special NRC procedures.

Affected communities may be able to obtain emergency response financial assistance necessary for training and equipment from other sources or Federal programs or other sources. Nationwide, there are numerous shipments of Federally controlled or licensed radioactive material each year, for which the States and some municipalities already provide capable emergency response. Significant additional costs to States would likely not be incurred related to unique or different training to respond to potential transportation accidents involving SNF as compared to existing radioactive materials commerce. However, the NRC staff recognize that if SNF is shipped to a CISF, some States, Tribes, or municipalities along transportation routes may incur costs for emergency response training and equipment that would otherwise likely be eligible for funding under NWPA Section 180(c) provisions if the SNF were shipped by DOE from existing sites to a repository. Because needs of individual municipalities along transportation routes and the costs of this training and equipment vary widely, quantification of such would be speculative. Furthermore, how the States may distribute funding for first-responder training and equipment to local municipalities is not within NRC's authority and is beyond the scope of this EIS.

The operations stage of Phases 2-20 would require workers to carry out operation and maintenance activities commensurate to those as part of the proposed action (Phase 1). Holtec stated in their ER that no additional workers would need to be hired for these tasks (Holtec, 2019a); therefore, population, employment, housing, utilities, and community services previously evaluated for the proposed action (Phase 1) operations stage would not change. Holtec assumes that the operation costs would be the same for each phase, regardless of how many phases were active during an individual project year (EIS Section 8.3.2). Therefore, the NRC staff concludes that the annual socioeconomic impacts associated with operations of CISF Phases 2-20 would be SMALL.

Defueling

Defueling would involve removal of the SNF from the proposed CISF. Defueling the CISF would involve a similar workforce as that used to load and emplace the SNF during the operations stages previously evaluated for Phase 1 and Phases 2-20. Thus, defueling would be expected to have similar impacts for both direct (e.g., traffic, public services) and indirect (e.g., consumer goods) effects within the socioeconomic ROI compared to the earlier portion of the operations stage. Therefore, the NRC staff concludes that the potential impacts to socioeconomics during defueling would be SMALL.

4.11.1.2.1 Rail Spur

Holtec did not provide an estimate for the workforce needed for the rail spur operations stage, but the operation of the rail spur mostly involves offsite transportation of SNF; therefore, the socioeconomic impacts from operating the rail spur are addressed in the socioeconomic impact analysis in EIS Section 4.11.1.2 (Operations Impacts). Specifically, the NRC and BLM staffs conclude that maintenance activities on the rail spur would require fewer than the 40 operations workers, considered in EIS Section 4.11.1.2. In addition, the NRC and BLM staffs anticipate that the same train operators that are currently operating trains nationwide would be used to operate the trains used to transport SNF to the proposed CISF, and that they and their families would not move into the 4-county ROI from their current places of residence. Therefore, population, employment, wages, and community services previously evaluated in EIS Section 4.11.1.2 would not change. Therefore, the NRC and BLM staffs conclude that the overall socioeconomic impacts associated with operations for the rail spur would be SMALL.

4.11.1.3 Decommissioning and Reclamation Impacts

At the end of the license term of the proposed CISF project, once the SNF inventory is removed, the facility would be decommissioned such that the proposed project area and remaining facilities could be released and the license terminated. Decommissioning activities, in accordance with 10 CFR Part 72 requirements, would include conducting radiological surveys and decontaminating, if necessary. Decommissioning activities for the proposed action (Phase 1) and for Phases 2-20 would involve the same activities, but the activities would be scaled to address the overall size of the CISF (i.e., the number of phases completed).

Holtec has committed to reclamation of nonradiological-related aspects of the proposed project area (Holtec, 2019a). Reclamation would include dismantling and removing equipment, materials, buildings, roads, the rail spur, and other onsite structures; cleaning up areas; waste disposal; erosional control; and restoring and reclaiming disturbed areas. EIS Sections 2.2.1.4 and 2.2.1.7 describe the decommissioning and reclamation activities.

Potential environmental impacts on socioeconomics could result from hiring additional workers compared to the operations stage of the proposed action (Phase 1) to conduct radiological surveys; dismantle and remove equipment, materials, buildings, roads, rail, and other onsite structures; clean up areas; dispose of wastes; and reclaim disturbed areas. However, Holtec anticipates that the workforce needed for dismantling the proposed action (Phase 1) would not exceed the number of workers needed for the construction of the proposed CISF project (Holtec, 2019a). If no additional workers are hired beyond the number that were directly employed during the construction stage of the proposed action (Phase 1), then the NRC staff expects that there would be no increased demand for housing and public services during the decommissioning stage of the proposed action (Phase 1). There would be similar demands on resources such as roads (traffic) and water and other public services. Holtec estimates that the total decommissioning costs for the proposed action (Phase 1) would be $24,822,656 (EIS Table 8.3-3), which is less than the annual costs for the operation phase and would therefore have a small impact on the economy within the socioeconomic ROI.

Holtec estimates that the costs for decommissioning Phases 1-20 (full build-out) would be $496,453,127 (EIS Table 8.3-3). Based on the RIMS II analysis (in 2019 dollars) and the same multipliers used to estimate construction impacts (BEA, 2019), the NRC staff estimates that decommissioning the CISF project would generate $717,771,931 of annual output and $338,357,688 of labor earnings within the ROI, resulting in a MODERATE and beneficial impact. There is uncertainty regarding socioeconomic conditions in the ROI at license termination. Technological progress and improvements in our understanding of best practices would play an important role at the end of the license term of the proposed CISF project by changing both the type of services available in the region and the manner in which they are delivered. The development of a final closure plan would occur in accordance with 10 CFR Part 72 requirements closer to the date of actual decommissioning. The NRC staff would take into consideration the likely socioeconomic environment in which the closure would take place and draw upon other closure experiences in the region, including strategies used and lessons learned.

The NRC staff anticipates that the potential socioeconomic impacts from dismantling the proposed CISF project Phases 1-20 would not exceed the estimated socioeconomic impacts determined in EIS Section 4.11.1.1.1 for construction of proposed action (Phase 1) during peak employment. Thus, the NRC staff concludes that the socioeconomic impacts from decommissioning and reclamation of the proposed CISF project would be SMALL to MODERATE.

4.11.1.3.1 Rail Spur

Dismantling the rail spur would include activities necessary to release the proposed rail spur location for unrestricted use, in accordance with BLM requirements. The workforce would be similar to or less than that used to construct the rail spur. Activities would include radiological and site surveys, dismantling and removing any equipment and the rail line (unless BLM determines to keep the infrastructure), and recontouring and reseeding disturbed areas. There would not be detectable changes in the potential socioeconomic impacts during dismantling of the rail spur. Therefore, the NRC and BLM staffs conclude that the potential socioeconomic impacts of decommissioning the rail spur would be SMALL.

4.11.2 No-Action Alternative

Under the No-Action alternative, the NRC would not license the proposed CISF project. Within the 4-county socioeconomic ROI for the proposed CISF project, socioeconomic impacts from the proposed project would be avoided because no workers or materials would be needed to build the CISF, and no tax revenues from the CISF would be generated. Operational impacts would also be avoided because no workers would be needed to operate the proposed CISF project, and no tax revenues would be generated. Socioeconomic impacts from decommissioning activities would not occur because there would be no facility to decommission. The proposed CISF project property would continue to be privately owned, and existing land uses would continue. The current socioeconomic conditions on and near the project would remain essentially unchanged under the No-Action alternative. In the absence of a CISF, the NRC staff assumes that SNF would remain onsite in existing wet and dry storage facilities and be stored in accordance with NRC regulations and be subject to NRC oversight and inspection. Site-specific impacts at each of these storage sites would be expected to continue, as detailed in generic (NRC, 2013, 2005a) or site-specific environmental analyses. In accordance with current U.S. policy, the NRC staff also assumes that the SNF would be transported to a permanent geologic repository, when such a facility becomes available.

4.12 Environmental Justice

4.12.1 Impact from the Proposed CISF

Environmental justice refers to the Federal policy established in 1994 by Executive Order 12898 (59 FR 7629) that directs Federal agencies to identify and address disproportionately high and adverse human health and environmental effects of its programs, policies, and activities on minority or low-income populations. As an independent agency, the Executive Order does not automatically apply to the NRC. But as reflected in its subsequent Policy Statement on the Treatment of Environmental Justice Matters in NRC Regulatory and Licensing Actions (69 FR 52040), the NRC strives to meet the goals of EO 12898 through its normal and traditional NEPA review process.

Appendix B to this document provides additional information on the NRC staff's methodology for addressing environmental justice in environmental analyses. This environmental justice review includes an analysis of the human health and environmental impacts on low-income and minority populations resulting from the proposed action (Phase 1), Phases 2-20, and the No-Action alternative. EIS Section 3.11.1.3 explains why the NRC staff use block groups for evaluating census data and defines and identifies the minority and low-income populations within the 80-km [50-mi] radius of the proposed CISF project. EIS Section 3.11.1.3 also explains the NRC staff's 50 percent or greater than 20 percent criteria in NUREG–1748 Appendix C (NRC, 2003), and the more inclusive criteria applied to this analysis (i.e., including census block groups with a percentage of Hispanics or Latinos at least as great as the statewide average) for identifying potentially affected environmental justice populations. There are 115 block groups that fall completely or partially within the 80-km [50-mi] radius of the proposed project area. Of the 115 block groups, 64 have minority populations that meet one of the above criteria. The majority of the 64 block groups are located in Lea County in and around the City of Hobbs. Of the 115 block groups within 80 km [50 mi] of the proposed CISF project, 10 block groups have potentially affected low-income families and low-income individuals. The locations of these block groups that represent environmental justice populations are shown on EIS Figures 3.11-4 and 3.11-5. Appendix B provides additional detail about the minority populations in the 115 block groups.

4.12.1.1 Construction Impacts

For each of the areas of technical analysis presented in this EIS, a review of impacts to the human and natural environment was conducted to determine if any minority or low-income populations could be subject to disproportionately high and adverse impacts from the proposed action. Table 4.12-1 summarizes the potential impacts on minority and low-income populations. The primary resource areas that construction could affect are land use, transportation, soil, groundwater quality, groundwater quantity, air quality, ecology, socioeconomics, and radiological health. The following discussion summarizes proposed project impacts on the general population and addresses whether or not minority and low-income populations would experience disproportionately high and adverse impacts during the construction stage for the proposed action (Phase 1) and Phases 2-20. The NRC staff considered the CEQ's Environmental Justice Guidance under the National Environmental Policy Act, NRC's general guidelines on the evaluation of environmental analyses in "Environmental Review Guidance for Licensing Actions Associated with NMSS (Nuclear Material Safety and Safeguards) Programs" (NUREG–1748), and NRC's final policy statement on the Treatment of Environmental Justice Matters in NRC Regulatory and Licensing Actions (69 FR 52040) in determining potential environmental justice impacts (CEQ, 1997; NRC, 2003). A more detailed list of the impacts from the proposed project, as evaluated in other sections of this EIS, is provided in Appendix B.

In summary, the NRC staff considered the potential physical environmental impacts and the potential radiological health effects from constructing the proposed CISF project (full build-out) to identify means or pathways for the proposed action to disproportionately affect minority or low-income populations. No means or pathways have been identified for the proposed action to disproportionately affect minority or low-income populations. No commercial crop production takes place within the proposed project area. Also, as stated in EIS Section 4.6.1, there is no adequate habitat within the proposed project area to support aquatic life (e.g., fish); therefore, no analysis was performed for subsistence consumption of fish. Because land access restrictions would limit hunting, and no fish or crops on the land are available for consumption, the NRC staff concludes that there is minimal, if any, risk of radiological exposure through subsistence consumption pathways. Moreover, adverse health effects to all populations, including minority and low-income populations, are not expected under the proposed action, because Holtec is expected to maintain current access restrictions (EIS Section 2.2); comply with license requirements, including sufficient monitoring to detect radiological releases (EIS Chapter 7); and maintain safety practices following a radiation protection program that addresses the NRC safety requirements in 10 CFR Parts 72 and 20 (EIS Section 4.13.1.2).

After reviewing the information presented in the license application and associated documentation, considering the information presented throughout this EIS, and considering any special pathways through which environmental justice populations could be more affected than other population groups, the NRC staff did not identify any high and adverse human health or environmental impacts and conclude that no disproportionately high and adverse impacts on any environmental justice populations would exist.

Table 4.12-1 Potential Impacts of the Proposed Action on Minority and Low-Income Populations*

Area of Potential Impact	Potentially Affected Population (Minority or Low-Income)	Level of Impact
Land Use	Hispanic/Latino populations surrounding the proposed CISF	SMALL
Transportation and Traffic	Hispanic/Latino populations along likely transportation routes into and out of the proposed CISF	SMALL
Soil	Hispanic/Latino populations adjacent to the proposed CISF	SMALL
Groundwater Quality	Hispanic/Latino populations in the vicinity of the proposed CISF	SMALL
Groundwater Quantity	Hispanic/Latino populations that use domestic wells and stock watering in the vicinity of the proposed project area	SMALL
Ecology	Hispanic/Latino populations in the vicinity of the proposed CISF	SMALL to MODERATE
Air Quality	Hispanic/Latino populations in the vicinity of the proposed CISF	SMALL
Socioeconomics	All minority[†] and low-Income populations in the region	
Employment		SMALL
Population		SMALL
Economic Structure		SMALL to MODERATE
Community Resources		SMALL
Human Health	Hispanic/Latino populations near the proposed CISF and along transportation routes into and out of the proposed CISF	SMALL

*Locations of block groups with potentially affected minority and low-income populations are shown on EIS Figures 3.11-4 and 3.11-5.
All block groups shown on EIS Figures 3.11-4 contain potentially affected Hispanic/Latino populations. Two block groups on the east side of Hobbs contain potentially affected black populations.

Because all phases are located within the proposed project area, the construction of the proposed action (Phase 1) would affect the same minority and low-income populations as the construction of Phases 2-20. As determined for the proposed action (Phase 1) construction stage impacts on environmental justice populations, the NRC staff did not identify any special pathways during construction of Phases 2-20 through which environmental justice populations could be more affected than other population groups. Therefore, the NRC staff determines that no disproportionately high and adverse impacts from the proposed action (Phase 1) or Phases 2-20 on any environmental justice populations would exist.

4.12.1.1.1 Rail Spur

For each of the areas of technical analysis presented in this EIS, a review of impacts to the human and natural environment was conducted to determine if any minority or low-income populations could be subject to disproportionately high and adverse impacts from the proposed action. The construction of the proposed rail spur would affect the same minority and low-income populations within an 80-km [50-mi] radius around the proposed CISF project as the construction of proposed action (Phase 1) and Phases 2-20. The primary resource areas that construction of the rail spur could be affected are land use, transportation, soil, groundwater quality, groundwater quantity, air quality, ecology, socioeconomics, and human (radiological) health. The potential impacts from construction of the proposed action (Phase 1) and Phases 2-20 on land use, soils, groundwater quality, groundwater quantity, air quality, ecology, socioeconomics, and human health would be SMALL. After reviewing the information presented in the license application and associated documentation, considering the information presented in related sections of this EIS, and considering any special pathways through which environmental justice populations could be more affected than other population groups, the NRC staff did not identify any high and adverse human health or environmental impacts and conclude that no disproportionately high and adverse impacts on any environmental justice populations would exist. Therefore, the NRC and BLM staffs determine that no disproportionately high and adverse impacts on any environmental justice populations would exist.

4.12.1.2 Operations Impacts

The primary environmental resources that the operation of the proposed action (Phase 1) could affect are the same as those discussed in EIS Section 4.12.1.1.1. The NRC evaluated the proposed action (Phase 1) operations stage impacts in this EIS for land use (Section 4.2.1.2), transportation (Section 4.3.1.2), soils (Section 4.4.1.2), groundwater quality (Section 4.5.2.1.2), groundwater quantity (Section 4.5.2.1.2, air quality (Section 4.7.1.1.3), ecology (Section 4.6.1.2), and socioeconomics (Section 4.11.1.2). In each of these sections, the NRC concluded that the impacts from the proposed action (Phase 1) operations would be SMALL, with the exception of a SMALL-to-MODERATE impact on ecological resources and SMALL-to-MODERATE impact on socioeconomics.

For human health, the proposed action (Phase 1) operations stage of the proposed facility would require shipment of SNF to and from the facility and hazardous, mixed, and low-level radioactive waste (LLRW) to disposal facilities. Potential accident scenarios associated with rail transportation could result in members of the general public being exposed to additional levels of radiation beyond those associated with normal operations (EIS Section 4.15); however, minority and low-income populations would not be more obviously at risk than the general population because during normal operations and off-normal conditions, the requirements of 10 CFR Part 20 must be met. The NRC staff concludes in EIS Section 4.13 that impacts from the operations stage of the proposed action (Phase 1) on public and occupational health would be SMALL. The NRC staff further concluded that because the annual occupational radiation doses would be limited by regulation and administratively controlled in accordance with applicable radiation protection plans, the radiological impact to workers from incident-free transportation of SNF to and from the proposed CISF project would be SMALL.

In summary, in this EIS, the NRC staff concluded that the impacts of the proposed action (Phase 1) operations stage on the resources evaluated would be SMALL for most resources, with the exception of a SMALL to MODERATE impact on ecological resources. The NRC staff found no activities, resource dependencies, preexisting health conditions, or health service availability issues resulting from normal operations at the proposed CISF project that would cause a health impact for the members of minority or low-income communities within the study area. Therefore, it is unlikely that normal operations of the proposed action (Phase 1) would disproportionately and adversely affect any minority or low-income population.

For Phases 2-20, the potential impacts would affect the same minority and low-income populations within an 80-km [50-mi] radius of the proposed CISF project as the operations stage of the proposed action (Phase 1). The NRC staff determined that adverse health effects to all populations, including minority and low-income populations, are not expected during the operations stage of the proposed action (Phase 1) or for Phases 2-20. Similarly, the NRC staff concludes that there would be no disproportionately high and adverse impacts on low-income and minority populations from the operations stage for Phases 2-20.

Defueling

The NRC staff determined that radiological exposure to workers and the public during the proposed action (Phase 1) and Phases 2-20 activities would not exceed exposures experienced when SNF is emplaced at the proposed CISF project. Because the NRC staff determined that adverse health effects to all populations, including minority and low-income populations, are not expected during the proposed action (Phase 1) and Phases 2-20, the NRC staff concludes that there would be no disproportionately high and adverse impacts on low-income and minority populations from defueling.

4.12.1.2.1 Rail Spur

The operations stage of all phases would utilize a rail spur to transfer SNF from the main rail lines to the proposed CISF. Holtec would conduct routine monitoring of the rail line. The maintenance of the rail spur is anticipated to have a minimal impact on the natural or physical environment. Additionally, the NRC and BLM staffs have not identified any potential impacts on the natural or physical environment from using the rail spur that would significantly and adversely affect a particular population group. Therefore, the NRC and BLM staffs conclude that the rail spur would have no disproportionately high and adverse impacts on any group, including minority and low-income populations.

4.12.1.3 Decommissioning and Reclamation Impacts

At the end of the license term of the proposed CISF project, once the SNF inventory is removed, the facility would be decommissioned such that the proposed project area and remaining facilities could be released and the license terminated. Decommissioning activities, in accordance with 10 CFR Part 72 requirements, would include conducting radiological surveys and decontaminating, if necessary. Decommissioning activities for the proposed action (Phase 1) and for Phases 2-20 would involve the same activities, but the activities would be scaled to address the overall size of the CISF (i.e., the number of phases completed).

Holtec has committed to reclamation of nonradiological-related aspects of the proposed project area (Holtec, 2019a). Reclamation would include dismantling and removing equipment, materials, buildings, roads, the rail spur, and other onsite structures; cleaning up areas; waste disposal; erosional control; and restoring and reclaiming disturbed areas. EIS Sections 2.2.1.4 and 2.2.1.7 describe the decommissioning and reclamation activities.

The NRC staff's examination of the various environmental pathways reveals that there would be no disproportionately high and adverse impacts on low-income and minority populations from decommissioning the proposed facility.

Reclamation activities, including dismantling, would be similar to the construction activities for the proposed action (Phase 1). The additional impacts on low-income and minority populations from dismantling the proposed CISF project Phases 2-20 are not expected to significantly change the estimated impacts low-income and minority populations experience from decommissioning the proposed action (Phase 1). Therefore, the NRC staff's examination of the various environmental pathways reveals that there would be no disproportionately high and adverse impacts on low-income and minority populations from decommissioning Phases 2-20.

4.12.1.3.1 Rail Spur

Decommissioning of the proposed rail spur would affect the same minority and low-income populations within an 80-km [50-mi] radius of the proposed CISF project as the construction and operation of the proposed project. The primary resource areas that decommissioning the rail spur could affect are land use, soil, groundwater quality, groundwater quantity, air quality, ecology, socioeconomics, and human (radiological) health, and the potential impacts would be SMALL. After reviewing the information presented in the license application and associated documentation, considering the information presented in the referenced sections of this EIS, and considering any special pathways through which environmental justice populations could be more affected than other population groups, the NRC and BLM staffs did not identify any high and adverse human health or environmental impacts and conclude that no disproportionately high and adverse impacts on any environmental justice populations would exist.

4.12.2 No-Action Alternative

Under the No-Action alternative, the NRC would not license the proposed CISF project. Therefore, impacts from the CISF on land use, transportation, soils, water resources, air quality, ecological resources, socioeconomics, and human health would not occur. Construction impacts would be avoided because CISF storage pads, buildings, and transportation infrastructure would not be built. Operational impacts would also be avoided because no SNF canisters would arrive for storage. The current physical environmental conditions on and near the project would remain essentially unchanged under the No-Action alternative and thus there would be no high or adverse impact on minority or low-income populations. In the absence of a CISF, the NRC staff assumes that SNF would remain onsite in existing wet and dry storage facilities and be stored in accordance with NRC regulations and be subject to NRC oversight and inspection. Site-specific impacts at each of these storage sites would be expected to continue as detailed in generic (NRC, 2013, 2005a) or site-specific environmental analyses. In accordance with current U.S. policy, the NRC staff also assumes that the SNF would be transported to a permanent geologic repository, when such a facility becomes available.

4.13 <u>Public and Occupational Health</u>

The potential radiological and nonradiological effects from the proposed CISF project may occur during all stages of the project life cycle. Additionally, the potential hazards and associated effects can be either radiological or nonradiological. Therefore, the analysis in this section evaluates the potential radiological and nonradiological public and occupational health and safety effects for normal conditions for each stage of the proposed CISF project. Normal conditions refers to proposed activities that are executed as planned. The impacts of potential accident conditions, when unplanned events can generate additional hazards, are evaluated in EIS Section 4.15.

4.13.1 Impacts from the Proposed Facility

The environmental impacts on public and occupational health and safety for the proposed action (Phase 1), Phases 2-20, and the No-Action alternative are described in the following sections.

4.13.1.1 Construction Impacts

Construction activities at the proposed CISF would include clearing and grading for roads; excavating soil, building foundations, and assembling buildings; constructing the rail spur, and laying fencing. Workers and the public could be exposed to low levels of background radiation or nonradiological emissions during the construction stage. Background radiation exposures could result by direct exposure, inhalation, or ingestion of naturally occurring radionuclides during construction activities. Nonradiological exposures may result from inhalation of combustion emissions and fugitive dust from vehicular traffic and construction equipment.

In the absence of site-specific measurements, the NRC staff assume that the natural background radiation at the proposed CISF applicable to construction worker and public construction exposures is encompassed by the national average natural background radiation described in EIS Section 3.12.1.1. Because terrestrial radiation (e.g., from natural radioactivity in soil) is a small fraction of the natural background radiation, the fugitive dust generated from facility construction activities would not be expected to result in an increased radiological hazard to workers and the public. In addition, Holtec has proposed implementing standard dust control measures, such as water application or chemical dust suppression compounds, to reduce and control fugitive dust emissions (Holtec, 2019a). Therefore, the NRC staff estimates that the direct exposure, inhalation, or ingestion of fugitive dust would not result in an increased radiological hazard to workers and the general public during the construction stage of the proposed action (Phase 1) and Phases 2-20 of the proposed CISF project.

The construction stage of the proposed action (Phase 1) would be conducted without the presence of project-related radioactive materials; therefore, there would be no worker radiation exposure from stored SNF. As construction proceeded to Phases 2 and beyond, loaded storage casks would be present at the proposed action (Phase 1) pad, and on-going adjacent construction activities would result in the installation of additional subsurface storage casks near the existing loaded storage casks. Therefore, the Phase 2 excavation would remove the shielding provided by soil, and occupational exposure to radiation [e.g., emitted laterally from the subsurface proposed action (Phase 1) modules] would occur. This circumstance was previously accounted for in the NRC certification of the Holtec HI-STORM UMAX cask system to ensure that suitable shielding was provided on the subsurface casks and an adequate buffer distance was defined to limit the dose rate to construction workers at an adjacent excavation to acceptable levels (Holtec, 2016).

Nonradiological impacts to construction workers during the construction stage of the proposed action (Phase 1) and Phases 2-20 of the proposed CISF project would be limited to the normal hazards associated with construction (i.e., no unusual situations would be anticipated that would make the proposed construction activities more hazardous than normal for an industrial construction project). The proposed CISF project would be subject to Occupational Safety and Health Administration (OSHA's) General Industry Standards (29 CFR Part 1910) and Construction Industry Standards (29 CFR Part 1926). These standards establish practices, procedures, exposure limits, and equipment specifications to preserve worker health and safety.

Occupational hazards within the construction industry, typically including overexertion, falls, or being struck by equipment (NSC, 2018), can result in fatal and nonfatal occupational injuries. To estimate the number of potential injuries for the construction stage of the proposed action (Phase 1) and Phases 2-20 of the proposed CISF project (as well as for the operation and decommissioning stages), the NRC staff considered the National Safety Council (NSC, 2018) annual data on fatal and nonfatal occupational injuries. This includes Bureau of Labor Statistics (BLS) and OSHA compiled data. BLS and OSHA data applicable to construction were used to estimate the occupational injuries for construction and decommissioning. The data applicable to the trucking and warehousing industry were used to estimate the occupational injuries for the operations stage. EIS Table 4.13-1 presents the expected number of potentially fatal and nonfatal occupational injuries for each stage of the proposed CISF project. Over the 2-year duration of the construction stage of the proposed action (Phase 1), the estimated fatalities are less than one, and the total number of estimated construction injuries is five. Over the proposed 19-year duration of construction of Phases 2-20, the fatality estimate is also less than one, and the total number of estimated construction injuries is 49. Because the construction activities at the proposed CISF during any phase would be typical and subject to applicable occupational health and safety regulations, there would be only minor impacts to worker health and safety from construction-related activities. Therefore, the NRC staff concludes that the nonradiological occupational health effects of the construction stage of the proposed action (Phase 1) and the construction stage of Phases 2-20 would be minor.

Further reduction in the estimated occupational safety hazards from construction may be possible by following established safety practices, such as those OSHA recommended (OSHA, 2016).

The potential nonradiological air quality impacts from fugitive dust and diesel emissions, including comparisons with health-based standards, are evaluated in EIS Section 4.7.1.1. Fugitive dust emissions would occur primarily from travel on unpaved roads and wind erosion. Construction equipment would be diesel powered and would emit diesel exhaust, which includes small particles (PM_{10}) and a variety of gases. In EIS Section 4.7.1.1, the NRC staff concluded that construction stage air emissions would have a SMALL impact on air quality because the pollutant concentrations would be low compared to the National Ambient Air Quality Standards (NAAQS) and Prevention of Significant Deterioration (PSD) thresholds. Additionally, Holtec's compliance with Federal and State occupational safety regulations would limit the potential nonradiological effects of fugitive dust and diesel emissions to levels acceptable for workers. Based on the foregoing analysis, the NRC staff concludes that overall impacts on workers and the general public from the construction stage of the proposed action (Phase 1) and the construction stage of Phases 2-20 would be SMALL.

Table 4.13-1 Estimated Fatal and Non-Fatal Occupational Injuries for the Proposed CISF Project by Work Activity and Project Phase

Activity	Number of Full-time Workers*	Duration (years)	Fatal Injury Rate*	Estimated Fatalities	Non-Fatal Injury Rate†	Estimated Non-Fatal Injuries
Construction–proposed action (Phase 1)	80	2	9.8×10^{-5}	0.016	3.2×10^{-2}	5
Construction–Phases 2-20	80	19	9.8×10^{-5}	0.15	3.2×10^{-2}	49
Operation–proposed action (Phase 1)	40	1	1.3×10^{-4}	0.0052	4.5×10^{-2}	1.8
Operation–Phases 2-20	40	19	1.3×10^{-4}	0.099	4.5×10^{-2}	34
Decommissioning proposed action (Phase 1)	80	2	9.8×10^{-5}	0.016	3.2×10^{-2}	5
Decommissioning–Phases 2-20	80	2	9.8×10^{-5}	0.016	3.2×10^{-2}	5
Total				0.30		100

*The number of operational workers does not include security staff who would not be directly involved in the proposed project activities evaluated for injuries and fatalities.
†Source: NSC, 2018. The fatal and nonfatal injury rates are the number of reported occupational deaths and nonfatal medically consulted occupational injuries per annual worker full-time equivalent for construction and transportation and warehousing industries.

4.13.1.1.1 Rail Spur

For the rail spur, construction activities could contribute to radiological and nonradiological impacts to workers and the public. However, the construction activities conducted for the rail spur would be significantly less than the construction activities for the proposed CISF project and therefore would be expected to result in fewer occupational injuries and fatalities. Because the proposed CISF has not involved prior use of radioactive materials, the radioactive materials present in the proposed project area would be naturally occurring. Therefore, the NRC and BLM staffs conclude that the public and occupational health impacts of constructing the rail spur, which would be completed as part of the construction stage of the proposed action (Phase 1), would be SMALL.

4.13.1.2 Operations Impacts

Operational activities at the proposed CISF would include the receipt, transfer, handling, and storage of canistered SNF. During these activities, the radiological impacts would include expected occupational and public exposures to low levels of radiation. The nonradiological impacts would include the potential for typical occupational injuries and fatalities during the proposed CISF operations.

The radiological impacts from normal operations involve radiation doses to workers and members of the public. Operational worker doses would occur as a result of the proximity of workers to SNF casks and canisters during receipt, transfer, handling, and storage operations. Public radiation doses from normal operations occur from offsite exposure to low levels of direct radiation from the stored SNF casks. Holtec would monitor and control both occupational and public radiation exposures by following a radiation protection program that addresses the NRC safety requirements in 10 CFR Parts 72 and 20. The following detailed evaluations of the radiological effects to workers and the public from normal operations at the proposed CISF is based on the NRC staff's site-specific review.

Holtec estimated occupational radiation exposures during proposed operations involving the receipt and inspection of the shipping cask, transfer of the canister from the shipping cask to the transfer cask (the HI-TRAC CS), movement of the transfer cask to the storage pad, and loading the canister into the HI-STORM cask at the storage pad (Holtec, 2019b). Holtec's estimated dose rate values included both neutron and gamma contributions for fuel compositions considered to be representative of typical SNF. Detailed dose estimates for each step of the process are documented in Holtec's SAR Table 11.3-1 (Holtec, 2019b). Per individual canister, the collective dose estimate for the entire crew was 0.0081 person-Sv [0.81person-rem]. The person-Sv (person-rem) is an expression of the collective dose equivalent exposure to a number of individuals doing different tasks. These estimates were conservative because they did not account for shielding. Holtec provided additional estimates in the ER, based on actual experience loading over 800 storage systems at other sites (Holtec, 2019a). This loading experience resulted in a collective dose for a crew of 20 workers of 0.2 person-rem (200 person-mrem) for loading a canister over a week's time; therefore, Holtec estimated a single worker's annual dose would be 500 mrem (i.e., 200 person-mrem/week × 50 weeks/yr/20 workers).

The NRC staff's review of Holtec's worker dose estimate found that it did not account for the amount of work Holtec planned to be completed within a year based on the schedule provided in the ER (Holtec, 2019a). The NRC considered Holtec's reported duration of these handling operations in SAR Table 11.3-1, of approximately 20 hours per canister, and the total annual number of canisters expected to be received and processed (500) during the operations stage of the proposed action (Phase 1), and the operations stage of any single phase of Phases 2-20, and scaled the Holtec single worker dose estimate to accomplish this amount of work in a year. The resulting single worker annual dose estimate for processing 500 canisters during any single phase was 0.025 Sv [2.5 rem] (i.e., 500 mrem/yr × 1 year/50 origin canisters × 1 origin canister loaded/week × 1 week/2 Holtec canisters loaded × 500 Holtec canisters loaded/yr × 1 rem/1000 mrem). This estimated dose, applicable to the most highly exposed group of workers, is below the 0.05 Sv/yr (5 rem/yr) occupational dose limit specified in 10 CFR 20.1201(a) for occupational exposure. Because these exposures do not exceed NRC dose limit for workers, the NRC staff concludes that the radiological impacts to workers during the operations stage of the proposed action (Phase 1) and the operations stage of Phases 2-20 would be minor.

To assess the radiological impacts to the general public from normal operation of the proposed CISF project, the NRC staff evaluated Holtec's estimates of the potential dose to a hypothetical maximally exposed individual located at the boundary of the proposed CISF project controlled area (i.e., protected area), as well as to nearby residents. Holtec defined the hypothetical maximally exposed individual as the individual that, because of proximity, activities, or living habits, could receive the highest possible dose of radiation. They placed the hypothetically maximally exposed individual at the closest publicly accessible site boundary location. Because the direct radiation emitted from the storage modules under normal operations decreases with distance, the nearest publicly accessible location is the location where the radiation dose rate is the highest for a member of the public.

The potential exposure pathways at the proposed CISF include direct exposure to radiation (neutrons and gamma rays), including skyshine, emitted from the storage casks.

Exposure pathways that would require a release of radioactive material from the casks (e.g., environmental transport to air, water, soil, and subsequent inhalation or ingestion) are not applicable to normal operations. The potential for release of radioactive material is addressed separately in the EIS accident analysis (Section 4.15). Factors that contribute to the containment of SNF during normal operations include the use of sealed (welded closure) canisters that would remain closed for the duration of storage, the engineered features of the cask system, and plans to reject and return canisters that have unacceptable external contamination (Holtec, 2019b).

Holtec calculated dose rates for locations at the boundary of the CISF for the HI-STORM cask design (Holtec, 2019a). The location of the maximum dose to an individual at the proposed controlled area (i.e., protected area) boundary of the CISF is at the nearest fence line 400 m [1,300 ft] from the proposed storage pads. Holtec provided dose estimates that assumed that the proposed CISF was fully loaded and consisted of an array of 500 HI-STORM storage casks for the operations stage of the proposed action (Phase 1) and any single phase of Phases 2-20, as well as 10,000 HI-STORM storage casks for full build-out (Holtec, 2019a,b). Holtec assumes each cask array contained 45 Gigawatt-Day/MTU [GWD/MTU] burnup, 8-year cooled, and 3.2 weight % enriched PWR SNF (Holtec, 2019b). Holtec derived these SNF characteristics by modifying the design-basis fuel (that was used in the NRC certification of the HI-STORM storage casks) to meet the thermal limit of the HI-STAR 190 transportation cask that Holtec plans to use for the transportation of the SNF to the CISF (Holtec, 2019a). The NRC staff considers this an acceptable adjustment because the SNF would have to comply with the design specifications (including the thermal limit) in the certificates of compliance for both the storage and transportation casks and in this case the transportation cask thermal limit would bound the characteristics of SNF that could be shipped in the transportation cask to the CISF.

For the operations stage of the proposed action (Phase 1) and any single phase of Phases 2-20, Holtec estimated an annual dose of 0.022 mSv [2.2 mrem] to a hypothetical individual that spends 2,000 hours at the fence line 100 m [328 ft] from the proposed CISF (Holtec, 2019b). Doses to actual individuals further away from the proposed CISF project or who spend less than 2,000 hours at the proposed project boundary would be smaller. The estimated 0.022 mSv [2.2 mrem] dose is less than the 0.25 mSv [25 mrem] regulatory limit specified in 10 CFR 72.104 for the maximum permissible annual whole body dose to any real individual. Additionally, the 0.022 mSv [2.2 mrem] dose is less than 1 percent of the average annual background radiation dose in the United States of 6.2 mSv [620 mrem].

For the full build-out (Phases 1-20) of 10,000 loaded canisters, Holtec estimated an annual dose of 0.122 mSv [12.2 mrem] to a hypothetical individual that spends 2,000 hours at the fence line 100 m [328 ft] from the proposed CISF (Holtec, 2019a). Doses to actual individuals further away from the proposed CISF project or who spend less than 2,000 hours at the boundary would be smaller. The estimated 0.122 mSv [12.2 mrem] dose is less than the 0.25 mSv [25 mrem] regulatory limit specified in 10 CFR 72.104 for the maximum permissible annual whole body dose to any real individual. Additionally, the 0.122 mSv [12.2 mrem] dose is less than 1 percent of the annual natural background radiation dose in the United States of 3.1 mSv [310 mrem].

The nearest current resident is Salt Lake Ranch, 2.4 km [1.5 mi] north of the proposed CISF (Holtec, 2019a). Additional residences exist at the Bingham Ranch 3.2 km [2 mi] south and at the R360 complex, 3.2 km [2 mi] southwest. At large distances, absorption and attenuation of radiation in the air significantly reduces the dose. Holtec calculated the dose to residents assuming 8,760 hours (an entire year) were spent at a location 1 km from the CISF without shielding by a residence or other structures. The calculated 0.00089 mSv [0.089 mrem] annual dose assuming 500 loaded storage casks for the operations stage of the proposed action (Phase 1) and any single phase of Phases 2-20 (Holtec, 2019b) and the calculated 0.018 mSv [1.8 mrem] annual dose based on full build-out (Holtec, 2019a) are both smaller than the 0.25 mSv [25 mrem] regulatory limit specified in 10 CFR 72.104 for the maximum permissible annual whole body dose to any real individual. The 0.00089 mSv [0.089 mrem] annual dose and the 0.018 mSv [1.8 mrem] annual dose are less than 0.01 percent and 0.3 percent of the natural background radiation dose in the United States, respectively.

The NRC staff reviewed Holtec's public dose calculation methods, assumptions, and parameters and found them to be technically acceptable. The NRC staff also found that the calculated dose estimates were within expectations based on prior ISFSI public dose estimates (NRC, 2009; 2005b,c; 2001). Because Holtec's public dose estimates are a small fraction of the NRC public dose limit as well as the natural background radiation dose, the NRC staff concludes that the radiological impacts to the public from the operations stage of the proposed action (Phase 1), Phases 2-20, and full build-out would be minor.

Nonradiological impacts to operations workers would be limited to the normal hazards associated with CISF operations. The proposed CISF would be subject to OSHA's General Industry Standards (29 CFR Part 1910). These standards establish practices, procedures, exposure limits, and equipment specifications to preserve worker health and safety.

To estimate the number of potential injuries for operation of the proposed CISF project for the operations stage of the proposed action (Phase 1), Phases 2-20, and full build-out, the NRC staff considered annual data on fatal and non-fatal occupational injuries the National Safety Council (NSC, 2018) reported. This includes data the Bureau of Labor Statistics (BLS) and OSHA compiled. BLS and OSHA data applicable to the trucking and warehousing industry were used to estimate the occupational injuries for the active portion of the operations stage (e.g., receipt, transfer, and loading of casks), based on similarities to proposed activities (e.g., transfer of heavy objects, crane operations). EIS Table 4.13-1 presents the expected number of potentially fatal and nonfatal occupational injuries for each stage and by phase of the proposed CISF project. For the operations stage of the proposed action (Phase 1), the operations stage of Phases 2-20, and operations to full build-out, the estimate of fatalities is less than one, and the number of estimated injuries is 1.8, 34, and 100 respectively. Because the operation activities at the proposed CISF project would be typical and subject to applicable occupational health and safety regulations, there would be only small impacts to nonradiological worker health and safety from operations-related activities. Therefore, the NRC staff concludes that the nonradiological occupational health impacts of the operations stage of the proposed action (Phase 1), Phases 2-20, and full build-out would be minor.

Overall, based on the preceding analysis that considers occupational dose estimates for operations that are below applicable NRC standards, public dose estimates from CISF storage operations that are well below NRC standards, a small fraction of background radiation exposure, and small occupational injury estimates, the NRC staff concludes that the radiological and nonradiological public and occupational health impacts from the operations stage of the proposed action (Phase 1), Phases 2-20, and full build-out would be SMALL.

Defueling

Removal of the SNF from the proposed CISF project, or defueling, would involve reversing the activities conducted at the start of operations to receive, handle, and transfer SNF that arrived at the CISF from nuclear power plants and ISFSIs. Therefore, the public and occupational health impacts would be bounded by the impacts evaluated for receiving, handling, and transferring the SNF at the proposed CISF and would be SMALL.

4.13.1.2.1 Rail Spur

For the rail spur, the operation of the rail spur mostly involves offsite transportation; therefore, the additional impacts to workers and the public from operating the rail spur are addressed in the transportation impact analysis in EIS Section 4.3.1.2. The operation of the rail spur within the proposed CISF boundary is associated with the receipt of shipments, which is addressed in EIS Section 4.13.1.2. Therefore, the NRC and BLM staffs conclude that the public and occupational health impacts of the rail spur as part of the operations stage of the proposed action (Phase 1), Phases 2-20, and at full build-out would be SMALL.

4.13.1.3 Decommissioning and Reclamation Impacts

At the end of the license term of the proposed CISF project, once the SNF inventory is removed, the facility would be decommissioned such that the proposed project area and remaining facilities could be released and the license terminated. Decommissioning activities, in accordance with 10 CFR Part 72 requirements, would include conducting radiological surveys and decontaminating, if necessary. Decommissioning activities for the proposed action (Phase 1) and for Phases 2-20 would involve the same activities, but the activities would be scaled to address the overall size of the CISF (i.e., the number of phases completed).

Holtec has committed to reclamation of nonradiological-related aspects of the proposed project area (Holtec, 2019a). Reclamation would include dismantling and removing equipment, materials, buildings, roads, the rail spur, and other onsite structures; cleaning up areas; waste disposal; erosional control; and restoring and reclaiming disturbed areas. EIS Sections 2.2.1.4 and 2.2.1.7 describe the decommissioning and reclamation activities.

Radiological safety during decommissioning activities would be maintained as required by the existing NRC-approved 10 CFR Part 20 compliant radiological protection plan and an NRC-approved decommissioning plan. The decommissioning plan would identify any areas of the facilities or grounds or materials where surveys may be needed to evaluate the radiological status prior to unrestricted release or disposal, in accordance with NRC regulations or guidelines.

As discussed in EIS Section 4.13.1.2, no radiological contamination of the facility, the storage casks, or storage pads is expected under normal operations. The removal of storage pads and related facilities during reclamation would involve activities similar to construction. The NRC assumes the same duration and number of workers would be needed to complete the reclamation activities as would be needed originally to construct the facility. Because the SNF would have been moved offsite to a permanent geologic repository prior to the start of decommissioning, no further exposures to workers or the public from SNF would occur.

The radiological exposures of workers to naturally occurring radioactive materials during reclamation of the proposed CISF project would be equal to or less than those evaluated for the construction stage in EIS Section 4.13.1.1. The nonradiological worker and public impacts during reclamation of the CISF would also be expected to be similar to construction. Thus, the estimates of worker fatalities and injuries for Phase 1 of construction are expected to be applicable to reclamation, as shown in EIS Table 4.13-1. Consequently, for the decommissioning and reclamation stage of the proposed action (Phase 1), the decommissioning and reclamation stage of Phases 2-20, and decommissioning and reclamation of full build-out, 5 nonfatal occupational injuries are anticipated, and 0.016 (i.e., less than one) fatal injury is anticipated. These estimates for Phases 2-20 or full build-out could increase if the number or workers or time needed to complete the reclamation work were increased; however, the overall number of expected fatalities and injuries would not be expected to exceed the occupational fatalities and injuries estimated for constructing full build-out of the CISF (less than one fatality and 54 injuries). Additionally, the impacts to workers and the public from nonradiological emissions of dust and equipment exhaust would be small and similar to construction impacts based on low pollutant concentrations, compared to the NAAQS and PSD thresholds.

Overall, based on the effective containment of SNF during operations under normal conditions, the existing radiological and nonradiological controls and decommissioning planning, and the similarity of reclamation activities and impacts to construction, the public and occupational health impacts for the decommissioning and reclamation stage of the proposed action (Phase 1), the decommissioning and reclamation stage of Phases 2-20, and decommissioning and reclamation of full build-out would be SMALL.

4.13.1.3.1 Rail Spur

For the rail spur, decommissioning activities could contribute to radiological and nonradiological impacts to workers and the public. However, the decommissioning activities conducted for the rail spur would be significantly less than the decommissioning activities for the proposed CISF project, and therefore would be expected to result in fewer occupational injuries and fatalities. Because of the radiological protection program and the containment of the casks and canisters, the NRC and BLM staffs do not anticipate the rail spur to have radiological contamination. Therefore, any radioactive materials present in the proposed project area would be naturally occurring. Therefore, the NRC and BLM staffs conclude that the public and occupational health impacts of decommissioning the rail spur as part of the decommissioning stage of the proposed action (Phase 1), decommissioning stage of Phases 2-20, and decommissioning of full build-out would be SMALL.

4.13.2 No-Action Alternative

Under the No-Action alternative, the NRC would not license the proposed CISF project. Therefore, public and occupational impacts such as typical construction hazards and the occupational and public radiation exposures from the proposed storage of SNF would not occur. Construction impacts would be avoided because SNF storage pads, buildings, and transportation infrastructure would not be built. Operational impacts would also be avoided because SNF receipt, transfer, or storage at the proposed CISF would not occur. Public and occupational impacts from the proposed decommissioning and reclamation activities would not occur, because unbuilt SNF storage pads, buildings, and transportation infrastructure would require no decommissioning and reclamation. The current public and occupational health conditions on and near the project would remain unchanged by the proposed CISF under the No-Action alternative. In the absence of a CISF, the NRC staff assumes that SNF would remain on-site in existing wet and dry storage facilities and be stored in accordance with NRC regulations and be subject to NRC oversight and inspection. Site-specific impacts at each of these storage sites would be expected to continue, as detailed in generic (NRC, 2013, 2005a) or site-specific environmental analyses. In accordance with current U.S. policy, the NRC staff also assumes that the SNF would be transported to a permanent geologic repository, when such a facility becomes available.

4.14 Waste Management

This section describes the potential impact to waste management for the proposed action (Phase 1), Phases 2-20, and the No-Action alternative.

4.14.1 Impacts from the Proposed CISF

EIS Section 2.2.1.6 provides a description of various waste streams the proposed CISF project generated. EIS Table 2.2-3 describes the quantities of waste the various CISF stages (construction, operation, and decommissioning and reclamation) generate for the waste streams analyzed in this EIS. The proposed CISF project generates two waste streams for which the impacts are analyzed elsewhere in the EIS: stormwater runoff impacts are analyzed in EIS Section 4.5.1 (Water Resources – Surface Water) and excavated soil impacts are analyzed in EIS Section 4.4 (Geology and Soils).

As described in EIS Section 2.2.1, at full build-out, the proposed CISF project would be constructed in 20 phases over a 21-year period (Holtec, 2019a). Holtec has proposed constructing an access road and rail spur to access the proposed CISF project, which would be constructed during the proposed action (Phase 1) (Holtec, 2019a). The following sections analyze the potential impacts on waste management from the construction, operation, and decommissioning and reclamation stages of the proposed CISF project, including the railroad spur.

4.14.1.1 Construction Impacts

For the proposed action (Phase 1), the construction stage would consist of building the storage modules and pad, as well as all of the infrastructure and facilities needed to support the proposed CISF project (e.g., cask transfer building, security building, administration building, access road, and concrete batch plant). The proposed action (Phase 1) would generate a volume of 5,080 metric tons [5,600 short tons] of nonhazardous solid waste over the 2-year construction stage (Holtec, 2019a), which is about 5.4 percent of the annual volume of waste disposed at the Sandpoint Landfill (EIS Section 3.13). Should the waste be disposed at the Lea County Solid Waste Authority Landfill, this percentage would be 5.8 (EIS Section 3.13).

Construction of the proposed action (Phase 1) would not generate hazardous waste such that Holtec expects to be classified as a Conditionally Exempt Small Quantity Generator (CESQG) (EIS Section 4.14.1.2). The proposed CISF project would store and dispose any hazardous waste produced during any phase of the proposed project in accordance with applicable State and Federal requirements.

Additionally, the proposed action (Phase 1) would generate 11,360 liters (L)/day [3,000 gal/day] of sanitary liquid waste. Sanitary liquid waste would be collected onsite using sewage collection tanks and underground digestion tanks and then disposed at an offsite treatment facility (Holtec, 2019a). Holtec has committed to (i) storage of waste in designated areas until the waste would be shipped offsite; (ii) use and regular maintenance of portable systems for handling sanitary wastes during construction; (iii) implementing procedures and practices for collection, temporary storage, processing, and disposal of categorized solid waste in accordance with regulatory requirements; and (iv) recycling of debris to the extent possible.

Furthermore, as described in EIS Section 2.2.1.6, the sanitary waste management systems would be designed and operated in accordance with all applicable NMED and Federal standards. The NRC staff consider the amount of nonhazardous solid waste and sanitary liquid water the proposed action (Phase 1) construction stage generated to be minor in comparison to the capacity of the landfills and offsite disposal of sanitary waste.

For construction of Phases 2-20, the total nonhazardous solid waste the proposed CISF project generated over the project schedule described in EIS Section 2.2.1.6 would be 96,525 metric tons [106,394 short tons] (Holtec, 2019a). This would be about 3.3 percent of the capacity of the Sandpoint Landfill, based on multiplying the annual volume of waste disposed at this landfill by the projected lifespan of this landfill (Holtec, 2019a). Should the waste be disposed at the Lea County Solid Waste Authority Landfill, this percentage would be 3.0 (Holtec, 2019a). The NRC staff anticipates that all mitigation measures implemented as part of the proposed action (Phase 1) would also apply for Phases 2-20. The NRC staff considers that the amount of nonhazardous solid waste the construction stage for Phases 2-20 generated would be minor in comparison to the capacity of the landfills to dispose of such waste.

Construction of Phases 2-20 would generate limited volumes of hazardous waste such that Holtec expects to be classified as a CESQG. The proposed CISF project would store and dispose any hazardous waste in accordance with applicable State and Federal requirements.

For Phases 2-20, the proposed project would also generate 11,360 L/day [3,000 gal/per day] of sanitary liquid waste, which is the same as for the proposed action (Phase 1) with the same disposal and mitigation for liquid waste. For Phases 2-20 (i.e., 19 years) the total sanitary liquid waste produced, as determined by multiplying daily waste production {i.e., 11,360 L/day [3,000 gal/per day]} by 365 days/year and 19 years, would be approximately 78,781,600 L [20,805,000 gal] in total. The NRC staff considers the amount of liquid sanitary waste the proposed CISF construction stage generated to be relatively minor in comparison to the capacity of publicly owned treatment works to process such waste. Therefore, the NRC staff concludes that the impact for waste streams for both the proposed action (Phase 1) and for Phases 2-20 would be SMALL.

4.14.1.1.1 Rail Spur

Small quantities of nonhazardous waste (e.g., rail construction waste) are anticipated to be generated from construction of the rail spur. In addition, the NRC and BLM staffs assume that a minor quantity of sanitary waste would be generated during construction of the rail spur (Holtec, 2019a). The amounts of waste generated would be much less than those generated during the construction of the proposed CISF storage pads, buildings, and other infrastructure; therefore, the NRC and BLM staffs conclude that the potential impacts to waste management for the construction stage of the rail spur would be SMALL.

4.14.1.2 Operations Impacts

As described in EIS Table 2.2-3, the operations stage generates hazardous waste, sanitary liquid wastes, nonhazardous solid waste, and LLRW.

The proposed action (Phase 1) would involve limited activities that generate hazardous waste, such as the use of solvents or other chemicals during operations (Holtec, 2019a). Holtec estimates that the operations stage would generate up to 1.2 metric tons [1.32 short tons] per year of hazardous waste. Based on this volume of waste, Holtec expects to be classified as a

Conditionally Exempt Small Quantity Generator (CESQG) (Holtec, 2019a). The proposed CISF project would store and dispose of the hazardous waste in accordance with applicable State and Federal requirements. The NRC staff considers the amount of hazardous waste that the operations stage for the proposed action (Phase 1) would generate to be minor in comparison to the capacity for disposing of such waste.

The proposed action (Phase 1) would generate 11,360 L/day [3,000 gal/day] of sanitary liquid waste. As during the construction stage, Holtec would dispose of sanitary liquid waste using sewage collection tanks and underground digestion tanks which, as described in EIS Section 2.2.1.6, would be designed and operated in accordance with all applicable NMED and Federal standards (Holtec, 2019a). The NRC staff considers the amount of liquid sanitary waste that the CISF operations stage would generate to be minor in comparison to the capacity of publicly owned treatment works to process such waste.

The amount of nonhazardous solid waste the proposed action (Phase 1) would generate during the operations stage would be 91.1 metric tons [100.4 short tons] per year. (Holtec, 2019a). The amount of this type of waste the operations stage generates would be commensurate with typical office and personnel waste the work force produced at the proposed CISF project. The nonhazardous solid waste the proposed action (Phase 1) generated would be relatively minor in comparison to the capacity of the landfills.

The operations stage for the proposed action (Phase 1) would generate limited amounts of LLRW, consisting of contamination survey rags, anti-contamination garments, and other health physics materials (Holtec, 2019a). Per EIS Section 2.2.1.6, there are two different facilities (i.e., Waste Control Specialists and Energy*Solutions*) that could receive the LLRW from the proposed project, both of which have significant available disposal capacity. The operations stage would annually generate a volume of 0.45 metric tons [0.50 short tons] of LLRW (Holtec, 2019a). Historically, private industry has met the demand for LLRW disposal capacity. The NRC expects that this trend would continue into the future. The NRC staff considers the amount of LLRW that the operations stage of the proposed action (Phase 1) would generate to be minor.

The NRC staff does not expect that hazardous, nonhazardous, and sanitary waste volumes that would be generated during operations would be greater than waste volumes produced during the construction stage. A small amount of LLRW would be generated during the operations stage. Holtec estimates that the operations stage for Phases 2-20 would generate 1.2 metric ton per year [1.32 short tons] of hazardous waste (e.g., solvents or other chemicals) (Holtec, 2019a). As with the proposed action (Phase 1) given this volume of waste, Holtec expects to be classified as a Conditionally Exempt Small Quantity Generator (Holtec, 2019a). For nonhazardous waste for Phases 2-20, 3,460 metric tons [3,814 short tons] would be generated as the result of the waste generation from the proposed facilities (e.g., administration building) as a function of square feet over the operations stage of Phases 2-20 (i.e., 38 years). The total LLRW waste the operations stage of Phases 2-20 generated would be 8.61 metric tons [9.49 short tons], which is based on the additional 9,500 casks loaded as part of Phases 2-20 build-out. Liquid sanitary waste generated during the operations stage of Phases 2-20 would be 11,360 liters/day [3,000 gallons/day]. The NRC staff anticipates that all mitigation measures implemented as part of the proposed action (Phase 1) also apply to the operations stage of Phases 2-20. Therefore, the NRC staff consider the impact from all waste streams for Phases 2-20 for the operations stage to be SMALL.

Defueling

The removal of the SNF from the proposed CISF project would generate nonhazardous solid waste, LLRW, hazardous solid waste, and sanitary liquid wastes. The NRC staff expects that the amounts of the various wastes, as well as the associated impacts, would be similar to that of the SNF emplacement activities that occur earlier in the operations stage and are included in the total amounts discussed for operations. Therefore, the NRC staff concludes that the potential impacts to waste management during defueling of the proposed project would be SMALL.

4.14.1.2.1 Rail Spur

The use of the rail spur to transfer SNF to the proposed project would require the operation of a rail line across BLM land. Similar to the construction stage, the NRC and BLM staffs assume that limited quantities of nonhazardous, hazardous waste, and sanitary waste would be generated during operations of the rail spur (Holtec 2019a). These impacts would be bounded by those under the construction stage; therefore, the NRC and BLM staffs conclude that the potential impacts to waste management for the operations stage of the rail spur would be SMALL.

4.14.1.3 Decommissioning and Reclamation Impacts

At the end of the license term of the proposed CISF project, once the SNF inventory is removed, the facility would be decommissioned such that the proposed project area and remaining facilities could be released and the license terminated. Decommissioning activities, in accordance with 10 CFR Part 72 requirements, would include conducting radiological surveys and decontaminating, if necessary. Decommissioning activities for the proposed action (Phase 1) and for Phases 2-20 would involve the same activities, but the activities would be scaled to address the overall size of the CISF (i.e., the number of phases completed).

Holtec has committed to reclamation of nonradiological-related aspects of the proposed project area (Holtec, 2019a). Reclamation would include dismantling and removing equipment, materials, buildings, roads, the rail spur, and other onsite structures; cleaning up areas; waste disposal; erosional control; and restoring and reclaiming disturbed areas. EIS Sections 2.2.1.4 and 2.2.1.7 describe the decommissioning and reclamation activities.

The decommissioning and reclamation stage generates nonhazardous solid waste, LLRW, hazardous solid waste, and sanitary liquid wastes. If decommissioning and reclamation of the proposed CISF were to also occur, additional nonhazardous demolition waste would encompass the majority of the decommissioning waste that would be generated. Regarding the potential for LLRW shipments, the NRC staff expects that generated radioactive waste would be limited to negligible volumes because (i) SNF canisters would remain sealed during storage, (ii) external contamination would have been limited by required surveys at the reactor site prior to shipment, and (iii) the canisters would be inspected upon arrival at the proposed CISF project. Therefore, NRC staff expected the decommissioning activities to be limited and have minor associated waste volumes. EIS Section 3.13 provides a detailed description of the relevant disposal sites for each type of waste.

Reclamation would include activities and procedures for dismantling the proposed CISF project after the SNF (i.e., canisters) are removed from the proposed CISF project. EIS Section 2.2.1.4

describes reclamation activities, including dismantling and removing equipment, materials, buildings, rail, and other structures.

For the proposed action (Phase 1), activities producing waste during decommissioning and reclamation would be similar in nature to construction activities (Holtec 2019a). If reclamation of the proposed CISF were to occur, the nonhazardous solid waste the proposed CISF project generated would be 281,228 metric tons [310,000 short tons] (Holtec, 2019a). As discussed in EIS Section 3.13, both the Sandpoint and Lea County landfills are anticipated to close prior to decommissioning and reclamation of the proposed action (Phase 1) (NMENV, 2019). The NRC staff anticipates that the State of New Mexico would put in place additional landfill facilities as part of the normal urban development needs of the area. Therefore, the NRC staff assumes that the nonhazardous waste would be disposed according to all applicable regulations, and future capacity would be available. LLRW produced as a result of radiological decommissioning would consist of contamination survey rags, anti-contamination garments, and other health physics materials used to perform the final radiation survey of the site (Holtec, 2019a). For LLRW, decommissioning would generate 0.91 metric tons [1.00 short tons] of waste, which would be disposed at one of the two identified disposal facilities for LLRW. Historically, private industry has met the demand for LLRW disposal capacity. The NRC expects that this trend would continue into the future; therefore, the NRC staff consider the amount of LLRW the decommissioning stage of the proposed action (Phase 1) generated to be minor, in comparison to future disposal capacity for LLRW. Waste volume from sanitary waste would be 11,360 L/day [3,000 gal/day]. The NRC staff considers the amount of liquid sanitary waste the CISF decommissioning stage generated as relatively minor in comparison to the capacity of publicly owned treatment works to process such waste. Any contaminated storage casks would be decontaminated to levels at or below applicable NRC limits for unrestricted use, and therefore would be considered nonhazardous waste (Holtec, 2019a). The NRC staff assumes that any additional hazardous waste generated for the proposed action (Phase 1) would be equal to or less than that produced as part of the operations stage {1.2 metric tons per year [1.32 short tons]}. The NRC staff concludes that for the proposed action (Phase 1) decommissioning stage, the impacts for all waste streams would be SMALL.

For Phases 2-20, similar to the proposed action (Phase 1), nonhazardous solid waste the proposed CISF project generated as part of reclamation for Phases 2-20 would be 5,343,324 metric tons [5,893,306 short tons] (Holtec, 2019a). Similar to the proposed action (Phase 1), for Phases 2-20, both the Sandpoint and Lea County landfills are anticipated to close prior to the decommissioning and reclamation stage (NMENV, 2019). The NRC staff anticipates that the State of New Mexico would put in place additional landfill facilities as part of the normal urban development needs of the area. The NRC staff assumes that the volume of nonhazardous waste would be disposed of according to all applicable regulations and future capacity would remain available. However, because of the large volume of Phases 2-20 nonhazardous waste, the NRC staff concludes that the potential impact to landfill facilities could be MODERATE. For LLRW, the decommissioning stage of Phases 2-20 would generate 17.24 metric tons [19 short tons] and would be disposed at one of the two identified disposal facilities for LLRW. Historically, private industry has met the demand for LLRW disposal capacity. The NRC staff expects that this trend will continue into the future; therefore, the NRC staff considers the amount of LLRW the decommissioning and reclamation stage of the Phases 2-20 generates to be relatively minor in comparison to future available disposal capacity. Waste volume from sanitary waste would be 11,360 liters/day [3,000 gallons/day]. The NRC staff considers the amount of liquid sanitary waste the CISF decommissioning and reclamation stage generates to be relatively minor in comparison to the capacity of publicly owned treatment works to process such waste. As with the proposed action (Phase 1), any contaminated storage casks would be decontaminated to levels at or below applicable NRC limits for unrestricted use, and therefore would be considered nonhazardous waste (Holtec, 2019a). The NRC staff assumes that any additional hazardous waste generated for decommissioning and reclamation of Phases 2-20 would be equal to or less than hazardous waste produced as part of the operations stage {1.2 metric ton per year [1.32 short tons]}. The NRC staff concludes that for the Phases 2-20 decommissioning and reclamation stage, the impacts for LLRW, hazardous, and sanitary waste streams would be SMALL, and MODERATE for nonhazardous waste until a new landfill becomes available, after which the impact would be SMALL.

4.14.1.3.1 Rail Spur

Decommissioning of the rail spur and associated access road would occur at the discretion of the land owner (BLM). A minor amount of nonhazardous waste, including materials that cannot be recovered or recycled, are anticipated to be generated from decommissioning of the rail spur. In addition, the NRC and BLM staffs assume that a minor quantity of sanitary waste and hazardous waste would be generated during decommissioning of the rail spur (Holtec, 2019a). The amounts of waste generated would be much less than those generated from decommissioning the proposed CISF storage pads, buildings, and other infrastructure; therefore, the NRC and BLM staffs conclude that the potential impacts to waste management for the decommissioning stage of the rail spur would be SMALL.

If the rail spur is not decommissioned, there would be no hazardous, nonhazardous, LLRW or sanitary waste generated.

4.14.2 No-Action Alternative

Under the No-Action alternative, the NRC would not license the proposed CISF project. Therefore, impacts on waste management would not occur, because the generation of wastes from activities associated with the proposed CISF project would not occur. Construction wastes would be avoided because SNF storage pads, buildings, and transportation infrastructure would not be built. Operational wastes would also be avoided because no SNF canisters would arrive for storage. Decommissioning wastes would be avoided because there are no facilities to dismantle or SNF to relocate from the CISF. In the absence of a CISF, the NRC staff assume that SNF would remain onsite in existing wet and dry storage facilities and be stored in accordance with NRC regulations and be subject to NRC oversight and inspection. Site-specific impacts at each of these storage sites would be expected to continue as detailed in generic (NRC, 2013, 2005a) or site-specific environmental analyses. In accordance with current U.S. policy, the NRC staff also assume that the SNF would be transported to a permanent geologic repository, when such a facility becomes available.

4.15 Accidents

This section addresses the environmental impacts of postulated accidents involving the storage of spent fuel at the proposed CISF project. The fuel would be stored in dry storage casks the NRC licensed. The types and consequences of accidents evaluated for the CISF are summarized in this section along with associated environmental impact conclusions.

NRC regulations at 10 CFR Part 72 “Licensing Requirements for the Independent Storage of Spent Nuclear Fuel, High-Level Radioactive Waste, and Reactor-Related Greater than Class C Waste,” require that structures, systems, and components important to safety shall be designed to withstand the effects of natural phenomena (such as earthquakes, tornadoes, hurricanes) and human-induced events without loss of capability to perform their safety functions. NRC siting regulations at 10 CFR 72, Subpart E, “Siting Evaluation Factors,” also require applicants to consider, among other things, physical characteristics of sites that are necessary for safety analysis or that may have an impact on plant design (e.g., the design earthquake). These characteristics are identified, characterized, and considered in determining the acceptability of the site and design criteria of the facility in the NRC’s safety evaluation, which is documented in the Safety Evaluation Report (SER).

Numerous features combine to reduce the risk associated with accidents involving SNF storage at the proposed CISF project. The NRC staff’s safety review verifies that Holtec has incorporated safety features into the design, construction, and operation of the proposed CISF project as a first line of defense to prevent the release of radioactive materials. The NRC staff also confirms that additional measures are designed to mitigate the consequences of failures in the first line of defense.

Consistent with the NRC’s defense-in-depth philosophy, this section describes design basis events that are evaluated to prevent or mitigate the consequences of accidents that could result in potential offsite doses. For some design basis events, such as tornadoes, this section describes how the proposed CISF project would be designed and built to withstand the event without loss of systems, structures, and components necessary to ensure public health and safety. In these cases, the environmental impacts are small because no release of radioactive material would occur. Other design basis events, such as spent fuel-handling accidents, are design basis accidents that Holtec must assume could occur. In these cases, Holtec must show how engineered safety features in the facility mitigate a postulated release of radioactive material. The environmental impacts of design basis accidents are small because Holtec must maintain engineered safety features that ensure that the NRC dose limits for these accidents are met. The basis for impact determinations for design basis events (i.e., whether the accident is prevented or mitigated) is described for each type of design basis event presented in this section. The consequences of a severe (or beyond-design-basis) accident, if one occurs, could be significant and destabilizing. The impact determinations for these accidents, however, consider the low probability of these events. The environmental impact determination with respect to severe accidents, therefore, is based on the risk, which the NRC defines as the product of the probability and the consequences of an accident. This means that a high-consequence low-probability event, like a severe accident, could result in a small impact determination, if the risk is sufficiently low.

Design Basis Events, Design Basis Accidents, and Severe Accidents

Design basis events are conditions of normal operation, design basis accidents, external events, and natural phenomena, for which the facility must be designed to ensure the capability to prevent or mitigate the consequences of accidents that could result in potential offsite exposures (NRC, 2007).

Design basis accidents are postulated accidents that are used to set design criteria and limits for the design and sizing of safety-related systems and components (NRC, 2007).

Severe accidents, or beyond-design basis accidents, are accidents that may challenge safety systems at a level much higher than expected.

In the safety analysis report for the proposed CISF project (Holtec, 2019b), Holtec evaluates four categories of design events based on the NRC's standard review plan for spent fuel dry storage facilities (NRC, 2000). The four categories encompass a range of events including normal, off-normal, and accidental events. Specifically, Design Events represent those associated with normal operations. These events are expected to occur regularly or frequently. Examples of normal events include receipt, inspection, unloading, maintenance, and loading of a transportation package; transfer of loaded storage casks to the storage pads; and handling of radioactive waste generated as part of the operation of the proposed facility. The impacts from these events are similar to those of normal operations at the proposed CISF project (EIS Section 4.13.1.2), and are therefore anticipated to be SMALL.

Design Events II represent those associated with off-normal operations that can be expected to occur with moderate frequency, or approximately once per year. These events could result in members of the general public being exposed to additional levels of radiation beyond those associated with normal operations. During normal operations and off-normal conditions, the requirements of 10 CFR Part 20 must be met. In addition, the annual dose equivalent to any individual located beyond the controlled area must not exceed 0.25 mSv [25 mrem] to the whole body, 0.75 mSv [75 mrem] to the thyroid, and 0.25 mSv [25 mrem] to any other organ.

Off-normal events Holtec evaluated for the proposed CISF project (Holtec, 2019b) included off-normal pressure within a SNF storage canister, off-normal environmental temperature, leakage of an SNF storage canister seal weld, partial blockage of air inlet and outlet ducts in a SNF cask, hypothetical wind, and cask drop below the design allowable height. Holtec's safety evaluation of these off-normal events concluded that the proposed storage system would not exceed applicable 10 CFR 72.106(b) dose limits to individuals at or beyond the controlled area boundary and satisfies applicable acceptance criteria for maintaining safe operations regarding criticality, confinement, retrievability, and instruments and control systems (Holtec, 2019b). The NRC staff's review and acceptance of the Holtec off-normal design basis events analysis is contingent upon the completion of the NRC SER for the proposed CISF project. The NRC safety review staff evaluates Holtec's off-normal events analysis, determines if the required safety criteria have been met with any necessary acceptable safety margin, and documents the results of that review in the FSER. The NRC cannot grant a license for construction and operation of the proposed CISF project until it determines that all regulatory requirements of the AEA and NRC are satisfied. If the NRC safety review of Holtec's off-normal event's analysis is satisfactory, then the environmental impacts associated with off-normal events would be SMALL.

Design Events III represent infrequent events that could be reasonably expected to occur over the lifetime of the dry cask storage facility, while Design Events IV represent extremely unlikely events or design basis accidents that are postulated to occur because they establish the conservative design basis for systems, structures, and components important to safety. The dose from any credible design basis accident to any individual located at or beyond the nearest boundary of the controlled area may not exceed that specified in 10 CFR 72.106; specifically, the more limiting total effective dose equivalent of 0.05 Sv [5 rem] or the sum of the deep dose equivalent to and the committed dose equivalent to any individual organ or tissue (other than eye lens) of 0.05 Sv [50 rem]; a lens dose equivalent of 0.15 Sv [15 rem]; and a shallow dose equivalent to skin or any extremity of 0.5 Sv [50 rem].

Accident events Holtec evaluated for the proposed CISF project (Holtec, 2019b) included fire; partial blockage of SNF storage canister basket vent holes; tornado missiles; flood; earthquake; rupture of all fuel rods in a SNF storage canister; confinement boundary release; explosion;

lightning; complete blockage of air inlet and outlet ducts; burial under debris; extreme environmental temperature; cask tipover; cask drop; loss of shielding; adiabatic heatup; accidents at nearby sites; building structural failure onto structures, systems, and components; and rupture of all fuel rods in a SNF storage canister coincident with other accident events. Holtec's safety evaluation of these accident events concluded that the proposed storage system would not exceed applicable 10 CFR 72.106(b) dose limits to individuals at or beyond the controlled area boundary and satisfies applicable acceptance criteria for maintaining safe operations regarding criticality, confinement, retrievability, and instruments and control systems (Holtec, 2019b). The NRC staff's review and acceptance of the Holtec accident analysis is contingent upon the completion of the NRC FSER for the proposed CISF project. The NRC safety review staff evaluates Holtec's accident analysis, determines if the required safety criteria have been met with any necessary acceptable safety margin, and documents the results of that review in the FSER. The NRC cannot grant a license for construction and operation of the proposed CISF project until it determines that all regulatory requirements of the AEA and NRC are satisfied. If the NRC safety review of Holtec's accident analysis is satisfactory, then the environmental impacts associated with accident events would be SMALL.

The natural hazards that climate change could affect, which are important to the proposed CISF project siting and design, include flood and high-wind hazards. The timeframe for considering these hazards in this EIS is the proposed 40-year license term. The amount and rate of future climate change depends on current and future human-caused emissions (GCRP, 2014). Quantitative expressions, such as the amount of projected changes in rainfall or ambient temperature extend to the end of the century. To whatever extent climate change alters the magnitude and frequency of natural phenomena during the proposed CISF project license term, the NRC's oversight authority over the CISF is the mechanism that addresses the impact of natural hazards. Under current NRC regulations applicable to dry cask storage facilities, the NRC requires that Holtec include design parameters on the ability of the storage casks and facilities to withstand severe weather conditions such as hurricanes, tornadoes, and floods. To this end, the NRC safety staff have evaluated the proposed CISF project to ensure that performance of the safety systems, structures, and components will be maintained in response to natural phenomena hazards. In the event of impacts climate change induced, such as increases in ambient temperature, rainfall patterns, and the severity of weather events, which occur gradually over long periods of time, the NRC regulations (e.g., 10 CFR 72.172, "Corrective Action") require licensees to implement corrective actions to identify and correct conditions adverse to safety. In summary, the CISF is designed to withstand the design basis accidents without losing safety functions. If climate change influences on natural phenomena create conditions adverse to safety, the NRC has sufficient time to require corrective actions to ensure that spent fuel storage at the proposed CISF project proceeds with minimal impacts for the term of the license. In addition, in order for the 40-year license to be extended with a 40-year renewal, the NRC staff would conduct another safety and environmental review to determine whether to grant the license extension. Those reviews would consider current and projected conditions at the time of renewal.

Overall, the NRC-licensed dry cask storage systems included in the Holtec CISF proposal are designed to withstand all normal and off-normal events (Design Events I and II) and postulated design basis accidents (Design Events III and IV) with no loss of the safety functions. In addition, the potential effects of climate changes over time can be addressed as needed by NRC oversight and required corrective actions. Based on the NRC staff's analysis, the overall environmental impact of the accidents at the proposed CISF project during the license term is SMALL because safety-related structures, systems, and components are designed to function during and after these accidents.

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5 CUMULATIVE IMPACTS

5.1 Introduction

The Council on Environmental Quality's (CEQ's) regulations regarding National Environmental Policy Act (NEPA) define cumulative effects as "the impact on the environment which 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 other actions" [Title 40 of the *Code of Federal Regulations* (CFR) 1508.7]. Cumulative effects, synonymous with cumulative impacts, can result from individually minor but collectively significant actions taking place over a period of time. A proposed project could contribute to cumulative effects when its environmental impacts overlap with those of other past, present, or reasonably foreseeable future actions. For this environmental impact statement (EIS), other past, present, and future actions considered in the analysis for the proposed consolidated interim storage facility (CISF) project include (but are not limited to) potash mining, oil and gas production, other nuclear facilities, and wind and solar farms.

This analysis of the potential cumulative impacts from the proposed CISF project was based on publicly available information about existing and proposed projects, information in the Environmental Report (Holtec, 2019a) and the Safety Analysis Report (Holtec, 2019b) for the HI-STORE CISF, Holtec's responses to the U.S. Nuclear Regulatory Commission (NRC) requests for additional information (RAI) (Holtec, 2019c), general knowledge of the conditions in southeast New Mexico and in the nearby communities, and information about reasonably foreseeable future actions that could occur. Only past, present, and reasonably foreseeable future actions within the broadest geographic scope of analysis for an individual resource area {80-kilometers (km) [50-miles (mi)] radius for Geology and Soils} are described in the next sections; however, each resource area may further delineate a narrower geographic scope of the analysis, as necessary {e.g., the analysis for land use is evaluated within a 10-km [6-mi] radius}.

EIS Section 5.1.1 describes other past, present, and reasonably foreseeable future actions considered in the cumulative impacts analysis. The methodology used to conduct the cumulative impacts analysis in this EIS is provided in Section 5.1.2.

5.1.1 Other Past, Present, and Reasonably Foreseeable Future Actions

The proposed CISF project would be located 51 km [32 mi] east of Carlsbad, New Mexico and 55 km [34 mi] west of Hobbs, New Mexico in Lea County, New Mexico (EIS Figure 2.2-1). The vicinity of the proposed CISF project area is predominantly rural, with limited development outside the cities of Carlsbad and Hobbs. The land surrounding the proposed CISF project area is predominantly used for cattle grazing; potash mining; and oil and gas exploration, development, and industry. There are currently three facilities within the region of the proposed CISF project area that are licensed to handle nuclear material, and another facility currently undergoing license review. The NRC staff used the EISs (or supporting documents) for these four facilities, the management plans for the U.S. Bureau of Land Management (BLM)-owned lands in the vicinity, the development plans for both the City of Carlsbad and the City of Hobbs, and other publicly available information to determine past, present, and reasonably foreseeable future actions in the vicinity of the proposed CISF project area.

5.1.1.1 Mining and Oil and Gas Development

The Permian Basin is one of the largest and most active oil basins in the United States and has recently risen to be the world's top oil producer (Rapier, 2019). It covers more than 220,000 km^2 [86,000 mi^2], stretching approximately from Lubbock, Texas, to the Rio Grande and into southeast New Mexico and includes the Delaware Basin, Central Basin Platform, and the Midland Basin (EIA, 2018). The area continues to be the focus of extensive exploration, leasing, development, and production of oil and gas with the most heavily concentrated area of wells being located in eastern Eddy County and western Lea County (BLM, 2018). The proposed CISF project area is located in the middle of the Permian Basin oil hub, near the Lea County and Eddy County borders. Lea County and Eddy County are consistently the top two producers of oil in the State and rank in the top five in gas production (Sites Southwest, 2012). The oil and gas industry in the region is anticipated to continue to have stable production output with some expansion over the foreseeable future (EIA, 2019a; BLM, 2018). Both counties have economies driven by the oil and gas industries, which tend to cycle through periods of booms and busts, resulting in the push for both Lea and Eddy County to diversify their local economies while still supporting continued development of oil and gas industry infrastructure and support services, such as additional housing and improved water systems (Lea County, 2005; Consensus Planning, 2017). For example, the Double Eagle Water Supply System improvement project is expected to continue through approximately 2020 and include the addition of 8 km [5 mi] of waterline to increase water supply to Carlsbad and oil and gas extraction facilities (Onsurez, 2018). In Artesia, New Mexico, in addition to oil and gas extraction is the HollyFrontier Navajo Refinery. HollyFrontier is an independent petroleum refiner that produces gasoline, diesel fuel, jet fuel, specialty lubricant products, and specialty and modified asphalt. The Navajo Refinery has a crude oil capacity of 100,000 barrels per day and can process several types of crude oils. Inputs to the refinery are mainly from the Permian Basin in west Texas and southeast New Mexico, serving markets in the southwestern United States and northern Mexico (HollyFrontier, 2019).

Potash mining is also a major part of Lea and Eddy County economies. Mosaic and Intrepid Mining LLC (Intrepid), the two largest producers of potash in New Mexico, have multiple operations in both counties (Sites Southwest, 2012). Near Carlsbad, Intrepid has a solar evaporation mine and an underground mine where a rare, naturally occurring mineral called langbeinite is extracted (Intrepid, 2019). The Intrepid North Plant is located within 10 km [6 mi] of the proposed CISF project area and immediately adjacent to the proposed rail spur. The NRC staff does not anticipate that potash mining operations would cease or slow down for the foreseeable future. Besides the Intrepid North Plant, there are six other active potash mines in Eddy County (Consensus Planning, 2017). Based on historic market trends, the demand for potash will likely gradually increase over time, causing an increase in new mining operations over the next 20 to 30 years (BLM, 2018). Ochoa Sulphate of Potash Mine (SOP) is a fertilizer production operation that plans to use room-and-pillar mining to extract polyhalite/sulphate potash from the Rustler Formation method, and will be approximately 25 km [15.5 mi] south-southeast of the proposed CISF encompassing over 12,599 ha [31,134 ac] in southwest Lea County (BLM, 2014). Once mined and processed, the final product would then be transported via truck to a loadout facility near Jal, New Mexico, loaded onto trains, and shipped (BLM, 2014). In 2014, BLM published a Final EIS on the Ochoa Mine which evaluated the environmental impacts of the SOP and estimated that at full production, approximately 4.99 million tonnes per year [5.5 million short tons per year] of polyhalite ore would be processed. PolyNutra, the owners of the SOP project expect the mine to have a life of 38 years and plan to complete construction in early 2021 with production starting in late 2021 (PolyNutra, 2017).

Caliche is mined near the surface and is crushed for use in surface roads and pads for the oil and gas industry, as well as other road construction activities. There is one caliche mine in Eddy County, and although caliche forms the basis of the Llano Estacado throughout northern and central Lea County, desirable caliche only occurs sporadically in the southern portion of Lea County (Consensus Planning, 2017; BLM, 2018). Both Lea County and Eddy County have high potential for the development of caliche, and as the oil and gas industry continues to grow over the next 20 to 30 years, the demand for caliche will increase (BLM, 2018).

Salt has been mined since 1931 in the vicinity of the proposed CISF project with variable production (BLM, 2018). There are currently three salt mines in Eddy County (Consensus Planning, 2017). According to BLM (BLM, 2018), the potential for development of salt mines is high, but because of the unpredictable demand, it is not possible to anticipate the actual land development areas.

Historically, there were 32 permitted brine well operations in New Mexico, with the majority of those located in Lea and Eddy County. After a collapse of two brine wells in Eddy County in 2008, a moratorium was placed on new brine wells (Consensus Planning, 2017). Currently there are only nine active brine wells in New Mexico and only one in Eddy County.

5.1.1.2 Nuclear Facilities

The Waste Isolation Pilot Plant (WIPP) is located approximately 25 km [16 mi] south of the proposed project area. WIPP is a permanent disposal facility for transuranic (TRU) waste. The disposal area is located 655 meters (m) [2,150 feet (ft)] underground in large panels mined out of the salt rock beds (WIPP, 2019a). The facility is the nation's only deep geologic repository (WIPP, 2019b) and currently consists of eight panels, with two more panels planned (WIPP, 2019a). Operational since March 1999, WIPP has disposed of defense-generated TRU waste from over 22 generator sites across the nation (WIPP, 2019c) and is a major employer in Eddy County (Consensus Planning, 2017).

Approximately 60 km [37 mi] southeast of the proposed CISF project, near Eunice, New Mexico, there is an operating uranium enrichment facility known as the National Enrichment Facility (NEF). It is currently the only operating commercial enrichment facility in the United States, producing approximately one-third of the nation's annual enriched uranium for commercial nuclear power reactors (Urenco, 2019). The uranium is enriched by vaporizing solid uranium hexafluoride and then feeding it into a centrifuge, after which it is compressed, cooled, and stored (Urenco, 2019). The NRC licensed NEF in 2006 for 30 years (NRC, 2012a), and it began operation in 2010 (Urenco, 2019). The environmental impacts as assessed during the licensing processes were primarily deemed to be small, with the exception of the positive impact of increased tax revenue (NRC, 2005b).

Waste Control Specialists (WCS) is a company that provides treatment, storage, and disposal of Class A, B, and C LLRW, as defined by 10 CFR 61.55, hazardous waste and byproduct materials. WCS's facility is located on the Texas side of the New Mexico-Texas border, east of Eunice, New Mexico, approximately 72 km [45 mi] from the proposed CISF project (EIS Figure 5.1-1). Because Texas is an Agreement State, WCS is regulated by the Texas Commission on Environmental Quality (TCEQ) and is licensed by the TCEQ to dispose LLRW and by-product material in Andrews County, Texas (TCEQ, 2019). Class A, B, and C LLRW is disposed of by burying waste near-surface in concrete-lined cells on top of a 183-m [600-ft]-thick red-bed clay, which serves as a natural inhibitor to infiltration (WCS, 2019). The TCEQ's safety and environmental analysis regarding WCS concluded that, as authorized in the

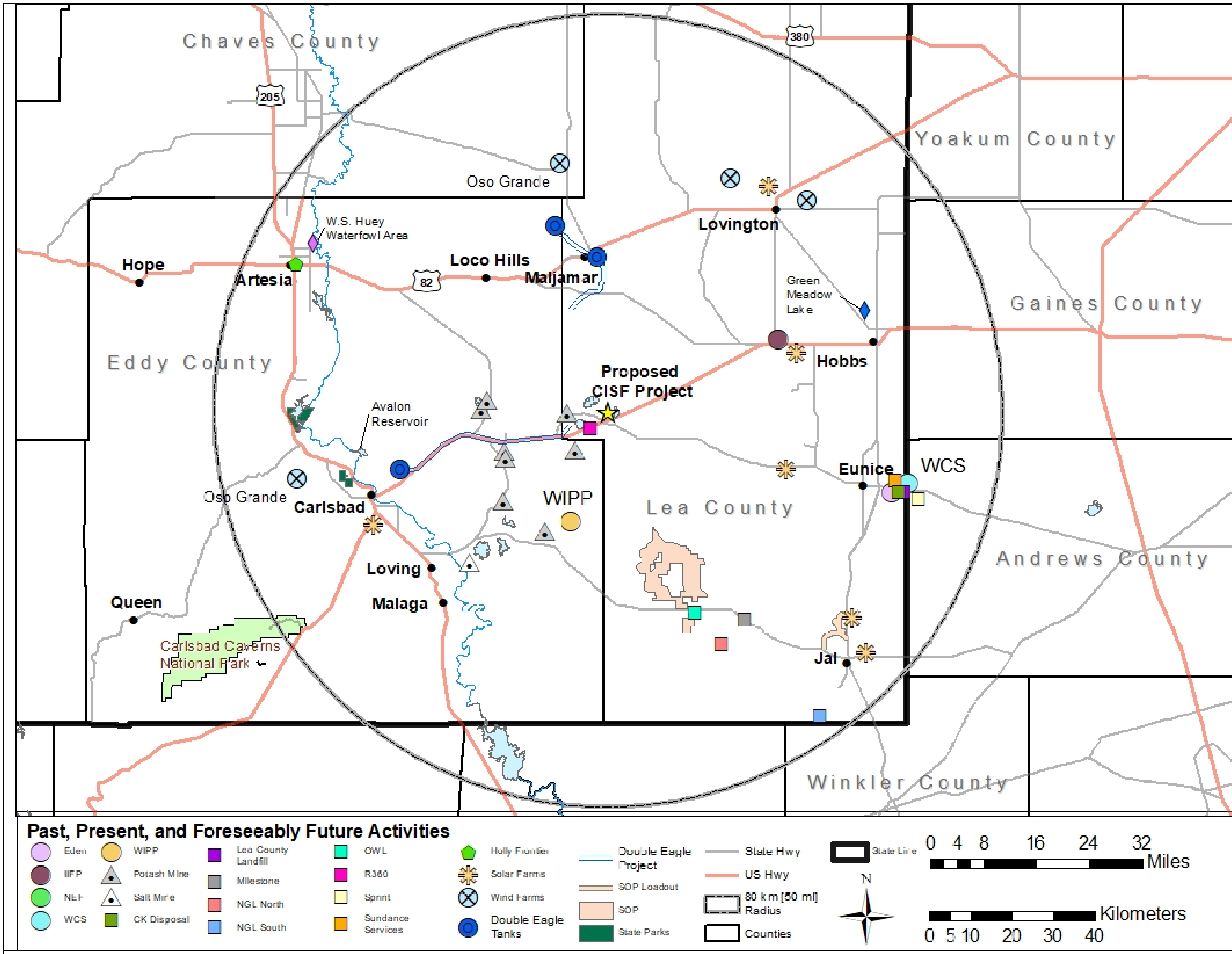

Figure 5.1-1 Location of Facilities within 80 km [50 mi] of the Proposed CISF Project

license, WCS's actions would protect health and minimize danger to life and the environment (TCEQ, 2019). In addition, WCS can currently store, but not dispose of, Greater-Than Class C (GTCC) and transuranic waste. These WCS disposal and storage capabilities are ongoing at the site.

In January 2015, TCEQ sent a letter to the NRC with questions concerning the State's authority to license a disposal cell for GTCC, GTCC-like, and transuranic waste. The Commission began considering the issue and undertook actions such as development of a regulatory basis, evaluation of technical issues, and stakeholder engagement activities. In February 2016, the U.S. Department of Energy (DOE) issued a final EIS titled, "Final Environmental Impact Statement for the Disposal of Greater-Than-Class C (GTCC) Low-Level Radioactive Waste and GTCC-Like Waste." The document evaluated disposition paths for GTCC, and the Final EIS identified the preferred alternative as the WIPP geological repository and/or land disposal at generic commercial facilities. In October 2018, DOE issued an environmental assessment (EA) that provides a site-specific analysis of the potential environmental impacts of disposing the entire inventory – 12,000 m^3 [423,776 ft^3] – of GTCC LLRW and GTCC-like waste at WCS (DOE, 2018a). However, publication of these documents by DOE is not a decision on GTCC LLRW disposal. Under the Energy Policy Act of 2005, additional actions would be required by both DOE and Congress. The NRC's actions regarding review of the TCEQ request and determinations regarding GTCC are ongoing. The NRC reviewed the DOE's Final EIS and EA, and has developed a draft regulatory basis for GTCC and transuranic waste disposal (ADAMS Accession No. ML19059A403). The NRC GTCC rulemaking is currently in progress. Thus, because disposal of GTCC at WCS would require completion of these NRC activities and actions by DOE and Congress, a detailed evaluation of this reasonably foreseeable future action is not feasible at this time but is included here for completeness.

In October 2012, the NRC issued a license to International Isotopes Fluorine Products, Inc. (IIFP) for construction and operation of a depleted uranium deconversion facility known as the Fluorine Extraction and Depleted Uranium Deconversion Plant (FEP/DUP) (NRC, 2019). The facility would convert depleted uranium hexafluoride into fluoride products for commercial resale and uranium oxides for disposal (NRC, 2019). The environmental impacts, as assessed during the licensing process, were predominantly small, with air quality during construction potentially being moderate (NRC, 2012b). Since the issuance of the license, no construction activities have occurred.

On June 11, 2019, Eden informed NRC of its intent to submit a license application to construct and operate a Medical Isotopes Production Facility (Eden, 2019a). Licensing of this facility would be subject to NRC regulations at 10 CFR Part 50 (Domestic Licensing of Production and Utilization Facilities); 10 CFR Part 70 (Domestic Licensing of Special Nuclear Materials) to receive, possess, use, and transfer special nuclear materials; and 10 CFR Part 30 (Rules of General Applicability to Domestic Licensing of Byproduct Material) to possess and transport molybdenum-99 for medical applications. Eden has stated its intent to build their facility east of Eunice, New Mexico, 3 km [1.9 mi] west of the New Mexico-Texas State line and 69 km [43 mi] southeast of the proposed CISF (Eden, 2019b). If an NRC license were issues, Eden would anticipate beginning construction in early 2022 and production in late 2024 (Eden, 2019c).

5.1.1.3 Second CISF

In April 2016, WCS submitted a license application to the NRC requesting authorization to construct and operate a CISF for SNF at its existing hazardous and LLRW storage and disposal site in Andrews County, Texas. In 2018, WCS partnered with Orano CIS LLC to form Interim

Storage Partners (ISP), and ISP submitted a revised license application to the NRC for the proposed CISF. The proposed ISP CISF would be co-located with the WCS facilities discussed in the prior section. Similar to the proposed Holtec CISF evaluated in this EIS, the function of the ISP CISF would be to store SNF and reactor-related GTCC LLRW generated at commercial nuclear power reactors. The SNF and reactor-related GTCC LLRW would be transported from commercial reactor sites to the CISF by rail. Although the initial license request is to store 5,000 MTU [5,500 short tons] at the CISF, ISP intends to submit future license amendment requests such that the facility would eventually store up to 40,000 MTU [44,000 short tons]. The NRC is in the process of reviewing the ISP application. The NRC is conducting a safety evaluation that will be documented in a Safety Evaluation Report (SER) and will also prepare an EIS. This is an ongoing evaluation, and the NRC will not make a licensing decision for this facility until the EIS and SER are complete. However, because detailed information about the ISP proposal is available, information about this reasonably foreseeable future action is included where appropriate in this EIS.

5.1.1.4 Solar, Wind, and Other Energy Projects

New Mexico has a high potential for solar energy generation (Roberts, 2018). According to New Mexico's Energy, Minerals, and Natural Resources Department, New Mexico was generating over 254 megawatts (MW) of energy from solar sources as of January 2017, and had plans to generate 1,103 more MW of energy from solar sources within the State of New Mexico (EMNRD, 2017). Within the region, there are six operating solar power facilities: one in Eddy County and five in Lea County (EIA, 2019a) (EIS Figure 5.1-1). SPS5 Hopi is a solar power station located in south Carlsbad, New Mexico (EIA, 2019a). SPS5 Hopi has been operating since late 2011 (EIA, 2019b). In Lea County, there are five operational solar power plants: (i) SPS1 Dollarhide, (ii) SPS2 Jal, (iii) SPS3 Lea, (iv) SPS4 Monument, and (v) Middle Daisy, all of which have been in operation since late 2011, with the exception of Middle Daisy, which began operations in 2017 (EIA, 2019a; EIA, 2019b).

There are currently two operational wind projects located within the region of the proposed CISF project area (EIS Figure 5.1-1). Wildcat Wind Project, owned and operated by Exelon Generation, is located near Lovington, New Mexico, and went into operation in July 2012, producing 27 MW of power for Lea County, New Mexico (Exelon, 2019). Gaines Cavern Wind Project supplies 2 MW of power to Gaines, Texas, and was completed in 2013 (RES, 2019).

According to the American Wind Energy Association, New Mexico is a leader in wind power, growing faster than any other State and with a goal of sourcing at least 50 percent of their energy from renewable sources by 2030 (AWEA, 2018; 2019). The Oso Grande Wind Project is in the development stage at the time of this EIS, with construction estimated to start late in 2019 and to be completed in late 2020. The Oso Grande Wind Project includes a total of 61 wind turbines, some of which would be built in Chaves County, New Mexico, near State Highways 249 and 172, along with an electrical substation. The rest of the wind turbines would be built in Lea and Eddy County, along with transmission lines. According to the contractors, the expected annual energy production is expected to power over 100,000 homes and reduce carbon emissions by 688,000 metric tons [758,390 short tons] annually (EDF, 2019a; EDF, 2019b).

Xcel Energy is currently in the process of completing of their Power for the Plains Project, which is a project designed to improve the reliability of the existing transmission grid and provide an outlet for additional wind generation. The project plans to build new transmission lines and related facilities through portions of New Mexico and Texas (Xcel, 2019a). Power for the Plains involves the addition of two substations, construction of at least four new transmission lines, and the rebuilding of four power lines in Eddy and Lea Counties (Xcel, 2019b).

5.1.1.5 Housing Development and Urbanization

In addition to the energy projects previously described, there are several proposed and existing urban development projects within the region of the proposed CISF.

One of the goals stated in Lea County's most recent Comprehensive Plan is to increase housing in Lea County by 2025, as well as to increase the diversity in types of housing, including rentals, multi-family homes, and high-end homes (Lea County, 2005).

The City of Carlsbad is directing development efforts toward improving previously developed areas and areas that, if improved, would contribute to overall community services and facilities (Sites Southwest, 2012). There are a few exceptions to this plan, such as a new housing plan announced in March 2019, to provide temporary housing with 400 beds for oil workers (KRQE, 2019). Overall, it is the goal of the City of Carlsbad to ensure that future development and urbanization does not negatively impact the city's environmental resources, and the City is making efforts to protect water quality and wildlife, harvest storm water for irrigation and aquifer recharge, and adopt water conservation techniques (Sites Southwest, 2012). The City of Carlsbad recognizes the need for improved water and wastewater systems to support new housing developments and facilities, and funds have been allocated for future water and wastewater system rehabilitations (Sites Southwest, 2012).

5.1.1.6 Recreational Activities

Major National and State parks and recreational areas in the region of the proposed CISF project area are shown in EIS Figure 5.1-1. Carlsbad Caverns National Park is located south of Carlsbad and contains some of the largest caves in North America, including Carlsbad Caverns. Carlsbad Wilderness is desert backcountry surrounding Carlsbad Caverns National Park. The Guadalupe Back Country Byway west of Carlsbad is a 48-km [30-mi] road, which ascends about 915 m [3,000 ft] from the Chihuahuan Desert into the Guadalupe Mountains. The Living Desert Zoo and Gardens is located in Carlsbad and is dedicated to the interpretation of the Chihuahuan Desert. Brantley Lake State Park, located between the cities of Carlsbad and Artesia, includes a 1,214-ha [3,000-ac] lake on the Pecos River, created by construction of the Brantley Dam. Avalon Reservoir located 4.8 km [3 mi] north of Carlsbad, is a shallow 27-ha [66-ac] lake on the Pecos River and is stocked for fishing by the New Mexico Department of Fish and Game (NMDFG). The W.S. Huey Waterfowl Area, located northeast of Artesia, is a stopping and resting area for migrating waterfowl, including sandhill cranes and snow geese. Green Meadow Lake Fishing Area, located north of Hobbs, is stocked for fishing by the NMDFG. Local parks and recreational facilities (e.g., sport complexes, swimming pools, golf courses, hiking and biking trails, shooting ranges, and lakes) are also maintained by the cities of Carlsbad, Hobbs, Artesia, and Lovington.

5.1.1.7 Other Projects

R360 (also known as the Lea Land, Inc. industrial waste landfarm) provides bioremediation of wellsite waste, disposal and recycling of nonhazardous oilfield operation materials, transportation of drilling waste, and other waste management services in support of the oilfield industry (R360, 2016). R360 has a facility across U.S. Highway 62, approximately 3.2 km [2 mi] southwest of the proposed project area and is approximately 130 ha [321 ac]. NMED has received a request from R360 for a major modification to their current permit, which would modify and expand their current operations (NMEMNRD, 2019a, b). The expanded facility would consist of 12 evaporation ponds, and approximately 187.3 ha [463 ac] would be set aside for permanent disposal of exempt and non-hazardous oilfield waste (NMEMNRD, 2019b).

There are multiple existing and foreseeable waste disposal companies in the cumulative impacts study area, including Sundance Services, Lea County Sanitary Waste Landfill, and Sprint Andrews County Disposal. Sundance Service is a full-service oilfield waste disposal facility with two existing facilities: one in Eunice, NM (Parabo Facility), and the other located 8 km [5 mi] east of Eunice, New Mexico, near the New Mexico-Texas State line (Sundance, 2015). Together, the two facilities are approximately 340 ha [840 ac]. Since starting operations in 1978, Sundance Services has disposed both exempt (e.g., produced waters, drilling fluids, and drill cuttings) and non-exempt (e.g., waste solvents, cleaning fluids, and used hydraulic fluids) hazardous waste (Sundance, 2015). Sundance Services has proposed opening a new facility, Sundance West, 4.8 km [3 mi] east of Eunice, New Mexico, adjacent to the existing facility approximately 60.5 km [37.6 mi] east-southeast from the proposed CISF (Gordon Environmental, 2016). Sundance West would replace the older Sundance facility and include a liquid oilfield waste processing area and an oilfield waste landfill (Gordon Environmental, 2016). Construction of the new 129 ha [320 ac] facility would be phased over 4 years after the issuance of the final permit (Gordon Environmental, 2016); a draft, tentative permit was released in January 2017 (NMEMNRD, 2017).

The Lea County Sanitary Waste Landfill is approximately 62.7 km [37.6 mi] east-southeast of the proposed CISF project area. Lea County Sanitary Waste Landfill estimates that they annually receive: 90.7 metric tons [100 short tons] each of treated formerly characteristic hazardous waste, offal, sludge, and spill waste; 454 metric tons [500 short tons] each of industrial solid waste, petroleum-contaminated soils, and other solid waste; and up to 2,268 metric tons [2,500 short tons] of asbestos waste.

Sprint Andrews County Disposal is a waste disposal facility currently in the planning phase, which if built, would be on WCS-owned property, less than 3.2 km [2 mi] southeast of the second proposed CISF site (EIS Section 5.1.1.3) and 65.9 km [40.9 mi] east-southeast of Holtec's proposed CISF site (BME, 2018). The Sprint facility would store, treat, reclaim, and dispose non-hazardous oil and gas waste (BME, 2018). The facility would cover 66.8 ha [165 ac] and would consist of four processing units and an evaporation pond (BME, 2018). The capacity of the facility, if permitted, would be 8,764,408 m^3 [11,463,414 yd^3], making the expected life of the facility 36 years (BME, 2018).

The Oilfield Water Logistics (OWL) Surface Waste Management Facility 35.4 km [22 mi] northwest of Jal, New Mexico is a new 218.5 ha [540 ac] oil and gas landfill, capable of handling over 400 loads per day of mud, cuttings, and other oil and gas solid wastes (OWL, 2018a,b). The OWL facility opened in 2019 and is approximately 44.2 km [27.4 mi] southwest of the proposed CISF (OWL, 2018b). Additionally, there are three potential waste facilities in Lea County, New Mexico that currently have submitted permit applications to NMED (NMEMNRD, 2019a). Milestone Environmental Services and NGL are the applicants for the proposed facilities. The proposed Milestone facility would be a 4 ha [10 ac] oilfield waste landfill 22.5 km [14 mi] west of Jal, New Mexico and 50.7 km [31.5 mi] south-southeast of the proposed CISF and would operate an Underground Injection Control Class II disposal well for the injection of slurry into the subsurface (NMEMNRD, 2019c). The first of the NGL facilities, NGL North, would be located approximately 27 km [17 mi] west of Jal, New Mexico and 52.8 km [32.8 mi] south-southeast of the proposed CISF and consist of 122.6 ha [303 ac] for non-hazardous oilfield waste (NMEMNRD, 2019d). NGL's second proposed facility, NGL South, would be located a little over 12.8 km [8 mi] southwest of Jal, New Mexico and 75.7 km [47 mi] south-southeast of the proposed CISF (NMEMNRD, 2019e). The facility would consist of 72.8 ha [180 ac] for non-hazardous oilfield waste (NMEMNRD, 2019e).

5.1.2 Methodology

The NRC's general approach for assessing cumulative impacts is based on principles and guidelines described in the CEQ's *Considering Cumulative Effects under the National Environmental Policy Act* (CEQ, 1997) and relevant portions of the EPA's *Considerations of Cumulative Impacts in EPA Review of NEPA Documents* (EPA, 1999). Based on these documents, the NRC's regulations in Title 10 of the *Code of Federal Regulations* (10 CFR) Part 51, and NRC's guidance for developing EISs in NUREG–1748 (NRC, 2003), the NRC developed the following methodology for assessing cumulative impacts in this EIS:

1. Identify the potential environmental impacts of the proposed action, and evaluate the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions for each resource area. Potential environmental impacts of the proposed action are discussed and analyzed in EIS Chapter 4.

2. Identify the geographic scope for the analysis for each resource area. This scope will vary from resource area to resource area, depending on the geographic extent over which the potential impacts may occur.

3. Identify the timeframe for assessing cumulative impacts. The selected timeframe begins with NRC acceptance of the application for an NRC license to operate the proposed Holtec CISF Project on March 31, 2017. The cumulative impacts analysis timeframe ends in approximately 2060, the date estimated for the expiration of the initial license. The licenses that the NRC issues for 10 CFR Part 72 storage facilities (such as for the proposed CISF) are typically granted for a 40-year period. As discussed in Chapter 1 of this EIS, Holtec proposes to build the CISF project in 20 phases (Phases 1-20). In its license application, Holtec requests authorization for the initial phase (Phase 1) of the proposed CISF project. Holtec plans to subsequently request amendments for each of 19 expansion phases of the proposed CISF (a total of 20 phases) to be completed over the course of 20 years, to expand the facility to eventually store up to 10,000 canisters of SNF (Holtec, 2019a). Holtec's expansion of the proposed project (i.e., Phases 2-19) is not part of the proposed action currently pending before the agency. However, as a matter of discretion, the NRC staff considered these expansion phases in its impacts analysis in Chapter 4 of this EIS and carries forth those impacts into the description of cumulative impacts in this chapter, where appropriate, so as to conduct a bounded analysis for the proposed CISF project. Therefore, impacts are described in terms of the proposed action (Phase 1) and full build-out (Phases 1-20). Holtec has estimated that each phase will take a year to construct, while decommissioning would take 2 years.

4. Identify ongoing and prospective projects and activities that take place or may take place in the area surrounding the project site. These projects and activities are described in EIS Section 5.1.1.

5. Assess the cumulative impacts for each resource area from the proposed CISF project, and other past, present, and reasonably foreseeable future actions. This analysis would take into account the environmental impacts identified in Step 1 and the resource-area-specific geographic scope identified in Step 2.

The following terms, as defined in NUREG–1748 (NRC, 2003), describe the level of cumulative impact:

SMALL: The environmental effects are not detectable or are so minor that they would neither destabilize nor noticeably alter any important attribute of the resource considered.

MODERATE: The environmental effects are sufficient to alter noticeably, but not destabilize, important attributes of the resource considered.

LARGE: The environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource considered.

The NRC staff recognize that many aspects of the activities associated with the proposed CISF project would have SMALL impacts on the affected resources, as described in EIS Chapter 4. It is possible, however, that an impact that may be SMALL by itself, but could result in a MODERATE or LARGE cumulative impact when considered in combination with the impacts of other actions on the affected resource. Likewise, if a resource is regionally declining or imperiled, even a SMALL individual impact could be significant if it contributes to or accelerates the overall resource decline. The NRC staff determined the appropriate level of analysis that was merited for each resource area that the proposed CISF project potentially affected. The level of analysis was determined by considering the impact level to the specific resource, as well as the likelihood that the quality, quantity, and stability of the given resource could be affected. EIS Table 5.1-1 summarizes the potential cumulative impacts of the proposed CISF project on environmental resources the NRC staff identified and analyzed for this EIS, which are then detailed in the subsequent sections. The potential cumulative impacts take into account the other past, present, and reasonably foreseeable activities identified in EIS Section 5.1.1.

Table 5.1-1 Summary Table of Environmental Impacts of the Proposed Action (Phase 1), Phases 2-20, and the Cumulative Impact Considering All Phases

	Proposed Action (Phase 1)*	Phases 2-20*	Cumulative Impact
Land Use	SMALL	SMALL	The proposed project is projected to have a SMALL incremental effect when added to the MODERATE impacts from other past, present, and reasonably foreseeable future actions resulting in an overall MODERATE cumulative impact to land use.

Table 5.1-1 Summary Table of Environmental Impacts of the Proposed Action (Phase 1), Phases 2-20, and the Cumulative Impact Considering All Phases			
	Proposed Action (Phase 1)*	**Phases 2-20***	**Cumulative Impact**
Transportation	SMALL	SMALL for all stages, if reclamation transportation occurs in five or more years	The proposed project is projected to have a SMALL incremental effect for traffic-related impacts for all project stages, if reclamation transportation occurs in 5 or more years, and SMALL incremental effect for the radiological effects of radioactive materials transportation when added to the SMALL impacts from other past, present, and reasonably foreseeable future actions resulting in an overall SMALL cumulative impact to transportation resources.
Geology and Soils	SMALL	SMALL	The proposed project is projected to have a SMALL incremental effect when added to the MODERATE impacts from other past, present, and reasonably foreseeable future actions resulting in an overall MODERATE cumulative impact to geology and soils.

Table 5.1-1 Summary Table of Environmental Impacts of the Proposed Action (Phase 1), Phases 2-20, and the Cumulative Impact Considering All Phases

	Proposed Action (Phase 1)*	Phases 2-20*	Cumulative Impact
Surface Water	SMALL	SMALL	The proposed project is projected to have a SMALL incremental effect when added to the SMALL impacts from other past, present, and reasonably foreseeable future actions resulting in an overall SMALL cumulative impact to surface water.
Groundwater	SMALL	SMALL	The proposed project is projected to have a SMALL incremental effect when added to the MODERATE impacts from other past, present, and reasonably foreseeable future actions resulting in an overall MODERATE cumulative impact to groundwater.

Table 5.1-1 Summary Table of Environmental Impacts of the Proposed Action (Phase 1), Phases 2-20, and the Cumulative Impact Considering All Phases			
	Proposed Action (Phase 1)*	**Phases 2-20***	**Cumulative Impact**
Ecology	SMALL for wildlife and MODERATE for vegetation "No Effect" on Federally listed species, and "No Effect" on any existing or proposed critical habitats	SMALL for wildlife and MODERATE for vegetation "No Effect" on Federally listed species, and "No Effect" on any existing or proposed critical habitats	The proposed project is projected to have a SMALL to MODERATE incremental effect when added to the SMALL to MODERATE impact from other past, present, and reasonably foreseeable future actions resulting in an overall SMALL to MODERATE cumulative impact to ecology. "No Effect" on Federally listed species, and "No Effect" on any existing or proposed critical habitats
Air Quality	SMALL	SMALL	The proposed project is projected to have a SMALL incremental effect when added to the MODERATE impacts from other past, present, and reasonably foreseeable future actions resulting in an overall MODERATE cumulative impact to air quality.

Table 5.1-1 Summary Table of Environmental Impacts of the Proposed Action (Phase 1), Phases 2-20, and the Cumulative Impact Considering All Phases

	Proposed Action (Phase 1)*	Phases 2-20*	Cumulative Impact
Noise	SMALL	SMALL	The proposed project is projected to have a SMALL incremental effect when added to the SMALL impacts from other past, present, and reasonably foreseeable future actions resulting in an overall SMALL cumulative impact to noise.
Historic and Cultural	SMALL. Pending completion of consultation under NHPA Section 106, the NRC staff's preliminary conclusion is that the proposed project would have no effect on historic properties.	SMALL. Pending completion of consultation under NHPA Section 106, the NRC staff's preliminary conclusion is that the proposed project would have no effect on historic properties.	The proposed project is projected to have a SMALL incremental effect when added to the SMALL impact from other past, present, and reasonably foreseeable future actions resulting in an overall SMALL cumulative impact to historic and cultural resources.
Visual and Scenic	SMALL	SMALL	The proposed project is projected to have a SMALL incremental effect when added to the SMALL impact from other past, present, and reasonably foreseeable future actions resulting in an overall SMALL cumulative impact to visual and scenic resources.

Table 5.1-1	**Summary Table of Environmental Impacts of the Proposed Action (Phase 1), Phases 2-20, and the Cumulative Impact Considering All Phases**		
	Proposed Action (Phase 1)*	**Phases 2-20***	**Cumulative Impact**
Socioeconomic	SMALL impact for population, employment, housing, and public services and SMALL to MODERATE and beneficial impact for local finance.	SMALL impact for population, employment, housing, and public services and SMALL to MODERATE and beneficial impact for local finance.	The proposed project is projected to have a SMALL to MODERATE incremental effect when added to the SMALL to MODERATE impacts from other past, present, and reasonably foreseeable future actions resulting in a SMALL to MODERATE cumulative impact in the socioeconomic region of influence.
Environmental Justice	No disproportionately high and adverse impacts to low-income or minority populations	No disproportionately high and adverse impacts to low-income or minority populations	The cumulative impacts would have no disproportionately high and adverse impacts to low-income or minority populations.
Public and Occupational Health	SMALL	SMALL	The proposed project is projected to have a SMALL incremental effect when added to the SMALL impacts from other past, present, and reasonably foreseeable future actions resulting in an overall SMALL cumulative impact to public and occupational health.

Table 5.1-1 Summary Table of Environmental Impacts of the Proposed Action (Phase 1), Phases 2-20, and the Cumulative Impact Considering All Phases			
	Proposed Action (Phase 1)*	**Phases 2-20***	**Cumulative Impact**
Waste Management	SMALL	SMALL to MODERATE until a new landfill becomes available	The proposed project is projected to have a SMALL to MODERATE incremental effect when added to the SMALL impacts from other past, present, and reasonably foreseeable future actions resulting in an overall SMALL to MODERATE cumulative impact to waste management.

*These impact determinations are discussed in further detail in resource area sections of Chapter 4 of this EIS.

5.1.3 License Renewal and Use of the Continued Storage Generic Environmental Impact Statement (CS GEIS)

If the NRC grants a license for the proposed CISF, Holtec would have to apply for license renewal before the end of the initial license term, to continue operations. The license renewal process would require another NRC safety and environmental review for the proposed renewal period.

For the period of time beyond the license term of the proposed CISF, the NRC's CS GEIS (NUREG–2157) and rule at 10 CFR 51.23 apply. The CS GEIS analyzed the environmental effects of the continued storage of SNF at both at-reactor and away-from-reactor ISFSIs (NRC, 2014a).

The Continued Storage GEIS (NUREG–2157) is applicable only for the period of time after the license term of an away-from-reactor ISFSI (i.e., a CISF) (NRC, 2014a). In accordance with the regulation at 10 CFR 51.23(b), the impact determinations from the GEIS are deemed incorporated into this EIS for the timeframe beyond the period following the term of the CISF license. Thus, those impact determinations are not reanalyzed in this EIS.

Section 5.0 of the Continued Storage GEIS indicates several assumptions about the size and characteristics of a hypothetical CISF that were based on characteristics similar to the licensed, but not constructed, Private Fuel Storage Facility (PFSF) (NRC, 2014a). Although some characteristics of the proposed Holtec CISF differ from the PFSF design, the Continued Storage GEIS acknowledges that not all storage facilities will necessarily match the "assumed generic facility," and therefore when it comes to "size, operational characteristics, and location of the facility, the NRC will evaluate the site-specific impacts of the construction and operation of any proposed facility as part of that facility's licensing process." In accordance with the regulation at 10 CFR 51.23(c), this EIS serves as the site-specific analysis of the impacts of construction and operation of the Holtec proposed CISF.

5.2 Land Use

The NRC staff assessed the geographic scope of the analysis on land use within a 10-km [6-mi] radius of the proposed project area, which is a land area of approximately 52,250 hectares (ha) [129,110 acres (ac)]. The timeframe for the analysis of cumulative impacts is 2017 to 2060, as described in EIS Section 5.1.2. Land use impacts result from (i) land disturbance, (ii) interruption, reduction, or impedance of livestock grazing and open wildlife areas, (iii) land access, and (iv) competition for mineral rights. The cumulative impacts on land use were not assessed beyond 10 km [6 mi] from the proposed project area because, at that distance, land use would not be anticipated to influence or be influenced by the proposed CISF project. As part of the NRC scoping process, the NRC staff received comments concerning the presence of dairy and pecan farms in southeastern New Mexico. However, both types of farms are outside of the geographic scope of the analysis for land use and are therefore not analyzed further. Land within a 10-km [6-mi] radius of the proposed project area is privately-owned or owned by BLM or the State of New Mexico (EIS Figure 3.2-1). BLM or the State of New Mexico own the subsurface mineral rights within the land use geographic scope (EIS Figure 3.2-2). Within the geographic scope of the analysis, activities on both private and public lands (e.g., livestock grazing, oils and gas production, and potash mining) are ongoing and projected to continue in the future.

Land use within the region is predominantly rangeland used for livestock grazing (EIS Figure 3.2-3). Cumulative impacts from the loss of rangeland within the geographic scope of the analysis for land use from existing and potential activities include a decrease in the area available for foraging, loss of forage or cropland productivity, loss of animal unit months (AUMs), and loss of water-related range improvements (e.g., improved springs, water pipelines, or stock ponds). An AUM is the amount of forage an animal grazing for one month needs. Another impact could be dispersal of noxious and invasive weed species both within and beyond areas where the surface had been disturbed, which reduces the area of desirable grazing by livestock.

As described in EIS Section 4.2, the land use impacts from full build-out of the proposed CISF project would be SMALL. If only the proposed action (Phase 1) (including the rail spur) was constructed and operated, the impacts would also be SMALL. At full build-out, the proposed CISF project would disturb approximately 133.5 ha [330 ac] and restrict cattle grazing. Over the license term, the amount of land that would be disturbed and fenced would be small {133.5 ha [330 ac]} in comparison to the available grazing land within the land use geographic scope of the analysis {i.e., approximately 52,250 ha [129,110 ac] of land within a 10-km [6-mi] radius of the proposed CISF project}.

Existing and reasonably foreseeable future nuclear facilities within the region are described in EIS Section 5.1.1.2. These facilities include WIPP, NEF, WCS, and FEP/DUP. However, all of these facilities are outside the geographic scope of the analysis for land use that is anticipated to influence or be influenced by construction and operation of the proposed CISF. WIPP is located approximately 25 km [16 mi] southwest of the proposed project area, NEF is approximately 61 km [38 mi] southeast, WCS is approximately 63 km [39 mi] southeast, and FEP/DUP is approximately 37 km [23 mi] northeast.

As described in EIS Section 5.1.1.1, the Permian Basin is the focus of extensive exploration, leasing, development, and production of oil and gas with the most heavily concentrated area of wells located in eastern Eddy County and western Lea County. As described in EIS Section 3.2.4, extensive oil and gas production activities surround the proposed project area. The location of oil and gas wells within and surrounding the proposed CISF project area are shown in EIS Figure 3.2-7. One operating gas well is present within the proposed CISF project area along with 18 plugged and abandoned wells. Impacts on land use from continued oil and gas development in the land use geographic scope would include construction of temporary access roads and 1.2-ha [3-ac] drill pads for each drill site (BLM, 2009). In addition, continued oil and gas development in the geographic scope of the analysis may lead to the need for additional support infrastructure such as compressor stations and pipelines to move oil and gas to market. EIS Figures 3.2-6 and 3.2-9 show oil and gas support facilities and pipelines surrounding the proposed CISF project area. As shown in EIS Figure 3.2-8, the majority of land within the geographic scope of the analysis for land use {i.e., land within a 10-km [6-mi] radius of the proposed CISF project} is within the known potash mining leasing area. As such, administrative controls implemented by the New Mexico Oil Conservation Commission, the New Mexico State Land Office, the State of New Mexico, U.S. Department of the Interior, and BLM would ensure that oil and gas development activities and potash mining activities within the geographic scope of the analysis for land use are closely monitored and regulated (Holtec, 2019c).

As described in Section 5.1.1.1, potash mining is a major part of the Eddy and Lea County economies. Intrepid operates two underground potash mines (Intrepid North and Intrepid East) within 9.6 km [6 mi] of the proposed CISF project area (EIS Figure 3.2-6). The Intrepid North mine, located to the west, is no longer mining potash underground; however, surface facilities are currently being used in the manufacture of potash products. The Intrepid East mine, located to the southwest, is still mining underground potash ore (Holtec, 2019a). As discussed in Section 5.1.1.1, based on historic market trends, the demand for potash will likely gradually increase over time, causing an increase in new mining operations over the next 20 to 30 years (BLM, 2018).

As described in EIS Section 5.1.1.3, New Mexico has a high potential for solar energy generation. However, no current or planned solar facilities are located within the geographic scope of the analysis for land use. As further described in EIS Section 5.1.1.3, there are currently two operational wind projects located within the region of the proposed CISF project area. However, both projects are outside of the geographic scope of the analysis for land use. If any future wind energy projects are developed in the region, they would be generally compatible with other land uses, including livestock grazing, recreation, and oil and gas production activities (BLM, 2005), with long-term disturbance associated with permanent facilities (i.e., access roads, support facilities, and tower foundations) (BLM, 2011).

Both urban development (EIS Section 5.1.1.5) and recreational activities (EIS Section 5.1.1.6) in the region all occur outside of the geographic scope of the analysis for land use. Within the geographic scope of the analysis for land use is the R360 oilfield waste facility located 3.2 km [2 mi] southwest of the proposed CISF. The NRC staff anticipates that with the large amount of oil and gas activity in the area that R360 would continue operating. Furthermore, R360 is privately owned and access is restricted to customers of the facility.

The NRC staff have determined that the cumulative impact on land use within the geographic scope of the analysis resulting from past, present, and reasonably foreseeable future actions would be MODERATE. This finding is based on the assessment of existing and potential impacts on land use within the geographic scope from the following actions:

- Land disturbance from existing and future oil and gas production and development activities, such as access road and drill pad construction as well as the oilfield waste facility

- Land disturbance and restrictions on livestock grazing from construction and operation of additional infrastructure (e.g., compressor stations, booster stations, and pipelines) to support existing and future oil and gas production

- Land disturbance and restrictions on livestock grazing from existing and future potash mining

Other existing and reasonably foreseeable future actions are not expected to have a noticeable impact on land use within the land use geographic scope. There are no solar or wind energy generation projects, urban development, or recreation facilities planned within the land use geographic scope. Solar and wind energy projects, if constructed and operated within the geographic scope of the analysis, are generally compatible with the primary land use (i.e., livestock grazing) (BLM, 2005).

5.2.1 Summary

The estimated land disturbance of 133.5 ha [330 ac] at full build-out for the proposed CISF project area is a small amount of land in comparison to the geographic scope of the analysis for land use of 52,250 ha [129,110 ac]. Livestock grazing would be restricted on this amount of land over the license term of the proposed CISF. The 114.5-ha [283-ac] protected area containing the SNF storage pads and cask transfer building within the 133.5-ha [330-ac] storage and operations area would be enclosed by security fencing to restrict and control public access (Holtec, 2019a). At the end of operations, Holtec would decommission the site in accordance with an NRC-approved decommissioning plan. Additionally, Holtec has committed to reclaim and restore the land to its preoperational use of livestock grazing, unless the landowner justifies and approves an alternative use (e.g., the landowner may want to retain roads or buildings) (Holtec, 2019a). Therefore, the NRC staff concludes that at full build-out (Phases 1-20), the proposed CISF would add a SMALL incremental effect to the MODERATE impacts to land use from other past, present, and reasonably foreseeable future actions in the geographic scope of the analysis, resulting in an overall MODERATE cumulative impact in the land use geographic area.

5.3 Transportation

Cumulative transportation impacts related to increases in road traffic were evaluated locally and regionally within a geographic scope of analysis of an 80-km [50-mi] radius of the proposed CISF project. This region was chosen to be inclusive of areas close to the proposed CISF that would be most likely to notice changes in traffic but also consider more distant locations (e.g., WCS) where other nuclear materials facilities engage in transportation of radioactive materials. Because the proposed CISF and other facilities in the region would ship radioactive materials on a national scale, the affected populations along the transportation routes, and therefore the cumulative impact analysis, goes beyond the geographic scope of the analysis to various national origins or destinations. The timeframe for the analysis is 2017 to 2060.

As discussed in EIS Section 4.3.1, the transportation impacts from the proposed CISF project for all stages at full build-out would be SMALL. If only the proposed action (Phase 1) were licensed, the impact would also be SMALL. These impact analyses address the transportation impacts of supply shipments and commuting workers and the radiological and nonradiological impacts to workers and the public under incident-free and accident conditions from operational SNF shipments to and from the proposed CISF. The NRC staff's assessment of nonhazardous reclamation waste shipments during the decommissioning and reclamation stage of the proposed CISF at full build-out concluded that a SMALL impact on daily truck traffic on Highway 62/180 near the proposed CISF project would occur if reclamation occurs over a 5-year or longer period.

Other past, present, and reasonably foreseeable actions, including nuclear materials facilities within the region of the proposed CISF project are described in EIS Section 5.1.1. The NRC staff do not anticipate transportation impacts on the main rail, because of SNF shipments to the proposed CISF. Currently, the rail lines are managed by the rail carriers who direct traffic to maximize utility. While SNF shipments would be travelling at a slower speed than other trains, the NRC staff reasonably assumes that assume that rail carriers would make adjustments to account for SNF shipments. Therefore, the cumulative impact from the proposed CISF SNF shipments with other past, present, and reasonably foreseeable actions would be SMALL. Traffic-generating activities within the geographic scope of the analysis that could overlap with the traffic the proposed CISF activities generated are accounted for in the existing annual average daily traffic counts for area roadways described in EIS Section 3.3. If a second CISF were constructed, the NRC staff anticipates that the increase in traffic associated with the transport of construction materials would most likely come from west Texas proximity and the availability of materials. No other major future traffic-generating projects were identified in Section 5.1.1, and, where applicable, the impact analyses of the proposed CISF in EIS Section 4.3.1 account for the potential for growth in traffic with time based on the historical trend. Therefore, the NRC staff concludes that further analysis of the cumulative traffic-related transportation impacts from the other past, present, and reasonably foreseeable future actions (including traffic volume, safety, and infrastructure wear and tear) would not significantly change the traffic-related impacts previously evaluated in EIS Section 4.3.1 for the proposed CISF. Additionally, worker safety-related transportation impacts (e.g., injuries and fatalities) pertain to individual worker and workplace risks that are not considered to be cumulative in nature, whereas annual occupational radiation exposures are cumulative but are monitored and limited by regulation regardless of workplace. Therefore, the focus of the remaining analysis of the impacts of other past, present, and reasonably foreseeable future actions focuses on public radiation exposure to other current or future radioactive materials shipments.

Within the geographic scope of the analysis for transportation, there are several nuclear materials facilities that are described in EIS Section 5.1.1 and Section 3.12.1.2 including WIPP, NEF, FEP/DUP, and WCS. Because of (i) the locations and distances from these facilities to the proposed CISF project, (ii) the predominant use of roadways to ship radioactive materials relative to the proposed CISF intent to use railways, and (iii) the separate local north-south rail lines serving facilities near Carlsbad and Hobbs, the NRC staff expects the potential for overlapping and accumulating radiation exposures to the public from this transportation (for example, shipments frequently exposing the same people in proximity to the transportation routes) would be low. However, because routes and locations of exposed individuals would vary, the cumulative impact analysis conservatively assumes the population dose estimates from all of these radioactive materials transportation activities are additive and therefore assume that the population is exposed to the radiation from all of the evaluated shipments.

EIS Table 5.3-1 summarizes the results of prior radioactive material transportation impact analyses conducted to evaluate the impacts of the proposed transportation for the aforementioned regional nuclear materials facilities. The analyses were conducted using the

Table 5.3-1 Summary of Available Transportation Risk Assessment Results for Other Facilities Within an 80-km [50-mi] Radius of the Proposed CISF Project				
Facility	**Material Shipped**	**Mode**	**Estimated Incident-Free Impacts (LCF)**	**Estimated Accident Impacts (LCF)**
WIPP	Transuranic Waste	Truck	0.23	2.33×10^{-3}
NEF	UF_6, Depleted UF_6, Residuals and Wastes	Truck	0.009	0.5
FEP/DUP	Depleted UF_6 and LLRW	Truck	0.4	0.6
WCS Disposal	LLRW and Byproduct Material	Truck and Rail	0.4*	0.6*
ISP Proposed CISF at WCS	Spent Nuclear Fuel	Rail	0.09†	0.02†
All Facility Total	Radioactive Material	Truck and Rail	1	2

*No prior transportation impact analysis was identified for WCS disposal operations; therefore, NRC staff assumed that impacts would be similar to the estimated impacts for FEP/DUP which included shipments of LLRW and uranium.

†LCF's for the proposed ISP CISF were estimated by the NRC staff using the representative-route calculation approach described in EIS Section 4.3.1.2.2 scaled by the proposed estimated number of ISP SNF shipments (3,000) at full-build-out.

Source: WIPP (DOE, 2009); NEF (NRC, 2005); FEP/DUP (NRC, 2012b).

RADTRAN, (Version 5 or higher) (Neuhauser et al., 2000) transportation risk assessment software and the TRAGIS routing software (Johnson and Michelhaugh, 2003) based on projected transportation operations, including the materials to be shipped, the packaging, the mode of transportation, the number of expected shipments, the known or expected origin and destinations and estimated routing, the population along routes, and accident rates. The RADTRAN software calculated radiation doses to the exposed population along the routes as well as dose-risks based on the probabilities and consequences of accidents, representing a wide range of severities, and these results were converted to expected latent cancer fatalities (LCF) using applicable conversion factors in the reports that documented the analyses. No available prior transportation risk was located for the WCS waste disposal operations; therefore, the NRC staff assumed that the FEP/DUP facility results were applicable based on similarities in the types of materials shipped.

As shown in EIS Table 5.3-1, the total estimated LCFs for incident-free radioactive materials transportation from decades of national transportation of radioactive materials from these other nuclear materials facilities within the region was one and the total estimated LCFs for transportation accidents was two. While the exposed population was not reported in the source documents, for national interstate transportation, the NRC previously reported that the exposed population along several representative truck and rail routes RADTRAN calculated ranged from 132,939 to 1,647,190 people (NRC, 2014b). Therefore, the estimated incident-free and accident LCFs are on the order of 1 and 2 LCFs per 100,000 or more exposed people, respectively. By comparison, as described in EIS Section 3.12.3, the baseline lifetime risk in the U.S. is 1 in 5 (or 20,000 per 100,000) for anyone developing a fatal cancer (ACS, 2018). Based on this analysis, the cumulative estimated increase in LCFs from potential exposures to radiation from the other regional nuclear material facilities in the region would have a negligible contribution to the number of LCFs expected in the exposed population from the existing baseline national cancer risk described in EIS Section 3.12.3. Therefore, the NRC staff concludes that the potential cumulative public dose impacts from the other past, present, and reasonably foreseeable future actions would be SMALL.

Other past, present, and reasonably foreseeable actions within the geographic scope of the analysis for transportation include solar and wind energy projects (EIS Section 5.1.1.4), urban development (EIS Section 5.1.1.5), recreational activities (EIS Section 5.1.1.6), and oilfield waste facilities (EIS Section 5.1.1.7). The NRC staff accounted for these projects in the analysis of current traffic conditions in EIS Section 4.3 and are not anticipated to contribute to radiological doses. Therefore, these projects contribute to the overall SMALL transportation impact for past, present, and reasonably foreseeable future actions.

5.3.1 Summary

Based on the preceding analysis, the NRC staff have determined that the cumulative impact on transportation in the geographic scope of the analysis resulting from other past, present, and reasonably foreseeable future actions would be SMALL. As described in the preceding analysis, the estimates of combined radiological exposures and associated LCF estimates from radioactive materials transportation associated with currently operating and proposed future facilities in the geographic scope represent a negligible contribution to the baseline cancer risk in the U.S. Considering the aforementioned estimated LCFs from the SNF transportation Holtec proposed for the CISF project at full-build-out of 0.31 public LCFs and 2.21 worker LCFs and the preceding estimated LCF risk from other past, present, and reasonably foreseeable future actions of 3 LCFs, the cumulative LCF risk would remain a negligible contribution to the estimated baseline cancer risk within the exposed populations that were evaluated. Additionally, the NRC staff's assessment of nonhazardous demolition waste shipments during the decommissioning and reclamation stage of the proposed CISF at full build-out concluded a SMALL impact on daily truck traffic on U.S. Highway 62/180 near the proposed CISF project. Therefore, the NRC staff concludes that at full build-out, the proposed CISF would add a SMALL impact for traffic-related impacts during decommissioning and reclamation, and a SMALL impact for the radiological effects of radioactive materials transportation incremental effect to the SMALL impacts to transportation resources from other past, present, and reasonably foreseeable future actions in the geographic scope of the analysis, resulting in an overall SMALL cumulative impact in the transportation geographic area.

5.4 <u>Geology and Soils</u>

The NRC staff assessed cumulative impacts on geology and soils within a geographic scope of analysis of 80 km [50 mi] to capture the large-scale nature of the geologic surface and subsurface formations in the region. The timeframe for the analysis of cumulative impacts is 2017 to 2060.

As described in EIS Section 4.4, the impacts to geology and soils from full build-out of the proposed CISF project would be SMALL. If only the proposed action (Phase 1) were constructed and operated, the impacts would also be SMALL. Impacts to geology and soils during construction, operation, and decommissioning of the proposed CISF project would be limited to soil disturbance, soil erosion, and potential soil contamination from leaks and spills of oil and hazardous materials. As described in EIS Section 4.4.1, Holtec would implement mitigation measures; BMPs; NPDES permit requirements; a Stormwater Pollution Prevention Plan (SWPPP); and a Spill Prevention, Control, and Countermeasures (SPCC) plan to limit soil loss, avoid soil contamination, and minimize stormwater runoff impacts.

Within the geological and soil resources geographic scope, nuclear-related activities, livestock grazing, oil and gas production and oilfield waste facilities, potash mining, solar and wind energy projects, and recreational activities are ongoing and projected to continue in the future (EIS Section 5.1.1).

Existing and reasonably foreseeable future nuclear facilities within the geological and soil resources geographic scope are described in EIS Section 5.1.1.2. These facilities include WIPP, NEF, WCS, FEP/DUP, and Eden. As described previously, approximately 730 ha [1,802 ac] have been or would be disturbed and/or set-aside to support nuclear-related activities at these facilities (Holtec, 2019a). Based on information in the license applications, development of future nuclear-related projects in the region (e.g., the proposed second CISF) would have impacts on geology and soils because of increased vehicle traffic, clearing of vegetated areas, soil salvage and redistribution, discharge of stormwater runoff, and construction and maintenance of project facilities and infrastructure (e.g., roads, pipelines, industrial sites, and associated ancillary facilities). The NRC staff assumes that the development of such projects within the region would be similar to the proposed Holtec CISF project, with similar potential for surface impacts to geology and soils, although specific impact determinations would be made in site-specific licensing reviews of those facilities. The construction and operation of the infrastructure for these future projects would be subject to similar requirements for monitoring, mitigation, and response programs to limit potential surface impacts (e.g., erosion, contamination from spills) as those for the proposed Holtec CISF project. Reclamation and restoration of disturbed areas would mitigate loss of soil and soil productivity associated with project activities.

Other past, present, and reasonably foreseeable future actions in the geology and soils geographic scope include livestock grazing, oil and gas production and oilfield waste processing, and potash exploration and mining. Surface-disturbing activities related to these actions, such as construction of new access roads and drill pads and overburden stripping, would have direct impacts on geological and soil resources. Direct effects on geology and soils from these activities would be limited to excavation and relocation of disturbed bedrock and unconsolidated surface materials associated with surface disturbances. Impacts from these activities include loss of soil productivity due primarily to wind erosion, changes to soil structure from soil handling, sediment delivery to surface water resources (i.e., runoff), and compaction from equipment and livestock pressure. Reclamation and restoration of soils disturbed by historic livestock grazing and exploration activities would mitigate loss of soil and soil productivity, and salvaged and replaced soil would become viable soon after vegetation is established.

As described in EIS Section 5.1.1.1, the Permian Basin is the focus of extensive exploration, leasing, development, and production of oil and gas, with the most heavily concentrated area of wells located in eastern Eddy County and western Lea County. In recent years, fluid injection and hydrocarbon production have been identified as potential triggering mechanisms for numerous earthquakes that have occurred in the Permian Basin (Frohlich et al., 2016). As described in EIS Section 3.4.4, recent seismicity within the geological and soil resources geographic scope in Eddy County approximately 80 km [50 mi] west of the proposed project area is suspected to be induced by wastewater injection from oil and gas production into deep wells. As further described in EIS Section 3.4.4, earthquakes suspected of being induced by wastewater injection west of the proposed project area, as well as in west Texas, typically have magnitudes ranging from 2.5 to 4.0. Potential seismic impacts at the proposed project site are evaluated in the NRC safety evaluation report, including the potential for oil and gas exploration and development activities to induce earthquakes or any other major ground motion.

As discussed in EIS Section 3.4.5, sinkholes and karst fissures formed in gypsum bedrock are common features of the lower Pecos region of west Texas and southeastern New Mexico. New sinkholes form almost annually, often associated with upward artesian flow of groundwater from regional karstic aquifers that underlie evaporitic rocks at the surface (Land, 2003, 2006). A number of these sinkholes are of anthropogenic (man-made) origin and are associated with improperly cased abandoned oil and water wells or with solution mining of salt beds in the shallow subsurface (Land, 2009, 2013). The location of anthropogenic sinkholes and dissolution features in southeastern New Mexico are shown in EIS Figure 3.4-12 and include the Jal, Jim's Water Service, Loco Hills, and the I&W Brine Well, which are located within the geological and soil resources geographic scope. As described previously, the potential for sinkhole development within and surrounding the proposed CISF project area is low because no thick sections of soluble rocks are present at or near the land surface.

As described in EIS Section 5.1.1.1, potash mining is a major part of the Eddy and Lea County economies. The location of potash mine workings in the area of the proposed CISF project are shown in EIS Figure 3.2-8. The potash in area mines is extracted from the Permian Salado Formation at maximum depths of approximately 549 m to 914 m [1,800 to 3,000 ft] (Holtec, 2019b). As discussed in EIS Section 3.4.6, a recent study employing satellite imagery identified significant subsidence in several distinct areas within potash mining areas located approximately 16.1 km [10 mi] west-southwest of the proposed project area (Zhang et al., 2018). A strong correlation was observed between the rate of subsidence and the potash production rate, indicating that potash extraction is the cause of the subsidence (Zhang et al., 2018). As discussed in Section 5.1.1.1, based on historic market trends, the demand for potash will likely gradually increase over time, causing an increase in new mining operations over the next 20 to 30 years (BLM, 2018). However, as discussed in EIS Section 3.2.4, the closest mined potash is approximately 3.2 km [2 mi] from the southwestern boundary of the proposed CISF project area and the closest active potash mines are at a distance of approximately 6.8 km [4.2 mi] from the proposed CISF project area (Holtec, 2019b). At these distances, the NRC staff does not anticipate that the proposed CISF would increase the potential of subsidence from past and active mining activities. In addition, as described in EIS Section 4.2.1.1, Holtec has entered into an agreement with Intrepid to relinquish certain potash mineral rights to the State of New Mexico and is in discussions with the New Mexico State Land Office regarding an agreement to retire potash leasing and mining within the proposed CISF project area (Holtec, 2019a,c). Therefore, the risk of subsidence at the site from potash mining is low.

As described in EIS Section 5.1.1.3, New Mexico has a high potential for solar energy generation. As of January 2017, New Mexico was generating over 254 MW of energy from solar sources and had plans to generate an additional 1,103 MW of energy from solar sources within the State of New Mexico (EMNRD, 2017). Within the cumulative impacts study area for geology and soils, there are six operating solar power facilities: one in Eddy County and five in Lea County (EIA, 2019a) (EIS Figure 5.1-1). Impacts to geology and soils from solar energy projects include use of geologic resources (e.g., sand and gravel) and increased soil erosion. Sand and gravel and/or quarry stone would be needed for access roads. Concrete would be needed for buildings, substations, solar panel array pads and/or foundations, and other ancillary structures. These materials would be mined as close to the potential solar energy site as possible. Soil erosion would result from (i) ground surface disturbance to construct and install access roads, pads/foundations, staging areas, substations, underground cables, and other onsite structures; (ii) heavy equipment traffic; and (iii) surface runoff. Any impacts to geology and soils would be largely limited to the proposed project area. Erosion controls that comply with county, State, and Federal standards would be applied. Implementation of BMPs would limit the impacts from earthmoving and construction activities. Excess excavation material would be stockpiled for use in reclamation activities.

As further described in EIS Section 5.1.1.3, New Mexico is a leader in wind energy generation. There are currently two operational wind projects located within the region of the proposed CISF project area. These projects are located east of the proposed CISF project area near Lovington, New Mexico and Gaines, Texas. Also in the geology and soils geographic scope is another wind energy project (Osa Grande Wind Project) which is under development in Chaves, Eddy, and Lea counties with construction to be completed in 2020 (EIS Section 5.1.1.3). Impacts to geology and soils from wind energy projects include use of geologic resources (e.g., sand and gravel), activation of geologic hazards (e.g., landslides and rockfalls), and increased soil erosion. Sand and gravel and/or quarry stone would be needed for access roads. Concrete would be needed for buildings, substations, transformer pads, wind tower foundations, and other ancillary structures. These materials would be mined as close to the potential wind energy site as possible. Tower foundations would typically extend to depths of 12 m [40 ft] or less. The diameter of tower bases is generally 5 to 6 m [15 to 20 ft], depending on the turbine size. Construction activities can destabilize slopes if they are not conducted properly. Soil erosion would result from (i) ground surface disturbance to construct and install access roads, wind tower pads, staging areas, substations, underground cables, and other onsite structures; (ii) heavy equipment traffic; and (iii) surface runoff. Any impacts to geology and soils would be largely limited to the proposed project area. Erosion controls that comply with county, State, and Federal standards would be applied. Operators would identify unstable slopes and local factors that can induce slope instability. Implementation of BMPs would limit the impacts from earthmoving activities. Foundations and trenches would be backfilled with originally excavated material, and excess excavation material would be stockpiled for use in reclamation activities (BLM, 2005).

Other past, present, and reasonably foreseeable actions within the geographic scope of the analysis for geology and soils include urban development (EIS Section 5.1.1.5), recreational activities (EIS Section 5.1.1.6), and oilfield waste facilities (EIS Section 5.1.1.7). Urban development occurring in Lea County and the Carlsbad area would be planned and developed under the regulations and policies of the local governments. Thus, the NRC staff assume that any new development would be protective of the landscape. Present recreational activities would not be anticipated to impact subsurface geologic systems or soils. National and State parks operate under the policies of park systems which the NRC staff assume would have policies in place to protect the natural environment. Oilfield waste facilities (oilfield landfarms) are owned and operated by private entities that must abide by all applicable State of New Mexico regulations. The occurrence of urban development, recreational activities, and oilfield waste facilities all contribute to the MODERATE impact to geology and soils.

Surface-disturbing activities associated with ongoing and reasonably foreseeable future nuclear-related, energy resource exploration and development (i.e., oil and gas and potash), solar and wind energy projects, urban development, and recreational activities would have direct impacts on geology and soils. Therefore, the NRC staff determines that the cumulative impacts on geology and soils within the geographic scope of the analysis from all past, present, and reasonably foreseeable future actions would be MODERATE. Direct impacts would result from any additional infrastructure constructed because of increased traffic, clearing of vegetated areas, soil salvage and redistribution, and construction of project facilities and infrastructure. In addition, induced seismicity, sinkholes, and subsidence resulting from oil and gas production and development and potash mining activities, although not anticipated within the proposed project area as discussed In EIS Section 4.4, could have direct impacts on geology and soils in other project areas elsewhere in the geographic scope of analysis.

5.4.1 Summary

Factors to consider for the cumulative impact determination for geology and soil resources include: (i) the systems, plans, and procedures that would be in place to limit soil loss, avoid soil contamination, and minimize stormwater runoff; (ii) available information showing that the proposed project area is in an area of low seismic risk from natural phenomena and is not likely to be affected by significant induced seismicity from oil and gas production and wastewater injection; (iii) a low potential for sinkhole development due to the absence of soluble rocks at or near the land surface; (iv) available information showing a low potential for subsidence from past potash mining; and (v) the reclamation and decommissioning that would take place to return the proposed project area to preoperational conditions through return of topsoil, removal of contaminated soils, and reestablishment of vegetation. Therefore, the NRC staff concludes that at full build-out, the proposed CISF would add a SMALL incremental effect to the MODERATE impacts to geology and soils from other past, present, and reasonably foreseeable future actions in the geographic scope of the analysis, resulting in an overall MODERATE cumulative impact in the geology and soils geographic area.

5.5 Water Resources

5.5.1 Surface Water

The NRC staff assessed cumulative impacts on surface waters within the Laguna Plata subbasin (i.e., the geographic scope of the surface water analysis), defined by the Watershed Boundary Dataset (USGS, 2019). As described in EIS Section 5.1.2, the timeframe for the analysis is from 2017 to 2060.

The Laguna Plata subbasin is approximately 63,540 ha [157,010 ac] and includes Laguna Gatuna and Laguna Plata as well as all drainage areas contributing to either laguna (EIS Figure 3.5-2). The proposed project area is located in the Laguna Plata subbasin and, as described in EIS Section 3.5.1, drains to Laguna Gatuna and Laguna Plata with no external drainage (EIS Figure 3.5-2). The cumulative surface water impact analysis outside of the Laguna Plata subbasin was not evaluated because drainage in other subbasins or watersheds is not anticipated to influence or to be influenced by the proposed CISF project.

As described in EIS Section 4.5.1.1, there are no perennial streams in the proposed CISF project area and any water in Laguna Plata and Laguna Gatuna occurs predominantly in response to surface drainage after precipitation events (Holtec, 2019a). Evaporation is the only mechanism for water loss in Laguna Plata and Laguna Gatuna (Holtec, 2019a).

The surface water impacts from full build-out of the proposed CISF project, as described in EIS Section 4.5.1, would be SMALL. If only the proposed action (Phase 1) was constructed, operated, and decommissioned, the impacts would also be SMALL. Surface-water runoff from the approximate 133.5-ha [330-ac] footprint of the facility would be able to be fully captured by Laguna Plata and Laguna Gatuna, assuming that both lagunas were dry prior to the start of the rain event (Holtec, 2019a). Prior to entering the lagunas, surface-water runoff would be managed in accordance with Holtec's Stormwater Pollution Prevention Plan (SWPPP), National Pollutant Discharge Elimination System (NPDES) permits for construction and for industrial stormwater, and a Spill Prevention, Control, and Countermeasures Plan (SPCC Plan), as described in EIS Section 4.5.1.1, which includes erosion and sediment control best management practices (BMPs). This would help mitigate the impacts of soil erosion, sedimentation, and spills and leaks of fuels and lubricants on Laguna Plata and Laguna Gatuna. Holtec will also implement any Section 401 certification conditions, if Section 401 certification is required.

Within the region, past, present, and foreseeable future actions include oil and gas production and exploration, oilfield waste processing, potash mining, nuclear-related activities, livestock grazing, wind and solar energy projects, recreational activities, and plans to increase housing in both Lea County and Eddy County (EIS Section 5.1.1). However, a number of these activities are outside the Laguna Plata subbasin and thus are not considered in the surface water cumulative impact analysis, including nuclear facilities WIPP, NEF, WCS, and FEP/DUP; the Wildcat Wind Project, located near Lovington, New Mexico, Gaines Cavern Wind Project in Gaines County, Texas, and the Oso Grande Wind Project in Chaves County, New Mexico (EIS Section 5.1.1.3); as well as recreational activities described in EIS Section 5.1.1.6. Additionally, plans to increase housing in both Lea County and Eddy County (EIS Section 5.1.1.5) are unlikely to impact the Laguna Plata Watershed due to the rural nature of the area and the limited amount of privately owned land that could be used for housing development (EIS Section 4.2). Development of housing is more likely to occur outside of the surface water geographic scope, near the cities of Carlsbad, New Mexico, Artesia, New Mexico, and Hobbs, New Mexico where populations are larger.

Within the surface water resources geographic scope of the analysis (Laguna Plata subbasin), the ongoing and reasonably foreseeable projects include oil and gas production and exploration, oilfield waste disposal, and potash mining, as described in EIS Sections 5.1.1.1 and 5.1.1.7. Oil and gas production and potash mining are the economic drivers of both Lea and Eddy County. Both counties have a history of extensive exploration, leasing, development, and production of oil, gas, and potash and this trend is expected to continue. The locations of oil and gas wells within and surrounding the proposed CISF project area are shown in EIS Figure 3.2-7 and include numerous active and plugged wells in the Laguna Plata subbasin. Within the proposed CISF project area, there is an operating gas well and 18 plugged and abandoned wells. Impacts on surface water resources from the continued development of the oil and gas and potash industries in the surface water geographic scope would include runoff from disturbed areas and leaks or spills of fuels or lubricants from equipment or operations. Oil and gas development activities and potash mining is monitored and regulated by the State of New Mexico, U.S. Department of the Interior, and BLM (Holtec, 2019c). Also, all industrial operations would be required to obtain a NPDES industrial stormwater permit, which would require a SWPPP, thus protecting surface water resources in the area.

The NRC staff concludes that the cumulative impact on surface water resources within the surface water geographic scope resulting from past, present, and reasonably foreseeable future actions would be SMALL. This finding is based on the lack of major surface water features other than the lagunas, and the assessment of existing and potential impacts on surface waters within Laguna Plata subbasin from existing and future oil and gas exploration, production and development, as well as potash mining. Other existing and reasonably foreseeable future actions are not expected to have a noticeable impact on surface water within the surface water geographic scope as there are no nuclear, solar or wind energy, recreational, or housing development projects planned in Laguna Plata subbasin.

5.5.1.1 Summary

The impacts to the surface water resources in the surface water geographic scope of the analysis from the proposed action (Phase 1) and the full build-out (Phases 1-20) would result from surface-water runoff and potential spills and leaks but would be mitigated by the implementation of Holtec's SWPPP, SPCC Plan, and NPDES permits. These impacts would cease at the end of decommissioning when the license is terminated. However, Holtec has committed to reclamation of the site to return the land to preoperational use. Therefore, the NRC staff concludes that at full build-out, the proposed CISF would add a SMALL incremental effect to the SMALL impacts to surface water from other past, present, and reasonably foreseeable future actions in the geographic scope of the analysis, resulting in an overall SMALL cumulative impact to surface water resources in the geographic area.

5.5.2 Groundwater

The NRC staff assessed cumulative impacts for groundwater within the Capitan Underground Water Basin as the geographic scope of the analysis, which is described further in Section 3.5 of this EIS, and which covers approximately 296,028 ha [731,500 ac] in south-central Lea County (EIS Figure 3.5-4). The timeframe for the analysis is from 2017 to 2060.

Important sources of groundwater in the groundwater geographic scope (the Capitan Underground Water Basin) include the Rustler Formation, Dockum Group (Santa Rosa Sandstone and Chinle Formation), Ogallala Formation (Ogallala Aquifer), and Quaternary alluvium. As described in EIS Section 3.5.3, no potable groundwater is known to exist in the vicinity of the proposed project area. Groundwater quality, as described in EIS Section 4.5.2.1.1, is variable in each of the aquifers, ranging from freshwater zones that stretch from Carlsbad to the Guadalupe Mountains to very poor water quality with high TDS concentrations and brines in Lea County (Bjorklund and Motts, 1959; Richey et al., 1985). The Ogallala Aquifer is a major source of groundwater in the geographic scope of the analysis for groundwater, supplying water to Carlsbad and northwestern Lea County (City of Carlsbad Water Department, 2018). However, only in the eastern portion of Lea County is the Ogallala Formation a water-producing unit, elsewhere the Ogallala (if present) is unsaturated.

The groundwater impacts from full build-out of the proposed CISF project, as described in EIS Section 4.5.2, would be SMALL. If only the proposed action (Phase 1), including the rail spur, was constructed, operated, and decommissioned, the impacts would also be SMALL. Groundwater impacts would result mainly from consumptive use and infiltration into near-surface aquifers. Potable water demands for the proposed action (Phase 1) and full build-out (Phases 1-20) would be provided by the City of Carlsbad's Double Eagle Water Supply facility, which draws from the Ogallala Aquifer (Holtec, 2019a). Negative impacts to groundwater quality in near-surface aquifers would be mitigated by the implementation of the SWPPP, SPCC Plan, and the requirements of the NPDES permits, groundwater discharge permit (if required), and Section 401 certification (if required). At the end of the license term, for either the proposed action (Phase 1) or full build-out (Phases 1-20), the proposed CISF project would be decommissioned such that the proposed project area and remaining facilities could be released for unrestricted use.

Within the region, past, present, and foreseeable future actions include oil and gas production and exploration, waste disposal, potash mining, nuclear-related activities, livestock grazing, wind and solar energy projects, recreational activities, and plans to increase housing in both Lea County and Eddy County (EIS Section 5.1.1).

Both counties have a history of extensive exploration, leasing, development, and production of oil, gas, and potash and this trend is anticipated to continue. The location of oil and gas wells within and surrounding the proposed CISF project area are shown in EIS Figure 3.2-7 and include numerous active and plugged wells in the groundwater geographic scope. Impacts on groundwater resources from the continued development of the oil and gas and potash industries in the groundwater geographic scope would include the consumptive use of water and potential contamination because of improperly plugged or cased wells, which could impact groundwater quality through infiltration to near-surface aquifers. Eddy County is currently making improvements to the Double Eagle Water System in anticipation of the increased water demand for oil and gas production as well as potash mining and will provide water to Eddy County and the northwestern portion of Lea County (Onsurez, 2018). The NRC staff anticipates that impacts from construction of these facilities would be subject to the same monitoring, mitigation, and response programs (e.g., NPDES permit, SWPPP, SPCC Plan) required to limit potential groundwater quality impacts. Construction and operation of the facilities would be monitored by the New Mexico Oil Conservation Commission, State of New Mexico, U.S. Department of the Interior, and BLM (Holtec, 2019c). The NRC staff anticipates that groundwater quality protections required during the operation of oil-, gas-, and potash-related facilities would be adequate to protect groundwater quality in the geographic scope of the analysis for groundwater.

Nuclear facilities discussed in EIS Section 5.1.1.2 include WIPP, NEF, WCS, FEP/DUP, and Eden. The NRC staff anticipates that impacts to groundwater from the existing facilities would remain similar to current uses, and proposed facilities would have similar consumptive water needs and stormwater runoff requirements. Similarly, the construction and operation of the future projects would be subject to the same monitoring, mitigation, and response programs required to limit potential groundwater quality impacts as those for the proposed Holtec CISF project. NRC, EPA, TCEQ, and NMED oversight would further mitigate negative impacts to groundwater resources in the geographic scope of the analysis for groundwater.

There are two operational wind projects in the geographic scope of the analysis, the Wildcat Wind Project, located near Lovington, New Mexico, and Gaines Cavern Wind Project in Gaines County, Texas. Because the projects are already operational, the NRC staff anticipates that the consumptive use of groundwater during operations would be less than that for construction. Should additional wind energy and associated infrastructure projects be constructed, the impacts to groundwater quality would be highest during construction as is the risk of negative impacts to groundwater quality would be from stormwater runoff and spills and leaks from construction equipment. However, the NRC staff anticipates that the stormwater runoff during construction would be managed according to a SWPPP, that spills and leaks would be prevented and handled in accordance with a SPCC Plan, that any surface water discharges would fall under the jurisdiction of a NPDES permit, and that any groundwater discharges would fall under the jurisdiction of a groundwater discharge permit (if required).

The City of Carlsbad also plans to improve and rehabilitate aging water and wastewater systems, which helps reduce potable water loss from broken or leaking supply lines and protects groundwater quality from contamination from broken or leaking wastewater lines (Sites Southwest, 2012). The construction and rehabilitation of buildings, portions of the water and wastewater systems, and infrastructure would require consumptive water use and could impact groundwater quality through infiltration to near-surface aquifers. The NRC staff anticipates that stormwater controls and spill prevention and response procedures similar to those for the proposed CISF project would be implemented both for the construction of new housing developments and for the construction, rehabilitation, and operation of related infrastructure (e.g., the water and wastewater systems).

Recreational activities in the region are all associated with either surface activities (e.g., hunting, fishing) or surface water bodies not hydrologically connected to the groundwater resources and therefore the NRC staff does not anticipate an overlapping cumulative impact. Oilfield waste facilities (oilfield landfarms) have the potential for spills and leaks as well as runoff from stormwater with the potential for infiltration. However, the NRC staff assumes that any potential spills, leaks, and stormwater runoff would be managed according to applicable regulations and in accordance with a NPDES permit.

The NRC staff concludes that the cumulative impact on groundwater resources within the geographic scope of the analysis resulting from past, present, and reasonably foreseeable future actions would be MODERATE. This finding is based on the assessment of existing and potential impacts on groundwater within the geographic scope of the analysis for groundwater from existing and future oil and gas exploration, production, development, and waste; potash mining; nuclear-related facilities; wind projects; recreational activities, and housing developments, all of which would require consumptive water use and have potential impacts on groundwater quality.

5.5.2.1 Summary

The impacts to groundwater resources in the geographic scope of the analysis from the proposed action (Phase 1) and the full build-out (Phases 1-20) would result from consumptive use and infiltration of surface-water runoff and spills and leaks to near-surface aquifers. The implementation of Holtec's SWPPP, SPCC Plan, NPDES permits, Section 401 certification (if required), and groundwater discharge permit (if required) would mitigate these impacts. After the land is returned to unrestricted use following the decommissioning of the proposed CISF project area, in accordance with an NRC-approved decommissioning plan, the impacts to groundwater resources would cease. Therefore, the NRC staff concludes that at full build-out, the proposed CISF would add a SMALL incremental effect to the MODERATE impacts to groundwater from other past, present, and reasonably foreseeable future actions in the geographic scope of the analysis, resulting in an overall MODERATE cumulative impact to groundwater resources in the geographic area.

5.6 Ecology

The impacts analysis in EIS Section 4.6 describes the ecological impacts that could occur within an approximate 3.2 km [2 mi] radius of the proposed project area. Given that wildlife and vegetation occurrences fluctuate over time within unpredictable boundaries, and because the proposed rail spur would extend approximately 6.1 km [3.8 mi] to the west of the proposed project area with a length of 8 km [5 mi], the cumulative impacts geographic scope of the analysis for ecology is an approximate 8-km [5-mi] radius from the middle of the proposed CISF project area. The cumulative impact analysis is limited to this radius because ecological resources are not anticipated to influence or to be influenced by the proposed CISF project outside of this area.

As described in EIS Section 3.6.1, the proposed CISF project is located in a transitional zone between the short grass prairie of the High Plains habitat and the Chihuahuan Desert Scrub habitat (Holtec, 2019a; NMDGF, 2016; Elliot, 2014). During the last century, conversion of grasslands to scrublands has occurred within this transition zone as a result of combinations of changes in land use, drought, livestock overgrazing, and decreases in fire frequency (NMDGF, 2016). As described in EIS Section 4.6, impacts to ecological resources from full build-out of the proposed CISF would be SMALL to MODERATE because (i) the area surrounding the proposed CISF project is largely undeveloped; (ii) there is abundant suitable habitat in the vicinity of the project to support displaced animals; (iii) there are no rare or unique communities, habitats, or wildlife on the proposed CISF project; (iv) the impacts to vegetation would be expected to contribute to the change in vegetation species' composition, abundance, and distribution within and adjacent to the proposed CISF project (i.e., ecosystem function); and, (v) per BLM, the establishment of mature, native plant communities may require decades. If only the proposed action (Phase 1) was constructed (including the rail spur) and operated, the impacts to ecological resources would also be SMALL to MODERATE. All phases of the CISF would have "No Effect" on Federally listed species, and "No Effect" on any existing or proposed critical habitats.

Activities in the region evaluated for cumulative ecological impacts include cattle grazing, mining, oil and gas exploration and waste disposal, recreational activities, and urban development. The nuclear facilities, wind and solar projects, recreational activities and housing and urban development described in EIS Section 5.1.1 are outside of the geographic scope of analysis for ecological resources. The cumulative effects of cattle grazing, mining, and oil and gas exploration can influence habitats indirectly (i.e., segmentation) or directly (i.e., vegetation removal), thereby affecting wildlife. Potential effects to ecological resources, both flora and fauna, include reduction in wildlife habitat and forage productivity, modification of existing vegetative communities through land-clearing activities, degradation of air and water quality, and potential spread of invasive species and noxious-weed populations from land disturbance. Impacts to wildlife could involve loss, alteration, and incremental habitat fragmentation; displacement of and stresses on wildlife; and direct and indirect mortalities. For these reasons, and similar to the NRC staff's conclusions for the proposed project described in EIS Section 4.6, the NRC staff determines that the impacts on ecological resources resulting from cattle grazing, mining, and oil and gas exploration and waste disposal would be SMALL to MODERATE.

As shown in EIS Figure 3.2-1, most of the land within the 8-km [5-mi] geographic scope of analysis for ecological resources is managed by the BLM and the State of New Mexico (BLM, 2018). Ecological resources in the geographic scope of the analysis for ecology would experience beneficial cumulative impacts from Federal and State management actions for the reasonably foreseeable future. For example, BLM restricts oil and gas drilling and seismic exploration from occurring in Lesser prairie-chicken habitat during the period from March 1 through June 15 annually, and certain activities are only allowed to occur between the hours of 3:00 am and 9:00 pm daily during this period. Additionally, BLM does not allow new oil and gas drilling within 200 m [0.12 mi] of Lesser prairie-chicken leks known at the time of permitting, and noise from pump jack engines must be muffled or otherwise sound-controlled so as not to exceed 75 db measured at 9.1 m [30 ft] from the source of the noise. These actions would lessen the impacts of oil and gas activities on the Lesser prairie-chicken. All reasonably foreseeable future actions in the geographic scope of the analysis for ecological resources are subject to Federal laws (e.g., the Endangered Species Act, the Migratory Bird Treaty Act, the Clean Water Act), and most private projects are subject to other State requirements such as land reclamation and complying with NPDES permits. Adherence to these standards would reduce many of the cumulative adverse impacts from reasonably foreseeable future actions. Conservation partnerships such as the Restore New Mexico program would contribute additional beneficial cumulative impacts as additional acres are restored to historical, native vegetative communities annually (BLM, 2018).

5.6.1 Summary

Significant changes to land use in the region over the last century have had a significant impact on ecological resources (NMDGF, 2016); however, because a large amount of the land in the geographic scope of the analysis for ecological resources is administered by the BLM and the State, reasonably foreseeable future actions are not expected to significantly impact ecological resources during the license term of the proposed CISF. Therefore, the NRC staff concludes that at full build-out, the proposed CISF would add a SMALL to MODERATE incremental effect to the MODERATE impacts to ecological resources from other past, present, and reasonably foreseeable future actions in the geographic scope of the analysis, resulting in an overall SMALL to MODERATE cumulative impact in the ecology geographic area.

5.7 Air Quality

The NRC staff assessed cumulative impacts on air quality within the region (inclusive of the geographic scopes of all other resource areas) with primary focus on the portions of the Pecos-Permian Basin Intrastate Air Quality Control Region located within this region (Figure 5.1-1). The NRC staff define this as the geographic scope of the analysis for air quality. As described in EIS Section 5.1.2, the timeframe for the analysis of cumulative impacts is 2017 to 2060.

5.7.1 Non-Greenhouse Gas Emissions

As described in EIS Section 4.7.1.1, the air quality impacts from full build-out of the proposed CISF project would be SMALL. This determination was based on the NRC staff's consideration of the following key assessment factors: (i) the existing air quality, (ii) the proposed CISF emissions levels, and (iii) the proximity of the proposed CISF emissions sources to receptors. If only the proposed action (Phase 1) was considered, the impacts would also be SMALL based on these same factors. The cumulative impacts analysis also considers similar factors such as the air quality in the geographic scope of the analysis, the contribution of the proposed CISF emission levels relative to the overall emission levels in the geographic scope of the analysis, and the ability of proposed CISF impacts to overlap with the impacts from the other emission sources (e.g., proximity of the emission sources to one another).

The effects of past and present activities on the geographic scope of the analysis's air quality are represented in the EPA's National Ambient Air Quality Standards compliance status for that area. As described in EIS Section 3.7.2.1, the entire geographic scope of the analysis is in attainment for all pollutants. Based on this attainment status, the NRC staff consider the geographic scope of the analysis air quality as good. However, all of the activities described in EIS Section 5.1.1 generate gaseous emissions at some level. In particular, the Permian Basin is one of the largest and most active oil basins in the United States. The geographic scope of analysis continues to be the focus of extensive exploration, leasing, development, and production of oil and gas with the most heavily concentrated area of wells being located in eastern Eddy County and western Lea County. These two counties are consistently the top two producers of oil in the state. The proposed CISF project area is located in the middle of the Permian Basis oil hub, near the Lea County and Eddy County borders. Activities associated with oil and gas contribute to the air emissions generated within these two counties (EIS Table 3.7-4). The NRC staff consider that the emission levels within the geographic scope of analyses are noticeable but not destabilizing. The future pollutant levels generated within the geographic scope of the analysis would be based on (i) the emission level trends for the existing sources and activities and (ii) the new emissions from reasonably foreseeable future actions.

BLM conducted air dispersion modeling to support their update of the Carlsbad Regional Management Plan. To analyze future cumulative impacts, modeling was conducted by BLM using an emission inventory based on the estimated emissions in the year 2028. The results predicted that the air quality for the geographic scope of the analysis for this EIS would continue to meet the NAAQS (URS, 2013). Therefore, the NRC staff expects the future air quality in the geographic scope of the analysis would remain good.

The NRC staff have determined that the cumulative impact on air quality within the geographic scope of analysis from the past, present, and reasonably foreseeable future actions for air emissions would be noticeable (EIS Table 3.7-4) but not destabilizing (i.e., in attainment for NAAQS compliance) and therefore MODERATE.

A factor for the cumulative impacts analysis is the contribution of the proposed CISF emission levels relative to the overall emission levels in the geographic scope of the analysis. EIS Table 3.7-4 describes the pollutant levels the various activities generated within the geographic scope of the analysis. EIS Table 5.7-1 describes the contribution (i.e., percent) of the proposed CISF estimated annual emission levels compared to the overall geographic scope of the analysis emission levels. Specifically, the proposed CISF emissions levels are no more than about one tenth of one percent of the geographic scope of the analysis emission levels.

Proximity of the proposed CISF to the other sources identified in EIS Section 5.1.1 influences the ability for impacts to overlap. Based on EIS Figure 5.1-1, the closest known reasonably foreseeable future action to the proposed CISF would be the new waterline for the Double Eagle Water Supply System improvement project located as close as about 26.5 km [16.5 mi] to the north. The timeframe for construction of the waterline would only overlap with the proposed CISF license term for a short duration. Because of these factors (i.e., distance and short duration of activities generating emissions) the NRC staff concludes that ability of the impacts of these projects to overlap would be limited. Because the other reasonably foreseeable future actions are located further away from the proposed CISF than the Double Eagle Water Supply System improvement project, the NRC staff concludes that impacts from other projects are unlikely to overlap with impacts to air quality from the proposed CISF.

5.7.1.1 Summary

In summary, the geographic scope of the analysis possesses good air quality, the proposed CISF emission levels are relatively minor when compared to the overall geographic scope of the analysis emission levels, and the overlapping impacts are limited, primarily because of the distance between the proposed CISF and the other emission sources in the geographic scope of the analysis. Therefore, the NRC staff concludes that at full build-out, the proposed CISF would add a SMALL incremental effect to the MODERATE impacts to air quality from other past, present, and reasonably foreseeable future actions in the geographic scope of the analysis, resulting in an overall MODERATE cumulative impact in the air quality geographic area.

Table 5.7-1 The Contribution (i.e., Percentage) of the Proposed CISF Estimated Annual Emissions Compared to the Geographic Scope's Estimated Annual Emission Levels							
County	Pollutant						
	Carbon Monoxide	Hazardous Air Pollutants	Nitrogen Oxides	Particulate Matter PM_{10}	Particulate Matter $PM_{2.5}$	Sulfur Dioxide	Volatile Organic Compounds
Lea	0.03	0.0002	0.06	0.11	0.10	0.0005	0.005
Eddy	0.03	0.0001	0.09	0.10	0.08	0.002	0.004
Both	0.01	0.0001	0.04	0.05	0.04	0.0004	0.002
Source: Generated from the information in EIS Tables 2.2-1, 2.2-2, 3.7-4, and SwRI (2019)							

5.7.2 Greenhouse Gas Emissions and Climate Change

The impact magnitude resulting from a single source or a combination of greenhouse gas emission sources over a larger region must be placed in geographic context for the following reasons:

- The environmental impact is global rather than local or regional,
- The effect is not particularly sensitive to the location of the release point,
- The magnitude of individual greenhouse gas sources related to human activity, no matter how large compared to other sources, are small when compared to the total mass of greenhouse gases resident in the atmosphere, and
- The total number and variety of greenhouse gas emission sources is extremely large, and the sources are ubiquitous.

Based primarily on the scientific assessments of the U.S. Global Climate Research Program (GCRP) and National Research Council, the EPA Administrator issued a determination in 2009 (74 FR 66496) that greenhouse gases in the atmosphere may reasonably be anticipated to endanger public health and welfare, based on observed and projected effects of greenhouse gases, their effect on climate change, and the public health and welfare risks and effects associated with such climate change. Therefore, the NRC staff concludes that national cumulative impacts of greenhouse gas emissions are noticeable but not destabilizing.

5.7.2.1 Proposed CISF Greenhouse Gas Emissions

Greenhouse gas emissions are generated by activities at the proposed CISF facility as well as during the SNF transportation to and from the proposed CISF. As described in EIS Section 2.2.1.6, the peak year Phase 1 activities at the proposed CISF generate an estimated 2,306 metric tons [2,542 short tons] of carbon dioxide and the peak year Phase 1-20 activities generate 2,642 metric tons [2,913 short tons] of carbon dioxide. As described in EIS Section 3.7.2.2, the EPA established thresholds for greenhouse gas emissions in the Tailoring Rule that define whether sources are subject to EPA air permitting. For new sources, the threshold is 90,718 metric tons [100,000 short tons] of carbon dioxide equivalents per year, and for modified existing sources, the threshold is 68,039 metric tons [75,000 short tons] of carbon dioxide equivalents per year. As described in EIS Section 4.7.1.1, the EIS compares estimated emission levels to such thresholds to provide context for understanding the magnitude of these emissions, which are mostly from mobile and fugitive dust rather than stationary sources. This comparison in the EIS does not document or represent a formal determination for air permitting or regulatory compliance. Because emission estimates for the proposed project are below the EPA thresholds in the Tailoring Rule, the NRC staff concludes that the activities at the proposed CISF would generate low levels of greenhouse gases relative to other sources and would have a minor impact on air quality in terms of greenhouse gas emissions. For context, the proposed action generates about 0.008 percent of the total projected greenhouse gas emissions in New Mexico of 31.3 million metric tons [34.5 million short tons] of carbon dioxide equivalents in 2017 (EPA, 2018). This also equates to about 0.00004 percent of the total United States annual emission rate of 6.5 billion metric tons [7.2 billion short tons] of carbon dioxide equivalents in 2017 (EPA, 2019).

The NRC staff estimated the proposed CISF greenhouse gases emissions from transporting the SNF from the nuclear power plants and ISFSIs to the proposed Holtec site by prorating the greenhouse gas estimates for transporting SNF along the Caliente rail alignment for the Yucca Mountain Project (DOE, 2008). This prorating accounted for the differences in the distance traveled by the SNF and the amount of SNF transported. EIS Table 5.7-2 contains the prorating information and the proposed CISF emission estimates. The purpose of this basic estimate was to provide a value for comparison to the EPA thresholds specified in the previous paragraph. Because proposed CISF emission estimates for transporting SNF are above the thresholds in the Tailoring Rule, the NRC staff expects that transporting SNF for both Phase 1 and full build-out would have a noticeable but not destabilizing impact on air quality in terms of greenhouse gas emissions.

To provide additional context, transporting SNF generates about 0.02 percent of the total United States annual emission rate of 6.5 billion metric tons [7.2 billion short tons] of carbon dioxide equivalents in 2017 (EPA, 2019.

In summary, the activities from the proposed CISF in combination with national SNF transportation would generate greenhouse gas levels above the EPA thresholds. Therefore, the NRC staff expects that both the proposed action (Phase 1) and full build-out in combination with the transportation of SNF would generate high levels of greenhouse gas emissions relative to other sources and would add a MODERATE incremental effect to air quality in terms of greenhouse gas emissions when added to the MODERATE impact to air quality from other past, present, and reasonably foreseeable future actions in the geographic scope of the analysis, resulting in an overall MODERATE cumulative impact to air quality greenhouse gas emissions in the geographic scope.

Greenhouse gas generation is considered in a nation-wide context; thus, the NRC staff considers it appropriate for the cumulative impacts analysis to include carbon footprint as a relevant factor in evaluating distinctions between alternatives, including the No-Action alternative. For activities associated with storing SNF, emissions for the proposed CISF and the No-Action alternative would be similar. The proposed CISF would add another site that generates emissions, but at the same time would allow for the elimination of emissions from nuclear power plants and ISFSIs that are fully decommissioned. For activities related to transporting SNF, the No-Action alternative would generate fewer emissions than the proposed CISF because the overall distance traveled from the nuclear power plants and ISFSIs to a repository would likely be less than from the nuclear power plants and ISFSIs to the proposed CISF and then to a repository.

Table 5.7-2 Proposed CISF Greenhouse Gas (GHG) Emission Estimates for Transporting SNF						
Proposed CISF SNF Transportation Event		**Yucca Mountain GHG Emissions (Tons)***	**Distance Prorating Factor†**	**Amount of SNF Prorating Factor‡**	**Proposed CISF GHG Emissions (Tons)§**	
					Total	**Annual‖**
From Nuclear Power Plants and ISFSIs to Proposed CISF	Phase 1	2,040,248	5.22	0.124	1,320,612	1,320,612
	Full Build-out	2,040,248	5.22	1.43	15,229,635	761,482
From Proposed CISF to Repository	Phase 1	2,040,248	2.03	0.124	513,571	513,571
	Full Build-out	2,040,248	2.03	1.43	5,922,636	296,132

*Greenhouse gas emissions from SNF transportation along the Caliente rail alignment, which is only a portion (i.e., the last segment) of the distance between the nuclear power plants and ISFSIs and the Yucca Mountain site. To convert metric tons to short tons, multiply by 1.1023

†Since the distance traveled for the estimated Yucca Mountain greenhouse gas emissions varies from the distance traveled for the proposed action, a prorating factor is used. The distance prorating factor is calculated by dividing the distance SNF travels for the proposed CISF transportation events {3,362 km [2,089 mi] for the nuclear power plants and ISFSIs to the proposed CISF and 1,308 km [813 mi] for the proposed CISF to Yucca Mountain site} by the distance SNF travels for the Caliente rail alignment segment {644 km [400 mi]}.

‡Since the amount of SNF transported for the estimated Yucca Mountain greenhouse gas emission varies from the amount of SNF transported for the proposed action, a prorating factor is used. The amount of SNF prorating factor is calculated by dividing the amount of SNF transported for the proposed CISF 8,680 MTU for Phase 1 and 100,000 MTU for full build-out by the amount of SNF transported for the Yucca Mountain analysis (70,000 MTU).

§To convert metric tons to short tons, multiply b 1.1023.

‖For Phase 1, the total and annual emissions are the same because they both transport 8,680 MTU of SNF over one year. For full build-out, the annual emissions were generated by dividing total emissions by 20 (i.e., the number of years this transportation event takes to accomplish).

Source: Final Environmental Impact Statement for a Rail Alignment for the Construction and Operation of a Railroad in Nevada to a Geologic Repository at Yucca Mountain, Nye County, Nevada (DOE, 2008)

5.7.2.2 Overlapping Impacts of the Proposed CISF and Climate Change

Climate change impacts could overlap with impacts from the proposed CISF. Based on the list of climate change projections for the State of New Mexico in EIS Section 3.7.1.2, the NRC staff concludes that water scarcity would be the most likely area where impacts from both climate change and the proposed action could overlap. Climate change is expected to increase drought intensity in New Mexico. Droughts can cause increased competition for limited water resources. Although some aspects of spent fuel storage require water, the amount of water needed is minimal and water use for spent fuel storage is not expected to cause water-use conflicts, even under the changed conditions that climate change could cause. Climate change impacts are predicted to occur over long periods of time, and the license term of the proposed facility is 40 years. Therefore, impacts from the proposed CISF that may overlap with the impacts of climate change are likely to be minor.

5.8 Noise

The NRC staff assessed cumulative impacts on noise resources within a geographic scope of 10-km [6-mi] around the proposed project area. The timeframe for the analysis is from 2017 to 2060. Cumulative noise impacts outside of the geographic scope of the analysis {10-km [6-mi]} were not evaluated because noise from the proposed project would not propagate outside of the 10-km [6-mi] radius such that there could be a cumulative impact with other noise sources.

The nearest noise receptors for the proposed action, as described in EIS Section 3.8, are travelers on State Highway 63, which is approximately 0.8 km [0.5 mi] south of the proposed CISF project property boundary. The nearest residents to the proposed CISF project area are located 2.4 km [1.5 mi] away (Holtec, 2019a). Within the 10-km [6-mi] geographic scope of the analysis for noise impacts, the land is sparsely populated and primarily used for livestock grazing. The main contributors to noise sources are traffic from U.S. Highway 62 and State Highway 243 (EIS Figure 3.2-4) and operating oil pump jacks (Holtec, 2019a).

As described in EIS Section 4.8, the impacts to noise from full build-out (Phases 1-20) of the proposed CISF project would be SMALL. If only the proposed action (Phase 1), including the rail spur, was constructed, operated, defueled, and decommissioned, the impacts would also be SMALL. Noise impacts associated with construction are from (i) heavy equipment and machinery use; (ii) construction of new buildings and infrastructure; (iii) additional vehicle traffic; and (iv) earthwork. As described in EIS Section 4.8, Holtec would primarily conduct construction activities during daylight hours. From U.S. Highway 62 and State Highway 243, the highest noise levels from construction are estimated to be in the range of 44 dBA to 59 dBA. Aside from construction, the main project-related noises are associated with the transfer of the casks and include noise from delivery trucks and rail cars and operation of cranes and loading equipment. Other operational noises are limited to the operation and maintenance of the buildings and infrastructure. After the license term ends, for either the proposed action (Phase 1) or full build-out (Phases 1-20), the proposed CISF project area would be decommissioned such that the area would be released for unrestricted use in accordance with 10 CFR Part 20, Subpart E, at which point all noise impacts would cease (EIS Section 4.8.1.3). It is expected that the greatest noise impacts would occur during the construction of the proposed action (Phase 1). Although there are no applicable noise restrictions in the area other than BLM timing restrictions which limit certain activities from 3:00 AM to 9:00 AM from March 1 to June 15 on land under their jurisdiction, OSHA standards limit noise exposure for employees within a facility.

Within the region described in EIS Section 5.1.1, other actions include oil and gas production, exploration and waste disposal, potash mining, nuclear-related activities, livestock grazing, recreational activities, and wind and solar energy projects. However, within the geographic scope of the analysis for noise, only the ongoing and reasonably foreseeable actions related to oil and gas production and exploration and potash mining are considered because they occur within the geographic scope.

Within 10 km [6 mi] of the proposed CISF project area, there are numerous oil, gas, and potash facilities (EIS Figure 3.2-7) in various stages of operation. Expansion or development of future oil-, gas-, and potash-related projects would have an impact on noise resources of the area because of increased vehicle traffic, heavy equipment use, and construction and maintenance of project facilities and infrastructure (e.g., roads, oil pump jacks, pipelines, electric lines, processing sites, and associated ancillary facilities). The NRC staff anticipates that the noise impacts of past, present, and reasonably foreseeable future oil and gas production and potash mining would last over the license term and have the potential to contribute to the ambient noise (i.e., background noise) of the area. The largest temporary impacts to noise would be associated with the construction of facilities, especially if construction activities of one facility overlap with those of another, or with the construction of either the proposed action (Phase 1) or the full build-out (Phases 1-20). However, OSHA standards would limit the amount of noise generated from these sites. Administrative controls implemented by the New Mexico Oil Conservation Commission, U.S. Department of the Interior, State of New Mexico, and BLM would also monitor and regulate oil and gas development activities and potash mining activities within the noise geographic scope of the analysis (Holtec, 2019c), further reducing the likelihood of noise impacts from coinciding construction activities.

The NRC staff have determined that the cumulative impacts to noise resources within the noise geographic scope of the analysis resulting from all past, present, and foreseeable future actions would be SMALL. This finding is based on the assessment of existing and potential impact on noise within the noise geographic scope of the analysis from existing and future oil and gas exploration, production and development as well as potash mining.

5.8.1 Summary

Noise impacts from the proposed action (Phase 1) and full build-out of the proposed CISF (Phases 1-20) are expected to be dominated by construction noise impacts which, at most, would be in the range of 44 dBA to 59 dBA at U.S. Highway 62 and State Highway 243. Noise impacts from the proposed CISF would cease after the decommissioning of the facility at the end of the license term. Therefore, the NRC staff concludes that at full build-out, the proposed CISF would add a SMALL incremental effect to the SMALL impacts to noise resources from other past, present, and reasonably foreseeable future actions in the geographic scope of the analysis, resulting in an overall SMALL cumulative impact in the noise geographic area.

5.9 <u>Historic and Cultural Resources</u>

Cumulative impacts on historic and cultural resources were assessed within a geographic radius of influence that encompasses a 16-km [10-mi] radius around the proposed Holtec CISF project. The study area covers a larger spatial extent than either the direct or indirect area of potential effect (APE) in order to evaluate activities outside the proposed project area. The assessment of cumulative impacts on historic and cultural resources beyond 16 km [10 mi] was not undertaken because at that distance, the impacts on historic and cultural resources from the proposed CISF on other past, present, and reasonably foreseeable future actions would be minimal. The timeframe for this analysis is 2017 to 2060, based on the estimated period of construction and operation of the proposed project.

Most of the cumulative impacts on historic and cultural resources in the study area were considered to be from future potash mining, other nuclear facilities, oil and gas development, and wind and solar projects, which are expected to continue at the same or increased intensity for the foreseeable future. Potential impacts to cultural and historic resources could also result from increased land area access and surface-disturbing activities associated with new projects in the study area. Impacts from these activities would result primarily from the loss of or damage to historic, cultural, and archaeological resources; temporary restrictions on access to these resources; or erosion and destabilization of land surfaces. As new developments start, the NRC staff anticipates that activities associated with surface-disturbing activities would be surveyed for historic and cultural resources, as appropriate. Given the amount of Federally owned land in New Mexico and Federal regulations involved with energy generation and transmission projects, it is likely that most mining, nuclear, oil and gas, and other energy developments would be subject to appropriate historic and cultural resource evaluations as part their own regulatory processes. Also, State-funded projects would also be required to ensure protection of cultural and historical resources. Therefore, the NRC staff concludes that other past, present, and reasonably foreseeable future nuclear facilities, mining projects, and oil and gas operations would not adversely affect historic and cultural resources. Therefore, the NRC staff concludes that other past, present, and reasonably foreseeable future nuclear facilities, mining projects, and oil and gas operations will be evaluated for impacts to historic and cultural resources along with adequate and reasonable preservation activities, including those that would be required by Federal and State agencies, which, when implemented, could avoid, minimize, or mitigate any impacts.

As discussed in EIS Section 4.9, four resources (one historic rail, one historic road segment and two prehistoric sites) were identified within the Holtec proposed project area. The two historic resources and one prehistoric resource will be recommended as not eligible for the National Register of Historic Places (NRHP) by NRC staff, and one prehistoric site will be recommended as eligible. However, none of the four resources are currently in the direct APE for the proposed project. Therefore, the NRC staff concludes that the proposed CISF project impacts on historic and cultural resources would be SMALL.

5.9.1 Summary

Because of the lack of historic or cultural resources within the direct APE, the NRC staff concludes that historic properties would not be affected by full build-out (Phases 1-20) of the proposed project. Due to the reliance on Federal and State regulations to ensure protection of cultural and historical resources, historic properties would not be affected by past, present, and reasonably foreseeable future projects. Therefore, the NRC staff concludes that the proposed project would add a SMALL incremental impact when added to the SMALL impact on historic and cultural resources from all other past, present, and reasonably foreseeable future actions, which would result in an overall SMALL impact to historic and cultural resources.

5.10 Visual and Scenic

The NRC staff assessed cumulative impacts to visual and scenic resources within a geographic scope of analysis of 10 km [6 mi] around the proposed project area. The timeframe for the analysis is from 2017 to 2060.

Cumulative visual and scenic impacts outside of a 10-km [6-mi] radius of the proposed project area were not evaluated, because the proposed CISF project would not influence visual and scenic resources. The past, present, and reasonably foreseeable future actions not included in this analysis are: NEF, WIPP, FED/DUP, wind and solar projects, recreational activities, and housing development, because none of these are within the geographic scope of the analysis for visual and scenic resources. Visual and scenic resources in the vicinity of the proposed project area, as described in EIS Section 3.10, are classified as Class IV by the BLM Visual Resource Management (VRM) evaluation (BLM, 1986). Class IV land can have high characteristic changes to the landscape, and those changes are allowed to dominate the view and be the major focus of viewer attention. As described in EIS Section 3.10, the area surrounding the proposed CISF project area is sparsely populated and primarily used for cattle grazing and oil and gas exploration and production, and BLM determined that the proposed CISF project area has a low sensitivity level for public concern regarding scenic quality (ELEA, 2007).

As described in EIS Section 4.10, the impacts to visual and scenic resources from full build-out of the proposed CISF project would be SMALL. If only the proposed action (Phase 1) was constructed, operated, and decommissioned, the impacts would also be SMALL. Visual and scenic impacts are the result of (i) heavy equipment use, (ii) construction of new buildings and infrastructure, (iii) additional vehicle traffic, (iv) fugitive dust, and (v) land disturbance. As described in EIS Section 4.10, Holtec would implement dust suppression and down-shielding of all security lights to mitigate some visual and scenic impacts. Other impacts related to the storage pads, facility building, and other infrastructure are either below-grade or have limited visibility from the major transportation corridor (i.e., U.S. Highway 62) where the majority of the public would view the facility. The land disturbance, additional traffic, and heavy equipment use would occur mainly during the construction and decommissioning stages of the proposed project. After the license term ends, for either the proposed action (Phase 1) or full build-out (Phases 2-20), the proposed CISF project area would be decommissioned such that the area would be released for unrestricted use.

Within the region described in EIS Section 5.1.1, there is oil and gas production and exploration, potash mining, nuclear-related activities, livestock grazing, and wind and solar energy projects. However, within the visual and scenic resources geographic scope {10 km [6 mi]}, the ongoing and reasonably foreseeable projects include only oil and gas exploration, production, and waste disposal, and potash mining.

Within the geographic scope of the analysis for visual and scenic resources, there are numerous oil, gas, and potash facilities (EIS Figure 3.2-7) in various stages of operation that impact the visual landscape. Expansion or development of future oil-, gas-, and potash-related projects would have an additional impact on the visual and scenic resources of the area because of increased vehicle traffic, land disturbances, landscape changes, heavy equipment use, and construction and maintenance of project facilities and infrastructure (e.g., roads, pipelines, electric lines, industrial sites, and associated ancillary facilities). The NRC staff anticipates that the visual and scenic impacts of past, present, and reasonably foreseeable future oil and gas production and potash mining would last for the license term of the proposed project with the potential to notably change the characteristics of the landscape and become a major focus of viewer attention. These changes would be allowed by the BLM VRM Class IV classification. Therefore, the NRC staff concludes that the cumulative impacts to visual and scenic resources within the geographic scope resulting from all past, present, and foreseeable future actions would be SMALL.

5.10.1 Summary

Because of the BLM VRM Class IV classification, the low sensitivity level of the proposed CISF project area, and the return of the land to unrestricted use after the decommissioning and reclamation of the facility at the end of the license term, the NRC staff concludes that at full build-out, the proposed CISF would add a SMALL incremental effect to the SMALL impacts to visual and scenic resources from other past, present, and reasonably foreseeable future actions in the geographic scope of the analysis, resulting in an overall SMALL cumulative impact in the visual and scenic geographic area.

5.11 Socioeconomics

The region of influence (ROI) for socioeconomics is the 4-county area described in EIS Chapters 3 and 4 (Andrews and Gaines, Texas, and Lea and Eddy, New Mexico). The timeframe for this analysis is from 2017 to 2060. The same socioeconomic indicators that were considered in NRC's analysis in Chapter 4 are considered as part of this analysis: employment and income, population, local finance, housing, school enrollment, and utilities and public services.

As described in EIS Section 4.11.1, the NRC staff determined that full build-out of the proposed CISF project would have a SMALL impact for population, employment, housing, and public services and MODERATE and beneficial impact for local finance. If only the proposed action (Phase 1) was constructed and operated, the impacts would also be SMALL to MODERATE.

As stated in EIS Section 4.11.1.1, impacts to socioeconomic and community resources are primarily associated with workers who might move into an area and tax revenues that they would generate, which would influence resources availability for the community. Because of the rapid rise and fall of populations in response to the oil and gas industry boom and bust cycles since the 1920s, population centers in the region have expanded to accommodate greater populations over that time period (EIS Section 3.11.1.1). The potash mineral industry could also contribute to employment and population changes through 2060. As stated in EIS Section 4.11.1, in 2016, Intrepid laid off 3,000 workers because of the stoppage at the West Mine near Carlsbad. For example, historical population data demonstrate that the population of Lea County alone rose by 15,000 people in less than 10 years between 1970 and the early 1980s, and then declined by approximately 10,000 people over a 5-year period between the mid-1980s and 1990 (Rhatigan, 2015). The NRC staff concludes that the type of historical population fluctuation demonstrated in Lea County is considered a MODERATE cumulative impact to socioeconomics in the region.

If the reasonably foreseeable future actions described in EIS Section 5.1.1 go forward and become functional within the geographic scope of the socioeconomic analysis, workers would be needed to build and operate these facilities. The reasonably foreseeable future actions described in EIS Section 5.1.1 within the region include agriculture, mining, oil and gas exploration, oilfield waste facilities, energy-related projects (nuclear facilities, wind, and solar), and urban planning and development. With regard to work force, these projects would be anticipated to influence or be influenced by construction and operation of the proposed CISF. It is likely that any additional workers that would be hired as a result of reasonably foreseeable future actions would desire to live closer to their places of employment and become active in their communities. Therefore, the NRC staff anticipates that the communities of Hobbs and Carlsbad, New Mexico, and Andrews, Texas, would experience the largest growth in the future because of commercial presence, housing availability, and location of major transportation routes in those communities. However, forward-looking population projections through 2060 for this area have not been accurate enough to provide reliable information for this analysis. For example, a 2003 population study the University of New Mexico Bureau of Business and Economic Research (BBER) conducted predicted a decline in population (a negative growth rage) in Lea County every 5 years from 2005 to 2040, while Eddy County would experience less than a 1 percent population growth rate every 5 years over the same time (Alcantara and Lopez, 2003). However, in reality, the population growth rate in Lea County was higher between 2000 and 2010 than it was in several previous decades.

Based on recent census data, the population growth rate of both Lea and Eddy Counties increased between 2010 and 2016 by approximately 6.5 and 4.7 percent, respectively (USCB, 2010, Table DP-1; USCB, 2016, Table B01003). In 2010, the BBER developed a population projection that predicted that about 73,000 people would be living in Lea County in 2030 (BBER, 2010). Two years later in 2012, the BBER developed a population projection that predicted that about 93,700 people would be living in Lea County in 2030, which is a difference of

20,700 people compared to their 2010 prediction (BBER, 2012). The same two documents projected an even larger difference in population projections for Lea County in 2040. These differences in population growth estimates up to 2040 demonstrate that population growth predictions are difficult and unlikely to reliably predict actual population sizes, particularly in this region where the oil and gas industry boom and bust cycles dominate the socioeconomic landscape.

The NRC staff predict that the oil and gas industry boom and bust cycle would continue as a major employment sector in the region as a reasonably foreseeable future action through 2060, and that the population in the region would also rise and fall through 2060. However, the continuation of agriculture, potash mining, and other large-scale projects (e.g., WIPP, wind projects) described in EIS Section 5.1.1 serve as a stable population employment base in the region. As further described in EIS Section 5.1.1, New Mexico is a leader in wind energy generation, and there are proposed wind projects and associated transmission line projects located within the geographic scope for the analysis for socioeconomics. The creation of new energy and transmission line projects in the region would increase jobs, increase the number of direct workers and families and indirect workers, and increase local finances by generating tax revenues. Smaller communities in the ROI, such as Jal, could experience housing impacts because of limited housing availability. As described in EIS Section 5.1.1, the NRC staff have confidence that the regional plans described to build additional housing, improve traffic congestion, and improve water systems located within the geographic scope for this socioeconomic analysis are sufficient to support the anticipated growth of the region through 2060. If, however, the new employees and their families relocate to one of the larger communities, such as Hobbs or Carlsbad where additional housing, transportation, and utility improvements are planned, the NRC staff anticipate that there would be adequate housing and infrastructure to absorb the influx of workers and their families from ongoing and reasonably foreseeable future actions. Based on the number of permanent employees needed to operate reasonably foreseeable future actions in the geographic scope of the analysis, there may be additional impacts to local government facilities, schools, and public services (e.g., fire protection, law enforcement services, hospitals) as population increases in the affected counties and communities, which would generally result in across-the-board increases in the demand on services. There are a number of existing medical and emergency facilities that would be capable of handling support for an increased population (EIS Section 4.11.1.1).

5.11.1 Summary

The NRC staff anticipates that, although exact numbers are unpredictable, there will be a rise and fall of population in the geographic scope of the analysis in the future, and these population changes would result in MODERATE socioeconomic impacts to employment and income, population, local finance, housing, school enrollment, and utilities and public services, based on the NRC staff's assessment provided in EIS Section 5.11. Although the nature of financial impacts from past, present, and reasonably foreseeable future actions depends on local economic activity, which the NRC staff cannot predict with certainty, the NRC staff anticipate that the past, present, and reasonably foreseeable future actions would not appreciably affect the overall socioeconomic characteristics of the area (i.e., expenditures, tax revenues, demand for housing, public utilities, and public services). Therefore, the NRC staff concludes that at full build-out, the proposed CISF would add a SMALL incremental effect for population, employment, housing, and public services and a MODERATE and beneficial incremental impact for local finance to the MODERATE impacts to socioeconomic resources from other past, present, and reasonably foreseeable future actions in the ROI, resulting in an overall SMALL to MODERATE and beneficial cumulative impact in the socioeconomic ROI.

5.12 Environmental Justice

The NRC staff assessed cumulative impacts on environmental justice within a geographic scope of analysis of 80 km [50 mi] around the proposed project area (NRC, 2003), comprising 115 block groups mostly located in Lea and Eddy counties. The timeframe for the analysis of cumulative impacts is 2017 to 2060.

Adverse health effects are measured in terms of the risk and rate of fatal or nonfatal adverse impacts on human health. Disproportionately high and adverse human health effects occur when the risk or rate of exposure to an environmental hazard for potentially affected minority and low-income populations exceed the risk or exposure rate for the general population or for another appropriate comparison group. Disproportionately high environmental effects refer to impacts or risk of impact on the natural or physical environment in a minority or low-income community that are significant and appreciably exceed the environmental impact on the larger community. Such effects may include biological, cultural, economic, or social impacts, and these potential effects have been evaluated in resource areas presented in Chapter 4 of this EIS. Minority and low-income populations in the geographic scope of analysis for environmental justice are subsets of the general public residing in the area, all of whom would be exposed to the same hazards generated from the proposed CISF and reasonably foreseeable future actions.

As explained in detail in EIS Sections 3.11 and 4.12, of the 115 block groups within 80 km [50 mi] of the proposed CISF project, 64 of the block groups have potentially affected minority populations, 8 block groups have potentially affected low-income families, and 8 block groups also have potentially affected low-income individuals. As described in EIS Section 4.12.1, after reviewing the information presented in the license application and associated documentation, considering the information presented throughout Chapters 1 through 4 of this EIS, and considering any special pathways through which potentially affected environmental justice populations could be more affected or affected differently from other segments of the general population, the NRC staff did not identify any disproportionately high and adverse human health or environmental impacts on any potentially affected environmental justice populations from full build-out of the proposed CISF. If only the proposed action (Phase 1) were constructed and operated, the same minority and low-income populations would be affected compared to full build-out; thus, there would also be no disproportionately high and adverse impacts on any potentially affected environmental justice populations.

Past, present, and reasonably foreseeable future actions described in EIS Section 5.1.1 could potentially contribute to cumulative disproportionately high and adverse human health or environmental effects within 80 km [50 mi] of the proposed CISF project. In this geographic scope, there are three other nuclear-related projects currently in the licensing and operation stages, one undergoing review (the proposed ISP CISF), and one speculative facility (Eden). These facilities have undergone or would require license reviews, are required to meet Federal and State environmental and safety regulations. As described in EIS Section 5.13, the NRC staff found that, because of the distance of nuclear-related projects from the proposed CISF project, these projects would not add to the radiation in the immediate vicinity of the proposed project area. However, it is possible an individual that routinely spends time at different locations within the region could be exposed to low levels of radiation from more than one facility over the course of a year. If the proposed second CISF were licensed, constructed, and operated, it could have site-specific impacts on environmental justice. Those impacts would be evaluated in a separate NRC licensing review, but, in general, would be expected to have impacts similar to the proposed action evaluated in this EIS, if the location has a similar population distribution and similar socioeconomic characteristics.

As described in EIS Section 5.1.1.1, the Permian Basin is the focus of extensive exploration, leasing, development, and production of oil and gas as well as oilfield waste disposal. Potash mining is also a major part of the Eddy and Lea County economies. Administrative controls implemented by the New Mexico Oil Conservation Commission, the New Mexico State Land Office, U.S. Department of the Interior, and BLM would ensure that oil and gas development activities and potash mining activities within the land use study area are closely monitored and regulated (Holtec, 2019c). There are no current or planned solar facilities located within the geographic scope of the analysis around the proposed CISF project area. However, there are currently two operational wind projects located within the 80-km [50-mi] radius of the proposed CISF project area. These projects are located east of the proposed CISF project area near Lovington, New Mexico, and Gaines, Texas. Another wind energy project within the region (the Osa Grande Wind Project) is under development in Chaves, Eddy, and Lea counties with construction to be completed in 2020 (EIS Section 5.1.1.3). Development of wind energy projects are associated with long-term disturbances, such as access roads, support facilities, and tower foundations (BLM, 2011). Therefore, the NRC staff anticipates that all of these facilities would continue to operate according to their Federal and State license requirements and would not have a disproportionately high and adverse effect on minority or low-income populations compared to other segments of the general population. Other existing and reasonably foreseeable future actions such as livestock grazing, land development, and recreational projects are not expected to contribute to cumulative disproportionately high and adverse human health or environmental effects.

While certain Tribal groups have expressed a heightened interest in cultural resources potentially affected by the proposed project and other nuclear facilities in the geographic region of analysis for environmental justice, the impacts to Indian Tribes would not be disproportionately high or adverse, because there are no Tribal lands and no potentially affected American Indian populations in the region. Holtec would follow inadvertent discovery procedures regarding the discovery of previously undocumented human remains during the project lifetime (EIS Section 5.9) (Holtec, 2019). These procedures would entail the stoppage of work and the notification of appropriate parties (Federal, Tribal, and State agencies).

The NRC staff determined in the Public and Occupational Health and Safety sections of this EIS (Sections 3.12 and 4.13) that the level of potential nonradiological impacts and radiological doses to the public from the proposed action would be within NRC regulatory limits and applicable Federal, State, and local regulatory limits. Holtec's safety evaluation of accident events described in EIS Section 4.15 concluded that the proposed CISF would not exceed applicable 10 CFR 72.106(b) dose limits to individuals at or beyond the controlled area boundary and satisfies applicable acceptance criteria for maintaining safe operations regarding criticality, confinement, retrievability, and instruments and control systems (Holtec, 2019b). Different segments of the population, including minority or low-income populations, would not be affected differently by accident events. In addition, accident events do not yield any pathways that could lead to adverse impacts on human health to minority or low-income populations. Based on the analysis above, the NRC staff determined that there would be no disproportionately high and adverse impacts on any environmental justice populations from the proposed CISF project and that there would most likely be no disproportionately high and adverse impacts on environmental justice communities from any past, present, or reasonably foreseeable future projects in the 80-km [50-mi] study area.

5.12.1 Summary

In summary, the environmental justice cumulative impact analysis assesses the potential for disproportionately high and adverse human health and environmental effects on minority and low-income populations that could result from past, present, and reasonably foreseeable future actions, including construction, operation, and decommissioning of the proposed CISF at full build-out. The NRC staff finds that the impacts from the proposed CISF on the resources evaluated in this EIS would be SMALL for most resources, SMALL to MODERATE for ecological resources and socioeconomics, and SMALL to LARGE for historic and cultural resources. Furthermore, the NRC staff did not identify any high and adverse human health or environmental impacts from the past, present, or reasonably foreseeable future actions in the geographic region of analysis {80 km [50 mi]} on minority and low-income populations, and concludes in EIS Section 4.12 that there would be no disproportionately high and adverse impacts on any environmental justice populations as a result of the proposed CISF. Therefore, the NRC staff finds that cumulative impacts would not be considered disproportionately high and adverse on low-income or minority populations.

5.13 Public and Occupational Health

The geographic scope of the analysis for public and occupational health is an 80-km [50-mi] radius of the proposed CISF project. This distance was chosen to be inclusive of areas in the region where other nuclear facilities that work with radioactive materials are located. This is a conservative approach (that is, it is expected to overestimate typical impacts) because the distances between the existing facilities are sufficient to limit cumulative exposures to radiation from operations of each facility unless the exposed individual moves from one facility to another. This approach is reasonable, however, because it is possible for an individual to live, work, and spend additional time near separate facilities. The timeframe for the analysis is 2017 to 2060.

The public and occupational health impacts from the proposed CISF Project would be SMALL and are discussed in detail in EIS Section 4.13.1. The potential exposure pathways at the proposed CISF include direct exposure to radiation emitted from the storage casks. During normal activities associated with all phases of the project lifecycle, radiological and nonradiological worker and public health and safety impacts would be SMALL. Annual radiological doses to workers and the most highly exposed nearest residents from the proposed CISF project would be below applicable NRC regulations. For the full build-out of 10,000 loaded canisters, Holtec estimated an annual dose of 0.122 mSv [12.2 mrem] to a hypothetical individual that spends 2,000 hours at the fence line 100 m [328 ft] from the proposed CISF (Holtec, 2019a). Doses to individuals located a greater distance from the proposed CISF project or who spend less than 2,000 hours at the boundary would be smaller. Occupational exposures would not exceed the NRC dose limit for workers, and therefore the radiological impacts to workers would be SMALL. Nonradiological impacts to public and occupational health include impacts associated with typical construction work and would also be SMALL.

Past, present, and reasonably foreseeable future nuclear materials facilities within the region of the proposed CISF project are described in EIS Section 5.1.1. Within an 80-km [50-mi] radius of the proposed CISF project, there are several nuclear materials facilities that are described in EIS Section 5.1.1 and Section 3.12.1.2 including WIPP, NEF, FEP/DUP, and WCS. Because of the distances from the proposed CISF project, the NRC staff consider that these projects would not add to the radiation in the immediate vicinity (e.g., within 1 km) of the proposed project area. However, it is possible that an individual who routinely spends time at different locations within the region could be exposed to low levels of radiation from more than one facility over the course of a year.

EIS Section 3.12.1.2 summarizes available information documenting public dose estimates at the boundary of each of the other nuclear materials facilities that include 1.04 × 10^{-6} mSv [1.04 × 10^{-4} mrem] for WIPP (DOE, 2018b); 0.019 mSv [19 mrem] for NEF (NRC, 2005); 0.21 mSv [20.8 mrem] for FEP/DUP (NRC, 2012b); and 0.027 mSv [2.7 mrem] for WCS (WCS, 2015). Additionally, ISP is seeking an NRC license to construct another CISF project adjacent to the existing WCS facility that would be smaller than the proposed Holtec CISF and therefore would have comparable or lower public dose impacts relative to the proposed CISF. Because these facilities are dispersed throughout the region, it would be unlikely for any individual to receive the full annual estimated dose from all of these facilities of 0.55 mSv [55 mrem]; and therefore, actual public doses would be a fraction of this total dose. Based on this analysis, the cumulative public dose to an individual from potential exposures to all of the other regional facilities would be below the NRC 10 CFR Part 20 annual public dose limit of 1 mSv [100 mrem] and have a negligible contribution to the 6.2 mSv [620 mrem] background radiation dose described in EIS Section 3.12.1.1. Therefore, the NRC staff concludes that the potential cumulative public dose impacts from the other past, present, and reasonably foreseeable future actions would be SMALL.

5.13.1 Summary

As described in the preceding analysis, the estimates of combined radiological exposures from currently operating and proposed future facilities in the geographic scope of the analysis are well below the regulatory public dose limit of 1.0 mSv/yr [100 mrem/yr] and have a negligible contribution to the 6.2 mSv [620 mrem] average yearly background dose for a member of the public from all sources. Adding the aforementioned public dose from the proposed Holtec CISF project of 0.122 mSv [12.2 mrem] to the preceding estimated dose from other past, present, and reasonably foreseeable future actions would not increase the estimated public dose above the NRC 10 CFR Part 20 annual public dose limit of 1 mSv [100 mrem]. Therefore, the NRC staff concludes that at full build-out, the proposed CISF would add a SMALL incremental effect to the SMALL impacts to public and occupational health from other past, present, and reasonably foreseeable future actions in the geographic scope of the analysis, resulting in an overall SMALL cumulative impact in the public and occupational health geographic area.

5.14 Waste Management

The geographic scope of the analysis for waste management is an 80-km [50-mi] radius around the proposed CISF project because the rural setting and large number of other industries make it feasible that waste disposal would be collected over several counties or transferred to further locations so as to not overwhelm smaller local landfills. The timeframe for the analysis of cumulative impacts is 2017 to 2060. This section evaluates the effects of the proposed CISF on the capacity and operating lifespan of waste-management facilities for LLRW, nonhazardous, hazardous, and sanitary wastes when added to the aggregate effects of other past, present, and reasonably foreseeable future actions.

The magnitude of cumulative impacts on waste management resources resulting from other past, present, and reasonably foreseeable future actions would depend on the total waste generation from the activities identified in EIS Section 5.1.1. These activities include nuclear facilities, solar and wind generation projects, housing developments, potash mining, and extensive exploration, leasing, development, production of oil and gas, and oilfield waste disposal. As described in EIS Section 5.1.1, three NRC-licensed nuclear material facilities and a second proposed CISF facility are within the geographic scope.

Cumulative Impact from LLRW Disposal

The geographic scope for the evaluation of cumulative impacts from disposal of LLRW considers the nuclear facilities discussed in EIS Section 5.1.1, which include the NEF, the WCS disposal facility, the licensed but not yet constructed FEP/DUP, and a second proposed CISF located at the WCS facility in Andrews, Texas. In NUREG–1790 and NUREG–2113, the NRC staff concluded that the impact of LLRW generated from the NEF and FEP/DUP on LLRW disposal facilities would be SMALL (NRC, 2005, 2012b). The WCS disposal facility is a minimal producer of LLRW, and is already licensed to dispose of LLRW. The second proposed CISF identified in EIS Section 5.1.1.3 would be less than half of the size of the proposed Holtec CISF, and in EIS Section 4.14, the NRC staff concluded that the proposed Holtec CISF would produce a minor amount of LLRW. Therefore, the NRC staff assume the proposed second CISF would also produce a minor amount of LLRW.

Holtec has identified two options for disposal of LLRW generated from the proposed CISF: the WCS facility in Andrews, Texas, and the Energy*Solutions* LLRW disposal facility in Clive, Utah, (Holtec, 2019a). In 2017, the total LLRW received at the Energy*Solutions* and WCS disposal facilities was 142,007 m^3 [185,738 yd^3], and 327 m^3 [427.7 yd^3], respectively (NRC, 2018). The total LLRW produced from the proposed project from full build-out (Phases 1-20), including decommissioning, would be approximately 27.21 metric tons [30 short tons] (Holtec, 2019a), which corresponds to a volume of approximately 261.5 m^3 [342 yd^3] of LLRW. This represents 0.2 percent of the total waste disposed at the Energy*Solutions* and WCS disposal facilities. As discussed in EIS Section 4.14, historically private industry has met the demand for LLRW disposal capacity, and the NRC staff expects that this trend will continue into the future, and that there would be adequate disposal capacity for the cumulative quantities of LLRW that the proposed CISF and other nuclear-related facilities located in the region would produce. Because present and reasonably foreseeable future nuclear facilities would produce a minor amount of LLW, the incremental increase in LLRW from the proposed Holtec CISF would be minor, and current LLRW facilities are capable and have the capacity to accept the LLRW, the NRC staff concludes that the combined impacts of LLWR from past, present, and reasonably foreseeable future actions on LLRW disposal capacity would be SMALL. In addition, with regard to these facilities, disposal of LLRW would be required to be conducted in accordance with all Federal and State regulations.

Cumulative Impact from Nonhazardous, Hazardous, and Sanitary Waste Disposal

As described in EIS Section 4.14, the waste management impacts from nonhazardous waste generated during the construction and operation stages of full build-out (Phases 1-20) of the proposed CISF project would be SMALL. Accordingly, if only the proposed action (Phase 1) was constructed and operated, the impacts would also be SMALL. Many of the activities within the geographic scope of the analysis, including those discussed in EIS Section 5.1.1, would produce nonhazardous, hazardous, and sanitary wastes. As identified in EIS Section 5.1.1.7, there are five waste disposal facilities within the geographic scope, and those facilities only accept oil and gas industry-related waste. Within the geographic scope of the analysis, there are six solar farms. Since these solar facilities are already constructed and operating, are passive systems, and require minimal maintenance, the NRC staff assume that the waste streams (i.e., nonhazardous, hazardous, and sanitary wastes) generated would be minor. In addition, there are two operating wind projects within the geographic scope of the analysis.

Similarly to the solar projects, the wind facilities would be passive and require minimal maintenance. Also in the geographic scope of the analysis, recreational activities and facilities are also assumed to have minor contributions to the waste streams discussed in this section. Furthermore, as detailed in EIS Section 5.1.1.5, some housing developments and urbanization projects are planned within the geographic scope of the analysis. Because these are new construction projects that do not involve significant demolition, the NRC staff does not anticipate that they would contribute significant amounts of nonhazardous waste to the waste streams within the geographic scope. Therefore, the NRC staff concludes that the impact from waste streams contributed from oil and gas industry, solar and wind projects, recreational activities, and housing and urbanization in the geographic scope of the analysis would be SMALL.

During the construction and operation stages of a full build-out (Phases 1-20) of the proposed CISF, the NRC staff estimated that approximately 5,171 metric tons [5,700 short tons] of nonhazardous waste would be generated annually and would have a minor impact. In NUREG–1790 and 2113, the NRC staff concluded that the impact of nonhazardous waste generation from the NEF and FEP/DUP on disposal facilities would be SMALL (NRC, 2005, 2012b). Therefore, the NRC staff concludes that the impact from nonhazardous waste contributed from the nuclear-related facilities within the geographic scope would be SMALL.

For disposal of all nonhazardous waste over the analysis timeframe, Holtec has selected two municipal landfills, the Sandpoint Landfill, located 40 km [25 mi] west of the proposed CISF, and the Lea County Landfill, located east of Eunice, NM. If either the Lea County Landfill or the Sandpoint Landfill were to receive all of this waste, it would generate less than 7 and 6 percent, respectively, of the cumulative annual municipal solid waste received at these landfills (NMENV, 2019). Therefore, the NRC staff concludes that cumulative annual volume of nonhazardous waste generated during the construction and operation stages of the full build-out (Phases 1-20) to be significantly less than the available capacity to dispose of such waste. As discussed in EIS Section 2.2.1.6, the total volume of waste produced as a result of reclamation is expected to be significantly higher than waste produced during the construction and operation stages. Nonhazardous waste produced from reclamation of the proposed CISF would be approximately 5,624,552 metric tons [6,200,000 short tons] over a 2-year decommissioning schedule. If the second proposed CISF were to decommission and undergo reclamation at the same time as the proposed Holtec CISF, the NRC staff estimate that the combined quantities of nonhazardous waste from both CISFs produced as a result of reclamation would be 7,874,373 metric tons [8,680,000 short tons] (i.e., scaling reclamation waste from the proposed Holtec CISF to accommodate the smaller size of the second proposed CISF). However, as discussed in EIS Section 4.11.1.3, both the Sandpoint and Lea County landfills are anticipated to be closed by the time of the decommissioning and reclamation stage (NMENV, 2019). Therefore, the impact from total estimated volume of nonhazardous solid waste from reclamation of the proposed CISF project, when added to the existing annual landfill throughputs would be MODERATE until the State licenses a new landfill. The number of new permitted landfills in New Mexico has increased over the last several years, with new facilities having a generally larger capacity than the current facilities (NMED, 2015). Additionally, there has been a trend toward the use of transfer stations, which would temporarily hold waste until a suitable landfill is available (NMED, 2015). Depending on where capacity is available, these transfer stations and subsequent landfills may be located outside the geographic scope of the analysis. Therefore, the NRC staff assume that for these reasons, the State of New Mexico would continue to have available landfill capacity to dispose of reclamation waste as needed and necessary. For these reasons, the NRC staff concludes that the potential impacts from contribution of the proposed CISF and past, present, and reasonably foreseeable future actions on nonhazardous waste management resources in the cumulative area of analysis would be MODERATE until a larger capacity landfill is identified and permitted, after which the NRC staff concludes the impact would be SMALL.

As described in EIS Section 4.14, the waste management impacts from hazardous waste generated during the operation and decommissioning and reclamation stages of the full build-out (Phases 1-20) of the proposed CISF project would be SMALL. Accordingly, if only the proposed action (Phase 1) were constructed, the operation and decommissioning impacts would also be SMALL. The proposed CISF would produce 1.2 metric tons per year [1.32 short tons] of hazardous waste. Activities in the geographic scope of the analysis, as discussed in EIS Section 5.1.5, would produce hazardous waste. Since 2001, the average quantity of hazardous waste produced from all hazardous waste generators in New Mexico was approximately 733,114 metric tons [808,118 short tons], with a majority being contributed by the HollyFrontier Navajo Refinery in Artesia, New Mexico (EPA, 2017). The second and third largest contributors to hazardous waste, based on EPA statistics, are Intel Corp, in Rio Rancho, New Mexico, and Los Alamos National Laboratories, in Los Alamos, New Mexico, respectively; however, these two facilities are outside of the geographic scope of the analysis (EPA, 2017). Already operating solar and wind projects are anticipated to produce a minor, if any, amount of hazardous waste. The oil and gas industry currently operating within the geographic scope of the analysis would be expected to produce some hazardous waste as part of operation. Any future oil and gas development would also produce hazardous waste. However, since the oil and gas industry is ongoing, the NRC staff assume that any hazardous waste produced would continue to be disposed of in accordance with State of New Mexico laws. Although total amounts of hazardous waste produced has decreased in recent years (EPA, 2017), the contribution from hazardous waste generated from the proposed CISF would result in an increase to the average total hazardous waste generated in the State of New Mexico (i.e., with HollyFrontier Navajo Refinery as the largest contributor) by approximately 0.00016 percent and therefore would be SMALL. Because the volume of hazardous waste the proposed CISF project generated would be SMALL, and the waste would be handled, stored, and disposed of in accordance with applicable regulations, the NRC staff concludes that the potential impacts from the contribution of the proposed CISF on waste management resources when added to past, present, and reasonably foreseeable future actions in the cumulative impacts area of analysis would be SMALL.

As discussed in EIS Section 2.2.1.6, the sanitary waste produced from the proposed CISF would be contained using onsite sewage collection tanks and underground digestion tanks similar to septic tanks but with no drain field, and after testing the waste in the collection tanks to ensure 10 CFR Part 20 release criteria are met, the sewage would be disposed at an offsite treatment facility. During the construction and operation stages of the proposed CISF, a maximum of 135 people would be expected to relocate to the geographic scope of the analysis and likely find housing within areas that a public wastewater system would serve (Holtec, 2019a). The major public wastewater treatment facilities in the geographic scope serve approximately 78,917 people and all have excess capacity (NRC, 2012). The addition of 135 staff for construction and operations would result in a 0.02 percent increase in the total number of people who rely on the public wastewater systems included within the geographic scope of the analysis. Therefore, the NRC staff concludes that the impact of the proposed CISF on public wastewater facilities would be SMALL.

5.14.1 Summary

As described in the preceding analysis, disposal infrastructure exists for LLRW, nonhazardous, hazardous, and sanitary wastes generated within the geographic scope of the analysis. For

LLRW, the NRC staff concludes that the combined impacts of LLRW generated from nuclear-related facilities within the geographic scope of the analysis on LLRW disposal would be SMALL. For nonhazardous waste, the NRC staff expects that the incremental quantity of nonhazardous waste the proposed CISF produced during concurrent construction and operations would be minor; however, the NRC staff expects the incremental quantity produced during reclamation to be MODERATE. The NRC staff expects that even though nonhazardous waste volumes produced from reclamation would have a MODERATE impact on currently available landfill capacity, adequate infrastructure and capacity for disposal of the additional waste in the State of New Mexico are likely to be available at that time. Thus, the NRC staff concludes that the potential impacts from the contribution of the proposed CISF on nonhazardous waste management resources in the cumulative area of analysis would be MODERATE, until a larger capacity landfill is identified and permitted, and SMALL thereafter. As previously discussed, because the volume of hazardous waste the proposed project generated would be minor and the waste would be handled, stored, and disposed of in accordance with applicable regulations, the NRC staff concludes that the potential impacts from the contribution of the proposed CISF on waste management resources in the cumulative impacts area of analysis would be SMALL. Additionally, the NRC staff concludes that the incremental quantity of sanitary waste the proposed CISF produced would be comparatively minor, and that capacity for offsite disposal would be adequate to handle the additional sanitary waste. Therefore, the NRC staff concludes that at full build-out, the proposed CISF would add a SMALL to MODERATE incremental effect to the SMALL impacts to waste management from other past, present, and reasonably foreseeable future actions in the geographic scope of the analysis, resulting in an overall SMALL to MODERATE cumulative impact in the waste management geographic area.

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6 MITIGATIONS

6.1 Introduction

This chapter summarizes mitigation measures that would reduce adverse impacts from the construction, operation, and decommissioning of the proposed Consolidated Interim Storage Facility (CISF) project.

Under Title 40 of the *Code of Federal Regulations* (CFR) 40 CFR 1508.20, the Council on Environmental Quality defines mitigation to include activities that

- avoid the impact altogether by not taking a certain action or parts of a certain action;
- minimize impacts by limiting the degree or magnitude of the action and its implementation;
- rectify the impact by repairing, rehabilitating, or restoring the affected environment;
- reduce or eliminate the impact over time by preservation and maintenance operations during the life of the action; and
- compensate for the impact by replacing or providing substitute resources or environments.

Mitigation measures are those actions or processes that could be implemented to control and minimize potential adverse impacts from construction and operation of the proposed CISF project. Potential mitigation measures can include general best management practices (BMPs) and more site-specific management actions.

BMPs are processes, techniques, procedures, or considerations that can be used to effectively avoid or reduce potential environmental impacts. While BMPs are not regulatory requirements, they can overlap with and support such requirements. BMPs will not replace any U.S. Nuclear Regulatory Commission (NRC) requirements or other Federal, State, or local regulations.

Management actions are active measures that an applicant specifically implements to reduce potential adverse impacts to a specific resource area. These actions include compliance with applicable government agency stipulations or specific guidance, coordination with governmental agencies or interested parties, and monitoring of relevant ongoing and future activities. If appropriate, corrective actions could be implemented to limit the degree or magnitude of a specific action leading to an adverse impact (reducing or eliminating the impact over time by preservation and maintenance operations) and repairing, rehabilitating, or restoring the affected environment. The applicant may also minimize potential adverse impacts by implementing specific management actions, such as programs, procedures, and controls for monitoring, measuring, and documenting specific goals or targets and, if appropriate, instituting corrective actions. The management actions may be established through standard operating procedures that appropriate local, State, and Federal agencies (including NRC) review and approve. The NRC may also establish requirements for management actions by identifying license conditions. These conditions are written specifically into the NRC license and then become commitments that are enforced through periodic NRC inspections.

The mitigation measures that Holtec proposed to reduce and minimize adverse environmental impacts at the proposed CISF project are summarized in this Environmental Impact Statement (EIS) in Section 6.2 and Table 6.3-1. Based on the potential impacts identified in Chapter 4 of this EIS, the NRC staff have identified additional potential mitigation measures for the proposed CISF project. These mitigation measures are summarized in EIS Section 6.3 and Table 6.3-2. The proposed mitigation measures provided in this chapter do not include environmental monitoring activities. Environmental monitoring activities are described in EIS Chapter 7.

6.2 Mitigation Measures Holtec Proposed

Holtec identified mitigation measures in its license application (Holtec, 2019a), as well as in response to the NRC staff's requests for additional information (RAIs) (Holtec, 2019c). EIS Table 6.3-1 lists the mitigation measures that Holtec has committed to for each resource area. Because Holtec committed to these, they were included as appropriate in the resource area impact determinations in EIS Chapter 4.

6.3 Potential Mitigation Measures the NRC Identified

The NRC staff have reviewed the mitigation measures that Holtec proposed and identified additional mitigation measures that could potentially reduce impacts (EIS Table 6.3-2). The NRC has the authority to address unique site-specific characteristics by identifying license conditions, based on conclusions reached in the safety and environmental reviews. These license conditions could include additional mitigation measures, such as modifications to required monitoring programs. While the NRC cannot impose mitigation outside its regulatory authority under the Atomic Energy Act, the NRC staff have identified mitigation measures in EIS Table 6.3-2 that could potentially reduce the impacts of the proposed CISF project. These additional mitigation measures are not requirements being imposed upon Holtec. For the purpose of the National Environmental Policy Act, and consistent with 10 CFR 51.71(d) and 51.80(a), the NRC is disclosing measures that could potentially reduce or avoid environmental impacts of the proposed project. Because Holtec has not committed to these, they are not credited in the resource area impact determinations in EIS Chapter 4.

Table 6.3-1 Summary of Mitigation Measures Holtec Proposed

Resource Area	Activity	Proposed Mitigation Measures
Land Use	Land Disturbance	Restore and re-seed disturbed areas as soon as practicable with an approved seed mix designed to stabilize soils from erosion and reduce the potential for exotic invasive plants. Use common corridors when locating pipelines and utilities. Coordinate with Intrepid to relocate the existing potable water pipeline so that it would not interfere with construction and operation activities. Minimize the construction footprint to the extent practicable. Stabilize disturbed areas with natural and low-water maintenance landscaping. Protect undisturbed areas with silt fencing and straw bales, as appropriate.

Table 6.3-1 Summary of Mitigation Measures Holtec Proposed		
Resource Area	**Activity**	**Proposed Mitigation Measures**
	Access Restrictions	Construct security fencing around the 114.5-ha [283-ac] protected area containing the storage pads and cask-handling building to restrict and control access. Maintain an adequate buffer between operational and construction areas to ensure that construction of additional SNF storage pads would not adversely impact operations. Prohibit grazing on the 133.5-ha [330-ac] storage and operations area. Designate the proposed project area as “Off Limits” to prevent accidental public use, and post “No Trespassing” along the boundary of the property in accordance with State and Federal requirements for posting real estate property.
Transportation	Transportation Safety	Use of an onsite concrete batch plant would limit the shipment of large premanufactured concrete structures during construction. Staged construction and operations disperses impacts to traffic and SNF shipments over a 20-year period. Use of rail and constructed rail spur for SNF shipments reduces the number of shipments that would be needed and the risk of accidents.

Table 6.3-1 Summary of Mitigation Measures Holtec Proposed		
Resource Area	**Activity**	**Proposed Mitigation Measures**
Geology and Soils	Soil Disturbance, Contamination, and Mineral Extraction	Utilize materials from higher portions of the proposed site for fill at the lower portions of the site, to the extent possible, and reuse excavated materials whenever possible. Use earthen berms, dikes, and sediment fences to limit suspended solids in runoff. Stabilize cleared areas not covered by pavement or structures as soon as practicable. Stabilize drainage culverts and ditches by lining them with rock aggregate/riprap. Create berms with silt fencing/straw bales to reduce flow velocity and prohibit scouring. Implement a Spill Prevention, Control, and Countermeasures (SPCC) Plan to minimize the impacts of potential soil hazardous material contamination. Conduct routine monitoring and inspections of canisters and SNF storage systems during all phases to verify that the proposed CISF project is performing as expected. Construct above-ground storage tanks with secondary containment structures (e.g., concrete berms and floor sumps) to stop fluids from spilling on the ground immediately around the tank or fuel pump, or potentially impacting downstream environments.
Surface Water Resources	Erosion, Runoff, and Sedimentation	Control impacts to water quality during construction through compliance with the Construction General Permit requirements and a Storm Water Pollution Prevention Plan (SWPPP). Use silt fencing and/or sediment traps. Utilizing berms around all above ground diesel storage tanks. Disturbed areas and soil stockpiles would be stabilized with native grass species, pavement, and crushed stone to control erosion, and eroded areas would be repaired.
	Spills and Leaks	Maintenance of construction equipment to prevent leaks of oil, greases, or hydraulic fluids. Construct above-ground storage tanks with secondary containment structures (e.g., concrete berms and floor sumps) to stop fluids from spilling on the ground immediately around the tank or fuel pump, or potentially impacting downstream environments.

Table 6.3-1 Summary of Mitigation Measures Holtec Proposed		
Resource Area	**Activity**	**Proposed Mitigation Measures**
Groundwater Resources	Water Use	Use an environmental monitoring program to detect potential radiological contamination. Immediate investigation and corrective action in the case of radioactive contaminant detection.
	Spills and Leaks	Obtain construction and industrial National Pollutant Discharge Elimination System (NPDES) permits, which require reporting of spills of petroleum products or hazardous chemicals. Develop and implement spill-response procedures to correct and remediate accidental spills. Report all regulated substance spills that occur at the site to the NMED, and remediate in accordance with State requirements.

Table 6.3-1 Summary of Mitigation Measures Holtec Proposed		
Resource Area	**Activity**	**Proposed Mitigation Measures**
Ecology	Reduce Human Disturbances	Minimize the construction footprint to the extent practicable. Control invasive plant species and noxious weeds. Disturbed areas and soil stockpiles would be stabilized with native grass species, pavement, and crushed stone to control erosion, and eroded areas would be repaired. Compliance with a SWPPP as part of the NPDES permitting process would reduce the potential impacts to surface-water runoff receptors (i.e., playas). Monitor for and repair leaks and spills of oil and hazardous material from operating equipment. Minimize fugitive dust that may settle on forage and edible vegetation (rendering it undesirable to animals). Conduct most construction activities during daylight hours, limiting the disruption of nocturnal animals. Comply with the requirements of a BLM permit, including BLM-required mitigation measures, and more thorough biological survey. Fence the protected area of the proposed CISF project to prevent large wildlife such as antelope and cattle from accessing the proposed CISF project. Down-shield security lighting for all ground-level facilities and equipment to keep light within the boundaries of the proposed CISF project during the operations stage, helping to minimize the potential for impacts on wildlife. Construct above-ground storage tanks with secondary containment structures (e.g., concrete berms and floor sumps) to stop fluids from spilling on the ground immediately around the tank or fuel pump, or potentially impacting downstream environments. Return the landscape to baseline contours, which would reduce the ecological impact by removing buildings and associated infrastructure.
Air Quality	Fugitive Dust	Suppress dust by spraying water or other techniques.
Noise	Exposure of Workers and Public to Noise	Use sound-abatement controls on operating equipment and facilities, such as locating process machinery inside, and restrict work to daytime hours (7 a.m. to 8 p.m.) in areas where the annoyance noise threshold could be exceeded at nearby residences.

Table 6.3-1 Summary of Mitigation Measures Holtec Proposed		
Resource Area	**Activity**	**Proposed Mitigation Measures**
Cultural and Historic Resources	Disturbance of Prehistoric Archaeological Sites and Sites Eligible for Listing on the National Register of Historic Places (NRHP)	Cease any work upon the inadvertent discovery of human remains during any phase of the project, as required by the Native American Graves Protection and Repatriation Act, until a professional archaeologist can evaluate the resources. Use existing roads, to the maximum extent feasible, to avoid additional surface disturbance.
Visual and Scenic	Potential Visual Intrusions in the Existing Landscape Character	Suppress dust along access roads. Down-shield all security lights at the CISF. Landscape using native plants. Re-vegetate and cover bare areas during construction. Minimize the removal of natural barriers, screens, and buffers.
Socioeconomics	Effects on Surrounding Communities	Preferentially source the labor force from the surrounding region to reduce any burden on public services and community infrastructure (e.g., housing, schools) in nearby towns.
Public and Occupational Health and Safety	Effects From Facility Construction and Operation	Both occupational and public radiation exposures would be monitored and controlled by Holtec following a radiation protection program that addresses the NRC safety requirements in 10 CFR 72 and 20. Transfer facilities and operations were designed to limit direct radiation exposure to workers by limiting direct exposure to the unshielded canister during transfer. Facility layout incorporates a setback distance of 400 m [1300 ft] from the proposed storage pads to the controlled area fence to limit exposures to members of the public at the facility boundary. Inspect incoming transportation casks to ensure acceptance criteria are met. Return of canisters that do not meet acceptance criteria adds confidence that canisters stored at the CISF meet safety specifications.

Table 6.3-1	Summary of Mitigation Measures Holtec Proposed	
Resource Area	**Activity**	**Proposed Mitigation Measures**
Waste Management	Disposal Capacity	All waste will be stored in designated locations of the facility until administrative limits are reached, at which time waste would be shipped offsite to the appropriate licensed treatment, storage, and/or disposal facility.
	Waste Reduction	No waste will be disposed onsite at the proposed CISF. All waste will be stored in designated locations of the facility until administrative limits are reached, at which time waste would be shipped offsite to the appropriate, licensed treatment, storage, and/or disposal facility. Sanitary wastes generated during construction of the proposed CISF will be contained with an adequate number of portable systems until installed plant sanitary facilities are available. Administrative procedures will be implemented for the collection, temporary storage, processing, and disposal of categorized solid waste, in accordance with regulatory requirements. Recycling will be maximized to the extent possible. All hazardous wastes generated would be identified, stored, and disposed of in accordance with State and Federal requirements applicable to Conditionally Exempt Small Quantity Generators (CESQGs). Any contaminated storage casks would be decontaminated to levels at or below applicable NRC limits for unrestricted use.

Table 6.3-2	Summary of Additional Mitigation Measures the NRC Identified	
Resource Area	**Activity**	**Proposed Mitigation Measures**
Land Use	Land Disturbance	No additional mitigations identified.
Transportation	Transportation Safety	Apply a phased approach to site reclamation to disperse waste shipments over a longer period to reduce potential transportation impacts.
Geology and Soils	Mineral Extraction	No additional mitigations identified.
Surface Water Resources	Spills and Leaks	No additional mitigations identified.
Groundwater Resources	Contamination	No additional mitigations identified.

Table 6.3-2 Summary of Additional Mitigation Measures the NRC Identified		
Resource Area	**Activity**	**Proposed Mitigation Measures**
Ecology	Reduce Human Disturbance	Conduct a more thorough biological survey of the proposed project area, and consult with NMDGF to develop an ecological baseline survey plan. Establish a buffer zone of 200 m [656 ft] around Laguna Gatuna that project activities would not disturb. Follow the U.S. Fish and Wildlife Service (FWS) recommendation that construction activities occur outside the general bird-nesting season between March 1 and September 1. Follow the FWS Nationwide Standard Conservation Measures and BLM's recommended disturbance-free dates and spatial buffers to protect raptors and songbirds. Construct and abandon power lines following the practices the Avian Power Line Interaction Committee (APLIC) provided to prevent or minimize risk of avian collision or electrocution of raptors. Follow the NMDGF trenching guidelines to limit hazards to wildlife from open trenches and steep-sided pits. Construct wildlife exclusion fencing around the areas under active construction to minimize impediments to game and avian movement that follow site-specific NMDGF-provided fence designs. Follow FWS recommendations to educate all employees, contractors, and/or site visitors of relevant rules and regulations that protect wildlife. Develop a wildlife inspection plan to identify animals that may be present at the proposed CISF project and take action to remove animals found within the storage and operations area, if present. Consult with BLM and NMDGF to determine appropriate mitigation measures to discourage wildlife use and habitation of the proposed project area, particularly near cask vents.

Table 6.3-2 Summary of Additional Mitigation Measures the NRC Identified		
Resource Area	**Activity**	**Proposed Mitigation Measures**
Air Quality	Fugitive Dust and Combustion Emissions from Construction Equipment and Mobile Sources	Apply erosion mitigation methods on disturbed lands, soil stock piles, and unpaved roads. Limit access to construction sites and staging areas to authorized vehicles only, through designated roads. Pave or put gravel on dirt roads and parking lots, if appropriate. Develop and implement a fugitive dust-control plan. Cover trucks carrying soil and debris to reduce dust emissions from the back of trucks. Limit dust-generating activities during unfavorable weather conditions (e.g., high winds). Perform road maintenance (e.g., promptly remove earthen material on paved roads). Set appropriate speed limits throughout the proposed site. Clean vehicles and construction equipment to remove dirt, when appropriate. Ensure vehicle and equipment exit construction areas through designated and treated access points. Coordinate construction and transportation activities to reduce maximum dust levels. Train workers to comply with the speed limit, use good engineering practices, minimize disturbed areas, and employ other BMPs, as appropriate. Minimize unnecessary travel. Develop and implement a construction traffic and parking management plan. Limit the numbers of hours in a day that effluent-generating activities can be conducted. Implement fuel-saving practices, such as minimizing vehicle and equipment idle time or utilizing a no-idle rule. If utilizing fossil-fuel vehicles, use those that meet the latest emission standards. Utilize newer, cleaner-running equipment (e.g., use construction equipment engines with the best available emissions control technologies). Ensure that equipment (e.g., construction equipment, generators) are properly tuned and maintained. Burn low-sulfur fuels in all diesel engines and generators. Consider using electric vehicles or other alternative fuels to reduce emissions of the National Ambient Air Quality Standards (NAAQS) pollutants and greenhouse gases. Encourage employee carpooling.

Table 6.3-2 Summary of Additional Mitigation Measures the NRC Identified		
Resource Area	**Activity**	**Proposed Mitigation Measures**
Noise	Exposure of Workers and the Public to Noise	Maintain noise levels in work areas to below Occupational Safety and Health Administration (OSHA) regulatory limits. Impose speed limits to reduce vehicle noise. Avoid construction activities during the night. Use personal hearing protection for workers in high noise areas.
Cultural and Historic Resources	Disturbance of Prehistoric Archaeological Sites and Sites Eligible for Listing on the National Register of Historic Places (NRHP)	Prepare an inadvertent discovery plan to manage Holtec's activities, in the event of a discovery of cultural resources during any phase of the project. Cease work if paleontological finds are identified during construction and employ a paleontology monitor to oversee construction activities as needed.
Visual and Scenic	Potential Visual Intrusions in the Existing Landscape Character	Follow the land use mitigation measures for land disturbance activities, which will also minimize impacts to vegetation and wildlife. Reclaim disturbed areas, and remove debris after construction is complete. Remove and reclaim roads and structures after operations are complete. Select building materials and paint that complement the natural environment.
Socioeconomics	Effects on Surrounding Communities	Coordinate emergency response activities with local authorities, fire departments, medical facilities, and other emergency services before operations begin.
Public and Occupational and Health and Safety	Effects from Facility Construction and Operation	No additional mitigations identified.

Table 6.3-2 Summary of Additional Mitigation Measures the NRC Identified		
Resource Area	**Activity**	**Proposed Mitigation Measures**
Waste Management	Disposal Capacity	Use decontamination techniques that reduce waste generation. Institute preventive maintenance and inventory management programs to minimize waste from breakdowns and overstocking. Develop a standard operating procedure to maximize the amount of recycling; minimize the production of hazardous waste; and for the collection, sorting, and temporary storage of all solid, nonhazardous solid waste. Salvage extra materials and use them for other construction activities. Avoid using hazardous materials when possible. Store and properly label hazardous chemicals in an appropriate area away from byproduct material to prevent any potential release. Ensure that equipment is available to respond to spills, and identify the location of such equipment. Inspect and replace worn or damaged components.

6.4 References

10 CFR Part 20. *Code of Federal Regulations*, Title 10, *Energy*, Part 20. "Standards for Protection Against Radiation." Washington, DC: U.S. Government Publishing Office.

10 CFR 51.71(d). *Code of Federal Regulations*, Title 10, *Energy*, § 51.71. "Draft environmental impact statement—contents." Washington, DC: U.S. Government Publishing Office.

10 CFR 51.80(a). *Code of Federal Regulations*, Title 10, *Energy*, § 51.80. "Draft environmental impact statement—materials license." Washington, DC: U.S. Government Publishing Office.

10 CFR Part 72. *Code of Federal Regulations*, Title 10, *Energy*, Part 72. "Licensing Requirements for the Independent Storage of Spent Nuclear Fuel, High-Level Radioactive Waste, and Reactor-Related Greater Than Class C Waste." Washington, DC: U.S. Government Publishing Office.

40 CFR 1508.20. *Code of Federal Regulations*, Title 40, *Protection of the Environment*, § 1508.20. "Mitigation." Washington, DC: U.S. Government Printing Office.

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Holtec. "Environmental Report-HI-STORE Consolidated Interim Storage Facility, Rev 7." ADAMS Accession No. ML19309E337. Marlton, New Jersey: Holtec International. 2019a.

Holtec. "Safety Analysis Report-HI-STORE Consolidated Interim Storage Facility." ADAMS Accession No. ML19318G865. Marlton, New Jersey: Holtec International. 2019b.

Holtec. "Responses to Request for Additional Information." ADAMS Accession No. ML19081A075. Marlton, New Jersey: Holtec International. 2019c.

7 ENVIRONMENTAL MEASURES AND MONITORING PROGRAMS

7.1 Introduction

This chapter describes Holtec's proposed monitoring programs to demonstrate compliance with regulations in Title 10 of the *Code of Federal Regulations* (10 CFR) Part 20 and 10 CFR Part 72 regarding radiological effluent release limits, public and occupational dose limits, and reporting. Monitoring programs provide data on operational and environmental conditions so that prompt corrective actions can be implemented when adverse conditions are detected. Thus, these programs help to limit potential environmental impacts at Independent Spent Fuel Storage Installation (ISFSI) facilities and the surrounding areas.

Required monitoring programs or those proposed in the license application can be modified to address unique site-specific characteristics by adding license conditions to address findings from the U.S. Nuclear Regulatory Commission (NRC) safety and environmental reviews. The NRC staff are conducting the safety review of the proposed CISF project, which will be documented in a Safety Evaluation Report (SER), and any license conditions resulting from the safety review that are relevant to the environmental impacts of the proposed action would be discussed in the final environmental impact statement (EIS). The description of the proposed monitoring programs for the proposed CISF project is organized as follows:

- Radiological Monitoring and Reporting (Section 7.2)
- Other Monitoring (Section 7.3)

The management of spills and leaks is not part of the routine environmental monitoring program described herein. Rather, spills and leaks, including the design of the infrastructure to detect leaks, are described in the NRC SER.

Pursuant to 10 CFR Part 20, the NRC requires that licensees conduct surveys necessary to demonstrate compliance and to demonstrate that the amount of radioactive material present in effluent from the proposed facility is kept as low as reasonably achievable (ALARA). Specifically, the NRC, in 10 CFR 20.1301, requires each licensee to conduct operations so that the total effective dose equivalent (TEDE) to individual members of the public from the licensed operation does not exceed 0.1 rem in a year, exclusive of the dose contributions from background radiation. The dose in any unrestricted area from external sources may not exceed 0.002 rem in any 1 hour. In addition, pursuant to 10 CFR 72, the NRC requires that licensees submit annual reports specifying the quantities of the principal radionuclides released to unrestricted areas and other information needed to estimate the annual radiation dose to the public from operations.

7.2 Radiological Monitoring and Reporting

Radiation monitoring requirements are met by using area radiation monitors in the cask transfer building for monitoring general area dose rates from the casks and canisters during canister transfer operations, and with thermoluminescent dosimeters (TLDs) along the perimeters of the restricted and controlled areas (Holtec, 2019b). TLDs provide a passive means for continuous monitoring of radiation levels and provide a basis for assessing the potential impact on the environment.

Monitoring is expected to include the following:

- Continuous radiation monitoring at the project boundary fence (via TLDs)
- Continuous monitoring (via TLDs) on the outside of all buildings
- Continuous monitoring (via TLDs) at strategic work locations, as backup for personnel radiation exposure monitoring
- Each TLD location will have a backup (i.e., two TLDs) with quarterly retrieval and processing
- Local radiation monitors with audible alarms to be placed in the canister transfer building

The radiological environmental monitoring program (REMP) includes the collection of data during preoperational years, to establish baseline radiological information that would be used in determining and evaluating potential impacts from operation of the proposed CISF project on the local environment. The REMP would be initiated at least 1 year prior to the operations stage. Radionuclides would be identified using technically appropriate analytical instruments (e.g., liquid scintillation or gamma/alpha spectrometry). Data collected during the operational years would be statistically compared to the baseline preoperational data generated. These comparisons would provide a means of assessing the magnitude (if any) of potential radiological impacts on members of the public and demonstrate compliance with applicable radiation protection standards (Holtec, 2019a,b).

Revisions to the REMP may be necessary and appropriate to ensure reliable sampling and collection of environmental data. Any revisions to the program would be documented and reported to the NRC and other appropriate regulatory agencies, as required (Holtec, 2019a).

As previously stated, compliance would be demonstrated through project boundary monitoring and environmental sampling data. If a potential release should occur, then routine operational environmental data would be used to assess the extent of the release. Compliance with regulations in 10 CFR 20.1301 would be demonstrated using a calculation of the dose to the individual who is likely to receive the highest dose, in accordance with regulations in 10 CFR 20.1302(b)(1). Compliance with 10 CFR 72.104 and 10 CFR 72.106 would be demonstrated by the annual reporting required by 10 CFR 72.44(d)(3) (Holtec, 2019a).

Reporting procedures would comply with the requirements of 10 CFR 72.44(d)(3). Reports of the concentrations of any radionuclides released to unrestricted areas would be provided and would include the Minimum Detectable Concentration (MDC) for the analysis. Each year, Holtec would submit a summary report of the environmental sampling program to the NRC, including all associated data, as required by 10 CFR 72.44(d)(3). The report would include the types, numbers, and frequencies of environmental measurements and the identities and activity concentrations of facility-related nuclides found in environmental samples. The report would also include the MDC for the analyses (Holtec, 2019a).

7.3 Other Monitoring

External radiological exposure for the public from the operations stage of the proposed CISF project would be from the SNF storage pad through direct shine (i.e., direct radiation). Because the casks are sealed and welded shut, there is no radiological exposure air pathway.

Continuous air monitors, if deemed necessary, would be located in the exhaust of the cask transfer building and also available as portable air samplers (Holtec, 2019b). There is no requirement for liquid monitoring, because there is also no potential for a liquid pathway and because there is no liquid component of SNF within the casks. The casks are sealed to prevent liquids from contacting the SNF assemblies (Holtec, 2019a,b).

Surface Water and Groundwater Monitoring

Since no pathways exist for exposures due to liquid effluents, administrative investigation and action levels are established for monitoring surface-water runoff as an additional step in the radiation-control process. However, at the proposed project area, the surface-water drainage paths are normally dry; therefore, it is not possible to monitor runoff on a continuous basis (Holtec, 2019a).

Detection of radionuclide impacts to surface-water runoff would be conducted in a two-step process. First, all casks would be checked for surface contamination during weekly surveys, and all storage pads would be checked for surface contamination during monthly surveys. Second, soil samples would be collected on a quarterly basis at the culverts leading to the proposed facility outfalls (Holtec 2019a,b).

Onsite sewage would be routed to holding tanks, which are periodically pumped; the sewage would then be sent offsite for disposal in a publicly owned treatment works. Each holding tank would be periodically sampled (prior to pumping) and analyzed for relevant radionuclides (Holtec, 2019a). In addition, there is a water pipeline within the proposed project area that would supply water for the facility. However, due to the lack of liquid effluent, there is no pathway for contamination during the operations stage that could contaminate this water supply (Holtec, 2019a).

Soil and Sediment Monitoring

Quarterly soil sampling conducted in surface-water drainage areas coupled with weekly and monthly radiological surveys on the casks and storage pad would be conducted (Holtec, 2019a).

Physiochemical Monitoring

Chemicals are not anticipated to be stored at the proposed CISF; therefore, no physicochemical monitoring would be required.

Ecological Monitoring

Ecological monitoring would not be required, given that the U.S. Fish and Wildlife Service has not reported any threatened or endangered species at the proposed project area that would be impacted during the construction and operation of the proposed CISF project.

7.4 References

10 CFR Part 20. Code of Federal Regulations, Title 10, *Energy*, Part 20. “Standards for Protection Against Radiation.” Washington, DC: U.S. Government Printing Office.

10 CFR 20.1301. Code of Federal Regulations, Title 10, *Energy*, § 20.1301. “Dose limits for individual members of the public.” Washington, DC: U.S. Government Printing Office.

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8 COSTS AND BENEFITS OF THE PROPOSED CISF AND THE NO-ACTION ALTERNATIVE

This chapter presents the cost-benefit analysis for the proposed Consolidated Interim Storage Facility (CISF) and the No-Action alternative. Section 8.1 provides an introduction, Section 8.2 identifies high-level assumptions associated with the overall analysis, Section 8.3 describes the proposed CISF's costs and benefits, Section 8.4 describes the No-Action alternative's costs and benefits, and Section 8.5 compares the costs and benefits of the proposed CISF to those of the No-Action alternative.

8.1 Introduction

In accordance with Title 10 of the *Code of Federal Regulations* (10 CFR) 51.71(d), this environmental impact statement (EIS) includes a consideration of the economic, technical, and other benefits and costs of the proposed action and alternatives. The analysis in this chapter considers both environmental and economic costs and benefits. The purpose of the cost-benefit analysis is not to exhaustively identify and quantify all of the potential costs and benefits, but instead, focus on those benefits and costs of such magnitude or importance that their inclusion in this analysis can inform the decision-making process (e.g., distinguish the proposed action from the No-Action alternative). The analysis in this chapter was informed by the Environmental Review Guidance for Licensing Actions Associated with the Office of Nuclear Material Safety and Safeguards (NMSS) Programs (NUREG–1748). As described in NUREG–1748 (NRC, 2003), the cost-benefit analysis provides input to determine the relative merits of various alternatives; however, the U.S. Nuclear Regulatory Commission (NRC) will ultimately base its decision on the protection of public health and safety.

The NRC staff generated the cost estimates in the EIS Tables 8.3-3, 8.4-1, 8.5-1, and 8.5-2 and EIS Appendix C provides additional details associated with generating the cost estimates in the tables.

8.2 Assumptions

Benefits and costs in this analysis focus on the societal perspective, as opposed to the perspective of any particular individual, company, or industry. As described in EIS Section 2.2.1, the environmental analysis considers both the proposed action (i.e., Phase 1) and the subsequent license amendments (i.e., Phases 2-20), assuming NRC approved such amendments. Similarly, this cost-benefit analysis will also consider both the proposed action (i.e., Phase 1) as well as full build-out (i.e., Phases 1-20). The benefit cost analysis includes all phases (Phases 1-20) because facilities and infrastructure completed as part of the proposed action (Phase 1) and their associated costs are integral to the additional phases.

As described in EIS Section 2.2.1, the proposed CISF would serve as an interim storage facility until the spent nuclear fuel (SNF) can be shipped to a permanent geologic repository or until the end of the 40-year license term. Therefore, transportation would take place in two campaigns. The first campaign would be transporting the SNF from the nuclear power plants and ISFSIs to the proposed CISF, and the second campaign would be transporting the SNF from the proposed CISF to the geologic repository. The No-Action alternative (i.e., the NRC would not grant a license for the proposed CISF) would include only a single campaign; specifically, transporting the SNF from nuclear power plants and ISFSIs to a geologic repository.

As described in EIS Section 5.1.1.3, the cumulative impacts analysis considers the potential presence of a second CISF as a reasonably foreseeable future action. Therefore, the cost-benefit analysis will also consider the potential presence of a second CISF as it pertains to impacts (i.e., changes) to the costs and benefits associated with the proposed Holtec CISF project.

As described in EIS Section 2.2.1, the license term for the proposed CISF project is 40 years. Therefore, cost estimates are discounted so that costs incurred over the 40-year license term can be compared to today's costs (i.e., present values), are comparable at a single point in time, and are expressed in constant 2019 dollars. Discounting reduces future values in order to reflect the time value of money. In other words, costs and benefits have more value if they are experienced sooner rather than later. The higher the discount rate, the lower the corresponding present value of future cash flows. Consistent with the Office of Management and Budget guidance (OMB, 2003), this cost-benefit analysis uses discount rates of 3 and 7 percent.

The NRC staff's evaluation of issues related to Holtec's financial qualifications and decommissioning funding assurance will be addressed in the NRC's Safety Evaluation Report (SER) rather than this EIS.

8.3 Costs and Benefits of the Proposed CISF

8.3.1 Environmental Costs and Benefits of the Proposed CISF

In EIS Chapter 4, the NRC staff analyze the potential impacts for the proposed CISF, which includes both negative and positive environmental impacts. Negative environmental impacts are classified as environmental costs. In contrast, positive environmental impacts are classified as environmental benefits. EIS Tables 8.3-1 and 8.3-2 define examples of environmental costs and environmental benefits of the proposed CISF, respectively.

Table 8.3-1 Examples of the Environmental Costs of the Proposed CISF

Resource	Description	Impact Assessment*
Land Use	For the duration of the license term, the proposed CISF would use approximately 133.5 ha [330 ac] and unavailable for other uses such as grazing and recreation.	SMALL
Transportation	Vehicles transporting workers and construction materials would increase local traffic counts.	SMALL
Geology and Soils	Surface soils would be disturbed, primarily during (i) construction of the proposed CISF and (ii) reclamation, which would include replacing the top soil.	SMALL
Groundwater	The proposed CISF consumptively uses groundwater for activities like operating the concrete batch plant.	SMALL
Vegetation	Land the proposed CISF disturbs results in short-term loss of vegetation. Moderate impact for the operation and decommissioning stages until vegetation is reestablished.	SMALL to MODERATE
Wildlife	Project-related traffic could cause wildlife injuries and fatalities. Wildlife could also be temporarily displaced by CISF project traffic and noise.	SMALL
Air Quality	The proposed CISF generates air effluents like fugitive dust and combustion emissions, which degrade air quality.	SMALL

Table 8.3-1	Examples of the Environmental Costs of the Proposed CISF	
Resource	**Description**	**Impact Assessment***
Historic and Cultural Resources	Pending concurrence by the NM SHPO, the NRC staff does not recommend any sites within the direct or indirect APE as eligible for listing in the NRHP; therefore, historic and cultural resources would not be adversely impacted by the proposed project.	SMALL
Public and Occupational Health	Limited potential exists for radiological and non-radiological impacts.	SMALL
Waste Management	The proposed CISF project impacts the available waste disposal capacity in the region because of the volumes that would be disposed at permitted facilities. The waste management decommissioning impact is SMALL for the proposed action (Phase 1) and MODERATE for Phases 2-20 until a new landfill becomes available.	SMALL to MODERATE
*See EIS Table 2.4-1 for impact assessment by phases and stages.		

Table 8.3-2	Summary of the Environmental Benefits of the Proposed CISF	
Resource	**Description**	**Impact Assessment**
Socioeconomics	For the duration of the license term, the proposed CISF would positively impact local finances through increased taxes and revenue.	SMALL to MODERATE and beneficial

8.3.2 Economic and Other Costs and Benefits of the Proposed CISF

8.3.2.1 Economic and Other Costs

Estimated costs for the proposed CISF include the following activities: constructing the proposed CISF, transporting the SNF from nuclear power plants and ISFSIs to the proposed CISF, operating and maintaining the proposed CISF, transporting the SNF from the proposed CISF to a permanent geologic repository, and decommissioning the proposed CISF.

EIS Table 8.3-3 contains the estimated costs the NRC staff would generate for both the proposed action (Phase 1) and full build-out (Phases 1-20). In addition, the NRC staff generated two overall cost estimates for the proposed CISF based on two different scenarios: a lower CISF operations estimate (Scenario A), which is based on costs from currently decommissioning reactor sites and a higher CISF operations estimate (Scenario B) based on the costs the applicant identified. Changing the proposed CISF operating costs between lower and higher cost estimates would have more influence on the costs of Phase 1 compared to the full build-out (Phases 1-20) costs (EIS Table 8.3-3). For the proposed action (Phase 1) the total costs of Scenario A are approximately 50 percent less than those for Scenario B, whereas for the full build-out (Phases 1-20) the total costs increased about 10 percent for Scenario B over Scenario A. Details concerning the calculation of the EIS Table 8.3-3 cost estimates, including the discounting, are presented in Appendix C, Section C–3.

Table 8.3-3 Estimated Costs for the Proposed CISF for both Phase 1 and Full Build-out (Phases 1-20)				
Activity	**Phase 1**		**Full Build-out (Phases 1-20)**	
	Scenario A	**Scenario B**	**Scenario A**	**Scenario B**
CISF Construction	$233,719,816	$233,719,816	$2,198,305,989	$2,198,305,989
SNF Transport to CISF	$269,883,561	$269,883,561	$3,223,678,281	$3,223,678,281
CISF Operations and Maintenance	$178,979,349	$1,059,919,752	$178,979,349	$1,059,919,752
SNF Transport to a Repository	$269,883,561	$269,883,561	$3,006,396,036	$3,006,396,036
CISF Decommissioning	$24,822,656	$24,822,656	$496,453,127	$496,453,127
Total Cost	$977,288,943	$1,858,229,346	$9,103,812,782	$9,984,753,185
3% Discounting	$660,569,922	$1,152,072,127	$5,350,971,268	$5,842,473,472
7% Discounting	$505,438,748	$772,588,346	$3,141,135,640	$3,408,285,238

*Consistent with the Office of Management and Budget guidance (OMB, 2003), this cost benefit analysis uses discount rates of 3 and 7 percent.
Source: Modified from Holtec, 2019

Discounting requires specifying when the various activities occur. EIS Table 8.3-4 contains the project schedule the NRC staff used to estimate the costs in EIS Table 8.3-3. With discounting, changing the timing of when an activity occurs also changes the estimated costs (i.e., the present values). Costs or benefits experienced closer to the present have more value than those experienced farther into the future. This means delaying or extending an activity results in lower estimated costs. From a discounting perspective, the estimated costs in EIS Table 8.3-3 are bounding because these costs are based on a project schedule prior to any delays.

A number of the activities in EIS Table 8.3-4 only occur for a short duration considering the 40-year license term. For the proposed action (Phase 1), CISF construction would last 2 years, and transporting SNF from nuclear power plants and ISFSIs to the proposed CISF would take 1 year. For each subsequent expansion phase, CISF construction would take 1 year, and transporting SNF from nuclear power plants and ISFSIs to the proposed CISF would take 1 year. However, operations and maintenance would occur over almost the entire license term of the proposed CISF. The applicant assumed that this cost would be the same, regardless of how much SNF was stored at the CISF (i.e., the estimated annual costs for this activity would be the same no matter how many phases were active during an individual project year). The NRC staff used two different estimated annual costs for the proposed CISF operations and maintenance. The lower cost estimate (Scenario A) of $4,709,983 (2019 constant dollars) was based on the costs for this activity at currently decommissioned nuclear power plants (Holtec, 2018). The applicant provided the higher cost estimate (Scenario B) of $27,892,625 (2019 constant dollars) (Holtec, 2019). The higher estimate provides an upper limit for the operation and maintenance costs in this EIS.

Table 8.3-4 Project Years when Activities Occur for the Proposed CISF for both Phase 1 and Full Build-out

Activity	Project Years when Activity Occurs*	
	Phase 1	Full Build-out (Phase 1 to 20)
CISF Construction	1 and 2	1 to 21
SNF Transportation from the Nuclear Power Plants and ISFSIs to CISF	3	3 to 22
CISF Operations and Maintenance	3 to 40	3 to 40
SNF Transportation from CISF to Repository	40	23 to 40
CISF Decommissioning	41	41

*Holtec specified the project years when the following activities occur: CISF construction, SNF transportation from nuclear power plants and ISFSIs to the CISF, and CISF operations and maintenance. For purposes of discounting the cost estimates, the NRC staff specified when the following activities occur: SNF transportation from the CISF to a repository and CISF decommissioning.
Source: Holtec, 2019b

For the proposed action (Phase 1), the NRC staff assumed that the proposed CISF would be utilized for the full license term, meaning that transporting SNF to a repository would occur during project year 40. For estimating the costs for full build-out (Phases 1-20), the NRC staff assumed that transporting SNF to a repository would occur during project years 23 to 40, which represents an early baseline schedule for this activity. This would bound the cost analysis from a discounting perspective because delaying removal of all the material on site to the end of the license would result in lower estimated costs. For both the proposed action (Phase 1) and full build-out (Phases 1-20), the NRC staff assumed that decommissioning would take 1 year and would occur immediately after transporting the SNF to a repository was complete. The NRC staff chose a 1- year time frame for decommissioning because this would bound the estimated costs for this activity from a discounting perspective.

The following are other cost considerations for the proposed CISF that have not been incorporated into EIS Table 8.3-3.

A Potential Second CISF

As described in EIS Section 8.2, consideration of a second CISF in this EIS would be limited to the potential impacts on the costs and benefits of the proposed Holtec CISF. The presence of a second CISF could impact the costs for the proposed Holtec CISF in several ways.

A second CISF could delay the schedule for transporting SNF to the proposed Holtec CISF, because two CISF sites would be available to receive and store SNF, thereby resulting in a lower present value cost estimate. This means the SNF transportation costs in Table 8.3-3 are bounding from a discounting perspective because costs are based on a SNF transportation schedule prior to any delays. Changes to the SNF transportation schedule to the proposed CISF would likely affect the cost estimates for full build-out (Phases 1-20). Because of the timing of transport for full build-out (Phases 1-20), the applicant assumes that transport would occur from project years 3 to 22, whereas for the proposed action (Phase 1) transport occurs in project year 3.

The presence of a second CISF also could impact whether the proposed Holtec CISF would reach full capacity (i.e., storing 10,000 SNF canisters). This would potentially affect the full build-out rather than Phase 1. As described in EIS Section 2.2.1, the Holtec expansion plan consists of 19 separate license amendment requests, with each one requesting to increase the

CISF capacity by an additional 500 SNF canisters. If the demand for SNF storage capacity decreases or no longer exists at some point in the future (e.g., because of the storage capacity provided by two CISFs), then the applicant has the option to either delay expansion or not expand. Again, because of discounting, the proposed action (Phase 1) cost estimate in EIS Table 8.3-3 bounds the estimated costs for any subsequent phases. Similarly, the full build-out (Phases 1-20) cost estimate in EIS Table 8.3-3 bounds the estimated costs if subsequent phases are delayed or not built.

Accidents at the Proposed CISF and During SNF Transport

For the proposed 40-year license term, the NRC staff's safety review will evaluate the potential for credible accidents at the proposed CISF. The EIS consideration of the cost of accidents at the proposed CISF would be informed by this safety determination. At this time, the safety analysis has not identified any credible accidents. Therefore, this EIS will not estimate the costs of an accident specific to this proposed CISF. Holtec has proposed a license condition addressing liability and financial assurance arrangements with its customers that would be applicable to events occurring during CISF operations, which the NRC staff will consider in its safety review.

Concerning SNF transportation, only a small fraction of accidents would result in any release of radioactive material and the probability of a significant release is very small. As determined in NUREG–2125, Spent Fuel Transportation Risk Assessment (NRC, 2014), more than 99.999999 percent of all accident scenarios do not lead to either a release of radioactive material or a loss of lead shielding. Therefore, the NRC staff has not attempted to quantify the economic cost of any particular accident in this EIS. Any attempt to calculate the economic costs of unlikely accidents with any precision is difficult because the costs can differ significantly depending on variables such as the location and conditions of the accident; the nature of the contamination dispersion and deposition; level of development; and land use. The NRC staff note that for the Final Supplemental Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada, final Yucca Mountain EIS (DOE, 2008) the U.S. Department of Energy (DOE) estimated that the costs for a severe, maximum reasonably foreseeable SNF transportation accident could range from $1 million to $10 billion. The Price-Anderson Act provides accident liability for incidents (including those caused by sabotage) involving the release of nuclear material for SNF transportation (NRC, 2019). Currently the amount of coverage per incident this Act provided is over $13 billion. In addition, Congress enacted legislation that developed a method to promptly consider compensation claims of the public for liabilities resulting from nuclear incidents that exceed this designated limit.

8.3.2.2 Economic and Other Benefits

Economic benefits for the proposed CISF are estimated as the costs society could save by using the proposed CISF. Potential savings are estimated by subtracting the costs associated with storing SNF at the proposed CISF from the costs of continuing to store SNF at reactor sites (i.e., the No-Action alternative). EIS Table 8.3-3 contains the estimated costs for the proposed CISF and EIS Table 8.4-1 contains the estimated costs for the No-Action alternative costs. EIS Section 8.5 compares the estimated costs of the proposed CISF to the No-Action alternative and discusses the net economic outcome of this comparison.

As previously described, not all cost considerations for the proposed CISF are quantified and incorporated into EIS Table 8.3-3 cost estimates. The following text discusses the benefits associated with these other cost considerations.

8.4 Costs and Benefits of the No-Action Alternative

One possible benefit of the proposed CISF is the repurposing of land use at the nuclear power plants and ISFSIs. For sites where the reactor is decommissioned and all of the SNF is relocated (i.e., sent to a CISF), the NRC can terminate its license and release the property for other uses. This benefit was not quantified in this EIS, because the cost of the land would be difficult to establish and would vary based on the individual nuclear power plant and ISFSI characteristics.

8.4.1 Environmental Costs and Benefits of the No-Action Alternative

Under the No-Action alternative, SNF would continue to be stored at the various nuclear power plants and ISFSIs. The environmental costs and benefits experienced at these nuclear power plants and ISFSIs are analyzed and documented in the EIS associated with those specific nuclear power plants and ISFSIs.

8.4.2 Economic and Other Costs and Benefits of the No-Action Alternative

8.4.2.1 Economic and Other Costs of the No-Action Alternative

EIS Table 8.4-1 contains the estimated costs the NRC staff generated for the No-Action alternative relevant to the proposed CISF for both the proposed action (Phase 1) and full build-out (Phases 1-20). The estimated costs for the No-Action alternative are based on two activities: the cost for operating and maintaining the SNF storage at the nuclear power plant and ISFSI sites and the cost for transporting the SNF from the nuclear power plants and ISFSIs to a geologic repository. Details concerning the calculation of the EIS Table 8.4-1 cost estimates including the discounting are presented in Appendix C, Section C–4.

Discounting requires specifying when the various activities occur. The operation and maintenance activities at the existing nuclear power plants and ISFSIs would occur during all 40 years associated with the proposed CISF. The schedule for transporting SNF to a repository would be the same as that for the proposed CISF described in EIS Table 8.3-4.

The estimated costs for the No-Action alternative are based on the amount of SNF that would be stored at the proposed CISF. The No-Action alternative costs relevant to the proposed action (Phase 1) of the proposed CISF were based on storing 500 SNF canisters at 14 reactor sites: 12 decommissioned sites and 2 active sites. The No-Action alternative costs relevant to full build-out of the proposed CISF were based on storing 10,000 SNF canisters at 72 reactor sites: 12 decommissioned sites and 60 active sites. It is important to identify whether the SNF is being stored at a decommissioned site or an active site because the estimated annual operations and maintenance costs vary for these two types of sites. Operations and maintenance costs at an active site are lower because of efficiencies gained by the presence of an operating reactor. The annual operation and maintenance costs for storing SNF at a decommissioned reactor site were estimated to be $6,984,013 (2019 constant dollars), whereas this cost was estimated at $1,117,442 (2019 constant dollars) for a site with an operating reactor (Holtec, 2019).

Table 8.4-1 Estimated Costs for the No-Action Alternative Relevant to the Proposed CISF for both Phase 1 and Full Build-out*				
Activity	**Phase 1**		**Full Build-out (Phases 1-20)**	
	Scenario 1†	**Scenario 2‡**	**Scenario 1†**	**Scenario 2‡**
Operation and Maintenance at the Nuclear Power Plants and ISFSIs	$3,441,721,600	$3,676,384,440	$4,615,398,812	$8,344,777,997
SNF Transport to a Repository‡	$269,883,561	$269,883,561	$3,006,396,036	$3,006,396,036
Total Cost	$3,711,605,161	$3,946,268,001	$7,621,794,848	$11,351,174,033
3% Discounting	$2,071,599,901	$2,168,249,278	$4,167,221,831	$5,856,614,539
7% Discounting	$1,165,123,684	$1,197,245,444	$2,244,892,112	$2,869,099,307

*The applicant specified that the SNF storage at the nuclear power plants and ISFSIs occur during CISF project years 1 to 40, and for purposes of discounting the estimated cost, the NRC staff specified that SNF transportation to a repository occur in project year 41.
†Scenario 1 assumes no more reactors are decommissioned over the 40-year license term of the proposed CISF.
‡Scenario 2 assumes all reactors are decommissioned in the year 2040.
Source: Holtec, 2019

For the No-Action alternative cost-benefit analysis, the NRC staff generated two different overall cost estimates based on two different scenarios. Scenario 1 assumes no more reactors are decommissioned over the 40-year license term for the proposed CISF. Scenario 2 assumes all reactors are decommissioned at year 2040. Scenario 2 bounds the storage costs for the No-Action alternative because the annual estimated operations and maintenance costs would increase from $1,117,442 to $6,984,013 (2019 constant dollars) at year 2040 for the active sites that transition to decommissioned sites. For the proposed action (Phase 1), this transition from active to decommissioned site occurs for two sites. For full build-out (Phases 1-20), this transition in cost occurs for 60 sites. As shown in EIS Table 8.4-1, this would have more of an influence on the full build-out (Phases 1-20) estimated costs compared to the proposed action (Phase 1) estimated costs.

8.4.2.2 Economic and Other Benefits

EIS Section 8.5 compares the estimated costs of the proposed CISF to the No-Action alternative and discusses the net economic outcome of this comparison. This quantitative comparison is based on the cost factors incorporated into EIS Tables 8.3-3 and 8.4-1. Under the No-Action alternative, SNF would continue to be stored at the various nuclear power plants and ISFSIs. Other benefits experienced at these nuclear power plants and ISFSIs are analyzed and documented in each EIS associated with those specific nuclear power plants and ISFSIs.

8.5 Comparison of the Proposed CISF to the No-Action Alternative

8.5.1 Comparison of the Environmental Costs and Benefits

For the environmental costs and benefits, the key distinction between the proposed CISF and the No-Action alternative is the location where the impacts occur. Under the proposed action (Phase 1), the environmental impacts of storing SNF would occur at a new location: the proposed Holtec site. In addition, environmental impacts would continue to occur at the nuclear power plants and ISFSIs with the exception of any sites that are fully decommissioned such that NRC terminates its license and releases the property for other uses. Under the No-Action alternative, environmental impacts from storing SNF would continue to occur at the nuclear power plants and ISFSIs and would not expand to the proposed Holtec site.

The proposed CISF consists of two SNF transportation campaigns, while the No-Action alternative consists of just one campaign. This affects more than just the estimated costs. As described in EIS Section 4.3, the No-Action alternative results in a net reduction in overall occupational and public exposures from the transportation of SNF, because the overall distance traveled from reactor sites to a repository would likely be less than from reactor sites to the proposed CISF and then to a repository.

8.5.2 Comparison of the Economic and Other Costs and Benefits

For both the proposed action (Phase 1) and full build-out (Phases 1-20), the NRC staff compared the proposed CISF costs to the No-Action alternative costs. This quantitative comparison is based on the cost factors incorporated into EIS Tables 8.3-3 and 8.4-1. The NRC staff generated net values by subtracting the proposed CISF costs from the associated No-Action alternative costs. If the results were positive, then the No-Action alternative costs were higher than the proposed CISF costs, and the proposed project generated a net benefit. If the results were negative, then the No-Action alternative costs were lower than the proposed CISF costs, and the proposed project generated a net cost. The proposed CISF costs included two scenarios: a low operation cost estimate (Scenario A) and a high operation cost estimate (Scenario B). The No-Action alternative costs also included two scenarios: no additional reactors decommissioned (Scenario 1) and all reactors decommissioning at 2040 (Scenario 2). Costs were also estimated with no discounting as well as discounting at 3 and 7 percent.

EIS Table 8.5-1 compares the proposed action (Phase 1) costs to the associated No-Action alternative costs. In all cases, the No-Action alternative costs exceed the proposed action (Phase 1) costs (i.e., a net benefit for the proposed CISF). As shown in EIS Table 8.5-1, the net values for proposed action (Phase 1) were influenced more by the estimated proposed CISF operation costs (Scenarios A and B) rather than the status of the reactor (i.e., active versus decommissioned) at which the SNF was stored (Scenarios 1 and 2).

EIS Table 8.5-2 compares the full build-out (Phases 1-20) costs to the associated No-Action alternative costs. The net values in EIS Table 8.5-2 reveal that for full build-out (Phases 1-20), some cases resulted in a net benefit, while other cases resulted in a net cost. As shown in EIS Table 8.5-2, the net values for full build-out (Phases 1-20) were influenced more by the status of the reactor (active versus decommissioned) at which the associated SNF was stored (Scenarios 1 and 2) rather than the estimated CISF operation costs (Scenarios A and B). Full build-out (Phases 1-20) universally resulted in net losses when compared to Scenario 1 (no additional reactors decommissioned) of the No-Action alternative. Full build-out (Phases 1-20) results in net benefits (except when discounted at seven percent) when compared to Scenario 2 (all reactors decommissioning at 2040) of the No-Action alternative.

The proposed CISF and the No-Action alternative also share or have in common other SNF transportation cost factors. A key difference between the proposed CISF and the No-Action alternative concerning these other common cost factors is the time these activities occur. For example, infrastructure improvements at or near nuclear power plants and ISFSIs would be needed for some nuclear power plants and ISFSIs (e.g., decommissioned sites) that no longer have the ability to transport SNF from the current storage location to the national rail route. This cost was not quantified in this EIS because it (i) would be difficult to establish, (ii) would vary based on the individual nuclear power plants and ISFSIs, and (iii) would be a common need for both the proposed CISF and the No-Action alternative.

Table 8.5-1 Phase 1 Net Values that Compares the Costs of the Proposed CISF to the No-Action Alternative.					
Discount Rate	Phase 1	No-Action Alternative		Net Value	
	Scenario A	Scenario 1	Scenario 2	Scenario 1	Scenario 2
0	$977,288,943	$3,711,605,161	$3,946,268,001	$2,734,316,218	$2,968,979,058
3	$660,569,922	$2,071,599,901	$2,168,249,278	$1,411,029,979	$1,507,679,356
7	$505,438,748	$1,165,123,684	$1,197,245,444	$659,684,936	$691,806,696
Rate	Scenario B	Scenario 1	Scenario 2	Scenario 1	Scenario 2
0	$1,858,229,346	$3,711,605,161	$3,946,268,001	$1,853,375,815	$2,088,038,655
3	$1,152,072,127	$2,071,599,901	$2,168,249,278	$919,527,774	$1,016,177,151
7	$772,588,346	$1,165,123,684	$1,197,245,444	$392,535,338	$424,657,098
Source: EIS Tables 8.3-3 and 8.4-1					

Table 8.5-2 Full Build-out (Phases 1-20) Net Values which Compares the Costs of the Proposed CISF to the No-Action Alternative					
Discount Rate	Full Build-out	No-Action Alternative		Net Value	
	Scenario A	Scenario 1	Scenario 2	Scenario 1	Scenario 2
0	$9,103,812,782	$7,621,794,848	$11,351,174,033	−$1,482,017,934	$2,247,361,251
3	$5,350,971,268	$4,167,221,831	$5,856,614,539	−$1,183,749,437	$505,643,271
7	$3,141,135,640	$2,244,892,112	$2,869,099,307	−$896,243,528	−$272,036,333
Rate	Scenario B	Scenario 1	Scenario 2	Scenario 1	Scenario 2
0	$9,984,753,185	$7,621,794,848	$11,351,174,033	−$2,362,958,337	$1,366,420,848
3	$5,842,473,472	$4,167,221,831	$5,856,614,539	−$1,675,251,641	$14,141,067
7	$3,408,285,238	$2,244,892,112	$2,869,099,307	−$1,163,393,126	−$539,185,931
Source: EIS Tables 8.3-3 and 8.4-1					

It is also possible that transporting SNF across the country would require infrastructure improvements along the national rail route. This could be the case for both the proposed CISF and the No-Action alternative. However, because the routes for transportation have not yet been established, the need for (and hypothetical cost of) infrastructure upgrades is speculative and beyond the scope of this EIS.

Another cost factor the proposed CISF and the No-Action alternative shared is emergency preparedness along the SNF transportation route. States are recognized as responsible for protecting public health and safety during radiological transportation accidents. Federal agencies are prepared to monitor transportation accidents and provide assistance if requested by States to do so. Nationwide, there are many shipments of radioactive material each year for which the States already provide capable emergency response, and a discussion about funding for emergency response is in EIS Section 4.11.

8.6 References

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9 SUMMARY OF ENVIRONMENTAL CONSEQUENCES

This chapter summarizes the potential environmental impacts of the proposed action (Phase 1, including the rail spur), Phases 2-20, and the No-Action alternative. The potential impacts of the proposed action (Phase 1) and Phases 2-20 are discussed in terms of (i) unavoidable adverse environmental impacts, (ii) irreversible and irretrievable commitments of resources, (iii) short-term impacts and uses of the environment, and (iv) long-term impacts and the maintenance and enhancement of productivity. The information is presented for each of the 13 resource areas that the proposed consolidated interim storage facility (CISF) project may affect. This information addresses the impacts during each phase of the project (i.e., construction, operations, and decommissioning and reclamation). The specific impacts are described in Environmental Impact Statement (EIS) Table 9-1.

The following terms are defined in NUREG–1748 (NRC, 2003).

- Unavoidable adverse environmental impacts: applies to impacts that cannot be avoided and for which no practical means of mitigation are available
- Irreversible: involves commitments of environmental resources that cannot be restored
- Irretrievable: applies to material resources and will involve commitments of materials that, when used, cannot be recycled or restored for other uses by practical means
- Short-term: represents the period from construction to the end of the decommissioning activities and, therefore, generally affects the present quality of life for the public
- Long-term: represents the period of time following the termination of the U.S. Nuclear Regulatory Commission (NRC) license, with the potential to affect the quality of life for future generations

As discussed in EIS Chapter 4, the significance of potential environmental impacts is categorized as follows:

SMALL: The environmental effects are not detectable or are so minor that they would neither destabilize nor noticeably alter any important attribute of the resource.

MODERATE: The environmental effects would be sufficient to alter noticeably, but not to destabilize, important attributes of the resource.

LARGE: The environmental effects would be clearly noticeable and are sufficient to destabilize important attributes of the resource.

Section 9.1 describes the environmental impacts from implementing the proposed action (Phase 1) and Phases 2-20, and Section 9.2 describes the environmental impacts from implementing the No-Action alternative.

Table 9-1 Summary of Environmental Impacts of the Proposed CISF Project

Impact Category	Unavoidable Adverse Environmental Impacts	Irreversible and Irretrievable Commitment of Resources	Short-Term Impacts and Uses of the Environment and Long-Term Impacts and the Maintenance and Enhancement of Productivity
Land Use	For the proposed action (Phase 1) there would be a SMALL impact to land use. During construction, the total amount of land earthmoving activities affect to construct the storage pads, facilities, and associated infrastructure would be approximately 48.3 ha [119.4 ac] within the proposed project boundary of 421 ha [1,040 ac]. For Phases 2-20, an additional 85.2 ha [210.6 ac] of land would be disturbed for additional storage pads. The 133.5 ha [330 ac] of total disturbed land would be fenced off from livestock grazing for the license term. During decommissioning and reclamation, land would be impacted by earthmoving activities to reclaim and reseed the affected areas.	No impact. There would be no irreversible and irretrievable commitment of land resources from implementing the proposed CISF project. The duration of the project would be the 40-year license term after which time the land would be reclaimed and made available for other uses.	There would be a SMALL impact to land use from implementing the proposed project. The proposed CISF project would cause temporary alteration of rangeland and short-term restricted access to adjacent lands. Approximately 133.5 ha [330 ac] would be controlled and unavailable for other uses, such as grazing and recreation; oil and gas exploration could coexist with Holtec's proposed project. There would be no long-term impact to land resources from implementing the proposed CISF project. The land would be available for other uses following license termination and decommissioning.

Table 9-1 Summary of Environmental Impacts of the Proposed CISF Project

Impact Category	Unavoidable Adverse Environmental Impacts	Irreversible and Irretrievable Commitment of Resources	Short-Term Impacts and Uses of the Environment and Long-Term Impacts and the Maintenance and Enhancement of Productivity
Transportation	During the construction, operation, and decommissioning and reclamation stages of the proposed action (Phase 1) and at full build-out (Phases 1-20), there would be a SMALL increase in local traffic counts associated with project-related traffic on U.S. Highway 62/180 and other roadways from the proposed CISF project. The potential radiological and nonradiological impacts from operational SNF shipments to and from the proposed CISF under incident-free and accident conditions would be SMALL.	No impact. There would be no irreversible and irretrievable commitment of resources, except for fuel resources consumed by vehicles and equipment operation, heating, commuter traffic, and regional transport. Use of transportation corridors would return to pre-project usage.	During the construction, operations, and decommissioning and reclamation stages of the proposed action (Phase 1) and at full build-out (Phases 1-20), there would be a SMALL increase in local traffic counts associated with project-related traffic on U.S. Highway 62/180 and other roadways from the proposed CISF project. The potential radiological and nonradiological impacts from operational SNF shipments to and from the proposed CISF under incident-free and accident conditions would be SMALL. There would be no long-term impacts to transportation following license termination.
Geology and Soils	There would be a SMALL impact on geology and soils for the proposed action (Phase 1) and Phases 2-20. The construction, operation, and decommissioning stages would disturb surface soils during construction of the proposed facility and infrastructure. These impacts would be temporary, and at the end of the decommissioning and reclamation stage, topsoil would be replaced and surfaces reseeded.	Soil layers would be irreversibly disturbed by the proposed CISF project; however, topsoil would be replaced during decommissioning and reclamation. Reseeding and recontouring would mitigate the impact to topsoil.	There would be a SMALL impact to geology and soils. No sinkhole or ground subsidence is expected, because no thick sections of soluble rocks are present at or near the land surface and the risk of subsidence from potash mining is low. Topsoil would be replaced during the reclamation and reseeding processes. There would be no long-term impacts to geology and soils following license termination and decommissioning and reclamation.

Table 9-1 Summary of Environmental Impacts of the Proposed CISF Project

Impact Category	Unavoidable Adverse Environmental Impacts	Irreversible and Irretrievable Commitment of Resources	Short-Term Impacts and Uses of the Environment and Long-Term Impacts and the Maintenance and Enhancement of Productivity
Surface Waters and Wetlands	There would be a SMALL impact to surface water and wetlands from the proposed project for the proposed action (Phase 1) and Phases 2-20. The occurrence of surface water is limited. Holtec would use erosion-control mitigation measures such as grading and contouring and implementation of a stormwater pollution management plan to ensure surface-water runoff from disturbed areas met National Pollutant Discharge Elimination System (NPDES) permit limits.	There would be no irreversible and irretrievable commitment of either surface water or wetlands from implementing the proposed CISF project. No drainage would be significantly altered by the proposed CISF project.	There would be a SMALL impact to surface waters. The proposed CISF project does not produce effluents, and the NPDES permits would regulate water runoff. There would be no long-term impacts to surface water and wetlands. The proposed project would discharge stormwater runoff into the closed playa system with no further outlet.
Groundwater	There would be a SMALL impact on groundwater from the proposed project due to consumptive use of groundwater, including for a concrete batch plant, for the proposed action (Phase 1) and Phases 2-20. The proposed CISF would have no effluents; therefore, groundwater quality would not be impacted.	There would be an impact on groundwater resources. In addition to consumptive use, groundwater would be used to operate the concrete batch plant. The proposed CISF would have no effluents; therefore, groundwater quality would not be impacted.	Short-term impacts to groundwater would include water used via a pipeline running from Carlsbad to the proposed facility. Water use would decrease after construction is complete. These impacts would be SMALL. There would be no long-term impacts to groundwater resources. Consumptive water use would cease after license termination and decommissioning. The proposed CISF would have no effluents; therefore, groundwater quality would not be impacted.

Table 9-1 Summary of Environmental Impacts of the Proposed CISF Project

Impact Category	Unavoidable Adverse Environmental Impacts	Irreversible and Irretrievable Commitment of Resources	Short-Term Impacts and Uses of the Environment and Long-Term Impacts and the Maintenance and Enhancement of Productivity
Ecological Resources	There would be SMALL to MODERATE impacts until vegetation has been reestablished, and then the impact would be SMALL. Construction, operation, and decommissioning of the proposed CISF project would result in short-term loss of vegetation on approximately 48.3 ha [119.4 ac] for the proposed action (Phase 1) and an additional 85.2 ha [210.6 ac] of land for Phases 2-20. The short-term loss of vegetation could stimulate the introduction and spread of undesirable and invasive, non-native species, and displacement of wildlife species.	Direct impacts to vegetative communities and wildlife injuries and mortalities because of earthmoving activities would be irreversible. However, the implementation of mitigation measures, such as the use of fencing to limit wildlife movement and the use of speed limits would reduce potential impacts to wildlife. Areas earthmoving activities impacted would be reclaimed and reseeded during decommissioning.	During any stage of the proposed CISF project, SMALL direct impacts to ecological resources could include injuries and fatalities to wildlife caused by either collisions with project-related traffic or habitat damage because of removal of topsoil. Wildlife could be temporarily displaced by increased noise and traffic during operations. Holtec has committed to implement mitigation measures to reduce the potential impact for wildlife species. Some of the vegetative communities that exist within the proposed CISF project could take years to be reestablished, resulting in MODERATE short-term impacts. Vegetation and wildlife species could experience SMALL long-term impacts if the composition and abundance of both plant and wildlife species in the proposed project area are altered or reduced in number. After license termination and decommissioning, the land would be regraded, reseeded, and released, so impacts would be SMALL.

Table 9-1 Summary of Environmental Impacts of the Proposed CISF Project

Impact Category	Unavoidable Adverse Environmental Impacts	Irreversible and Irretrievable Commitment of Resources	Short-Term Impacts and Uses of the Environment and Long-Term Impacts and the Maintenance and Enhancement of Productivity
Meteorology, Climatology, and Air Quality	There would be a SMALL impact to air quality. During all stages, the generation of air effluents results in the degradation of air quality. Effluent levels will be low, and the distance between the emission sources and receptors reduces the potential impacts.	There would be no irreversible or irretrievable commitment of air resources from the proposed CISF project.	There would be a SMALL impact. Fugitive dust generated primarily from the construction and decommissioning stages has the potential to result in short-term, intermittent impacts in and around the proposed CISF project area. The effect would be localized and temporary. Use of mitigation measures, such as applying water for dust suppression, would limit fugitive dust emissions. There would be no long-term impacts to air quality either from the proposed project or following license termination.
Noise	There would be a SMALL impact for the proposed action (Phase 1) and Phases 2-20. There would be no residences within the proposed project area. Any noise impacts would be short term, intermittent, and mitigated by sound-abatement controls on operating equipment.	Not applicable.	There would be a SMALL impact because of expected noise levels generated during construction and decommissioning activities, most notably in proximity to operating equipment, such as heavy trucks, bulldozers, or excavators. However, noise impacts would be short-term, intermittent, and mitigated by sound-abatement controls on operating equipment. There would be no long-term impacts to noise impact following license termination.

Table 9-1 Summary of Environmental Impacts of the Proposed CISF Project

Impact Category	Unavoidable Adverse Environmental Impacts	Irreversible and Irretrievable Commitment of Resources	Short-Term Impacts and Uses of the Environment and Long-Term Impacts and the Maintenance and Enhancement of Productivity
Historic and Cultural Resources	Historic and cultural resources would not be impacted by the proposed action (Phase 1) and Phases 2-20, resulting in a SMALL impact. Pending completion of consultation under NHPA Section 106, the NRC staff's preliminary conclusion is that the proposed project would have no effect on historic properties.	Because no historic or cultural resources have been recommended eligible for the NRHP, there would not be an irreversible and irretrievable loss of cultural resources.	There would be no short- and long-term impacts to historic properties from the proposed action (Phase 1) or Phases 2-20.
Visual and Scenic Resources	There would be a SMALL impact on the visual landscape for the proposed action (Phase 1) and Phases 2-20. Visual impacts from earthmoving activities that generate fugitive dust would be short term. Mitigation measures would be implemented to reduce fugitive dust. In addition, disturbed areas would be reclaimed as soon as practicable, and debris would be removed after construction activities.	No impact.	There would be a SMALL short-term impact to the visual landscape from the proposed CISF project. The activities would be consistent with the Bureau of Land Management Visual Resource Management designation of the area and the existing natural resource exploration activities in the area. There would be no long-term impacts to the visual landscape following license termination and decommissioning.

Table 9-1 Summary of Environmental Impacts of the Proposed CISF Project

Impact Category	Unavoidable Adverse Environmental Impacts	Irreversible and Irretrievable Commitment of Resources	Short-Term Impacts and Uses of the Environment and Long-Term Impacts and the Maintenance and Enhancement of Productivity
Socioeconomics	The proposed project would have a SMALL to MODERATE and beneficial impact on local finances (i.e., increased taxes and revenue), and a SMALL impact on population, employment, housing, school enrollment, and utilities and public services because of the influx of workers and their families.	Not applicable.	The proposed project would have a SMALL impact on local communities. Following license termination, workers who supported activities at the proposed CISF project would need to find other employment. There would be a loss of revenue to nearby communities.
Environmental Justice	There would be no disproportionately high and adverse impacts to minority or low-income populations from constructing, operating, and decommissioning the proposed CISF project. While certain Indian Tribes may have a heightened interest in cultural resources the proposed CISF project potentially affects, the impacts to Indian Tribes in this and other areas is not expected to be disproportionately high and adverse.	Not applicable.	The proposed CISF project would have a SMALL impact on environmental justice. However, the impacts are short term and there would be no disproportionately high and adverse impacts to minority or low-income populations from any aspect of the proposed CISF project. There would be no long-term environmental justice impacts following license termination and decommissioning. While certain Indian Tribes may have a heightened interest in cultural resources the proposed CISF project potentially affects, the impacts to Indian Tribes in this and other areas is not expected to be disproportionately high and adverse.

Table 9-1 Summary of Environmental Impacts of the Proposed CISF Project

Impact Category	Unavoidable Adverse Environmental Impacts	Irreversible and Irretrievable Commitment of Resources	Short-Term Impacts and Uses of the Environment and Long-Term Impacts and the Maintenance and Enhancement of Productivity
Public and Occupational Health	There would be a SMALL impact on public and occupational health for the proposed action (Phase 1) and full build-out (Phases 1-20). Construction and decommissioning would involve typical occupational hazards associated with construction projects that would not affect the public health. The applicant's compliance with Federal and State occupational safety regulations would limit the potential impacts to workers. During operations, based on the facility design and the applicant's compliance with the required radiological safety program, the radiological health and safety impacts would be SMALL for workers and the public.	Not applicable.	There would be a SMALL impact on public and occupational health for the proposed action (Phase 1) and full build-out (Phases 1-20). Construction and decommissioning would involve typical occupational hazards associated with construction projects that would not affect the public health. The applicant's compliance with Federal and State occupational safety regulations would limit the potential impacts to workers. During operations, based on the facility design and the applicant's compliance with the required radiological safety program, the radiological health and safety impacts would be SMALL for workers and the public. There would be no long-term impact to public and occupational health following license termination.

Table 9-1 Summary of Environmental Impacts of the Proposed CISF Project

Impact Category	Unavoidable Adverse Environmental Impacts	Irreversible and Irretrievable Commitment of Resources	Short-Term Impacts and Uses of the Environment and Long-Term Impacts and the Maintenance and Enhancement of Productivity
Waste Management	There would be a SMALL impact on waste management for the proposed action (Phase 1) and Phases 2-20 for construction and operation, and MODERATE for decommissioning. Hazardous solid waste, sanitary liquid wastes, nonhazardous solid waste, and low-level radioactive waste (LLRW) the proposed CISF project generated would be handled and disposed appropriately and in accordance with all applicable New Mexico Environment Department (NMED) permits. The proposed CISF project would result in MODERATE impacts on available disposal capacity because of available capacity at permitted facilities.	The energy consumed during the proposed CISF project stages, the construction materials used that could not be reused or recycled, and the space used to properly handle and dispose of all waste streams would represent an irretrievable commitment of resources.	During all stages of the proposed CISF, hazards associated with handling and transport of wastes would represent a short term and SMALL impact. There would be no long-term impact to waste management following license termination and decommissioning.

9.1 Proposed Action

The proposed action (Phase 1) is the issuance, under the provisions of Title 10 of the *Code of Federal Regulations* (10 CFR) Part 72, of an NRC license authorizing the construction and operation of the proposed Holtec CISF in southeastern New Mexico. Holtec requests authorization for the initial phase (Phase 1) of the proposed project to store 5,000 metric tons of uranium (MTUs) [5,512 short tons] in 500 canisters for a license period of 40 years. However, because the capacity of individual canisters can vary, the 500 canisters proposed in the Holtec license application have the potential to hold up to 8,680 MTUs [9,568 short tons]. Therefore, the analysis in this EIS analyzes the storage of up to 8,680 MTUs [9,568 short tons] for the proposed action (Phase 1). Holtec anticipates subsequently requesting amendments to the license to store an additional 5,000 MTUs [5,512 short tons] for each of 19 expansion phases of the proposed CISF to be completed over the course of 20 years to expand the facility to eventually store up to 10,000 canisters of SNF (Holtec, 2019a,b,c). Holtec's expansion of the proposed project (i.e., Phases 2-20) is not part of the proposed action currently pending before the agency. However, as a matter of discretion, the NRC staff considered these expansion phases in its description of the affected environment and impact determination where appropriate to conduct a bounding analysis for the proposed CISF project. For the bounding analysis, the NRC staff assumes the storage of up to 10,000 canisters of spent nuclear fuel (SNF). Therefore, this EIS will analyze the impacts from the proposed action (Phase 1) as well as subsequent phases of the proposed CISF project (i.e., Phases 2-20). A connected action to the proposed CISF project includes construction and operation of a rail spur on land leased from the U.S. Bureau of Land Management (BLM) to transport SNF from the main rail line to the proposed facility. Impacts resulting from the construction of this rail spur are also considered throughout this EIS.

The construction stage of the proposed CISF project would include the construction of the proposed facility and associated buildings and infrastructure as well as the construction of infrastructure that would support the proposed rail spur for transporting SNF to and from the proposed CISF project. The operations stage of the proposed CISF project would include receipt of SNF, operation of the proposed facility (i.e., passive storage), and also removal of the SNF inventory (defueling) for transport to a final repository. Decommissioning of the proposed facility would include the dismantling of the proposed facility and rail spur.

The decommissioning and reclamation evaluation in this EIS is based on currently available information and plans. Because decommissioning and reclamation are likely to take place well into the future, all technological changes that could improve the decommissioning or reclamation process cannot be predicted. As a result, the NRC requires that licensees applying to decommission an Independent Spent Fuel Storage Installation (ISFSI) (such as the proposed CISF project) submit a Decommissioning Plan. The requirements for the Final Decommissioning Plan are delineated in CFR 72.54(d), (i), and (g). The NRC staff would undertake a separate evaluation and National Environmental Policy Act (NEPA) review and prepare an environmental assessment or EIS, as appropriate, at the time the Decommissioning Plan is submitted to the NRC.

The potential environmental impacts from the proposed CISF project are summarized in EIS Table 9-1.

9.2 No-Action Alternative

Under the No-Action alternative, the NRC would not license the proposed CISF project. Therefore, impacts such as land disturbance and access restrictions on current land use would not occur. Construction impacts would be avoided because SNF storage pads, buildings, and transportation infrastructure would not be built. Operational impacts would also be avoided because no SNF canisters would arrive for storage. Impacts to land use from decommissioning and reclamation activities would not occur, because there would be no facility to decommission and land would not need to be reclaimed. The current land uses on and near the project, including grazing and natural resource extraction, would remain essentially unchanged under the No-Action alternative. In the absence of a CISF, the NRC staff assume that SNF would remain onsite in existing wet and dry storage facilities and be stored in accordance with NRC regulations and be subject to NRC oversight and inspection. Site-specific impacts at each of these storage sites would be expected to continue as detailed in generic (NRC, 2013, 2005a) or site-specific environmental analyses. In accordance with current U.S. policy, the NRC staff also assumes that the SNF would be transported to a permanent geologic repository, when such a facility becomes available.

9.3 References

10 CFR Part 72. *Code of Federal Regulations*, Title 10, *Energy*, Part 72. "Licensing Requirements for the Independent Storage of Spent Nuclear Fuel, High-Level Radioactive Waste, and Reactor-Related Greater Than Class C Waste." Washington, DC: U.S. Government Publishing Office.

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Holly Houghton, THPO
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Pawnee Nation of Oklahoma
Bruce Pratt, President
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Pueblo of Isleta
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Isleta Pueblo, NM 87022

Dr. Henry Walt, THPO
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El Paso, TX 79907

11.3 State Agency Officials

Secretary of New Mexico Environment Department
Harold L. Runnels Building
1190 St. Francis Drive, Suite N4050
Santa Fe, NM 87505

Bob Estes Ph.D.
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New Mexico State Historic Preservation Division
407 Galisteo St., Suite 236
Santa Fe, NM 87501

Ron Kellermueller
New Mexico Department of Game and Fish
One Wildlife Way
Santa Fe, NM 87507
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Santa Fe, NM

11.4 Local Agency Officials

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Mayor of Hobbs
City Hall
200 E. Broadway
Hobbs, NM 88240

Lea County Commissioners
City Hall
200 E. Broadway
Hobbs, NM 88240

Dale Janway
Mayor of Carlsbad
City Hall
101 N. Halaqueno
Carlsbad, NM 88221

Carlsbad City Council
City Hall
101 N. Halaqueno
Carlsbad, NM 88221

Eddy County Commissioners
101 West Greene Street
Carlsbad, NM 88220

Mayor of Artesia
511 W. Texas Ave.
Artesia, NM 88210

Mayor of Roswell
City Hall
425 N Richardson
Roswell, NM 88201

Mayor of Lovington
City Hall
214 S. Love
Lovington, NM 88260

Carlsbad Soil and Water Conservation Service
3219 S Canal
Carlsbad, NM 88220

Eddy-Lea Energy Alliance
Attention: Chip Low
100 N. Main Street
Lovington, NM 88260

Eddy-Lea Energy Alliance
City of Carlsbad
Attention: Denise Boyea
101 N. Halagueno
Carlsbad, NM 88220

11.5 Other Organizations and Individuals

Steve Vierck
Economic Development Corporation of Lea County
200 E. Broadway St., Suite A201
Hobbs, NM 88240

Roswell Public Library
301 N. Pennsylvania
Roswell, NM 88201

Hobbs Public Library
509 N Shipp St.
Hobbs, NM 88240

Carlsbad Public Library
101 S. Halagueno Street
Carlsbad, NM 88220

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APPENDIX A

CONSULTATION CORRESPONDENCE

APPENDIX A CONSULTATION CORRESPONDENCE

The Endangered Species Act of 1973, as amended, and the National Historic Preservation Act of 1966 require that Federal agencies consult with applicable State and Federal agencies and groups prior to taking action that may affect threatened and endangered species, essential fish habitat, or historic and archaeological resources. This appendix contains consultation documentation related to these Federal laws.

Table A–1 Chronology of Consultation Correspondence

Author	Recipient	Date of Letter	ADAMS Accession Number
U.S. Nuclear Regulatory Commission (C. Román)	U.S. Bureau of Land Management (J. Stovall)	October 1, 2018	ML18248A133
U.S. Nuclear Regulatory Commission (C. Román)	U.S. Bureau of Land Management Memorandum of Understanding (MOU)	October 1, 2018	ML18290A458
U.S. Nuclear Regulatory Commission (C. Erlanger)	Apache Tribe of Oklahoma (B. Komardley)	April 2, 2018	ML17339A865
U.S. Nuclear Regulatory Commission (C. Erlanger)	Mescalero Apache Tribe (B. Blazer)	April 2, 2018	ML18089A626
U.S. Nuclear Regulatory Commission (C. Erlanger)	Pawnee Nation of Oklahoma (B. Pratt)	April 2, 2018	ML18089A629
U.S. Nuclear Regulatory Commission (C. Erlanger)	Ysleta del Sur Pueblo (C. Hisa)	April 2, 2018	ML18089A635
U.S. Nuclear Regulatory Commission (C. Erlanger)	Pueblo of Tesuque (F. Vigil)	April 2, 2018	ML18089A641
U.S. Nuclear Regulatory Commission (C. Erlanger)	Pueblo of Isleta (R. Benavides)	April 2, 2018	ML18089A645
U.S. Nuclear Regulatory Commission (C. Erlanger)	Jicarilla Apache Nation (L. Pesata)	April 2, 2018	ML18089A647
U.S. Nuclear Regulatory Commission (C. Erlanger)	Navajo Nation (R. Begaye)	April 2, 2018	ML18089A648
U.S. Nuclear Regulatory Commission (C. Erlanger)	Kiowa Tribe of Oklahoma (M. Komalty)	April 2, 2018	ML18089A649
U.S. Nuclear Regulatory Commission (C. Erlanger)	Hopi Tribe (T. Nuvangyaoma)	April 2, 2018	ML18089A650
U.S. Nuclear Regulatory Commission (C. Erlanger)	Comanche Nation (W. Nelson)	April 2, 2018	ML18089A651

Table A–1 Chronology of Consultation Correspondence			
Author	**Recipient**	**Date of Letter**	**ADAMS Accession Number**
U.S. Nuclear Regulatory Commission (J. Caverly)	U.S. Nuclear Regulatory Commission (C. Román)	May 24, 2018	ML18141A483
U.S. Nuclear Regulatory Commission (S. Imboden)	U.S. Nuclear Regulatory Commission (C. Román)	June 19, 2018	ML18157A171
U.S. Nuclear Regulatory Commission (J. Caverly)	U.S. Nuclear Regulatory Commission (C. Román)	June 21, 2018	ML18164A215
U.S. Nuclear Regulatory Commission (J. Caverly)	U.S. Nuclear Regulatory Commission (C. Román)	July 21, 2018	ML18164A215
U.S. Nuclear Regulatory Commission (J. Caverly)	Keeper of the National Register of Historic Places (J. Beasley)	August 28, 2018	ML18240A206
State of NM Department of Game and Fish (C.Hayes)	U.S. Nuclear Regulatory Commission (J. Caverly)	August 31, 2018	ML18247A573
National Park Service Keeper of the National Register of Historic Places	U.S. Nuclear Regulatory Commission (C. Erlanger)	September 10, 2018	ML17338B232
U.S. Nuclear Regulatory Commission	U.S. Bureau of Land Management (J. Stovall)	October 1, 2018	ML18248A133
New Mexico State Historic Preservation Office	U.S. Nuclear Regulatory Commission	October 15, 2018	ML19346F971
CNWRA (A. Minor)	U.S. Bureau of Land Management (C. Brooks)	May 9, 2019	ML19218A163
U.S. Nuclear Regulatory Commission (S. Imboden)	U.S. Nuclear Regulatory Commission (C. Román)	June 13, 2019	ML19121A295
U.S. Nuclear Regulatory Commission (C. Román)	New Mexico Environment Department Memorandum of Understanding (MOU)	July 24, 2019	ML19206A094
U.S. Nuclear Regulatory Commission (K. Brock)	Kiowa Tribe of Oklahoma (M. Komalty)	August 29, 2019	ML19239A241
U.S. Nuclear Regulatory Commission (K. Brock)	Hopi Tribe (T. Nuvangyaoma)	August 29, 2019	ML19003A181
U.S. Nuclear Regulatory Commission (K. Brock)	Pueblo of Tesuque (M. Herrera)	August 29, 2019	ML19239A240
U.S. Nuclear Regulatory Commission (K. Brock)	Navajo Nation (J.Nez)	August 29, 2019	ML19239A242

Table A–1 Chronology of Consultation Correspondence			
Author	**Recipient**	**Date of Letter**	**ADAMS Accession Number**
Hopi Tribe (S. Koyiyumtewa)	U.S. Nuclear Regulatory Commission (K. Brock)	September 16, 2019	ML19275F380

APPENDIX B

SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE

APPENDIX B SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE

B.1 Worker Characterization Methodology

This section provides additional explanation of the methodology used in the socioeconomic analysis described in Chapter 4 of this Environmental Impact Statement (EIS).

An NRC staff study, Migration and Residential Location of Workers at Nuclear Power Plant Construction Sites, NUREG/CR–2002 (Malhotra, 1981) evaluated behaviors and characteristics of nuclear construction projects and provides a methodology for estimating in-migrating workforce sizes and residential distribution patterns at nuclear sites. The information provided in NUREG/CR–2002 regarding the estimated migration of a workforce was reaffirmed in NRC's most recent EIS for an application to obtain a combined operating license (NRC, 2016) and in NRC's EIS for the International Isotope Fluorine Products (IIFP) site (NRC, 2012). Therefore, the NRC staff considers that the methodology for evaluating behaviors and characteristics of nuclear construction projects described in NUREG/CR–2002 is appropriate to use in this EIS. In addition to the previously mentioned NRC documents, the NRC analysis conducted for the Private Fuel Storage (PFS) EIS (NRC, 2001) also contributed to the worker characteristics presented in EIS Table 4.11-2.

The following considerations serve as an example of how the NRC staff derived the information in EIS Section 4.11, including EIS Table 4.11-2. Specifically, the following steps were taken to determine the range of construction workers (10 percent to 30 percent) that may move into the socioeconomic region of influence (ROI) presented in EIS Table 4.11-2:

Step 1: The NRC staff began with Holtec's estimate of the peak number of construction workers that would be employed at any given time during the proposed CISF license term, which is equal to 80 construction workers (see first row of EIS Table 4.11-2).

Step 2: The NRC staff noted the estimated percentage of construction workers that, based on previous NRC socioeconomic analyses listed below, would move into the socioeconomic ROI. An inclusive range of 10 to 30 percent was determined for this EIS (see second row of EIS Table 4.11-2) (Malhotra, 1981; NRC, 2001, 2012).

Step 3: The range of construction workers for this EIS that NRC concluded may move into the socioeconomic ROI during peak employment with concurrent construction and operation stages of the proposed action (Phase 1) was determined (8-24 workers) by calculating 10 percent of 80 construction workers (8 workers) and 30 percent of 80 construction workers (24 workers) (see fourth row of EIS Table 4.11-2).

The U.S. Department of Commerce Bureau of Economic Analysis (BEA), Economic and Statistics Division uses an economic model called RIMS II. The NRC staff applied the BEA Type II multipliers and methodology for this EIS analysis, as explained in EIS Section 4.11.1.1. The RIMS II multipliers used for the socioeconomic ROI are available from the BEA in four tables, with two tables for Type I multipliers and two for Type II multipliers. Type I multipliers include only inter-industry direct and indirect impacts. The Type II multipliers account for these same direct and indirect impacts as well as for induced impacts that are associated with the purchases employees made. Type II multipliers are needed for this EIS analysis, as explained in EIS Section 4.11.1.1. One table for Type II multipliers provides multipliers for 369 detailed industries. Another table for Type II multipliers, BEA RIMS II Table 2.5, provides multipliers for 64 aggregated industries. While both sets of industry detail can be used in the same analysis, the NRC staff determined that the multipliers in BEA RIMS II Table 2.5 for aggregated industries are appropriate for this EIS.

Further clarification is provided regarding the employment multipliers for this EIS analysis. The estimated workers that would move into the socioeconomic ROI would create indirect jobs within the study area, as described in EIS Section 4.11.1. In this analysis, the NRC staff used the BEA direct effect employment multiplier for the “Construction” classification to estimate the number of jobs that would be created as a result of construction workers moving into the socioeconomic ROI, and the “Professional, scientific, and technical services” classification to estimate the number of jobs that would be created as a result of non-construction workers moving into the socioeconomic ROI.

When the number of estimated Holtec workers that would move into the socioeconomic ROI is multiplied by the direct effect employment multiplier provided in the BEA RIMS II Table 2.5, the result is the total change of jobs in the socioeconomic ROI, including the workers that would move into the socioeconomic ROI. However, by subtracting 1 from the direct effect employment multiplier before multiplying by the number of estimated Holtec workers that would move into the socioeconomic ROI, only the indirect number of jobs is captured. This explains why the multipliers provided in the BEA RIMS II Table 2.5 for the proposed project differ from the multiplier that NRC provides in EIS Table 4.11-2 to determine indirect jobs. The direct effect employment multipliers used for this project are provided in EIS Appendix B, Table B–1.

Final demand multipliers are used to provide an estimate of the total economic impact from a proposed action across all industries in the region. The final demand multipliers used to describe the economic impact in the socioeconomic ROI in EIS Section 4.11.1.1 are shown in Table B–2, followed by a brief description of the three types of final demand multipliers that the NRC staff used to estimate economic impacts in the socioeconomic ROI.

Table B–1 Direct Effect Employment Multipliers (Type II Table 2.5) for the Proposed CISF

Aggregate Industry	Direct Effect Employment Multiplier	Direct Effect Employment Multiplier (indirect portion only)
Construction	1.5518	0.5518
Professional, scientific, and technical services	1.5453	0.5453

Source: BEA, 2019

Table B–2 Final Demand Multipliers (Type II Table 2.5) for the Proposed CISF

Aggregate Industry	Final Demand Total Output	Final Demand Value Added	Final Demand Earnings
Construction (Applied to Holtec expenditures during the construction stage)	1.4458	0.7860	0.4714

Table B–2 Final Demand Multipliers (Type II Table 2.5) for the Proposed CISF			
Professional, scientific, and technical services (Applied to Holtec expenditures during the operations stage)	1.4306	0.8809	0.5715
Source BEA, 2019			

- **Total Output**: Output is the base multiplier from which all other multipliers are derived. The output multiplier describes the total output generated as a result of $1 spent in a particular industry. In this case, for every dollar that Holtec spends in the socioeconomic ROI to construct the proposed CISF, there is $1.4458 worth of economic activity in the socioeconomic ROI – the original dollar Holtec spent and an additional $0.4458.

- **Value added**: The value-added multiplier is a portion of the total output that provides an estimate of the additional value added to the economy as a result of the activity in an industry (i.e., the economic valued added to the socioeconomic ROI from the construction of the proposed CISF). Earnings are a part of value added. The rest of value added consists of taxes on production and imports and of gross operating surplus, which is a profits-like measure similar to gross domestic product.

- **Earnings**: The earnings multiplier measures the total increase in worker income in the local economy resulting from a $1 increase in income workers received in a particular industry (i.e., the increase of all workers in the socioeconomic ROI from the wages that Holtec pays their workers).

B.2 Environmental Justice Supporting Data

This section provides additional information about the methodology that the NRC staff follows to determine environmental justice populations, and material for the assessment of the potential for disproportionately high and adverse human health or environmental effects on minority and low-income populations resulting from the proposed construction, operation, and decommissioning of the proposed CISF.

On February 11, 1994, the President signed Executive Order 12898 (59 FR 76290), "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," which directs Federal agencies to develop strategies that consider environmental justice in their programs, policies, and activities. Environmental justice is described in the Executive Order as "identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low income populations." On December 10, 1997, the Council on Environmental Quality (CEQ) issued Environmental Justice Guidance under the National Environmental Policy Act (CEQ, 1997). As an independent agency, the Executive Order does not automatically apply to the NRC. But the NRC strives to meet the goals of EO 12898 through its normal and traditional NEPA review process. The NRC has provided general guidelines on the evaluation of environmental analyses in "Environmental Review Guidance for Licensing Actions Associated with NMSS [Nuclear Material Safety and Safeguards] Programs" (NUREG–1748) (NRC, 2003), and issued a final policy statement on the Treatment of Environmental Justice Matters in NRC Regulatory and Licensing Actions (69 FR 52040) and environmental justice procedures to be followed in NEPA documents the NRC's Office of Nuclear Material Safety and Safeguards (NMSS) prepared. NRC's NMSS environmental justice guidance, as found in Appendix C to NUREG–1748 (NRC, 2003), recommends that the area for assessment for a facility in a rural area be a circle with a radius of approximately 6.4 km [4 mi] whose centroid is the facility being considered. However, the guidance also states that the scale should be commensurate with the potential impact area. Therefore, for the proposed CISF project, the NRC staff determined that an environmental justice assessment area with an 80-km [50-mi] radius would be appropriate to be inclusive of (i) locations where people could live and work in the vicinity of the proposed project and (ii) of other sources of radiation or chemical exposure. As such, New Mexico and Texas and each county with land area within the 80-km [50-mi] radius from the center of the proposed CISF project are considered in the comparative analysis.

EIS Appendix B, Table B-3 presents the detailed census data for the environmental justice review and provides the minority and low-income population data for each census block group within 80 km [50 mi] of the center of the proposed Holtec CISF site (USCB, 2017). The State percentages of minority and low-income populations and the threshold that the NRC staff considered in this EIS are provided in Table B-3.

The following information was used in the environmental justice analysis described in Chapter 3 and Chapter 4 of this EIS.

- Land Use—The land in and surrounding the proposed project area is currently used for oil and gas development, grazing, and potash mining projects. Approximately 48.3 ha [119.4 ac] for the site access road, the rail spur, the security building, administration building, parking lot, and concrete batch plant and laydown area would be disturbed during construction. Cattle grazing would not be permitted within the protected area. Within the protected area, Holtec estimates that approximately 44.5 ha [110 ac] would be disturbed by the construction of the concrete pads once all 20 phases are completed (Holtec, 2019). At full build-out, the approximate133.5 ha [330 ac] of disturbed land from construction would be relatively small compared to the 421-ha [1,040-ac] proposed project area, which would result in a loss of 0.01 percent of the land available for grazing. The proposed project would not conflict with any existing Federal, State, local, or Indian Tribe land use plans, or planned development in the area. The NRC staff concluded in EIS Section 4.2 that the land use impacts resulting from the proposed action (Phase 1) and Phases 2-20, including the rail spur, from conversion from current land use to industrial use would be SMALL.

- Transportation—Impacts such as increases in traffic, potential changes to traffic safety, and increased degradation of roads would result from the use of roads for shipping equipment, supplies, and produced wastes, as well as because of commuting workers during the lifecycle of the proposed CISF project. The NRC staff concluded in EIS Section 4.3 that the impacts resulting from the proposed action (Phase 1) and Phases 2-20, including the rail spur, on transportation would be SMALL on the daily Highway 62/180 traffic near the proposed CISF project site. Further away from the proposed project area, for example, near Carlsbad, the existing car traffic is higher and the proposed CISF shipments would represent a smaller percentage of existing traffic and therefore would be less noticeable. The NRC staff concluded that this minor increase in local and regional car traffic would not significantly increase traffic safety problems or road degradation relative to existing conditions (EIS Section 4.3.1.1).

- Soils—The largest potential for impacts on soils from the lifecycle of the proposed CISF project would result from clearing and grading, which loosens soil and increases the potential for wind and water erosion. Best management practices (e.g., earthen berms) would be implemented during construction-related activities during the proposed action

(Phase 1) and Phases 2-20, including the rail spur, to limit soil loss. The NRC staff concluded in EIS Section 4.4 that the impacts resulting from the proposed action (Phase 1) and Phases 2-20, including the rail spur, on soils would be SMALL and confined to the proposed project area.

- Groundwater quality—Groundwater beneath the proposed project area is unconfined and recharged by natural precipitation. The nearest groundwater has been measured at depths ranging from 10.4 m to 11.49 m [34 ft to 37.7 ft] (ELEA, 2007; GEI Consultants, 2017), which is below the lower limit of the proposed facility. Due to the natural drainage of the proposed project area, any spill (e.g., of oils or lubricants) would enter the onsite ephemeral drainages with a potential to infiltrate the subsurface. However, a site-specific spill prevention and cleanup plan would be developed with procedures to manage spills. In addition, Holtec's required National Pollutant Discharge Elimination System permits and Section 401 certification, if required, would set limits on the amounts of pollutants entering ephemeral drainages that may be in hydraulic communication with alluvial aquifers at or near the site. Therefore, the NRC staff concluded in EIS Section 4.5.2 that impacts from the proposed action (Phase 1) and Phases 2-20, including the rail spur, on groundwater quality would be SMALL, localized, and temporary.

- Groundwater quantity—Potable water for domestic use and stock watering in the vicinity of the proposed project area site is generally obtained from pipelines that convey water to area potash refineries from the Ogallala Aquifer on the High Plains area of eastern Lea County. Consumptive water use during construction of the proposed CISF project would include dust control, cement mixing for construction, and worker consumption (Holtec, 2019). Potable water for construction and operation of the proposed CISF project would be provided by the City of Carlsbad (Holtec, 2019). Therefore, the NRC staff concluded in EIS Section 4.5.2.1.1 that impacts to groundwater quantity from the construction stage of the proposed action (Phase 1) and Phases 2-20 would be SMALL.

- Ecology—Approximately 48.3 ha [119.4 ac] of land would be disturbed from of the proposed action (Phase 1), and at full build-out, approximately 133.5 ha [330 ac] of land would be disturbed. The proposed action (Phase 1) and Phases 2-20, including the rail spur, would disturb and displace local wildlife. No impacts to rare or unique habitats, threatened or endangered species, or commercially or recreationally valuable species would result from activities at the proposed CISF project. The NRC staff concluded in EIS Section 4.6 that potential impacts to ecological resources from the proposed action (Phase 1) and Phases 2-20, including the rail spur, would be SMALL to MODERATE and localized based on the small area that would be impacted, compared to the available comparable habitat within the region.

- Air quality—EIS Section 4.7.1 reports that peak-year emissions, which represent the highest emission levels associated with the proposed CISF project for each individual pollutant in any one year and therefore also represent the greatest potential impact to air quality. The NRC staff concludes in EIS Section 4.7.1 that due to the existing air quality, the proximity of emission sources to receptors, and the proposed CISF project emission levels during the peak-year emissions, including the rail spur, for Phase 1 would be SMALL. The proposed CISF project emission levels for the peak-year impact level determination for Phases 2-20 are comparable to the description of the key factors for the peak year proposed action (Phase 1) impact level determination; therefore, the NRC staff concludes that the potential impacts to air quality during the peak year for Phases 1-20, including the rail spur, would be SMALL.

- Socioeconomics—The NRC staff evaluated peak employment in EIS Section 4.11, assuming concurrent construction and operation of proposed action (Phase 1) for EIS evaluation purposes, and provided an explanation of a maximum number of workers (i.e., 135) that would be employed by any one phase. The NRC staff estimated that up to 148 new residents would move into the socioeconomic 4-county study area, including workers, which would represent an increase of less than 0.1 percent in employment and population growth. Concurrent construction and operations activities of the proposed action (Phase 1), including the rail spur, would generate more than 1 percent of local revenues within the socioeconomic ROI, which would result in a moderate impact. The NRC staff concluded in EIS Section 4.11 that this small increase in the population, employment, and revenues within the study area as the result of the proposed action (Phase 1) and Phases 2-20 would have a SMALL to MODERATE impact on socioeconomics.

- Human health—A potential consideration under environmental justice is the possibility that, while the potential impact on the physical environment from the proposed CISF project would not be large, the impact on a minority or low-income community is disproportionately high and adverse because the group (i) is being currently affected by other facilities or environmental problems that leave them disproportionately vulnerable to adverse environmental effects of the facility in question; (ii) has been disproportionately affected by past projects or environmental practices, leaving them more vulnerable now; or (iii) has language barriers, geographical immobility, or inherently poorer access to health care or other response mechanisms than the general population, again leaving them more vulnerable to any environmental or socioeconomic impact from the proposed project (NRC, 2001). In this case, the expected radiological and nonradiological health impact from the proposed action (Phase 1) and Phases 2-20, including the rail spur, is SMALL for the general public for either normal operations or credible accidents (EIS Section 4.15); thus, the enhanced vulnerability concern does not apply, because minority and low-income populations would not be more obviously at risk than the general population from the proposed action (Phase 1) and Phases 2-20, including the rail spur.

No credible accident scenarios for the proposed CISF project could be found with potentially significant releases of radionuclides to air or ground that could result in significant effects to any offsite populations. The overall environmental impact of the accidents at the proposed CISF project during the license term for the proposed action (Phase 1) and Phases 2-20 is SMALL because safety-related structures, systems, and components are designed to function during and after these accidents. Thus, there is no mechanism for disproportionate environmental effects through accidents on minority and low-income residents near the proposed CISF project.

Table B–3 Census Block Groups Within 80 Kilometers [50 Miles] of the Proposed CISF Project

County/Tract	Block Group	Individuals Below Poverty Level (%)	Families Below Poverty Level (%)	African American (%)	American Indian and Alaskan Native (%)	Asian (%)	Native Hawaiian or Other Pacific Islander (%)	Some Other Race (%)	Two or More Races (%)	Hispanic Ethnicity (%)
State of New Mexico		20.6	15.6	1.8	8.7	1.3	0.0	0.2	1.6	48.2
Threshold for Environmental Justice Concerns		20.6	15.6	21.8	28.7	21.3	20.0	20.2	21.6	48.2
Chaves County, NM										
Census Tract 12	2	16.6	8.7	0.0	0.8	0.0	0.0	0.0	4.3	51.2
Census Tract 13	2	11.3	12.6	2.2	2.1	0.4	0.0	0.0	0.0	68.1
Census Tract 14	1	17.6	13.0	0.0	0.3	0.0	0.0	0.0	0.0	63.6
Census Tract 14	2	23.7	19.8	0.2	0.0	0.0	0.0	0.0	0.0	68.5
Eddy County, NM										
Census Tract 1	1	27.2	20.6	0.0	0.1	0.0	0.0	0.0	1.3	46.9
Census Tract 2	1	6.7	4.6	0.0	0.0	0.0	0.0	0.0	0.0	18.9
Census Tract 2	2	11.7	6.1	0.0	2.5	0.0	0.0	0.0	0.0	43.3
Census Tract 2	3	7.4	7.2	1.2	1.2	0.4	0.0	0.0	2.6	25.0
Census Tract 2	4	11.6	10.3	0.0	0.0	0.7	0.0	0.0	0.0	24.5
Census Tract 3	1	5.9	10.0	0.2	0.1	1.6	0.0	0.0	0.0	34.5
Census Tract 3	2	1.5	0.0	0.0	0.6	0.0	0.0	0.0	2.1	41.5
Census Tract 3	3	17.9	18.1	0.0	1.6	0.0	0.0	0.0	0.5	61.1
Census Tract 3	4	10.2	10.2	0.0	0.0	0.0	0.0	0.0	0.0	11.4
Census Tract 3	5	18.8	7.8	0.0	0.0	0.0	0.0	0.0	0.0	26.1
Census Tract 4.01	1	17.5	18.5	0.0	6.6	1.0	0.0	0.0	0.0	30.8
Census Tract 4.01	2	3.3	0.0	0.0	0.0	0.0	0.0	0.0	0.7	38.6
Census Tract 4.01	3	5.1	6.3	0.0	0.0	0.0	0.0	0.0	3.2	49.2
Census Tract 4.02	1	41.3	30.7	0.0	1.4	0.0	0.0	0.0	0.0	76.6
Census Tract 4.02	2	31.2	37.3	1.3	0.0	0.0	0.0	0.0	2.2	58.0
Census Tract 4.02	3	23.8	16.3	4.0	0.7	0.0	0.0	1.4	1.7	57.4
Census Tract 4.02	4	10.1	7.6	9.6	2.2	0.0	0.0	0.0	0.0	44.7
Census Tract 5	1	9.5	5.2	12.1	0.0	0.0	0.0	0.5	11.1	63.9
Census Tract 5	2	14.3	10.3	1.5	0.0	0.0	0.0	0.0	0.0	38.9
Census Tract 5	3	56.2	49.7	5.4	0.0	0.0	0.0	0.0	0.1	72.5
Census Tract 6	1	12.1	4.7	0.0	0.0	0.0	0.0	0.0	1.4	60.1
Census Tract 6	2	5.2	0.0	0.0	0.0	2.0	0.0	0.0	0.8	48.6
Census Tract 6	3	6.6	3.6	0.0	0.2	0.0	0.0	0.0	2.6	62.8
Census Tract 6	4	39.5	31.7	0.0	0.0	0.0	0.0	0.0	0.2	28.5
Census Tract 7	1	6.3	3.2	0.0	0.0	0.0	0.0	0.0	1.9	58.5
Census Tract 7	2	6.1	0.0	0.0	4.6	0.0	0.0	0.0	0.0	22.7

Table B–3 Census Block Groups Within 80 Kilometers [50 Miles] of the Proposed CISF Project

County/Tract	Block Group	Individuals Below Poverty Level (%)	Families Below Poverty Level (%)	African American (%)	American Indian and Alaskan Native (%)	Asian (%)	Native Hawaiian or Other Pacific Islander (%)	Some Other Race (%)	Two or More Races (%)	Hispanic Ethnicity (%)
Census Tract 7	3	7.0	4.2	2.7	0.0	0.0	1.7	0.0	0.0	55.5
Census Tract 7	4	10.3	0.0	0.0	0.0	0.0	0.0	0.9	0.0	39.9
Census Tract 8	1	15.6	12.5	0.0	3.1	0.0	0.0	0.0	0.0	34.8
Census Tract 8	2	16.2	16.5	0.0	9.7	0.0	0.0	0.0	0.0	74.8
Census Tract 9	1	2.0	0.5	1.7	0.0	0.0	0.0	0.0	0.0	49.9
Census Tract 9	2	12.6	10.7	1.7	0.0	0.0	0.0	0.0	0.0	43.7
Census Tract 9	3	21.2	15.3	0.0	3.7	0.7	0.0	0.0	0.0	51.1
Census Tract 10	1	8.9	8.5	0.0	0.2	0.0	0.0	0.0	0.0	74.6
Census Tract 10	2	9.0	10.0	2.7	19.0	0.0	0.0	0.0	0.0	78.0
Census Tract 10	3	59.5	35.5	6.6	0.0	0.0	0.0	0.0	0.0	65.8
Census Tract 10	4	51.1	38.2	3.8	0.0	0.0	0.0	0.0	0.0	28.8
Census Tract 10	5	19.8	17.4	0.0	0.0	0.0	0.0	0.0	0.0	59.2
Census Tract 10	6	11.4	13.0	0.0	0.0	0.0	0.0	0.0	1.3	45.7
Census Tract 11	1	5.4	9.1	0.0	0.0	12.6	0.0	0.0	0.0	15.8
Census Tract 11	2	14.8	12.8	0.0	0.0	0.0	0.0	0.0	0.0	20.5
Census Tract 11	3	16.2	16.1	0.0	0.0	0.0	0.0	0.0	2.6	70.4
Census Tract 11	4	29.9	16.8	1.9	0.0	0.0	0.0	0.0	0.0	45.3
Census Tract 11	5	7.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	44.3
Lea County, NM										
Census Tract 1	1	18.2	12.4	3.8	0.6	0.0	0.0	3.5	0.0	86.3
Census Tract 1	2	27.7	20.9	0.0	0.0	0.0	2.2	0.0	0.0	71.8
Census Tract 1	3	25.3	22.7	3.0	0.0	0.0	0.0	8.2	3.3	60.0
Census Tract 2	1	18.9	24.4	0.0	0.0	0.0	0.0	0.0	0.0	57.0
Census Tract 2	2	33.8	30.9	0.0	1.2	0.0	0.0	0.0	1.4	76.3
Census Tract 2	3	18.0	16.1	1.2	2.8	0.0	0.0	0.0	10.0	71.1
Census Tract 3	1	44.0	38.3	31.4	0.0	0.0	0.0	0.0	0.0	67.1
Census Tract 3	2	30.0	13.6	2.4	0.0	0.0	0.0	0.0	0.0	88.1
Census Tract 3	3	30.8	28.1	12.6	0.0	0.0	0.0	0.0	0.0	84.1
Census Tract 3	4	9.2	10.7	1.4	0.0	0.0	0.0	0.0	1.9	71.4
Census Tract 4	1	34.9	32.4	34.7	0.0	0.0	0.0	0.0	0.0	54.2
Census Tract 4	2	26.6	23.2	3.0	1.5	0.0	0.0	0.0	0.0	75.2
Census Tract 4	3	26.1	30.4	6.1	0.0	0.0	0.0	0.0	0.0	93.9
Census Tract 5.02	1	48.8	37.9	14.6	1.7	0.0	0.0	0.0	1.9	48.5
Census Tract 5.02	2	17.5	8.1	1.9	0.0	0.0	0.0	0.0	0.0	63.5
Census Tract 5.02	3	8.1	6.7	0.0	0.0	0.0	0.0	0.0	0.0	60.7

Table B–3 Census Block Groups Within 80 Kilometers [50 Miles] of the Proposed CISF Project

County/Tract	Block Group	Individuals Below Poverty Level (%)	Families Below Poverty Level (%)	African American (%)	American Indian and Alaskan Native (%)	Asian (%)	Native Hawaiian or Other Pacific Islander (%)	Some Other Race (%)	Two or More Races (%)	Hispanic Ethnicity (%)
Census Tract 5.02	4	6.8	0.0	15.6	2.7	0.0	0.0	0.0	3.3	55.7
Census Tract 5.02	5	17.5	13.0	0.0	0.0	0.0	0.0	0.0	2.1	47.9
Census Tract 5.02	6	37.0	37.5	0.0	0.0	0.0	0.0	0.0	0.0	42.6
Census Tract 5.03	1	3.5	4.9	4.2	0.0	0.0	0.0	0.0	3.8	47.8
Census Tract 5.03	2	11.3	4.2	11.8	0.0	0.0	0.0	0.0	1.8	14.0
Census Tract 5.03	3	8.5	10.2	0.0	1.0	0.0	0.0	0.0	0.0	33.5
Census Tract 5.04	1	0.7	0.0	5.7	0.0	1.1	0.0	1.4	2.1	14.0
Census Tract 5.04	2	7.4	4.0	0.0	5.6	0.0	0.0	0.0	3.1	23.4
Census Tract 5.04	3	10.4	13.0	4.1	0.0	0.0	0.0	0.0	21.3	28.1
Census Tract 6	1	12.5	7.6	0.0	0.0	0.0	0.0	0.0	0.0	58.6
Census Tract 6	2	23.1	17.1	0.0	0.0	0.0	0.0	0.0	0.0	43.8
Census Tract 6	3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	24.4
Census Tract 6	4	3.4	0.0	0.6	1.3	0.0	0.0	0.0	0.0	55.0
Census Tract 6	5	54.7	54.6	0.0	0.0	0.0	0.0	0.0	0.0	91.7
Census Tract 6	6	10.6	6.3	15.0	0.0	0.0	0.0	0.0	0.0	76.6
Census Tract 6	7	20.5	19.5	0.3	0.0	0.0	0.0	0.0	0.0	51.3
Census Tract 7.01	1	13.7	7.6	1.1	0.0	1.9	0.0	0.0	0.0	35.7
Census Tract 7.01	2	8.8	5.3	0.0	0.0	0.0	0.0	0.0	0.0	25.8
Census Tract 7.02	1	3.0	2.5	0.0	0.0	0.0	0.0	0.0	0.0	78.5
Census Tract 7.02	2	20.5	21.5	4.4	5.0	0.0	0.0	0.0	0.8	45.4
Census Tract 7.03	1	7.1	5.1	5.4	0.0	0.0	0.0	0.0	4.2	43.8
Census Tract 7.04	1	4.1	1.8	0.0	0.2	0.0	0.0	0.0	2.9	42.3
Census Tract 8	1	11.1	10.5	0.0	0.0	0.0	0.0	0.0	0.0	43.9
Census Tract 8	2	16.4	11.3	0.0	0.0	0.0	0.0	0.0	0.0	33.7
Census Tract 8	3	34.7	31.0	0.0	0.6	0.0	0.0	0.0	0.0	83.5
Census Tract 8	4	5.3	4.7	0.0	0.0	0.0	0.0	0.0	0.0	45.7
Census Tract 9	1	7.5	3.9	0.0	0.0	1.1	0.0	0.0	0.0	57.8
Census Tract 9	2	12.6	7.5	0.0	0.0	0.0	0.0	0.0	1.0	57.3
Census Tract 9	3	8.1	11.8	0.0	1.3	0.0	0.0	0.0	2.3	49.3
Census Tract 10.03	1	13.3	11.3	3.0	0.0	0.0	0.0	1.4	0.5	71.4
Census Tract 10.03	2	10.1	4.4	0.0	0.0	0.0	0.0	0.0	0.0	59.5
Census Tract 10.03	3	3.2	0.0	0.0	0.0	0.0	0.0	0.0	0.7	75.7
Census Tract 10.03	4	24.5	22.6	0.0	0.0	0.0	0.0	0.0	6.5	57.7
Census Tract 10.04	1	12.2	8.2	0.0	0.0	0.0	0.0	0.0	0.0	81.8
Census Tract 10.04	2	11.1	9.2	0.0	0.0	0.0	0.0	0.0	0.0	77.4

Table B–3 Census Block Groups Within 80 Kilometers [50 Miles] of the Proposed CISF Project

County/Tract	Block Group	Individuals Below Poverty Level (%)	Families Below Poverty Level (%)	African American (%)	American Indian and Alaskan Native (%)	Asian (%)	Native Hawaiian or Other Pacific Islander (%)	Some Other Race (%)	Two or More Races (%)	Hispanic Ethnicity (%)
Census Tract 10.04	3	16.9	6.7	5.1	0.0	0.0	0.0	0.0	0.0	64.1
Census Tract 10.05	1	7.1	10.8	0.9	0.0	0.0	0.0	0.0	0.0	45.5
Census Tract 10.05	2	19.8	26.1	0.0	0.0	0.0	0.0	0.0	0.0	36.1
Census Tract 10.05	3	24.1	18.6	0.0	1.0	0.0	0.0	0.5	0.0	83.2
Census Tract 11	1	9.5	8.5	0.0	1.5	0.0	0.0	0.0	0.8	46.9
Census Tract 11	3	24.5	19.1	0.0	0.0	0.0	0.0	0.0	0.7	43.9
Census Tract 11	4	2.8	3.0	0.0	0.0	0.0	0.0	0.0	0.0	51.4
Census Tract 11	5	3.3	2.4	0.0	0.0	0.0	0.0	0.0	0.0	64.7
State of Texas		16.0	12.4	11.7	0.2	4.5	0.1	0.1	1.6	38.9
Threshold for Environmental Justice Concerns		16.0	12.4	31.7	20.2	24.5	20.1	20.1	21.6	38.9
Andrews County, TX										
Census Tract 9501	1	6.0	4.8	0.3	0.7	1.6	0.0	0.0	0.6	36.7
Culberson County, TX										
Census Tract 9503	1	50.9	52.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gaines County, TX										
Census Tract 9502	1	16.8	10.6	0.0	0.0	0.0	0.0	0.0	0.0	17.2
Census Tract 9502	2	7.9	7.2	1.4	0.2		0.2	0.0	0.0	24.0
Loving County, TX										
Census Tract 9501	1	17.1	0.0	0.0	5.4	0.0	0.0	0.0	4.1	16.2
Reeves County, TX										
Census Tract 9501	1	24.4	30.0	6.3	0.0	0.9	0.0	0.1	1.1	75.5
Winkler County, TX										
Census Tract 9504	1	1.2	0.0	3.5	0.7	0.0	0.0	0.0	1.4	47.2
Yoakum County, TX										
Census Tract 9502	5	5.4	6.8	0.0	0.0	0.0	0.0	0.0	7.7	52.5

B.3 References

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APPENDIX C

COST BENEFIT

APPENDIX C COST BENEFIT

This appendix presents the details associated with the estimated costs the NRC staff generated for the proposed Consolidated Interim Storage Facility (CISF) [both the proposed action (Phase 1) and full build-out] as well as the No-Action alternative. As described in the Environmental Impact Statement (EIS) Section 8.2, the quantified cost estimates for the proposed CISF and the No-Action alternative are discounted. Discounting costs requires information on when activities occur (i.e., the project years when the activities occur). EIS Appendix C, Section C.1 describes the project schedule the U.S. Nuclear Regulatory Commission (NRC) staff used for discounting the estimated costs. The discounting calculation also required estimating annual costs for the various activities. In this EIS, costs were expressed in 2019 constant dollars so that these costs were comparable at a single point in time. EIS Appendix C, Section C.2 identifies the estimated annual costs for the activities and describes methodology the NRC staff used to convert these costs in 2019 constant dollars. EIS Appendix C, Section C.3 provides the details on how the NRC staff estimated the costs of the proposed CISF presented in EIS Table 8.3-3 using the information in this appendix. EIS Appendix C, Section C.4 provides the details on how the NRC staff estimated the costs of the No-Action alternative presented in EIS Table 8.4-1 using the information contained in this appendix. EIS Appendix C, Section C.5 contains references.

C.1 Project Schedule Used for Discounting Calculations

Under the No-Action alterative, SNF would continue to be stored at existing nuclear power plants and ISFSIs. Two activities are included in the quantified cost estimate in this EIS for the No-Action alternative: (i) operations and maintenance for storing SNF at the nuclear power plants and ISFSIs, and (ii) SNF transportation from the nuclear power plants and ISFSIs to a repository. Nuclear power plants and ISFSIs operations and maintenance would occur during all 40 years of the proposed CISF license term. For the purpose of discounting the cost estimate in this EIS, the NRC staff assumed that the schedule for transporting SNF from the nuclear power plants and ISFSIs to a repository would be the same as the schedule for transporting SNF from the proposed CISF to a repository described in EIS Appendix C, Table C–1.

Table C–1 Project Years when Activities Occur for the Proposed CISF for Both Phase 1 and Full Build-out (All Phases)

Activity	Project Years when Activity Occurs*	
	Phase 1	Full Build-out
CISF Construction	1 and 2	1 to 21
SNF Transportation from Nuclear Power Plants and ISFSIs to CISF	3	3 to 22
CISF Operations and Maintenance	3 to 40	3 to 40
SNF Transportation from CISF to Repository	40	23 to 40
CISF Decommissioning	41	41

*The applicant specified the project years when the following activities occur: CISF construction, SNF transportation from nuclear power plants and ISFSIs to the CISF, and CISF operations and maintenance. For the purpose of discounting the cost estimates, the NRC staff specified when the following activities occur: SNF transportation from the CISF to a repository and CISF decommissioning.
Source: Holtec, 2019a

As described in EIS Section 8.3.2.1, the cost estimates generated from these project schedules would be considered bounding from a discounting perspective since (i) these are considered to be the baseline schedules without any delays and (ii) delaying activities results in lower estimates for today's costs (i.e., lower present values).

C.2 Estimated Activity Costs Expressed in Constant 2019 Dollars

For this EIS, the estimated costs for the various activities are expressed in constant 2019 dollars. The estimated costs for the various activities quantified in the cost benefit analysis in the EIS (Chapter 8) were not initially expressed in 2019 dollars. Cost estimates from sources or documents older than 2019 needed to be adjusted to constant 2019 dollars. The NRC staff calculated the value for the constant 2019 dollars for these costs by following the Bureau of Labor Statistics (BLS) inflation calculator method (BLS, 2019), which uses the annual average Consumer Price Index (CPI) for a given year. The BLS CPI inflation calculator uses the following formula (hereafter called Equation 1):

$$2019\ Constant\ Dollars = \left(\frac{Current\ Month\ 2019\ CPI}{Annual\ Average\ CPI\ from\ Year\ X}\right) Cost\ in\ Year\ X \qquad \text{Eq. 1}$$

The August 2019 CPI was 256.558 (BLS, 2019). The NRC staff recognize that this single CPI value may not fully capture the changes in costs for various construction, operation, and transportation activities; however, using the CPI provides the NRC staff with a method of developing more comparable estimates than using non-adjusted figures from disparate years.

EIS Appendix C, Table C–2, identifies the various activities for both the proposed CISF and the No-Action alternative. In addition, this table also (i) specifies the initial annual cost estimate for the activities, (ii) identifies the year associated with this initial estimate (i.e., the year this cost estimate was made), (iii) specifies the CPI for the year associated with this initial estimate, and (iv) identifies the 2019 constant dollars the NRC staff calculated using the information in this table and Equation 1.

The cost estimates for the activities in EIS Appendix C, Table C–1 were expressed as annual costs. However, the ER (Holtec, 2019a) did not express the estimated costs for some activities as annual costs. Next, information detailing the method the NRC staff used to generate the annual costs for those activities is described.

In the ER (Holtec, 2019a), the proposed CISF construction cost estimates for both the proposed action (Phase 1) and full build-out were expressed as total costs rather than annual costs. As described in EIS Appendix C, Table C–1, the applicant stated that the proposed action (Phase 1) CISF construction would last 2 years and the construction for each of the 19 subsequent expansion phases would last 1 year. The NRC staff calculated the initial estimated annual cost for the proposed action (Phase 1) CISF construction by dividing the total cost for proposed action (Phase 1) CISF construction ($223.3 million) (Holtec, 2019a) by two (the number of years this activity would take). The NRC staff calculated the initial estimated total cost for all of the subsequent expansion phases by subtracting this proposed action (Phase 1) CISF construction cost from the full build-out construction cost ($2.1 billion) (Holtec, 2019a). Then, NRC staff calculated the initial estimated annual cost for each individual subsequent expansion phase by dividing the total cost for all of the subsequent expansion phases ($1.877 billion) by 19 (the number of expansion phases, with each expansion phase taking 1 year for construction).

Table C–2 Initial Annual Estimated Costs and 2019 Constant Dollar Values for the Various Activities for the Proposed CISF and the No-Action Alternative						
Activity		**Initial Cost Estimates**			**2019 Constant Dollars**
		Annual Value	**Year***	**Consumer Price Index†**	
CISF Construction	Phase 1	$111,650,000	2017	245.120	$116,859,908
	Subsequent Phase	$98,789,473	2017	245.120	$103,399,272
SNF Transportation - Nuclear Power Plants and ISFSIs to Repository	Phase 1	$225,680,000	2009	214.537	$269,883,561
	Subsequent Years	$130,000,000	2009	214.537	$155,462,880
CISF Operation and Maintenance	Low estimate	$4,500,000	2017	245.120	$4,709,983
	High estimate	$27,300,000	2018	251.107	$27,892,625
CISF Decommissioning	Phase 1	$23,716,000	2017	245.120	$24,822,656
	Full Build-out	$474,320,000	2017	245.120	$496,453,127
SNF Transportation - CISF to Repository	Phase 1	$225,680,000	2009	214.537	$269,883,561
	Subsequent Years	$139,665,882	2009	214.537	$167,022,002
Nuclear Power Plants and ISFSIs Operation and Maintenance	Low estimate	$1,000,000	2012	229.594	$1,117,442
	High estimate	$6,250,000	2012	229.594	$6,984,013
SNF Transportation from Nuclear Power Plants and ISFSIs to Repository	Phase 1	$225,680,000	2009	214.537	$269,883,561
	Subsequent Years	$139,665,882	2009	214.537	$167,022,002

*Year associated with the estimated cost

†The annual average Consumer Price Index for the year associated with the estimated cost.

Sources: Cost Estimates = (Holtec, 2018b) for Phase 1 CISF decommissioning, (Holtec, 2019c) for the proposed CISF lower cost estimate, and (Holtec, 2019a) for all other activities. Consumer Price Index yearly values = (BLS, 2019)

The ER (Holtec, 2019a) estimated the SNF transportation costs based on the amount of SNF being transported [i.e., $26,000 per metric tons of uranium (MTU)]. For the proposed CISF, two SNF transportation campaigns would occur: first, from the nuclear power plants and ISFSIs to the CISF, and second, from the CISF to the repository. As described in EIS Section 2.2.1, the proposed action (Phase 1) transports up to 8,680 MTU of SNF, and each subsequent phase transports up to 5,000 MTU of SNF {i.e., because the capacity of individual canisters can vary, the 500 canisters proposed in the Holtec license application have the potential to hold up to 8,680 MTUs [9,568 tons]}. As described in EIS Appendix C, Table C–1, the applicant stated that it would take 1 year to transport SNF from the nuclear power plants and ISFSIs to the proposed CISF for the proposed action (Phase 1) and each subsequent phase. The NRC staff calculated the annual costs for transporting the SNF from the nuclear power plants and ISFSIs to the proposed CISF by multiplying the cost per MTU times the appropriate amount of SNF transported.

As described in EIS Appendix C, Table C–1, the NRC staff assumed that transporting SNF from the proposed CISF to a repository would take 1 year for Phase 1 and 18 years for full build-out. The NRC staff assumed this in order to (i) discount the costs in the EIS and (ii) bound these costs from a discounting perspective. First, the NRC staff calculated the total transportation costs for the proposed action (Phase 1) as well as the total transportation costs for all of the remaining SNF by multiplying the cost per MTU ($26,000) times the appropriate amount of SNF transported {8,680 MTU for the proposed action (Phase 1) and 91,320 MTU for the remaining SNF} (Holtec, 2019a). Next, the NRC staff calculated the annual costs. For the proposed action (Phase 1), the total cost ($225,680,000) and the annual cost was the same since this activity would take 1 year to accomplish. The NRC staff calculated the annual transportation cost for the remaining SNF by dividing the total cost for the remaining SNF ($2,374,320,000) by the number of remaining years (17). The estimated costs for transporting SNF for the No-Action alternative (i.e., from the nuclear power plants and ISFSIs to a repository) would be the same as the estimated costs for transporting the SNF from the proposed CISF to a repository since the SNF transportation schedules and the amount of SNF transported would be the same.

The applicant expressed all of the operation and maintenance costs as annual cost estimates. As described in EIS Section 8.3.2.1, the applicant assumed that this cost would be the same, regardless of how much SNF was stored at the proposed CISF (i.e., the estimated annual costs for this activity would be the same no matter how many phases were active during an individual year).

For CISF decommissioning, the NRC staff assumed this activity would take 1 year for both the proposed action (Phase 1) and full build-out. The NRC staff chose a 1-year timeframe for decommissioning because this would bound the estimated costs for this activity from a discounting perspective. The applicant estimated the proposed action (Phase 1) total decommissioning cost at $23,716,000 (Holtec, 2018b); however, no estimate was provided for the full build-out decommissioning. For the purpose of the EIS cost benefit analysis, the NRC staff prorated the decommissioning costs based on the amount of SNF associated with the proposed action (Phase 1) and full build-out. The NRC staff used the proposed action (Phase 1) value of 5,000 MTU [5,512 tons] of SNF for this prorating rather than 8,680 MTU [9,568 tons] to generate a more conservative estimate. The proposed action (Phase 1) total decommissioning cost was multiplied by a prorating factor of 20 (100,000 MTU divided by 5,000 MTU) to obtain the full build-out decommissioning cost. The total decommissioning costs were also the annual costs since the NRC staff assumed that this activity would take 1 year to accomplish.

C.3 Generating the Estimated Costs for the Proposed CISF

This section provides details on how the NRC staff generated the estimated costs for the proposed CISF in EIS Table 8.3-3. The NRC staff calculated the costs for the proposed CISF for four cases in EIS Table 8.3-3: Phase 1 Scenario A (low operations cost estimate); Phase 1 Scenario B (high operations cost estimate); full build-out Scenario A (low operations cost estimate); and full build-out Scenario B (high operations cost estimate).

First, the NRC staff calculated the undiscounted costs for each case using the following steps:

- Creating tables that both (i) identified which activities occur in each project year (from EIS Table C–1), and (ii) specified the undiscounted annual cost for that activity (from EIS Table C–2).

* Generating the total costs for each activity by adding up the costs of each activity over the entire proposed CISF license term.

* Generating the total project costs for each case by adding up the costs of all activities for that case.

EIS Tables C–3, C–4, C–5, and C–6 contain the undiscounted cost estimates for Phase 1 Scenario A; Phase 1 Scenario B; full build-out Scenario A; and full build-out Scenario B, respectively. The NRC staff used information in these four tables to complete the undiscounted costs in EIS Table 8.3-3.

Table C–3 Undiscounted Cost Estimates for Phase 1 Scenario A (Lower CISF Operations Cost Estimate)

Project Year	CISF Construction (2019 dollars)	SNF Transportation to CISF (2019 dollars)	CISF Operations (2019 dollars)	SNF Transportation to Repository (2019 dollars)	CISF Decommissioning (2019 dollars)	Total Cost (2019 dollars)
1	116,859,908	0	0	0	0	116,859,908
2	116,859,908	0	0	0	0	116,859,908
3	0	269,883,561	4,709,983	0	0	274,593,543
4	0	0	4,709,983	0	0	4,709,983
5	0	0	4,709,983	0	0	4,709,983
6	0	0	4,709,983	0	0	4,709,983
7	0	0	4,709,983	0	0	4,709,983
8	0	0	4,709,983	0	0	4,709,983
9	0	0	4,709,983	0	0	4,709,983
10	0	0	4,709,983	0	0	4,709,983
11	0	0	4,709,983	0	0	4,709,983
12	0	0	4,709,983	0	0	4,709,983
13	0	0	4,709,983	0	0	4,709,983
14	0	0	4,709,983	0	0	4,709,983
15	0	0	4,709,983	0	0	4,709,983
16	0	0	4,709,983	0	0	4,709,983
17	0	0	4,709,983	0	0	4,709,983
18	0	0	4,709,983	0	0	4,709,983
19	0	0	4,709,983	0	0	4,709,983
20	0	0	4,709,983	0	0	4,709,983
21	0	0	4,709,983	0	0	4,709,983
22	0	0	4,709,983	0	0	4,709,983
23	0	0	4,709,983	0	0	4,709,983
24	0	0	4,709,983	0	0	4,709,983
25	0	0	4,709,983	0	0	4,709,983
26	0	0	4,709,983	0	0	4,709,983
27	0	0	4,709,983	0	0	4,709,983
28	0	0	4,709,983	0	0	4,709,983
29	0	0	4,709,983	0	0	4,709,983
30	0	0	4,709,983	0	0	4,709,983
31	0	0	4,709,983	0	0	4,709,983
32	0	0	4,709,983	0	0	4,709,983
33	0	0	4,709,983	0	0	4,709,983
34	0	0	4,709,983	0	0	4,709,983
35	0	0	4,709,983	0	0	4,709,983
36	0	0	4,709,983	0	0	4,709,983
37	0	0	4,709,983	0	0	4,709,983
38	0	0	4,709,983	0	0	4,709,983
39	0	0	4,709,983	0	0	4,709,983
40	0	0	4,709,983	269,883,561	0	274,593,543
41	0	0	0	0	24,822,656	24,822,656

Table C–3 Undiscounted Cost Estimates for Phase 1 Scenario A (Lower CISF Operations Cost Estimate)

Project Year	CISF Construction (2019 dollars)	SNF Transportation to CISF (2019 dollars)	CISF Operations (2019 dollars)	SNF Transportation to Repository (2019 dollars)	CISF Decommissioning (2019 dollars)	Total Cost (2019 dollars)
TOTAL	233,719,816	269,883,561	178,979,349	269,883,561	24,822,656	977,288,943
Sources: EIS Tables C–1 and C–2						

Table C–4 Undiscounted Cost Estimates for Phase 1 Scenario B (Higher CISF Operations Cost Estimate)

Project Year	CISF Construction (2019 dollars)	SNF Transportation to CISF (2019 dollars)	CISF Operations (2019 dollars)	SNF Transportation to Repository (2019 dollars)	CISF Decommissioning (2019 dollars)	Total Cost (2019 dollars)
1	116,859,908	0	0	0	0	116,859,908
2	116,859,908	0	0	0	0	116,859,908
3	0	269,883,561	27,892,625	0	0	297,776,186
4	0	0	27,892,625	0	0	27,892,625
5	0	0	27,892,625	0	0	27,892,625
6	0	0	27,892,625	0	0	27,892,625
7	0	0	27,892,625	0	0	27,892,625
8	0	0	27,892,625	0	0	27,892,625
9	0	0	27,892,625	0	0	27,892,625
10	0	0	27,892,625	0	0	27,892,625
11	0	0	27,892,625	0	0	27,892,625
12	0	0	27,892,625	0	0	27,892,625
13	0	0	27,892,625	0	0	27,892,625
14	0	0	27,892,625	0	0	27,892,625
15	0	0	27,892,625	0	0	27,892,625
16	0	0	27,892,625	0	0	27,892,625
17	0	0	27,892,625	0	0	27,892,625
18	0	0	27,892,625	0	0	27,892,625
19	0	0	27,892,625	0	0	27,892,625
20	0	0	27,892,625	0	0	27,892,625
21	0	0	27,892,625	0	0	27,892,625
22	0	0	27,892,625	0	0	27,892,625
23	0	0	27,892,625	0	0	27,892,625
24	0	0	27,892,625	0	0	27,892,625
25	0	0	27,892,625	0	0	27,892,625
26	0	0	27,892,625	0	0	27,892,625
27	0	0	27,892,625	0	0	27,892,625
28	0	0	27,892,625	0	0	27,892,625
29	0	0	27,892,625	0	0	27,892,625
30	0	0	27,892,625	0	0	27,892,625
31	0	0	27,892,625	0	0	27,892,625
32	0	0	27,892,625	0	0	27,892,625
33	0	0	27,892,625	0	0	27,892,625
34	0	0	27,892,625	0	0	27,892,625
35	0	0	27,892,625	0	0	27,892,625
36	0	0	27,892,625	0	0	27,892,625
37	0	0	27,892,625	0	0	27,892,625
38	0	0	27,892,625	0	0	27,892,625

Table C–4 Undiscounted Cost Estimates for Phase 1 Scenario B (Higher CISF Operations Cost Estimate)						
Project Year	**CISF Construction (2019 dollars)**	**SNF Transportation to CISF (2019 dollars)**	**CISF Operations (2019 dollars)**	**SNF Transportation to Repository (2019 dollars)**	**CISF Decommissioning (2019 dollars)**	**Total Cost (2019 dollars)**
39	0	0	27,892,625	0	0	27,892,625
40	0	0	27,892,625	269,883,561	0	297,776,186
41	0	0	0	0	24,822,656	24,822,656
TOTAL	233,719,816	269883561	1,059,919,752	269,883,561	24,822,656	1,858,229,346
Sources: EIS Tables C–1 and C–2						

Table C–5 Undiscounted Cost Estimates for Full Build-out Scenario A (Lower CISF Operations Cost Estimate)						
Project Year	**CISF Construction (2019 dollars)**	**SNF Transportation to CISF (2019 dollars)**	**CISF Operations (2019 dollars)**	**SNF Transportation to Repository (2019 dollars)**	**CISF Decommissioning (2019 dollars)**	**Total Cost (2019 dollars)**
1	116,859,908	0	0	0	0	116,859,908
2	116,859,908	0	0	0	0	116,859,908
3	103,399,272	269,883,561	4,709,983	0	0	377,992,816
4	103,399,272	155,462,880	4,709,983	0	0	263,572,135
5	103,399,272	155,462,880	4,709,983	0	0	263,572,135
6	103,399,272	155,462,880	4,709,983	0	0	263,572,135
7	103,399,272	155,462,880	4,709,983	0	0	263,572,135
8	103,399,272	155,462,880	4,709,983	0	0	263,572,135
9	103,399,272	155,462,880	4,709,983	0	0	263,572,135
10	103,399,272	155,462,880	4,709,983	0	0	263,572,135
11	103,399,272	155,462,880	4,709,983	0	0	263,572,135
12	103,399,272	155,462,880	4,709,983	0	0	263,572,135
13	103,399,272	155,462,880	4,709,983	0	0	263,572,135
14	103,399,272	155,462,880	4,709,983	0	0	263,572,135
15	103,399,272	155,462,880	4,709,983	0	0	263,572,135
16	103,399,272	155,462,880	4,709,983	0	0	263,572,135
17	103,399,272	155,462,880	4,709,983	0	0	263,572,135
18	103,399,272	155,462,880	4,709,983	0	0	263,572,135
19	103,399,272	155,462,880	4,709,983	0	0	263,572,135
20	103,399,272	155,462,880	4,709,983	0	0	263,572,135
21	103,399,272	155,462,880	4,709,983	0	0	263,572,135
22	0	155,462,880	4,709,983	0	0	160,172,863
23	0	0	4,709,983	167,022,002	0	171,731,985
24	0	0	4,709,983	167,022,002	0	171,731,985
25	0	0	4,709,983	167,022,002	0	171,731,985
26	0	0	4,709,983	167,022,002	0	171,731,985
27	0	0	4,709,983	167,022,002	0	171,731,985
28	0	0	4,709,983	167,022,002	0	171,731,985
29	0	0	4,709,983	167,022,002	0	171,731,985
30	0	0	4,709,983	167,022,002	0	171,731,985
31	0	0	4,709,983	167,022,002	0	171,731,985
32	0	0	4,709,983	167,022,002	0	171,731,985
33	0	0	4,709,983	167,022,002	0	171,731,985
34	0	0	4,709,983	167,022,002	0	171,731,985
35	0	0	4,709,983	167,022,002	0	171,731,985
36	0	0	4,709,983	167,022,002	0	171,731,985
37	0	0	4,709,983	167,022,002	0	171,731,985
38	0	0	4,709,983	167,022,002	0	171,731,985
39	0	0	4,709,983	167,022,002	0	171,731,985
40	0	0	4,709,983	167,022,002	0	171,731,985
41	0	0	0	0	496,453,127	496,453,127
TOTAL	2,198,305,989	3,223,678,281	178,979,349	3,006,396,036	496,453,127	9,103,812,782
Sources: EIS Tables C–1 and C–2						

Table C–6 Undiscounted Cost Estimates for Full Build-out Scenario B (Higher CISF Operations Cost Estimate)						
Project Year	**CISF Construction (2019 dollars)**	**SNF Transportation to CISF (2019 dollars)**	**CISF Operations (2019 dollars)**	**SNF Transportation to Repository (2019 dollars)**	**CISF Decommissioning (2019 dollars)**	**Total Cost (2019 dollars)**
1	116,859,908	0	0	0	0	116,859,908
2	116,859,908	0	0	0	0	116,859,908
3	103,399,272	269,883,561	27,892,625	0	0	401,175,458
4	103,399,272	155,462,880	27,892,625	0	0	286,754,777
5	103,399,272	155,462,880	27,892,625	0	0	286,754,777
6	103,399,272	155,462,880	27,892,625	0	0	286,754,777
7	103,399,272	155,462,880	27,892,625	0	0	286,754,777
8	103,399,272	155,462,880	27,892,625	0	0	286,754,777
9	103,399,272	155,462,880	27,892,625	0	0	286,754,777
10	103,399,272	155,462,880	27,892,625	0	0	286,754,777
11	103,399,272	155,462,880	27,892,625	0	0	286,754,777
12	103,399,272	155,462,880	27,892,625	0	0	286,754,777
13	103,399,272	155,462,880	27,892,625	0	0	286,754,777
14	103,399,272	155,462,880	27,892,625	0	0	286,754,777
15	103,399,272	155,462,880	27,892,625	0	0	286,754,777
16	103,399,272	155,462,880	27,892,625	0	0	286,754,777
17	103,399,272	155,462,880	27,892,625	0	0	286,754,777
18	103,399,272	155,462,880	27,892,625	0	0	286,754,777
19	103,399,272	155,462,880	27,892,625	0	0	286,754,777
20	103,399,272	155,462,880	27,892,625	0	0	286,754,777
21	103,399,272	155,462,880	27,892,625	0	0	286,754,777
22	0	155,462,880	27,892,625	0	0	183,355,505
23	0	0	27,892,625	167,022,002	0	194,914,627
24	0	0	27,892,625	167,022,002	0	194,914,627
25	0	0	27,892,625	167,022,002	0	194,914,627
26	0	0	27,892,625	167,022,002	0	194,914,627
27	0	0	27,892,625	167,022,002	0	194,914,627
28	0	0	27,892,625	167,022,002	0	194,914,627
29	0	0	27,892,625	167,022,002	0	194,914,627
30	0	0	27,892,625	167,022,002	0	194,914,627
31	0	0	27,892,625	167,022,002	0	194,914,627
32	0	0	27,892,625	167,022,002	0	194,914,627
33	0	0	27,892,625	167,022,002	0	194,914,627
34	0	0	27,892,625	167,022,002	0	194,914,627
35	0	0	27,892,625	167,022,002	0	194,914,627
36	0	0	27,892,625	167,022,002	0	194,914,627
37	0	0	27,892,625	167,022,002	0	194,914,627
38	0	0	27,892,625	167,022,002	0	194,914,627
39	0	0	27,892,625	167,022,002	0	194,914,627
40	0	0	27,892,625	167,022,002	0	194,914,627
41	0	0	0	0	496,453,127	496,453,127
TOTAL	2,198,305,989	3,223,678,281	1,059,919,752	3,006,396,036	496,453,127	9,984,753,185
Sources: EIS Tables C–1 and C–2						

Next, the NRC staff calculated the discounted costs at both 3 and 7 percent for the four cases in EIS Table 8.3-3: Phase 1 Scenario A (low operations cost estimate); Phase 1 Scenario B (high operations cost estimate); full build-out Scenario A (low operations cost estimate); and full build-out Scenario B (high operations cost estimate). The NRC calculated the discounted costs for each case using the following formula (hereafter called Equation 2):

$$\mathrm{PV} = \frac{Cost}{(1 + i)T} \qquad \text{Eq. 2}$$

where
PV = present values
Cost = annual cost in 2019 constant dollars
i = discount rate (0.03 or 0.07)
T = project year (1-40)

The last column in Tables C–3 to C–6 provides the cost input for Equation 2 (i.e., “Cost”), and the first column in these tables provides the project year input for this equation (i.e., “T”). Consistent with the Office of Management and Budget guidance (OMB, 2003), this cost benefit analysis uses discount rates of 3 percent (i.e., i = 0.03 for Equation 2) and 7 percent (i.e., I = 0.07 for Equation 2). Based on these inputs, the NRC staff calculated the proposed CISF estimated cost at a 3 percent discount rate in EIS Table C–7 and at the 7 percent discount rate in EIS Table C–8. The NRC staff used information in these two tables to complete the discounted costs in EIS Table 8.3-3.

Table C–7 Proposed CISF Estimated Cost Discounted at 3 Percent

Project Year	Phase 1 Scenario A (2019 dollars)	Phase 1 Scenario B (2019 dollars)	Full Build-out Scenario A (2019 dollars)	Full Build-out Scenario B (2019 dollars)
1	113,456,222	113,456,222	113,456,222	113,456,222
2	110,151,671	110,151,671	110,151,671	110,151,671
3	251,291,991	272,507,393	345,916,973	367,132,374
4	4,184,759	24,782,236	234,180,428	254,777,906
5	4,062,873	24,060,423	227,359,639	247,357,190
6	3,944,536	23,359,634	220,737,514	240,152,612
7	3,829,647	22,679,257	214,308,266	233,157,875
8	3,718,104	22,018,696	208,066,277	226,366,869
9	3,609,810	21,377,375	202,006,095	219,773,659
10	3,504,670	20,754,733	196,122,422	213,372,485
11	3,402,592	20,150,226	190,410,118	207,157,752
12	3,303,487	19,563,326	184,864,193	201,124,031
13	3,207,269	18,993,520	179,479,799	195,266,050
14	3,113,854	18,440,311	174,252,232	189,578,689
15	3,023,159	17,903,215	169,176,924	184,056,980
16	2,935,106	17,381,762	164,249,441	178,696,097
17	2,849,617	16,875,497	159,465,476	173,491,356
18	2,766,619	16,383,978	154,820,851	168,438,210
19	2,686,037	15,906,774	150,311,506	163,532,243
20	2,607,803	15,443,470	145,933,501	158,769,168
21	2,531,848	14,993,660	141,683,010	154,144,823
22	2,458,105	14,556,952	83,593,016	95,691,863
23	2,386,509	14,132,963	87,015,180	98,761,633
24	2,316,999	13,721,323	84,480,757	95,885,081
25	2,249,514	13,321,673	82,020,152	93,092,311
26	2,183,994	12,933,663	79,631,216	90,380,885
27	2,120,383	12,556,955	77,311,860	87,748,432
28	2,058,624	12,191,218	75,060,058	85,192,652
29	1,998,664	11,836,134	72,873,843	82,711,313
30	1,940,451	11,491,392	70,751,304	80,302,246

Table C–7	Proposed CISF Estimated Cost Discounted at 3 Percent			
Project Year	Phase 1 Scenario A (2019 dollars)	Phase 1 Scenario B (2019 dollars)	Full Build-out Scenario A (2019 dollars)	Full Build-out Scenario B (2019 dollars)
31	1,883,933	11,156,691	68,690,586	77,963,345
32	1,829,061	10,831,739	66,689,890	75,692,568
33	1,775,787	10,516,252	64,747,466	73,487,930
34	1,724,065	10,209,953	62,861,617	71,347,505
35	1,673,850	9,912,576	61,030,696	69,269,422
36	1,625,097	9,623,860	59,253,103	67,251,866
37	1,577,764	9,343,553	57,527,285	65,293,074
38	1,531,810	9,071,411	55,851,733	63,391,334
39	1,487,194	8,807,195	54,224,983	61,544,985
40	84,178,529	91,285,327	52,645,615	59,752,412
41	7,387,918	7,387,918	147,758,352	147,758,352
TOTAL	660,569,922	1,152,072,127	5,350,971,268	5,842,473,472
Sources: EIS Tables C–3 to C–6				

Table C–8	Proposed CISF Estimated Cost Discounted at 7 Percent			
Project Year	Phase 1 Scenario A (2019 dollars)	Phase 1 Scenario B (2019 dollars)	Full Build-out Scenario A (2019 dollars)	Full Build-out Scenario B (2019 dollars)
1	109,214,867	109,214,867	109,214,867	109,214,867
2	102,069,970	102,069,970	102,069,970	102,069,970
3	224,150,127	243,074,068	308,554,733	327,478,675
4	3,593,223	21,279,150	201,077,920	218,763,847
5	3,358,153	19,887,056	187,923,290	204,452,193
6	3,138,460	18,586,034	175,629,243	191,076,816
7	2,933,141	17,370,125	164,139,479	178,576,464
8	2,741,253	16,233,762	153,401,382	166,893,891
9	2,561,919	15,171,740	143,365,778	155,975,599
10	2,394,316	14,179,196	133,986,708	145,771,588
11	2,237,679	13,251,585	125,221,223	136,235,129
12	2,091,289	12,384,659	117,029,180	127,322,550
13	1,954,475	11,574,448	109,373,066	118,993,038
14	1,826,613	10,817,241	102,217,818	111,208,447
15	1,707,115	10,109,571	9,553,0671	103,933,128
16	1,595,434	9,448,197	89,281,001	97,133,764
17	1,491,060	8,830,091	83,440,188	90,779,219
18	1,393,514	8,252,421	77,981,484	84,840,391
19	1,302,350	7,712,543	72,879,892	79,290,085
20	1,217,149	7,207,984	68,112,048	74,102,884
21	1,137,523	6,736,434	63,656,120	69,255,031
22	1,063,105	6,295,733	36,153,124	41,385,751
23	993,556	5,883,862	36,226,327	41,116,633
24	928,557	5,498,937	33,856,380	38,426,760
25	867,810	5,139,193	31,641,477	35,912,860
26	811,038	4,802,984	29,571,474	33,563,420
27	757,979	4,488,770	27,636,891	31,367,683
28	708,392	4,195,113	25,828,870	29,315,591
29	662,048	3,920,666	24,139,131	27,397,749
30	618,737	3,664,174	22,559,936	25,605,373
31	578,259	3,424,461	21,084,052	23,930,255
32	540,429	3,200,431	19,704,722	22,364,724

Table C–8	Proposed CISF Estimated Cost Discounted at 7 Percent			
Project Year	Phase 1 Scenario A (2019 dollars)	Phase 1 Scenario B (2019 dollars)	Full Build-out Scenario A (2019 dollars)	Full Build-out Scenario B (2019 dollars)
33	505,074	2,991,057	18,415,628	20,901,611
34	472,031	2,795,381	17,210,867	19,534,216
35	441,151	2,612,505	16,084,922	18,256,277
36	412,291	2,441,594	15,032,638	17,061,941
37	385,318	2,281,863	14,049,194	15,945,739
38	360,110	2,132,582	13,130,088	14,902,560
39	336,552	1,993,068	12,271,110	13,927,626
40	18,337,461	19,885,607	11,468,327	13,016,473
41	1,549,221	1,549,221	30,984,420	30,984,420
TOTAL	505,438,748	772,588,346	3,141,135,640	3,408,285,238
Sources: EIS Tables C–3 to C–6				

C.4 Generating the Estimated Costs for the No-Action Alternative

This section provides details on how the NRC staff estimated costs generated for the No-Action alternative in EIS Table 8.4-1. The NRC staff calculated the costs for the proposed CISF for four cases in EIS Table 8.4-1: Phase 1 Scenario 1 (no additional reactors shut down); Phase 1 Scenario 2 (all reactors shut down in 2040); full build-out Scenario 1 (no additional reactors shut down); and full build-out Scenario 2 (all reactors shut down in 2040). Operation costs at the nuclear power plants and ISFSIs vary depending on whether the reactor is operating or shut down.

First, the NRC staff calculated the undiscounted costs for each case using the following steps:

- Creating a table that identifies the operational costs for the various project years based on (i) the number and types of reactors (i.e., active or decommissioned) associated with the SNF at the nuclear power plants and ISFSIs (EIS Section 8.4.2.1) and (ii) the undiscounted annual cost for storing SNF at nuclear power plants and ISFSIs (from EIS Table C–2).

- Creating tables that both (i) identified which activities occur in each project year (from EIS Table C–1 and EIS Section 8.3.1.1) and (ii) specified the undiscounted annual cost for that activity (the table generated by the preceding bullet point).

- Generating the total costs for each activity by adding up the costs of each activity over the entire proposed CISF time frame.

- Generating the total project costs for each case by adding up the costs of all activities for that case.

EIS Table C–9 identifies the operational costs for storing SNF at the nuclear power plants and ISFSIs by the various CISF project years. EIS Table C–10 contains the undiscounted cost estimates for the Phase 1 scenarios and EIS Table C–11 contains the undiscounted cost estimates for the full build-out scenarios. For full build-out, the NRC staff assumed the SNF transportation campaign lasts 18 years. The cost for storing SNF at the nuclear power plants and ISFSIs is eliminated because the SNF is relocated to the proposed CISF. To account for this, the NRC staff reduced the nuclear power plants and ISFSIs operation costs by 5.5 percent each year in EIS Table C–11, which evenly drops the cost for this activity over the 18-year

Table C–9	Operation Costs for Storing SNF at Nuclear Power Plants and ISFSIs by CISF Project Year.							
CASE	Project Years	Decommissioned Reactor Sites			Active Reactor Sites			Total Cost
		Number	Cost per Site	Decom Cost	Number	Cost per Site	Active Cost	
Phase 1 Scenario 1	1-40	12	$6,984,013	$83,808,156	2	$1,117,442	$2,234,884	$86,043,040
Phase 1 Scenario 2	1-20	12	$6,984,013	$83,808,156	2	$1,117,442	$2,234,884	$86,043,040
	21-40	14	$6,984,013	$97,776,182	0	$1,117,442	$0	$97,776,182
Full Build-out Scenario 1	1-40	12	$6,984,013	$83,808,156	60	$1,117,442	$67,046,520	$150,854,676
Full Build-out Scenario 2	1-20	12	$6,984,013	$83,808,156	60	$1,117,442	$67,046,520	$150,854,676
	21-40	72	$6,984,013	$502,848,936	0	$1,117,442	$0	$502,848,936
Source: EIS Table C–2								

Table C–10	The No-Action Alternative Undiscounted Cost Estimates for the Phase 1 Scenarios					
	Phase 1 – Scenario 1			Phase 1 – Scenario 2		
Project Year	Operations (2019 dollars)	SNF Transportation (2019 dollars)	Total Cost (2019 dollars)	Operations (2019 dollars)	SNF Transportation (2019 dollars)	Total Cost (2019 dollars)
1	86,043,040	0	86,043,040	86,043,040	0	86,043,040
2	86,043,040	0	86,043,040	86,043,040	0	86,043,040
3	86,043,040	0	86,043,040	86,043,040	0	86,043,040
4	86,043,040	0	86,043,040	86,043,040	0	86,043,040
5	86,043,040	0	86,043,040	86,043,040	0	86,043,040
6	86,043,040	0	86,043,040	86,043,040	0	86,043,040
7	86,043,040	0	86,043,040	86,043,040	0	86,043,040
8	86,043,040	0	86,043,040	86,043,040	0	86,043,040
9	86,043,040	0	86,043,040	86,043,040	0	86,043,040
10	86,043,040	0	86,043,040	86,043,040	0	86,043,040
11	86,043,040	0	86,043,040	86,043,040	0	86,043,040
12	86,043,040	0	86,043,040	86,043,040	0	86,043,040
13	86,043,040	0	86,043,040	86,043,040	0	86,043,040
14	86,043,040	0	86,043,040	86,043,040	0	86,043,040
15	86,043,040	0	86,043,040	86,043,040	0	86,043,040
16	86,043,040	0	86,043,040	86,043,040	0	86,043,040
17	86,043,040	0	86,043,040	86,043,040	0	86,043,040
18	86,043,040	0	86,043,040	86,043,040	0	86,043,040
19	86,043,040	0	86,043,040	86,043,040	0	86,043,040
20	86,043,040	0	86,043,040	86,043,040	0	86,043,040
21	86,043,040	0	86,043,040	97,776,182	0	97,776,182
22	86,043,040	0	86,043,040	97,776,182	0	97,776,182
23	86,043,040	0	86,043,040	97,776,182	0	97,776,182
24	86,043,040	0	86,043,040	97,776,182	0	97,776,182
25	86,043,040	0	86,043,040	97,776,182	0	97,776,182
26	86,043,040	0	86,043,040	97,776,182	0	97,776,182
27	86,043,040	0	86,043,040	97,776,182	0	97,776,182
28	86,043,040	0	86,043,040	97,776,182	0	97,776,182
29	86,043,040	0	86,043,040	97,776,182	0	97,776,182
30	86,043,040	0	86,043,040	97,776,182	0	97,776,182
31	86,043,040	0	86,043,040	97,776,182	0	97,776,182
32	86,043,040	0	86,043,040	97,776,182	0	97,776,182
33	86,043,040	0	86,043,040	97,776,182	0	97,776,182
34	86,043,040	0	86,043,040	97,776,182	0	97,776,182
35	86,043,040	0	86,043,040	97,776,182	0	97,776,182
36	86,043,040	0	86,043,040	97,776,182	0	97,776,182
37	86,043,040	0	86,043,040	97,776,182	0	97,776,182
38	86,043,040	0	86,043,040	97,776,182	0	97,776,182
39	86,043,040	0	86,043,040	97,776,182	0	97,776,182
40	86,043,040	269,883,561	355,926,601	97,776,182	269,883,561	367,659,743
Total	3,441,721,600	269,883,561	3,711,605,161	3,676,384,440	269,883,561	3,946,268,001
Sources: EIS Tables C–1 and C–2						

Table C–11 The No-Action Alternative Undiscounted Cost Estimates for the Full Build-out Scenarios

Project Year	Full Build-out Scenario 1 Operations (2019 dollars)	Full Build-out Scenario 1 SNF Transportation (2019 dollars)	Full Build-out Scenario 1 Total Cost (2019 dollars)	Full Build-out Scenario 2 Operations (2019 dollars)	Full Build-out Scenario 2 SNF Transportation (2019 dollars)	Full Build-out Scenario 2 Total Cost (2019 dollars)
1	150,854,676	0	150,854,676	150,854,676	0	150,854,676
2	150,854,676	0	150,854,676	150,854,676	0	150,854,676
3	150,854,676	0	150,854,676	150,854,676	0	150,854,676
4	150,854,676	0	150,854,676	150,854,676	0	150,854,676
5	150,854,676	0	150,854,676	150,854,676	0	150,854,676
6	150,854,676	0	150,854,676	150,854,676	0	150,854,676
7	150,854,676	0	150,854,676	150,854,676	0	150,854,676
8	150,854,676	0	150,854,676	150,854,676	0	150,854,676
9	150,854,676	0	150,854,676	150,854,676	0	150,854,676
10	150,854,676	0	150,854,676	150,854,676	0	150,854,676
11	150,854,676	0	150,854,676	150,854,676	0	150,854,676
12	150,854,676	0	150,854,676	150,854,676	0	150,854,676
13	150,854,676	0	150,854,676	150,854,676	0	150,854,676
14	150,854,676	0	150,854,676	150,854,676	0	150,854,676
15	150,854,676	0	150,854,676	150,854,676	0	150,854,676
16	150,854,676	0	150,854,676	150,854,676	0	150,854,676
17	150,854,676	0	150,854,676	150,854,676	0	150,854,676
18	150,854,676	0	150,854,676	150,854,676	0	150,854,676
19	150,854,676	0	150,854,676	150,854,676	0	150,854,676
20	150,854,676	0	150,854,676	150,854,676	0	150,854,676
21	150,854,676	0	150,854,676	502,848,936	0	502,848,936
22	150,854,676	0	150,854,676	502,848,936	0	502,848,936
23	142,557,669	167,022,002	309,579,671	475,192,245	167,022,002	642,214,247
24	134,260,662	167,022,002	301,282,664	447,535,553	167,022,002	614,557,555
25	125,963,654	167,022,002	292,985,656	419,878,862	167,022,002	586,900,864
26	117,666,647	167,022,002	284,688,649	392,222,170	167,022,002	559,244,172
27	109,369,640	167,022,002	276,391,642	364,565,479	167,022,002	531,587,481
28	101,072,633	167,022,002	268,094,635	336,908,787	167,022,002	503,930,789
29	92,775,626	167,022,002	259,797,628	309,252,096	167,022,002	476,274,098
30	84,478,619	167,022,002	251,500,621	281,595,404	167,022,002	448,617,406
31	76,181,611	167,022,002	243,203,613	253,938,713	167,022,002	420,960,715
32	67,884,604	167,022,002	234,906,606	226,282,021	167,022,002	393,304,023
33	59,587,597	167,022,002	226609599	198,625,330	167,022,002	365,647,332
34	51,290,590	167,022,002	218312592	170,968,638	167,022,002	337,990,640
35	42,993,583	167,022,002	210015585	143,311,947	167,022,002	310,333,949
36	34,696,575	167,022,002	201718577	115,655,255	167,022,002	282,677,257
37	26,399,568	167,022,002	193421570	87,998,564	167,022,002	255,020,566
38	18,102,561	167,022,002	185124563	60,341,872	167,022,002	227,363,874
39	9,805,554	167,022,002	176827556	32,685,181	167,022,002	199,707,183
40	1,508,547	167,022,002	168530549	5,028,489	167,022,002	172,050,491
Total	4,615,398,812	3,006,396,036	7,621,794,848	8,344,777,997	3,006,396,036	11,351,174,033

Sources: EIS Tables C–1 and C–2

period. The NRC staff used information in these tables to complete the undiscounted costs in EIS Table 8.4-1. Next, the NRC staff calculated the discounted costs at both 3 and 7 percent for the four cases in EIS Table 8.4-1 using Equation 2. The total cost columns in Tables C–10 and C–11 provide the cost input for Equation 2 and the first column in these tables provides the project year input for this equation. Consistent with the Office of Management and Budget guidance (OMB, 2003), this cost benefit analysis uses discount rates of 3 percent (i.e., i = 0.03 for Equation 2) and 7 percent (i.e., I = 0.07 for Equation 2). Based on these inputs, the NRC staff calculated the No-Action alternative estimated cost at a 3 percent discount rate in EIS Table C–12 and at the 7 percent discount rate in EIS Table C–13. The NRC staff used information in these two tables to complete the discounted costs in EIS Table 8.4-1.

Table C–12	No-Action Alternative Estimated Cost Discounted at 3 Percent			
Project Year	Phase 1 Scenario 1 (2019 dollars)	Phase 1 Scenario 2 (2019 dollars)	Full Build-out Scenario 1 (2019 dollars)	Full Build-out Scenario 2 (2019 dollars)
1	83,536,932	83,536,932	146,460,850	146,460,850
2	81,103,818	81,103,818	142,195,000	142,195,000
3	78,741,570	78,741,570	138,053,399	138,053,399
4	76,448,127	76,448,127	134,032,426	134,032,426
5	74,221,482	74,221,482	130,128,569	130,128,569
6	72,059,691	72,059,691	126,338,416	126,338,416
7	69,960,865	69,960,865	122,658,657	122,658,657
8	67,923,170	67,923,170	119,086,074	119,086,074
9	65,944,826	65,944,826	115,617,548	115,617,548
10	64,024,102	64,024,102	112,250,046	112,250,046
11	62,159,323	62,159,323	108,980,628	108,980,628
12	60,348,857	60,348,857	105,806,435	105,806,435
13	58,591,123	58,591,123	102,724,694	102,724,694
14	56,884,586	56,884,586	99,732,712	99,732,712
15	55,227,753	55,227,753	96,827,876	96,827,876
16	53,619,178	53,619,178	94,007,647	94,007,647
17	52,057,454	52,057,454	91,269,560	91,269,560
18	50,541,218	50,541,218	88,611,223	88,611,223
19	49,069,143	49,069,143	86,030,314	86,030,314
20	47,639,945	47,639,945	83,524,577	83,524,577
21	46,252,374	52,559,516	81,091,822	270,306,081
22	44,905,217	51,028,656	78,729,924	262,433,089
23	43,597,298	49,542,385	156,861,465	325,404,659
24	42,327,474	48,099,403	148,211,106	302,321,594
25	41,094,635	46,698,449	139,931,581	280,307,121
26	39,897,704	45,338,300	132,008,626	259,318,574
27	38,735,635	44,017,767	124,428,492	239,314,866
28	37,607,413	42,735,696	117,177,933	220,256,433
29	36,512,051	41,490,967	110,244,178	202,105,181
30	35,448,593	40,282,492	103,614,926	184,824,431
31	34,416,110	39,109,216	97,278,319	168,378,874
32	33,413,699	37,970,113	91,222,935	152,734,518
33	32,440,484	36,864,187	85,437,767	137,858,641
34	31,495,616	35,790,473	79,912,211	123,719,750
35	30,578,268	34,748,032	74,636,052	110,287,533
36	29,687,639	33,735,953	69,599,450	97,532,820
37	28,822,950	32,753,353	64,792,926	85,427,538
38	27,983,447	31,799,371	60,207,349	73,944,678
39	27,168,395	30,873,176	55,833,928	63,058,251
40	109,111,734	112,708,609	51,664,193	52,743,255
TOTAL	2,071,599,901	2,168,249,278	4,167,221,831	5,856,614,539
Sources: EIS Tables C–10 to C–11				

Table C–13	No-Action Alternative Estimated Cost Discounted at 7 Percent			
Project Year	Phase 1 Scenario 1 (2019 dollars)	Phase 1 Scenario 2 (2019 dollars)	Full Build-out Scenario 1 (2019 dollars)	Full Build-out Scenario 2 (2019 dollars)
1	80,414,056	80,414,056	140,985,679	140,985,679
2	75,153,323	75,153,323	131,762,316	131,762,316
3	70,236,751	70,236,751	123,142,352	123,142,352
4	65,641,823	65,641,823	115,086,310	115,086,310
5	61,347,498	61,347,498	107,557,299	107,557,299
6	57,334,111	57,334,111	100,520,840	100,520,840
7	53,583,281	53,583,281	93,944,711	93,944,711
8	50,077,833	50,077,833	87,798,795	87,798,795

Table C–13 No-Action Alternative Estimated Cost Discounted at 7 Percent				
Project Year	**Phase 1 Scenario 1 (2019 dollars)**	**Phase 1 Scenario 2 (2019 dollars)**	**Full Build-out Scenario 1 (2019 dollars)**	**Full Build-out Scenario 2 (2019 dollars)**
9	46,801,713	46,801,713	82,054,949	8,2054,949
10	43,739,918	43,739,918	76,686,868	76,686,868
11	40,878,428	40,878,428	71,669,970	71,669,970
12	38,204,139	38,204,139	66,981,280	66,981,280
13	35,704,803	35,704,803	62,599,327	62,599,327
14	33,368,974	33,368,974	58,504,044	58,504,044
15	31,185,957	31,185,957	54,676,677	54,676,677
16	29,145,755	29,145,755	51,099,698	51,099,698
17	27,239,023	27,239,023	47,756,727	47,756,727
18	25,457,031	25,457,031	44,632,455	44,632,455
19	23,791,618	23,791,618	41,712,575	41,712,575
20	22,235,157	22,235,157	38,983,715	38,983,715
21	20,780,520	23,614,228	36,433,378	121,444,599
22	19,421,047	22,069,372	34,049,886	113,499,625
23	18,150,511	20,625,581	65,304,867	135,473,094
24	16,963,095	19,276,244	59,396,859	121,157,945
25	15,853,359	18,015,181	53,982,366	108,136,001
26	14,816,224	16,836,618	49,022,102	96,299,326
27	13,846,938	15,735,157	44,479,808	85,548,569
28	12,941,064	14,705,754	40,322,026	75,792,306
29	12,094,452	13,743,695	36,517,886	66,946,428
30	11,303,226	12,844,575	33,038,911	58,933,575
31	10,563,763	12,004,276	29,858,839	51,682,613
32	9,872,675	11,218,949	26,953,449	45,128,147
33	9,226,799	10,484,999	24,300,412	39,210,081
34	8,623,177	9,799,065	21,879,145	33,873,200
35	8,059,044	9,158,005	19,670,677	29,066,790
36	7,531,817	8,558,883	17,657,528	24,744,283
37	7,039,081	7,998,956	15,823,594	20,862,936
38	6,578,581	7,475,660	14,154,042	17,383,528
39	6,148,206	6,986,598	12,635,214	14,270,078
40	23,768,914	24,552,458	11,254,534	11,489,597
TOTAL	1,165,123,684	1,197,245,444	2,244,892,112	2,869,099,307
Sources: EIS Tables C–11 to C–12				

C.5 References

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10. SUPPLEMENTARY NOTES

11. ABSTRACT (200 words or less)
The U.S. Nuclear Regulatory Commission (NRC) prepared this draft environmental impact statement (DEIS) as part of its environmental review of the Holtec International (Holtec) license application to construct and operate a consolidated interim storage facility (CISF) for spent nuclear fuel (SNF) and Greater-Than Class C waste, along with a small quantity of mixed oxide fuel. The proposed CISF would be located in southeast New Mexico at a site located approximately halfway between the cities of Carlsbad and Hobbs, New Mexico. This DEIS includes the NRC staff's evaluation of the environmental impacts of the proposed action and the No-Action alternative. The proposed action is the issuance of an NRC license authorizing the initial phase (Phase 1) of the project to store up to 8,680 metric tons of uranium (MTUs) [9,568 short tons] in 500 canisters for a license period of 40 years. Holtec plans to subsequently request amendments to the license to store an additional 500 canisters for each of 19 expansion phases of the proposed CISF (a total of 20 phases), to be completed over the course of 20 years, and to expand the proposed facility to eventually store up to 10,000 canisters of SNF. Holtec's expansion of the proposed project (i.e., Phases 2-20) is not part of the proposed action currently pending before the agency. However, as a matter of discretion, the NRC staff considered these expansion phases in its description of the affected environment and impact determinations in this DEIS, where appropriate, when the environmental impacts of the potential future expansion can be determined so as to conduct a bounded analysis for the proposed CISF project.

12. KEY WORDS/DESCRIPTORS (List words or phrases that will assist researchers in locating the report.)
environment, environmental impact, cumulative, impacts, consolidated interim storage, spent fuel, storage facility, Holtec, CISF, interim

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