Responses to Request for Supplemental Information

Docket No. 72-1051
Application for Site-Specific ISFSI License for the HI-STORE Consolidated Interim Storage Facility

<u>**License Application (LA)**</u>
RSI LA-1: Re-file the March 30, 2017, license application for the HI-STORE CIS facility under oath or affirmation.

The initial submission of the license application for the HI-STORE CIS facility was not submitted under oath or affirmation. NRC regulations require that each application for a specific ISFSI license be executed in an original signed by the applicant under oath or affirmation. Additional guidance on electronic submissions, including those that require oath or affirmation, is provided in Regulatory Issue Summary (RIS) 01-005, "Guidance on Submitting Documents to the NRC by Electronic Information Exchange or on CD-ROM."

This information is necessary to determine compliance with 10 CFR 72.16(b).

Holtec Response:
We apologize for the oversight; the appropriate certification is now included in the attached application.

Safety Analysis Report (SAR), Chapter 2, "Site Characteristics"

RSI 2-1: Provide a complete copy, including the appendices, with full-resolution figures and diagrams, of the Eddy Lea Energy Alliance's (ELEA) Global Nuclear Energy Partnership (GNEP) Siting Study (Reference 2.1.3 of the HI-STORE SAR).

The resolution of several figures in SAR Chapter 2 is too low; therefore, important details and dimensions are not discernible. The staff notes that the majority of the referenced drawings, figures, and diagrams are excerpted or copied from Reference 2.1.3. A complete copy, with all appendices and full-resolution figures, is also necessary to complete the staff's review of the HISTORE CIS Environmental Report (see RSI ER-1).

This information is needed to determine compliance with 10 CFR 72.24(a) and 10 CFR 72.90.

Holtec Response:

A copy of the GNEP Siting study including all appendices is provided as an attachment to these RSI responses.

RSI 2-2: Describe in detail the extent of mining in the subsurface at the Belco Shallow, Belco Deep facilities (SAR Figure 2.1.13), and Intrepid Mining NM, LLC facilities, as discussed in the 2007 GNEP Siting Study [ref 2.1.3] including any potential effects on the proposed CIS facility (e.g., long-term surface deformation due to subsidence). Also, discuss any effects of nearby oil and gas exploration and production activities on the proposed CIS facility operation (e.g., any effects of injection wells).

Detailed information regarding the mining techniques used to extract potash at the Belco Shallow and Belco Deep facilities, including the extent of excavation(s) at the subsurface, should be provided as these facilities are very close to the site boundary (SAR Figure 2.1.3). Additionally, the 2007 GNEP Siting Study states that potash mining by Intrepid Mining has not progressed as far as the proposed site; however, any progression of mining activities toward the proposed CIS facility site since then should be presented. This should include an assessment of whether these mining excavations may collapse in future and result in surface subsidence that may affect safe operation at the proposed CIS facility, as specified in Section 2.4.2 of NUREG-1567. In addition, detailed information of nearby oil and gas exploration and extraction related activities and an assessment of potential hazards posed by these should be provided.

This information is necessary to determine compliance with 10 CFR 72.24, 72.90(a) through (d), 72.94, and 72.98.

Holtec Response:

Subsection 2.1.4 has been modified using the below information to clarify the extent, methods, and potential effects of mining and oil and gas exploration on the CIS facility.

Potash was discovered in southeastern New Mexico in 1925 in a well that was being drilled for oil and gas. By the mid-1930s, there were 11 companies exploring for potash in southeastern New Mexico. The potash in southeastern New Mexico has been a major potash resource. The remaining potash reserves are estimated to be 500 million tons. Potash production continues in the Delaware Basin with active mining by Intrepid Mining and Mosaic Co. Although much of the high-grade zones have been mined out, exploration for commercially viable deposits continues (AECOM 2012).

Conventional mechanized underground mining operations are the most widely used method for the extraction of potash ore. A variety of mining techniques and equipment may be employed depending on factors such as: the orebody depth, geometry, thickness and consistency, the geological and geotechnical conditions of the ore and surrounding rock, and the presence of overlying aquifers. Methods in widespread use include variations of room and pillar, longwall, cut and fill, and open slope techniques. After the ore is extracted, it is generally transferred by bridge conveyor, shuttle cars or load-haul-dump units to a system of conveyors that carry it to underground storage bins, prior to haulage to the surface through a shaft by automated skips. On rare occasions shallow mines may use a decline and conveyor arrangement (NMBMMR 1980).

In general, potash ore zones are nearly flat lying; the potash ore is mined with slightly modified conventional coal-mining equipment. Room and pillar workings are commonly 6 feet high; as much as 60-70 percent of the ore is removed during the first stage of mining. Some operations also use a second “pillar-robbing” mining technique, allowing overlying rock to settle slowly. In this manner, as much as 92 percent of the ore may be removed (NMBMMR 1980, AECOM 2012).

When the potash to be extracted is at a depth of 3,000 feet or deeper and/or the potash is located in sedimentary rock, then solution mining provides a cost effective, efficient, and safe way to extract the resource. Conventional mining involves extracting a lot of rock material to access the mineral resource resulting in large underground caverns and this excess waste material must also be stored on surface. With solution mining, a brine is heated and injected into the deposit to dissolves the potash. The potash-rich brine is then pumped out of the cavern to the surface where the water is evaporated. Solution mining is currently used at a number of operations in New Mexico, and Intrepid Potash was recently approved to conduct solution mining of potash minerals in order to extract some of the remaining ore from suspended mines in the main potash mining area (AECOM 2012).

Subsidence is the phenomenon or response that occurs when an underground opening is created. In the Delaware Basin, subsidence caused by human activities largely has occurred as a result of potash mining and activities involving the withdrawal or injection of fluids for oil and gas production and brine extraction. Subsidence from mining creates voids that cause collapse of strata above the mining level. The overlying and surrounding rock or soil naturally deforms in an effort to arrive at a new and more stable overall equilibrium position. This equilibrium-seeking action can result in both vertical and horizontal ground movement, and, if not controlled or minimized, can cause damage to both surface and subsurface structures. It can result in the development of undesirable surface topography, such as surface cracking or collapse, sinkholes, blocking or changing stream channels, and modification of drainage pathways. The rate of subsidence is largely dependent on the type of material being mined and the amount of material mined (AECOM 2012).

The magnitude, rate of development, and surface expression of the subsidence process are controlled by several factors, most of which are interdependent. These include mining method, depth of extraction, size and configuration of openings, rate of advance or extraction, seam thickness, topography, lithology, structure, hydrology, in situ stresses, and rock strength and deformational properties. Taken collectively, they demonstrate the complexity of the subsidence process (USGS 1983).

Subsidence is expected in areas where 90 percent extraction rates occur with the room-and-pillar mining technique typically used in potash mining. Subsidence is not expected where 60-70 percent extraction rates are employed (e.g., first stage potash mining). The amount of subsidence is similar to findings concerning historic potash mining in the area where, given an average 6-feet mining extraction height, the maximum subsidence was found to be a nominal 4 feet. Subsidence fractures have been observed in the land surface above workings that have collapsed at depths of 1,000 feet or more (AECOM 2012).

As a general rule, the amount of maximum subsidence (i.e., the depth of subsidence) that could occur cannot exceed the thickness of the zone of mineral extracted (the mining thickness). Maximum subsidence depth, however, is seldom observed, due to one or more of the following reasons:

- Because subsidence actually spreads over an area somewhat larger than the mined area, the subsidence is proportionally less.
- Convergence, or closure of the mined area, is never fully complete or total, so some voids inevitably remain, reducing the amount of subsidence.
- The overlying rocks expand slightly in volume due to breakage as the ground moves downward into the mined area, resulting in a “bulking” effect, which contributes to a reduction in subsidence volume and depth.
- The subsidence process can be slow for rocks that creep—several hundred (or more) years may be required for ultimate subsidence to occur (AECOM 2012).

It is important to note that both historic data and anecdotal evidence suggest that for the southeastern New Mexico potash mines, virtual completion of the maximum surface subsidence profile occurs within just a few years (5 to 7 years) after completion of mining (AECOM 2012).

In some instances, surface subsidence induced by underground mining may alter river and stream drainage patterns, disrupt overlying aquifers, and damage buildings and infrastructure. The degree of subsidence depends on factors such as orebody thickness and geometry, the thickness of the overlying rock and the amount of ore recovered. The effects of subsidence have been reduced to some extent, through either: (1) the design of the ore extraction layout so as to reduce the rate and extent of subsidence, or (2) by backfilling openings with processing wastes such as salt tailings, to reduce or prevent subsidence (UNEP 2001).

SAR Figure 2.1.16 shows potash that has been historically mined within 6 miles of the proposed CIS Facility. As shown on that figure, the nearest mined potash is approximately 2 miles from the southwestern boundary of the CIS Facility Site. However, no active potash mines are within 4.2 miles of the Site. Per Mr. Robert Baldridge, Operations Manager for Intrepid Potash, potash mines in the area are generally a maximum of approximately 1,800-3,000 feet in depth, and the thickness of the zone of mineral extracted is a fraction of this total depth (Intrepid 2017). According to Golder and Associates, “the zone of disturbance of strata above the mine workings extends beyond the limit of the mine workings and data from the southeast New Mexico potash fields suggest that a reasonable limit for defining this zone of disturbance would be an angle of 45 degrees from the vertical” (Golder 1979). Consequently, for potash mining at a nominal 3,000-feet depth, the subsidence effects area could extend 3,000 feet beyond the edge of the mine workings (Golder 1979). Given that the nearest historic potash mine is approximately 2 miles away from the CIS Facility, subsidence effects at the CIS Facility Site from past or current potash mines would not be expected to occur.

With regard to the nearest potash mine (the National Potash Mine, located approximately 4.2 miles west of the Site, and shown on Figure 2.2.1 of the SAR), no deep mining has occurred at that mine since 1982. Given that surface subsidence generally occurs within 5 to 7 years after completion of mining, no further subsidence from that mine is expected. That mine is considered a surface facility and is used by Intrepid Potash as a warehouse and distribution center (Intrepid 2017).

With regard to potential future potash mining near the CIS Facility, SAR Figures 2.1.17 and 2.1.18 show the locations of potash core holes and potash leases within 6 miles of the CIS Facility Site. As shown on those figures, numerous potash core holes have been drilled in the areas surrounding the CIS Facility and there are potash leases surrounding the CIS Facility Site. As previously stated in Section 2.6.4 of the SAR, with regard to potential future drilling on the Site, Holtec has an agreement with Intrepid Mining LLC (Intrepid) such that Holtec controls the mineral rights on the Site and Intrepid will not conduct any potash mining on the Site.

Oil in southeastern New Mexico was discovered in 1909, 8 miles south of Artesia, but the well was never completed as a producer due to mechanical problems. Oil and gas production began in the New Mexico portion of the Delaware Basin in 1924 with the discovery of the Dayton-Artesia Field. Until the year 2000, 4.5 billion barrels of oil had been produced mainly from fields on the Northwest Shelf and Central Platform areas in the Delaware Basin. More than 3.5 billion barrels of the total production was extracted from Permian-age rocks. The U.S. Geological Survey (USGS) estimates that the greater Permian Basin area, including parts of southeastern New Mexico and west Texas, contains substantial undiscovered oil and gas resources on the order of 1.3 billion barrels of oil and 41 trillion cubic feet of gas (AECOM 2012).

As a precaution for the potash mines in this region, the mining companies historically left protection pillars around the oil and gas boreholes. Well casing corrosion is a common problem in the Delaware Basin, caused by contact with the brine fluids being withdrawn or injected depending on the purpose of the well. There are documented cases where escape of unsaturated brines and dissolution of salt formations caused catastrophic collapse to the surface, not only in the Delaware Basin, but in other basins having substantial thicknesses of salt layers and numerous wells penetrating the salt for the purpose of fluid withdrawal (AECOM 2012).

Thousands of wells have been drilled through evaporate formations in the Delaware Basin to explore for and produce oil and gas (see SAR Figure 2.1.19, which depicts wells immediately surrounding the CIS Facility) Because of the extent of the evaporites (salt and anhydrite), drilling and completion operations have to be conducted in a manner that prevents the dissolution of the salt and protects the well during drilling and through the productive lives of the wells, often 20 to 30 years or more. Oil and gas exploration targets range from relatively shallow oil and gas at 5,000 feet deep in the Delaware Canyon Formation to deep gas targets in middle Paleozoic formations in excess of 16,000 feet deep (AECOM 2012).

Salt can be extracted from subsurface formations by using wells that inject fresh water to dissolve the salt followed by extraction of the saturated water. In the Delaware Basin, these wells are referred to as brine wells. Brine wells in the Delaware Basin are used to extract saline water for use in oil and gas well drilling and workover fluids. Recently, a few brine wells in Eddy County that were 200 to 300 feet in diameter and 100 to 200 feet deep suffered catastrophic collapse causing sinkhole development at the surface. Each of the wells associated with the collapse were former oil and gas wells converted to brine wells. At one brine well in Carlsbad, New Mexico, geophysical surveys indicated the presence of subsurface fracturing, cavities, and collapse, but no surface manifestation of collapse has occurred other than tilting of the ground surface (AECOM 2012).

There are several examples in the Permian Basin of catastrophic subsidence as a result of suspected oil field casing corrosion and dissolution of salt. The examples of subsidence associated with oil and gas operations include the Wink Sinks I and II and the Jal Sink. There are other similar incidents that occurred in areas underlain by salt in Texas and in Kansas. The Wink Sinks developed in the Hendrick oil field in Winkler County, Texas, near the town of Wink, which is approximately 75 miles southeast of the proposed CIS Facility Site. Wink Sink I developed in 1980 and Wink Sink II occurred in 2002 (AECOM 2012).

The Jal sinkhole, which developed in 2001, is located about 8 miles northwest of Jal, New Mexico and approximately 50 miles southeast of the proposed CIS facility Site. The geologic settings of the Wink and Jal sinkholes are similar to that of the CIS Facility Site as they occurred at the basin margin above the Capitan Reef. In each incident, sinkholes formed around a well location and the sinks had diameters ranging from 200 to over 700 feet. Although the exact cause of development of these sinkholes is not known, it is suspected that casing failure allowed unsaturated water to come into contact with, and subsequently dissolve, salt layers (AECOM 2012).

The Belco Shallow and Belco Deep drill islands are located approximately 0.25 and 0.5 miles, respectively, from the CIS Facility Site boundary, and are intended to accommodate multiple oil and gas well locations, all or most of which will be horizontal wells completed below the Bone Springs formation (7,800 feet below the ground surface. Oil and gas drilling has occurred on those drill islands in the past and could be used in the future. Similarly, as shown on Figure 2.1.19, oil and gas wells have been drilled in the Green Frog Café Drill Island located just east of the proposed CIS Facility (CEHMM 2017).

References:

AECOM 2012	AECOM “Environmental Geology Assessment Report for Issues Related to the Proposed Ochoa Mine, Lea County, New Mexico.” July 2012
NMBMMR 1980	New Mexico Bureau of Mines and Minerals Resources, “Potash in New Mexico.” February 1980
USGS 1983	U.S. Geological Survey. “Geological Survey Circular 876 – Subsidence from Underground Mining: Environmental Analysis and Planning Considerations 1983
UNEP 2001	United Nations Environment Programme. “Environmental Aspects of Phosphate and Potash Mining.” 2001.
Intrepid 2017	Intrepid Potash LLC. “Phone conversation with Mr. Robert Baldridge, Operations Manager for Intrepid Potash, and Jay Rose, Tetra Tech.” July 25, 2017
Golder 1979	Golder and Associates Report to USDOI and USGS on Recommendations on Abandonment of the Will-Weaver Mine and Shafts. Prepared for the U.S. G Geological Survey by Golder and Associates,” November 1979.
CEHMM 2017	“Oil and Gas Information.” E-mail from Doug Lynn, Executive Director CEHMM, to Tetra Tech on July 31, 2017

RSI 2-3: Provide an assessment of the hazards from aircraft flight-related activities at nearby airports and aircraft flights through the nearby airways (e.g., IR180, IR192, V291, and V102) to the proposed CIS facility.

Although there are several airways in the near vicinity of the proposed site, no information has been provided to determine the probability of potential aircraft crashes onto the proposed facility. For example, airway IR180 traverses within 3.2 km [2 mi] of the site. Information of flight activities in nearby airways and airports, including any holding patterns, should be provided and the cumulative hazard for all nearby flight-related activities to the proposed CIS facility should be assessed, as specified in Section 2.2 of Regulatory Guide 3.48. Section 3.5.1.6 of NUREG–0800 provides guidance to assess aircraft crash hazards that may be applicable to the CIS facility. The assessment should consider the full capacity of the facility (SAR Table 1.0.1).

This information is necessary to determine compliance with 10 CFR 72.24(a), 72.90(a) through (d), 72.94, and 72.98.

Holtec Response:
SAR Subsection 2.2 has been modified using the following information to discuss the aircraft related hazards at the CIS Facility. Additional references have been added to Chapter 19. The airspace surrounding the CIS Facility is unrestricted and at any given time there would be the potential for commercial aircraft, military aircraft, and civilian aircraft to be flying in that airspace at various altitudes and at various speeds. Commercial aircraft would fly in accordance with flight plans filed with the Federal Aviation Administration (FAA) and would be controlled by the national air traffic control system (Delta 2017).

Because airspace above the United States from the surface to 10,000 feet above sea level is limited to 250 knots (indicated airspeed) by FAA regulations, any aircraft below 10,000 feet would be travelling at speeds of less than 250 knots. There is a military exception to this requirement, however. The Military Training Route Program is a joint venture by the FAA and the Department of Defense (DOD), developed for use by military aircraft to gain and maintain proficiency in tactical "low-level" flying. These low-level training routes are generally established below 10,000 feet for speeds in excess of 250 knots. Military training routes do not constitute an official airspace, and are all open to civilian traffic (MTR 2017).

There are four designated military training routes in the vicinity of the proposed CIS Facility: (1) Instrument Route (IR) 180; (2) IR 192; (3) Visual Route (VR) 291; and (4) VR 102. The routes are individually operated by the military, which schedule and 'own' the route. The FAA requires the military to provide advance notice to other aircraft that the military training routes will be used to allow for civilian traffic to de-conflict if needed. IR 180 is located approximately 10 miles east of the CIS Facility; IR 192 is located approximately 10 miles west of the CIS Facility; VR 291 is located approximately 30 miles north of the CIS Facility; and VR 102 is located above the CIS Facility. Military training routes are usually limited to 420 knots, and in no case are aircraft allowed to exceed Mach 1 within United States sovereign airspace, except in designated Military Operation Areas. While on the route, military aircraft squawk a Mode C Transponder code of '4000', which informs controllers that they are 'speeding' on a route. This squawk however is only legal by military aircraft, while inside a properly scheduled route corridor.

The closest Military Operation Area to the CIS Facility is approximately 30 miles to the west, just north of Carlsbad. A Military Operation Area is airspace designated to separate or segregate certain nonhazardous military activities from non-military traffic (MTR 2017).

As discussed below, most of the commercial airline operations at airports in the area of the CIS Facility involve regional jets. The largest commercial planes (Boeing 737s) are flown in and out of Midland International Air and Space. A summary of the airplane operations at airports near the CIS Facility are provided below.

Cavern City Air Terminal is a public use airport in Eddy County, New Mexico, United States. It is owned by the city of Carlsbad and located five nautical miles southwest of its central business district, approximately 35 miles from the CIS Facility. The airport is served by one commercial airline. In 2015, the airport had approximately 6,900 aircraft operations, an average of 18 per day: 53 percent general aviation, 39 percent scheduled commercial, 4 percent air taxi, and 4 percent military. There are approximately 24 aircraft based at this airport: 67 percent single-engine, 21 percent multi-engine, and 12 percent helicopter (FAA 2015).

Lea County Regional Airport is 4 miles west of Hobbs, approximately 30 miles from the CIS Facility. The airport covers 898 acres and has three runways. It is an FAA certified commercial airport served by United Airlines' affiliate with daily regional flights. Lea County Regional Airport is the largest of the three airports owned and operated by Lea County Government. Lea County also owns and operated two general aviation airports in Lovington and Jal, New Mexico. For the 12 month period ending April 30, 2017, the Lea County Regional Airport had approximately 12,745 aircraft operations, an average of 35 per day: 77 percent general aviation, 16 percent air taxi and 7 percent military. There are 47 aircraft based at this airport: 83 percent single-engine, 8 percent multi-engine, 8 percent jet, and 3 percent helicopter (FAA 2017a).

Midland International Air and Space is located approximately midway between the Texas cities of Midland and Odessa. It is owned and operated by the City of Midland. In September 2014 it became the first US facility licensed by the FAA to serve both scheduled airline flights and commercial human spaceflight. Midland International Air and Space Port is ranked eighth in Texas for primary commercial service airports. For the 12 month period ending April 30, 2017, the airport has approximately 63,000 aircraft operations, averaging 173 per day: 25 percent military, 42 percent general aviation, 15 percent air taxi and 18 percent airline. Approximately 78 aircraft are then based at the airport: 39 percent single-engine, 47 percent multi-engine, 12 percent jet and 2 percent helicopter The airport has three airlines, two serving hubs with regional jets and one (Southwest) flying mainline jets (Boeing 737s) (FAA 2017b).

References:

Delta 2017 Delta Airlines. Personal Communication between Captain Chick Winship, Delta Air Lines and Jay Rose, Tetra Tech, on July 26, 2017.

FAA 2015 Federal Aviation Administration (FAA). “FAA Master Record for CNM.” Available at: http://www.gcr1.com/5010web/airport.cfm?Site=CNM&AptSecNum=2. Accessed on July 24, 2017.

FAA 2017a FAA. "FAA Master Record for HOB." Available at: http://www.gcr1.com/5010web/airport.cfm?Site=HOB&AptSecNum=2. Accessed on July 24, 2017.

FAA 2017b FAA. "FAA Master Record for MAF." Available at: http://www.gcr1.com/5010web/airport.cfm?Site=MAF&AptSecNum=2Accessed on July 24, 2017.

MTR 2017 Military Training Routes (MTR). Available at: http://www.cfinotebook.net/notebook/national-airspace-system/military-training-routes. Accessed on July 26, 2017.

RSI 2-4: Provide an assessment of potential hazardous cargo that may be transported through roads and railroads near the proposed CIS facility.

There is one major (US 62) and a few rural roads in the vicinity of the proposed CIS facility. The application did not provide an assessment of hazardous cargo that may be transported through these roads. Additionally, although SAR Table 1.0.1 lists a Southwestern Railroad rail terminal approximately 6 km [3.8 mi] away from the site, no discussion or assessment has been provided whether rail traffic may pose a hazard to the operation of the proposed CIS facility. An assessment of materials transported using nearby roads and railroads and their potential effects on safe operation of the CIS facility should be provided, as specified in Section 2.4.2 of NUREG–1567 and Section 2.2 of Regulatory Guide 3.48.

This information is necessary to determine compliance with 10 CFR 72.24(a), 72.90(a) through (d), 72.94, and 72.98.

Holtec Response:
SAR Subsection 2.2 has been modified using the following information to discuss the transport of hazardous cargo near the CIS Facility. Additional references have been added to Chapter 19. U.S. Highway 62/180, approximately 1 mile south of the proposed CIS Facility is the closest and most trafficked public road. It provides a route from the state of Texas to Carlsbad, New Mexico and points further west. It is a divided highway with a maximum speed limit of 70 miles per hour in the area near the proposed CIS Facility. This highway is on the National Hazardous Materials Route Registry (79 FR 40844, July 14, 2014) and can be used for the transportation of radioactive waste materials to WIPP (NHMRR 2014). There have been instances where transuranic wastes associated with WIPP have been transported along U.S. Highway 62/180 within approximately 1 mile of the proposed CIS Facility.

Like similar roads, commercial shipments of hazardous materials are also transported over U.S. Highway 62/180. Such shipments could include a wide range of hazardous materials, including, but not limited to: gasoline, diesel fuel, acids, carbon dioxide (CO_2), nitrogen (N_2), liquid nitrogen (LN_2), chlorine (Cl) gas, refrigerants, fuel gases, oxygen (O_2), explosives, and low-level radioactive materials. In preparing the information for this RSI, Holtec contacted the New Mexico Department of Transportation and the New Mexico State Police in an effort to determine the specific types of hazardous materials and the quantities of the hazardous materials. However, the State of New Mexico does not keep records of hazardous material shipments via roadways or rail. Consequently, specific types and quantities cannot be provided. In 2015, the annual average daily traffic on U.S. Highway 62/180 was 5,696 vehicles per day in the vicinity of the proposed Site (near the Eddy-Lea County line) and approximately 43 percent of these vehicles were associated with commercial trucks (NMDOT 2016). In 2014, in the entire state of

New Mexico, there were 69 Hazardous Material Incidents required to be reported by 49 CFR 171.15 and 171.16 (USDOT 2015). While truck shipments in the area are expected to rise over time, this highway is not included in the planning for increasing freight traffic in the "New Mexico Freight Plan" (NMDOT 2015).

The nearest operating railroad is an industrial railroad approximately 3.8 miles west of the proposed CIS Facility and serves the local potash mines to transport ore to the refiners. The potash ore is not a hazardous material. From 2008 to 2012, the annual average of train accidents per 1,000 railroad miles was 10.4, the fatality rate was zero and the injury rate was 0.4 (NMDOT 2015). As with highway transport, shipments by rail could include a wide range of hazardous materials, including, but not limited to: gasoline, diesel fuel, acids, CO_2, N_2. LN_2, Cl gas, refrigerants, fuel gases, O_2, explosives. However, no specific records are maintained by the state of New Mexico regarding hazardous material shipments via rail.

References:

NHMRR 2014 National Hazardous Materials Route Registry (NHMRR). U.S. Department of Transportation. Available at: www.fmcsa.dot./gov/regulations/hazardous-materials/national-hazardous-materials-route-registry-state. Accessed on July 18, 2017.

USDOT 2015 United States Department of Transportation (USDOT) Bureau of Transportation Statistics. "State Transportation Statistics." Available at: www.bts.gov. Accessed on July 18, 2017.

NMDOT 2016 New Mexico Department of Transportation (NMDOT). "Road Segments by Posted Route/Point with (AADT) Info." Email from Jessica Crane, NMDOT, to Tetra Tech. November 30, 2016

NMDOT 2015 NMDOT. "New Mexico Freight Plan." Available at: dot.state.nm.us/content/dam/nmdot/planning/nm_2040_plan-freight_plan.pdf. August 2015.

RSI 2-5: Provide the following information:

a) information that characterizes the location, size, and hydrologic characteristics of all surface hydrologic features, including streams, ephemeral drainage, and playa lakes within and surrounding the site;
b) information that describes hydrological processes that may result in surface runoff and flow into the playa lakes within and surrounding the site;
c) information that identifies the sources of the hydrologic information, the types of data collected, and the methods and frequency of collection, including extreme precipitation events such as probable maximum precipitation of various durations.

The application does not provide sufficient information or descriptions of surface flow into adjacent playa lakes, particularly Laguna Gatuna and Plata, and through hydraulic features, such as ephemeral drainage waterways.

Aerial photos (e.g. Figures 2.1.2, 2.1.3, and 2.1.8 of the HI-STORE SAR) show surface hydrologic features (potentially ephemeral) of drainage on the northeastern side of the site. These features suggest that this drainage connects to nearby playa lakes, including one within the boundary of the site (Laguna Gatuna, Figure 2.1.2). The figure also indicates that manmade impounding occurs before water is drained into the playa. Drainage features on the northwestern side (ephemeral) within the facility boundary is clearly visible in Figures 2.1.6 and 2.1.7, "Topography of the Site and Surrounding Area." In Section 2.5, "Subsurface Hydrology," the application states that brine in Laguna Gatuna is around 3,500 feet above mean sea level. The application should provide a more precise description and characterization of these hydrologic features and their respective elevations, which may impact the flood water level and perched groundwater levels under extreme precipitation conditions.

This information is needed to determine compliance with 10 CFR 72.90(a), and 72.92(a) and (b).

Holtec Response:
SAR Section 2.4.1 has been updated using the following information to discuss the local hydrology, hydrological processes and the sources used to obtain this information. (a) There are no surface-water bodies or surface-drainage features on the proposed CIS Facility Site. In Lea County neither of the two major drainage basins, the Texas Gulf Basin in the north and east and the Pecos River Basin in the south and west, contain large-scale surface-water bodies or through-flowing drainage systems. The surface water supplies that exist are transitory and limited to quantities of runoff impounded in short drainage ways, shallow lakes, and small depressions, including various playas and lagunas. The Texas Gulf Basin contains a lake, the Llano Estacado, and the Simona Valley. The Pecos River Basin contains the Querecho Plains, the Eunice Plains, and the Antelope Ridge (ELEA 2007, Section 2.5.1).

(a) The CIS Facility Site is contained within the Upper Pecos-Black watershed; however, there are no freshwater lakes, estuaries, or oceans in the vicinity of the site (SAR Figure 2.4.1). Local surface hydrologic features in the vicinity of the site include a cluster of four saline playas that are located in the Querecho Plain area of the west-central part of the county. These playas, which retain runoff temporarily, are referred to locally as lagunas. Laguna Plata covers the largest area, about 2 square miles. Laguna Toston, the smallest of the four with a surface area of one-quarter square mile, is completely filled with sediments; the other three all contain accumulations of clastic sediments and salts (halite, gypsum) (Lea County 1999; ELEA 2007, Section 2.5.1). SAR Figures 2.4.2 and 2.4.3 show hydrologic features in the vicinity of the CIS Facility.

    The lagunas help to create shallow saline ground-water which exists under much of the Querecho Plain. The presence of the shallow saline water has been recognized to the extent that the New Mexico Oil Conservation Commission Order No. R-3221, banning the surface disposal of produced water into unlined pits within the State was amended (OCC Order No. R-3221-B, July 25, 1968) to exclude much of the area (Lea County 2016, 1999).

    Laguna Gatuna is located on the eastern boundary of the Site. Laguna Gatuna is an ephemeral playa that covers a surface area of 0.54 square miles, has an average depth of 10 feet, and a total shore line of 4 miles. The lake, which sits at an elevation of 3,495 feet drains a watershed that covers 170 square miles. Laguna Gatuna was the site of multiple facilities for collection and discharge of brines that were co-produced from oil and gas wells in the entire area; facility permits authorized discharge of almost one million barrels of oilfield brine per month between 1969 and 1992. As a result, saturations of shallow groundwater brine have been created in a number of areas associated with the playa lakes (ELEA 2007, Section 2.4.2.1).

Laguna Tonto is located approximately 2.5 miles northeast of the Site. Laguna Tonto is an ephemeral playa that covers a surface area of 0.28 square miles, has an average depths of 12 feet, and has a total shore line of 2 miles. The playa, which sits at an elevation of 3,531 feet, drains a watershed that covers 49 square miles.

Laguna Plata is located approximately 1.8 miles northwest of the Site. Laguna Plata is an ephemeral playa that covers a surface area of 2 square miles, has an average depth of 14 feet, and has a total shore line of 6 miles. The playa, which sits at an elevation of 3,432 feet, drains a watershed that covers 254 square miles. Laguna Plata is the largest of the playas in the vicinity of the site with a total water volume of approximately 14,593 acre-feet. Laguna Plata is the topographically lowest point in the area and alluvial groundwater appears to flow toward this site (ELEA 2007, Section 2.4).

Laguna Toston is the smallest of the playas in the vicinity of the CIS Facility Site with a surface area of one-quarter mile. The playa is a major input point for potash refinery brine and water appears to drain radially away from this location (ELEA 2007, Section 2.4).

The U.S. Geological Survey (USGS) does not have permanent stream gages in Lea County which measure daily surface flows. However, peak flow rates have been spot measured at Monument Draw (near Monument) and Antelope Draw (near Jal). Each of these Draws can occasionally convey sizable flows. In June of 1972, a flow of 1280 cubic feet per second (CFS) (the highest recorded) occurred at Monument Draw. In July of 1994, a flow of 530 (CFS) (also the highest recorded) occurred at Antelope Draw. These flows should be considered indicative of flows that can occur at other gullies and swales in Lea County (Lea County 2016, 1999).

The proposed CIS Facility Site is not located near any floodplains. The Site is located in an area of Lea County designated as “Zone D”. The “Zone D” designation is used for areas where there are possible but undetermined flood hazards, as no analysis of flood hazards has been conducted or when a community incorporates portions of another community’s area where no map has been prepared (FEMA 2017). A digital version of the map panel for the CIS Facility location in the National Flood Hazard Layer is presented in Figure 2.4.4 (FEMA 2017).
Groundwater within Lea County is provided primarily by the High Plains Aquifer composed of the Ogallala Formation. Cretaceous and Triassic rocks underlying the Ogallala Formation limit downward percolation from the Ogallala Aquifer. The region includes portions of five declared underground water basins (UWBs): Capitan, Carlsbad, Jal, Lea County, and Roswell. (A declared UWB is an area of the state proclaimed by the State Engineer to be underlain by a groundwater source having reasonably ascertainable boundaries. By such proclamation the State Engineer assumes jurisdiction over the appropriation and use of groundwater from the source.) The Jal UWB falls entirely within the Lea County region, but the other four are shared with the Lower Pecos Valley region, although only a small portion of the Lea County UWB extends into the Lower Pecos Valley region, and Lea County overlies only a small extension of the Roswell Basin (Lea County 2016).

The CIS Facility Site is within the Capitan UWB (SAR Figure 2.4.5) and lies within the Upper Pecos-Black Watershed which is part of the Pecos River Basin (SAR Figure 2.4.6). The Capitan UWB covers approximately 1,100 square miles and occupies the south-central portion of Lea County. The Capitan UWB is located within a geologic province known as the Delaware Basin, a subdivision of the

Permian Basin. The Capitan UWB is aerially oriented in a northwest-southeast alignment above an arc shaped section of a formation known as the Capitan Reef Complex. The Capitan aquifer occurs within dolomite and limestone strata deposited as an ancient reef. The ground-water quality of the Capitan in Lea County is very poor. Other aquifers in the Capitan UWB are found in the overlying Rustler Formation4, Santa Rosa Sandstone5, and Cenozoic Alluvium. The primary uses of ground-water from the Capitan UWB are mining, oil recovery, industry, livestock, and domestic use. The towns of Eunice and Jal are located within the Capitan UWB, but currently tap beds of saturated Quaternary alluvium located within the Lea County UWB and Jal UWB respectively (Lea County 1999).

(b) The climate at the CIS Facility Site is typically semi-arid with generally mild temperatures, low precipitation, low humidity, and with a high evaporation rate. A summary of rainfall data collected at the Lea County Regional Airport station resulted in an annual mean average total rainfall of 10.2 inches with monthly mean average totals ranging from 0.24 inches in March to 1.9 inches in September. The monthly minimum total is 0.00 inches and the monthly maximum total is 6.2 inches. The highest daily total is 3.6 inches occurring in December of 2015 (WRCC 2016).

A summary of snowfall data collected at the Lea County Regional Airport station resulted in an annual mean average total rainfall of 5.13 inches with monthly mean average totals ranging from 1.84 inches in February to 0.0 inches from May to October. The monthly minimum total is 0.00 inches and the monthly maximum total is 21.2 inches. The highest daily total is 10.00 inches occurring in February of 1956 (WRCC 2016).

The site topography is irregular, with a slight slope toward the north, with elevations ranging between about 3,500 and 3,550 feet above mean sea level (Google Earth 2017). Based on a review of the USGS topographic map, the elevation at the CIS Facility Site is approximately 3,530 feet above mean sea level. Several shallow depressions are shown along the western portions of the Site. Figure 2.4.7 illustrates local topography in the area of the proposed CIS Facility Site. A topographic high is present within the central portion of the property with ephemeral washes draining from this point; one to the west into Laguna Plata and another to the east into Laguna Gatuna. Both of these drainages would be able to accept a one day severe storm total within the 7.5 inch range with excess free board space. The natural drainage of the Site is useful by providing a natural area for impoundment of excess runoff during severe storms (ELEA 2007). For details regarding the estimated maximum flood, see the responses to RSI 2-7 and RSI 2-8.

The Project area is classified as Apacherian-Chihuahuan mesquite upland scrub (NatureServe 2013). This ecosystem often occurs as invasive upland shrublands such as those that are concentrated in the foothills and piedmonts of the Chihuahuan Desert (NatureServe 2009). Substrates are typically derived from alluvium, often gravelly without a well-developed argillic or calcic soil horizon that would limit infiltration and storage of winter precipitation in deeper soil layers. Deep-rooted shrubs are able to access the deep-soil moisture that is unavailable to grasses and cacti. Water held in storage in the soil is subsequently subject to evapotranspiration. Historical periods of high temperature and low precipitation in Lea County have resulted in high demands for irrigation water and higher open water evaporation and riparian evapotranspiration (Lea County 2016). Evapotranspiration at the Site is five times the precipitation rate, indicating that there is little infiltration of precipitation into the subsurface. Surface drainage at the Site is contained within two local playa lakes that have no external drainage. Runoff does not drain to one of state's major rivers. Essentially all the precipitation that occurs at the Site is subject to infiltration and/or evapotranspiration.

No major surface water supplies are available in Lea County, only intermittent streams, lakes, stock ponds, and small playas that collect runoff during thunderstorms. Intermittent streams that channel runoff include Lost Draw, Sulfur Springs Draw, and Monument-Seminole Draw in the northern half of Lea County, which is part of the Texas Gulf Basin, and Landreth-Monument Draw in the southern portion of the county, which flows to the Pecos River. The Site lies within the Pecos River Basin as depicted in Figure 2.4.8, which has a maximum basin width of 130 miles, and a drainage area of 44,535 square miles. The Pecos River generally flows year-round. The main stem of the Pecos River and its major tributaries have low flows, and the tributary streams are frequently dry. Seventy-five percent of the total annual precipitation and 60 percent of the annual flow result from intense local thunderstorms between April and September. Due to the seasonal nature of the rainfall, most surface drainage is intermittent. There are no surface-water bodies or surface-drainage features on the proposed CIS Facility Site. The intermittent surface drainages, lakes, and watersheds in Lea County are shown on SAR Figure 2.4.8 (Lea County 2016).

The USGS does not have permanent stream gages in Lea County which measure daily surface flows. However, peak flow rates have been spot measured at Monument Draw (near Monument) and Antelope Draw (near Jal). Each of these Draws can occasionally convey sizable flows. In June of 1972, a flow of 1,280 cubic feet per second (cfs) (the highest recorded) occurred at Monument Draw. In July of 1994, a flow of 530 cfs (also the highest recorded) occurred at Antelope Draw. These flows should be considered indicative of flows that can occur at other gullies and swales in Lea County (Lea County 2016, 1999).

The proposed CIS Facility Site is not located near any floodplains. The Site is located in an area of Lea County designated as “Zone D”. The “Zone D” designation is used for areas where there are possible but undetermined flood hazards, as no analysis of flood hazards has been conducted or when a community incorporates portions of another community’s area where no map has been prepared (FEMA 2017). A digital version of the map panel for the CIS Facility location in the National Flood Hazard Layer is presented in SAR Figure 2.4.9 (FEMA 2017).

There are no wetlands on the proposed CIS Facility Site. Wetlands in the vicinity of the CIS Facility are shown on SAR Figure 2.4.10.

(c) For details regarding the estimated maximum flood, see the responses to RSI 2-7 and RSI 2-8. The USGS does not have permanent stream gages in Lea County which measure daily surface flows. Western Regional Climate Center provides information on annual mean average precipitation data at Lea County Regional Airport (WRCC 2016). The NOAA Atlas provides precipitation frequency by location. Precipitation frequency results are based on data from a variety of sources, but largely from the National Centers for Environmental Information (see: https://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html).

References:

ELEA 2007 — Eddy-Lea Energy Alliance (ELEA). GNEP Siting Study. 2007.

CEHMM 2016 — CEHMM. “Holtec Hi-Store Facility Area GIS Conflict Analysis.” October 7, 2016.

FEMA 2017 — Federal Emergency Management Agency (FEMA). FEMA Flood Map Service Center. Available at: https://msc.fema.gov/portal.

Google Earth 2017	"Hydrologic Features." 32.583, -103.708. Google Earth. February 1, 2017. Accessed on: July 21, 2017.
Lea County 1999	State of New Mexico Interstate Stream commission, Office of the State Engineer. Lea County Regional Water Plan 1999. Available at: http://www.ose.state.nm.us/Planning/RWP/region_16.php.
Lea County 2016	State of New Mexico Interstate Stream commission, Office of the State Engineer. Lea County Regional Water Plan 2016. Available at: http://www.ose.state.nm.us/Planning/RWP/Regions/16_Lea%20County/2016/Reg%2016_Lea%20County_Regional%20Water%20Plan%202016_December%202016.pdf
NatureServe 2009	NatureServe. International Ecological Classification Standard: Terrestrial Ecological Classifications. NatureServe Central Databases. Arlington, VA. U.S.A. 2009.
NatureServe 2013	NatureServe. Madrean Archipelago Rapid Ecoregional Assessment Pre-Assessment Report. Arlington, Virginia. 2013.
USFWS 2017	U.S. Fish and Wildlife Service. National Wetlands Inventory, Wetlands-Data. Available at: https://www.fws.gov/wetlands/data/Google-Earth.html.
WRCC 2016	Western Regional Climate Center (WRCC). Hobbs, Lea County Airport Data. Available at: http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?nm4028. Accessed on October 14, 2016.

RSI 2-6: Provide information regarding the elevations of structure, system, and components (SSCs) important to safety with respect to the site-specific probable maximum flood elevation. Provide site topographical information before and after the SSCs are constructed, with the location and elevation of the SSCs clearly annotated.

Elevations of on-site SSCs relative to the estimated probable maximum flood water level are not adequately described. The application does not provided the site topography before and after construction that is necessary to determine if there are any potential impacts to the site drainage patterns and the general environment, e.g., soil erosion.

This information is needed to determine compliance with 10 CFR 72.90(a), 72.92(a), and 72.122(b).

Holtec Response:
SAR Section 2.4.3 has been updated to include the following information. The topography of the CIS Facility Site is irregular, with a slight slope toward the north. A topographic high is present within the central portion of the property with ephemeral washes draining from this point; one to the west into Laguna Plata and another to the east into Laguna Gatuna. Based on a review of the USGS topographic map, the elevation at the Site is approximately 3,530 feet above mean sea level. Several shallow depressions are shown along the western portions of the Site. The Site is not within the 100-year and 500-year floodplains (see response to RSI 2-5). Table 2.4.1 provides estimates of the 24-hour 100-year

rain event for the Hobbs, New Mexico. For details regarding the estimated maximum flood, see the responses to RSI 2-7 and RSI 2-8.

RSI 2-7: Provide supplemental information and technical basis to justify the conclusion in Section 2.4.2 of the SAR that Laguna Gatuna and Laguna Plata would be able to accept a one day severe storm total precipitation within the 7.5 inch range with excess free board space. In addition, provide information that compares the 7.5 inch precipitation with regional probable maximum precipitation of various durations.

The application states that, "Both of these drainages [Laguna Gatuna and Laguna Plata] would be able to accept a one day severe storm total within the 7.5 inch range with excess free board space." However, the applicant did not provide information that shows how the 7.5 inch storm precipitation compares with the probable maximum precipitation at the site. Furthermore, the application does not provide technical evidence to show that the two Laguna could support severe storms with excess free board space.

This information is needed to determine compliance with 10 CFR 72.90(b), 72.92(a), and 72.122(b).

Holtec Response:
Section 2.4.2 has been updated to include the results of the following site specific flood analysis.

Flood Analysis Objective:
The objective of this study was to determine the amount of flooding that would occur at HI-STORE (Figure 1) with 7.5 inches of rain during a 24-hour period using publically available GIS data.

Flood Analysis Data Acquisition:
The boundary of the site is defined as the Area of Interest (AOI). All other GIS data for the analysis were identified, derived, and/or acquired from publically available data sources. This data included a Digital Elevation Model (DEM) [Reference 1] of the AOI, one foot contours of the area (derived from the DEM), hydrologic unit boundary for the 12-digit sub-watersheds (HUC-12) [Reference 2], and the NRCS soils [Reference 3] present in the AOI. Also derived from the DEM was a Triangular Interpolated Network (TIN) layer used in the polygon volume calculations. All data were projected into the NAD83, UTM Zone 13N coordinate system.

Flood Analysis & Results:
The flooding analysis was conducted with ESRI ArcGIS for Desktop software, version 10.2.2, with 3D and Spatial Analyst extensions. The HUC-12 sub-watersheds layer was assessed for proximity to the site, and two sub-watersheds were identified as relevant basins (i.e., Laguna Grande and Laguna Plata Watersheds). The Laguna Gatuna and Laguna Plata wetlands both were the downslope point of catchment for their respective watersheds. Acreage was calculated for each of these watersheds, and the watersheds were buffered to eliminate edge effects of contour creation. Two DEMs (east and west, corresponding to Laguna Grande and Laguna Plata, respectively) were extracted from the buffered layers and contours were created at one foot intervals.

The NRCS soils layer was clipped to the watershed boundaries. The soil attributes of concern, Depth to Restrictive Layer (depth to impermeable bedrock in centimeters, "Dep2ResLyr") and Saturated Hydraulic Conductivity (Ksat in µm/second) were extracted and consolidated into one layer. The Ksat values were used from the top 0-80 inch active soil zone. The infiltration level (Ksat) was converted into inches of water absorbed per 24 hour period, and the Dep2ResLyr converted to inches. The restrictive depth was then halved to add conservatism, and 7.5 inches was subtracted from this value. Area where saturation and run-off occurred within the 24-hour/7.5 inch rain event were calculated for these soil types, normalized for feet, and multiplied by the acreage for the respective watersheds, yielding acre-feet of runoff that were converted to cubic feet of runoff. These values were 23,379,663.14 ft3 (Laguna Gatuna eastern wetland basin) and 15,508,872.72 ft3 (Laguna Plata western wetland basin). These volumes were used to determine the level of flooding in each watershed.

A TIN was created from watershed's DEM. This provided a 3D functional surface representing elevations over the watershed and was used as an input for polygon volume calculation. From the contour layers, polygons were created in an ascending order of elevations from the lowest level in each laguna. The Polygon Volume tool was run iteratively on these polygons, calculating the volume between the polygon and the TIN surface. Based on the watershed and hydrologic modeling the results of the analysis show the volume of flooding in the eastern Laguna Gatuna would rise 5 feet from 3,500 feet to an elevation of 3,505 feet. The volume of flooding in the western Laguna Plata would rise 2 feet from 3,427 feet to an elevation of 3,429 feet. The Project site is bisected by the two sub-watersheds. The lowest elevation of the Project site on the west side is 3,501 feet which is 72 feet above the modeled flood elevation, and the east side is 3,523 feet which is 18 feet above the modeled flood elevation. In summary, this analysis indicates that the Project site will not flood during a 24-hour/7.5 inch rain event even with 50% reduction in the soil saturation capacity/depth to restriction which was added into this model as a conservative measure. It should be noted that the model assumes that the playas were dry prior to the 24-hour/7.5 inch rain event.

References:

[1] https://nationalmap.gov, Resolution 1/3 arc second (10 meters)

[2] New Mexico Resource Geographic Information System, http://rgis.unm.edu/

[3] NRCS web soil survey, https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx

RSI 2-8: Provide a site-specific analysis of the probable maximum flood that considers site-specific topographic and hydrologic information. Provide the results of the analysis as probable maximum flow rate, velocity, and surface water elevation. The analysis should contain an estimate of the erosion potential based on these results, and compare the elevation with the base elevations of the HI-STORM UMAX units and other onsite structures, systems, and components. Provide sufficient technical basis to support the claim that the proposed site is flood-dry. If any of the HI-STORM UMAX units are below the calculated surface or subsurface water elevation, identify the design basis flood (DBF) and provide a rationale for this specific design basis.

Section 2.4.1 of the SAR, "Hydrologic Description," states that "the Site can be considered "flood-dry" and therefore it can be concluded that none of the facilities important to safety structures will be affected by the Site's hydrologic features." However, no technical basis was provided to support this statement. The American National Standards Institute/American Nuclear Society (ANSI/ANS) 2.8-1981 Standard defines 'flood dry' when the proposed site is so high above potential sources of flooding that safety to structures important to safety is obvious or can be documented with little analysis. To justify this definition, the application should provide: (1) the flood water elevations, and (2) the elevations of structures and components with respect to the most severe flood water elevations.

Section 2.4.3 of the SAR states that an analysis conducted for the International Isotopes Fluorine Products, Inc.(IIFP) Fluorine Extraction Process & Depleted Uranium De-conversion Plant (FEP/DUP) site, located 23 miles away, shows the flood water level would be approximately 4.8 inches for the HI-STORE CIS site. The application states that, "Holtec determined that the probable maximum flood (PMF) for the CIS Facility Site would be similar to the PMF developed […] for the FEP/DUP site." These statements do not appear to be consistent with the statements in Section 2.4.1 that the site is flood-dry.

This information is needed to determine compliance with 10 CFR 72.90 (b), 72.92(a) and (c), and 72.122(b).

Holtec Response:
Please see the response to RSI 2-7, which provides an evaluation demonstrating that the site is flood-dry.

Observations:
Obs 2-1: Provide a legible scale for Figures 1.0.1, 2.1.3, and 2.1.6.

Several figures throughout the SAR (e.g., Figs. 2.1.3 and 2.1.6; Fig. 1.0.1) lack a scale, and in other cases the scale is not legible.

This information is necessary to determine compliance with 10 CFR 72.24(a).

Holtec Response:
The figures have been replaced with more appropriate versions.

Obs 2-2: Provide maps and aerial photographs of the site with radial coverage extending to a minimum of 8 km [5 mi] from the site.

Although aerial photographs of the site were provided in SAR Figures 2.1.2 and 2.1.3, they do not have radial coverage extending to a minimum of 8-km [5-mi] from the site, as recommended in Section 2.4.1.1 in NUREG–1567. In addition, no map of the same region has been provided clearly showing adjacent buildings, roads, railroads, transmission lines, wetlands, and surface water bodies, as specified in Section 2.4.1.1 of NUREG-1567.

This information is needed to determine compliance with 10 CFR 72.24(a), 72.90(a)–(c), 72.92, 72.94, 72.98, and 72.100.

Holtec Response:
The figures have been replaced with more appropriate versions. The response to RSI 2-5 also incorporated additional figures related to water resources, wetlands, and topographical features in the vicinity of the CIS Facility.

Obs 2-3: Provide details of current transient population and future projected population (both resident and transient) distributions within 8 km [5 mi] of the site.

Although the current population data within an 8-km [5-mi] radius from the site have been presented in a sector map (SAR Figure 2.1.10), no information has been presented on projected population in the same region. In addition, there is no information regarding current and future transient population within this region. This information is necessary to determine the potential for radiological and environmental impacts on the region with due consideration of the characteristics of the population, as specified in Section 2.4.1.3 of NUREG–1567 and in Section 2.1.3 of Regulatory Guide 3.48.

This information is needed to determine compliance with 10 CFR 72.24(a), 72.90(e), 72.98, and 72.100.

Holtec Response:
SAR Section 2.1.3 has been updated using the following information. SAR Figure 2.1.12 depicts the current population living within 5 miles of the proposed CIS Facility Site. As shown on that figure, there are 9 people living within 5 miles of the Site. As discussed in Section 3.8.1 of the ER, population estimates in the Region of influence (ROI) are projected to grow at a slower rate than New Mexico, increasing 10 percent between 2015 and 2025, while New Mexico is projected to increase 19 percent during the same time period. Assuming a 10 percent growth between 2015 and 2025, the projected population living within 5 miles of the CIS Facility would grow from 9 to 10 persons.

With regard to transient populations within 5 miles of the CIS Facility, Holtec contacted all employers within 5 miles and determined that there are currently approximately 303 persons working within 5 miles of the CIS Facility boundary, broken down as follows:

- Land Farm (R360 Disposal): 1.9 miles southwest of the CIS Facility Site boundary; 43 full time equivalent (FTE) workers;
- Intrepid East Mine: 4.9 miles east of the CIS Facility Site boundary; 210 FTE's;
- Intrepid North Mine: 4.2 miles west of the CIS Facility Site boundary; 40 FTE's;
- Caliche Mine: 4 miles southwest of the CIS Facility Site boundary; 10 FTE's (CEHMM 2017).

With regard to future projections, there are no reasonably foreseeable projects expected to occur within 5 miles of the CIS Facility boundary and no changes to the existing transient workforce were forecast by the employers in the area (CEHMM 2017). Consequently, it is assumed that the transient population of 303 workers would remain constant going forward.

References:

CEHMM 2017 CEHMM. "Transient Employment." E-mail from Doug Lynn, Executive Director CEHMM, to Tetra Tech on July 27, 2017.

Obs 2-4: Provide detailed information regarding nearby pipelines (e.g., size, pressure, material conveyed, depth of burial, construction details, location(s) of nearest shut-off valves, age) including distances(s) to important to safety structures and systems and an assessment of the hazards from potential rupture of these pipelines at the proposed CIS facility.

There are several pipelines carrying natural gas and hazardous liquids near the site. SAR Section 2.1.2 identifies existing underground natural gas pipelines along the North-South axis to the East of the site. Based on SAR Figure 2.1.13, these pipelines are very close to Route 55 [Area 13 Boundary in SAR Figure 2.1.4(b)], which is approximately 333 m [1,000 ft] from the edge of the storage pad. However, SAR Section 2.2 states that the closest natural gas pipeline is approximately 3.2 km [2 mi] from the site. The applicant should reconcile the discrepancy between these two sections of the SAR.

Details of these pipelines should be provided, as specified in Section 2.4.2 of NUREG–1567 and Section 2.2 of Regulatory Guide 3.48. Additionally, technical basis for why an underground pipeline would not be a hazard to the proposed CIS facility operations, as stated in SAR Section 2.1.2, should be provided. Although rare, underground pipelines have ruptured and posed hazard to the surrounding areas.

In addition, there is an oil recovery facility with tanks within the site boundary. Details of this facility and an assessment of potential hazards from this facility to the CIS facility operations should be provided, as per Section 2.4.2 of NUREG–1567 and Section 2.2 of Regulatory Guide 3.48.

This information is necessary to determine compliance with 10 CFR 72.24(a), 72.90(a)–(d), 72.94, 72.98, and 72.122.

Holtec Response:
SAR Section 2.2 was updated to include the following additional information regarding the nearby pipelines. There are approximately 27,000 miles of energy-related pipelines in New Mexico that are regulated by the U.S. Department of Transportation's Pipeline and Hazardous Materials Safety Administration (PHMSA). Three pipelines are currently near the CIS Facility Site: (1) a Transwestern (TW) 20-inch diameter natural gas pipeline located approximately 0.8 miles from the western boundary of the Site, and (2) a DCP Midstream (DCP) 20-inch diameter natural gas pipeline located approximately 0.16 miles east of the eastern boundary of the Site; and (3) a DCP 10-inch diameter natural gas pipeline located approximately 0.17 miles east of the eastern boundary of the Site. The two 20-inch pipelines are classified as high-pressure pipelines rated for a pressure of 1,180 pounds per square inch (psi). They are normally operated at a pressure of approximately 680 psi. A fourth pipeline is proposed to be constructed near the two DCP pipelines east of the CIS Facility Site. That pipeline would be a 10.75-inch diameter low-pressure natural gas pipeline and would run south-to-north between the two existing pipelines which are east of the CIS Facility (CEHMM 2017).

PHMSA has collected pipeline incident reports since 1970. Although the reporting regulations and incident report formats have changed several times over the years, PHMSA merged the various report formats to create pipeline incident trend lines going back 20 years. PHMSA defines significant incidents based on any of the following conditions:

- Fatality or injury requiring in-patient hospitalization;
- $50,000 or more in total costs, measured in 1984 dollars; or
- Highly volatile liquid releases of 5 barrels or more or other liquid releases of 50 barrels or more (PHMSA 2017).

The most significant incident in New Mexico occurred on August 19, 2000, when a 30-inch diameter El Paso Natural Gas pipeline ruptured near Carlsbad, New Mexico. That incident killed 12 members of an extended family camping over 600 feet from the rupture point. The force of the escaping gas created a 51-foot-wide crater about 113 feet along the pipe. A 49-foot section of the pipe was ejected from the crater, in three pieces measuring approximately 3 feet, 20 feet, and 26 feet in length. The largest piece of pipe was found about 287 feet northwest of the crater. The cause of the failure was determined to be severe internal corrosion of that pipeline (NTSB 2000).

In order to determine whether the potential failure of a pipeline could have significant impact on people or property, the PHMSA has developed a calculation that accounts for the size of the pipeline and the maximum allowable operating pressure. The term "PIR" means the radius of a circle within which the potential failure of a pipeline could have significant impact on people or property. The PIR is determined by the following formula:

$$r = 0.69 \cdot \sqrt{p \cdot d^2}$$

where:
r = the PIR in feet,
p = the pipeline maximum operating pressure in pounds per square inch (psi), and
d = the nominal pipeline diameter in inches (C-FER 2000).

SAR Figure 2.2.2 depicts a graphic representation of the results of that formula. As can be seen from that figure, for the maximum expected diameter pipeline (42-inch) operating at the maximum pressure (1450 psi), the hazard area radius is not expected to exceed approximately 1,100 feet from the explosion. For the CIS Facility, there are no pipelines in the vicinity greater than 20-inch diameter or with operating pressures greater than 1,180 psi. As shown on Figure 2.2.2, for a 24-inch diameter pipeline with an operating pressure of approximately 1,180 psi, the hazard area radius is not expected to exceed approximately 600 feet from the explosion. All pipelines near the CIS Facility are located more than 600 feet from the Site boundary, and more than 1 mile from the ISFSI.

SAR Table 2.2.3 presents a summary of some of the most relevant pipeline explosions that have occurred in the U.S. since approximately 1969. As can be seen from that table, impacts occurred within 1,000 feet of all explosions. Given that there are no pipelines within one-half mile of the proposed operations at the CIS Facility, it would be extremely unlikely for a pipeline rupture to impact operations at the facility.

With regard to past operations at the site involving an oil recovery facility with tanks within the CIS Facility Site boundary, it should be noted that there are no oil recovery operations presently occurring on the Site and none are reasonably foreseeable. There are 7 aboveground storage tanks (ASTs) associated with past brine disposal activities on the site. These ASTs are holding tanks that were used for storing brine and settling solids and separating residual oil from oil-field brines. 'The tanks range in size from 150 barrels to 250 barrels. These holding tanks or ASTs are not in use. No containers of hazardous substances have been noted in prior site visits (2007) or most recent site visits (2016). Within Section 13, which is where the CIS Facility would be located, two additional tanks (250 gallon barrels) are present at the well location in the southwest portion of the Site. One active oil/gas well on the southwest portion of Section 13 operates at minimum production to maintain mineral rights.

References:

CEHMM 2017 — CEHMM. "Pipeline Information." E-mail from Doug Lynn, Executive Director CEHMM, to Tetra Tech on July 27, 2017.

C-FER 2000 — C-FER Technologies, Stephens, Mark. "A Model for Sizing High Consequence Areas Associated with Natural Gas Pipelines." October 2000.

NTSB 2000 — National Transportation Safety Board (NTSB). "Pipeline Accident Report PAR-03-01, dated August 19, 2000." Available at: NTSB.gov. Accessed July 2017.

PHMSA 2017 — Pipeline and Hazardous Materials Safety Administration (PHMSA). "Pipeline Safety." Available at: https://www.phmsa.dot.gov/. Accessed July 2017.

Obs 2-5: Provide dimensions of the storage pads including pad-to-pad distances. Additionally, provide dimensions of the placement of the storage casks in a pad including different subgrade spaces.

Figure 4.3.1 and Table 4.3.3 specifies different subgrade spaces of the storage pad, namely, Space A, B, C, and D; however, dimensions of these subgrade spaces and cask placement configuration are not provided. This information is necessary to assess whether the design of the storage pads in the CIS facility would be able to fulfill the safety functions.

This information is necessary to determine compliance with 10 CFR 72.24(a), 72.103, and 72.122.

Holtec Response:
Section 2.4.3 was revised for clarity. Additional information pertaining to this observation is also provided in the responses to RSIs 2-6 to 2-8.

Safety Analysis Report (SAR), Chapter 3, "Operations at the CIS Facility"

RSI 3-1: Provide additional descriptions of the estimated completion times and expected doses from cask loading, unloading, and normal operations, and revise the facility's radiation protection plan to demonstrate the adequate implementation of the ALARA principle. In addition, revise relevant parts of Chapter 10 and Chapter 11 of the SAR to ensure consistency, as necessary.

Section 3.0 of the SAR states that: "[t]he information presented in this chapter along with the technical basis of the system design described in the canister's FSAR in its host 10 CFR Part 72 docket will be used to develop detailed operating procedures. In preparing the site-specific procedures, the conditions of the license and technical specifications, equipment-specific operating instructions, as well as the information in this chapter will be utilized to ensure that the short-term operations shall be carried out with utmost safety and ALARA." The SAR further states that: "[t]he following generic criteria shall be used to determine whether the site-specific operating procedures developed pursuant to the guidance in this chapter are acceptable for use […]." The staff cannot assess the adequacy of the radiation protection program for the HISTORE CIS design without additional descriptions of the estimated completion times for each operation, and the estimated dose from these operations.

This information is necessary to determine compliance with 10 CFR 72.104, 72.126(a)(6), and 72.126(d).

Holtec Response:
Ensuring all operations are performed in accordance with the ALARA principle is a guiding principle in the design of the HI-STORE facility. To provide a better reference to the facility's radiation protection program and the estimated dose to facility workers during operations, Section 3.1.4 of Chapter 3 is expanded to include the following paragraph:

This section provides a summary overview of the canister handling and normal storage operations at HI-STORE CIS facility. A more detailed description is provided in Chapter 10. Radiation exposure to facility workers and the general public will be maintained as low as reasonably achievable (ALARA) during all operations in accordance with the facility's radiation protection program described in Chapter 11. Table 11.3.1 of Chapter 11 provides detailed estimates of expected durations and dose to facility workers for all canister handling operations.

The table referenced in Chapter 11 provides detailed step-by-step estimated durations. In addition, an additional descriptive step (Removal of Canister Lid Bolts) is added to Figure 3.1.1 to provide better clarity of operations. Additionally some operational descriptions in Figure 3.1.1 are updated to provide better consistency with Table 11.3.1, so that the durations can be compared.

RSI 3-2: Provide an accident recovery operation plan that demonstrates the adequate implementation of the defense in-depth measures for the safe operation of the ISFSI with respect to radiation protection.

Section 3.0 of the SAR states that: "it is shown that the loading operations are characterized by a number of defense-in-depth measures intended to preclude a handling accident or ALARA transgression." To support this statement, the SAR lists several measures to demonstrate that the facility operations are conducted using procedures that provide defense in-depth. However, these examples do not include handling accidents. Accidents other than those listed could occur and may need additional time to correct. Doses received during recovery operations from all credible off-normal and accident conditions must be included to demonstrate compliance with 10 CFR 72.106.

This information is necessary to determine compliance with 10 CFR 72.24(e) and 72.106.

Holtec Response:
As stated in Section 3.0, the design criteria for all handling equipment established in Chapter 4 are sufficient to render a canister handling accident non-credible at the HI-STORE site. A specific accident recovery plan is therefore considered beyond design basis, and not included in the SAR. Recovery actions for beyond design basis incidents will be addressed as required in accordance with the site's corrective action program.

To clarify this intent, the second paragraph of Section 3.0 is revised as follows (changes shown in italics):

"In particular, it is shown that the loading operations are characterized by a number of defense-in-depth measures, *described in Chapter 4 and evaluated in Chapter 15, that are* intended to preclude a handling accident or ALARA transgression. *The defense-in-depth measures include:"*

In addition, the following additional bullet point is added to the list of defense-in-depth measures listed in Section 3.0, and other minor grammatical errors in the section are corrected:

- *All operations will be performed in accordance with written and QA validated procedures.*

Obs 3-1: Provide additional justification, either through supplemental evaluations, incorporation by reference, or through revised operational procedures, to demonstrate that the proposed receipt inspection procedures and acceptance criteria for the CIS facility, as described in the HI-STORE SAR, provide adequate confirmation of the aged canisters' structural and confinement integrity for continued storage at the CIS facility. The justification should clearly discuss how the confinement analyses and the materials considerations analyses in Chapter 9 and 17, were used to derive the proposed canister receipt inspection procedures and acceptance criteria.

The justification should also discuss whether the safety analyses in Chapter 9 and 17 adequately support the application of the same receipt procedures and criteria for canisters of any age, type, or storage term prior to receipt at the HI-STORE CIS facility.

The safety analyses for confinement and structural integrity referenced in the HI-STORE SAR (from the HI-STORM UMAX and HI-STORM FW FSARs) rely on the canister remaining within the CoC/license conditions during the licensed storage period. Specifically, Section 9.2.1 of the HI-STORE SAR states that, "[c]onfinement safety of the canisters in this docket is therefore demonstrated by reference to confinement determination reached in the HI-STORE UMAX FSAR." These safety analyses include canister loading, transfer operations from the spent fuel pool to the ISFSI pad, and storage operations. However, these safety analysis do not evaluate transport operations from their initial storage facility to the HI-STORE CISF. The application does not discuss if and how the proposed canister receipt inspection procedures and acceptance criteria are used to complement the confinement safety analyses and ensure that all canister operations prior to receipt at the CIS facility are evaluated for confinement integrity.

This information is needed to determine compliance with 10 CFR 72.122(f), 72.128(a)(1) and (a)(3).

Holtec Response:
For receipt in the HI-STORE facility, the canister must be certified to meet the material considerations described in Chapter 17 and meet the pre-shipment requirements required for transport that verify the canister's confinement integrity has been maintained. As described in Chapter 9 of the SAR, these requirements demonstrate that the canister continues to maintain its confinement. The following inspection criterion is therefore added to Section 3.1.4.1 (addition shown in italics):

When the transportation cask arrives at the HI-STORE CIS facility, the transportation cask is visually inspected for any outward indications of damage or degradation prior to entry into the Protected Area (PA). C*anister records are reviewed to certify that the canister meets the material considerations of Chapter 17 and the receipt inspection requirements of Chapter 10 to ensure the canister continues to meet the no-credible-leakage criteria to which it has been certified in the HI-STORM UMAX docket [1.0.6]. Canisters that have undergone an accident while in Part 71 transportation will not be accepted at the HI-STORE facility.* Additionally, a review of the transportation documentation package, which includes verification that a pre-shipment inspection was performed and acceptable, is mandatory prior to receiving a transportation cask into the security vehicle trap.

<u>Safety Analysis Report (SAR), Chapter 5, “Installation and Structural Evaluation”</u>

RSI 5-1: Provide the design features applicable to the lifting devices, the cask transfer building crane and the vertical cask transporter structures, systems, and components necessary to render cask drops non-credible events in the proposed Technical Specifications in Chapter 16 of the SAR.

Section 15.3.14, “Cask Drop,” of the HI-STORE SAR states that cask drops are not credible and cites Sections 4.5.1, 4.5.2, and 4.5.3 of the SAR, which apply to the design of lifting devices, the cask transfer building cane, and the vertical cask transporter, respectively, as the basis for this conclusion. The design features applicable to these structures, systems and components necessary to render cask drops non-credible events have not been captured in the proposed Technical Specifications in Chapter 16 of the SAR. The requirements of 10 CFR 72.44(c) specify that each license include technical specifications with requirements in the following categories:

1. Functional and operating limits and monitoring instruments and limiting control settings.
2. Limiting conditions.
3. Surveillance requirements.
4. Design features.
5. Administrative Controls.

This information is required to determine compliance with 10 CFR 72.44(c).

Holtec Response:
Section 16.4 of the SAR and Section 4.0 of Appendix A to the Proposed HI-STORE CIS Facility Technical Specifications have been revised to address the design features of cask lifting equipment that render cask drops non-credible at the HI-STORE CIS Facility.

RSI 5-2: Provide information describing how redundant drop protection features are incorporated into the canister lowering operation.

Section 4.5.3 of the SAR, “Vertical Cask Transporter,” describes the design criteria applicable to the VCT. Item ii of Section 4.5.3.3 states: “*Prevention of a cask or canister drop is afforded by design conformance with NUREG-0612 [1.2.7] and ANSI N14.6 [1.2.4] combined with the use of automatic redundant drop protection features along with hydraulic check valves and enhanced safety margins.*”

Figure 3.1.1 of the SAR, “Cask Handling Summary Illustrations,” includes diagrams depicting canister lowering operations. The staff did not find information in the SAR describing how redundant drop protection features are incorporated into the canister lowering operation. The application should explain in detail how the canister lowering operation protects against a canister drop.

This information is required to determine compliance with 10 CFR 72.24(d).

Holtec Response:
The canister lowering operation protects against a canister drop by virtue of the following structural design requirements, which apply to the Vertical Cask Transporter (VCT) as discussed in Section 4.5 of the SAR:

1) The VCT overhead beam and the load bearing components of the MPC downloader system (i.e., pulleys, pins, etc.) are designed to meet the increased safety factors per ANSI N14.6 for critical loads.
2) The slings used to lower the MPC comply with the provisions of NUREG-0612 and ASME B30.9, and therefore they either provide redundant load paths or possess twice the normal design factor.
3) The MPC Lift Attachment, which connects the MPC downloader system to the MPC lid, is a special lifting device, which is designed, tested, operated and maintained in accordance with NUREG-0612 and ANSI N14.6.
4) The threaded anchor locations (i.e., interfacing lift points) on the MPC lid are designed to have a safety factor of 10 with respect to ultimate strength per Section 5.1.6 of NUREG-0612.

In addition, the VCT design must insure that any electrical malfunction in the control system, motors, or power supply will not lead to an uncontrolled lowering of the load. Also, the hydraulic jacks that are used to raise and lower the overhead beam shall be equipped with redundant drop protection features such as counter-balance or hydraulic check valves to prevent a sudden loss of hydraulic pressure.

The structural design requirements listed above enable the VCT to be designated as a single-failure-proof handling system per Section 5.1.6 of NUREG-0612, and thereby eliminates the possibility of a canister drop during MPC downloading operations.

Lastly, to better align the FSAR text with the above response, item ii of Section 4.5.3.3 has been reworded as follows:

"Prevention of a cask or canister drop is afforded by design conformance with NUREG-0612 [1.2.7] and ANSI N14.6 [1.2.4] combined with enhanced safety margins and the use of redundant drop protection features, such as hydraulic check valves and a fail-safe electrical control system;"

Safety Analysis Report (SAR), Chapter 6, "Thermal Evaluation"

RSI 6-1: Provide allowable temperatures for the storage system components listed in Chapter 6 of the HI-STORE SAR so that an evaluation of the structures, systems, and components important to safety (SSCs ITS) can be performed.

Tables 6.4.3, 6.4.5, 6.4.6, 6.5.2, 6.5.3, and 6.5.4 of the HI-STORE SAR list the temperatures of components during normal, off-normal, and accident conditions. However, corresponding allowable temperatures were not provided. Likewise, the incorporation by reference, as described in HI-STORE CIS SAR Table 4.0.1, did not clearly describe the locations for the allowable temperatures for all of the components and conditions mentioned in Tables 6.4.3, 6.4.5, 6.4.6, 6.5.2, 6.5.3, and 6.5.4 (e.g., HI-TRAC inner/outer shell, HI-STAR 190 Holtite, HI-STAR 190 enclosure shell).

This information is needed to determine compliance with 10 CFR 72.122(h) and 72.128(a)(4).

Holtec Response:
Allowable normal, short-term, off-normal and accident temperature limits of components evaluated in cited tables are addressed in HI-STORE CIS SAR Chapter 4 as follows:

HI-TRAC CS and CTF components	Chapter 4, Table 4.4.1
HI-STAR 190 components	Chapter 4, Table 4.4.4
MPC components (including fuel)	HI-STORM UMAX FSAR Table 2.3.7 cited in Chapter 4, Para. 4.3.1.2
UMAX VVM	HI-STORM UMAX FSAR Table 2.3.7 cited in Chapter 4, Para. 4.3.2.2

For ready reference, the location of HI-STORM UMAX temperature limits incorporated by reference into the HI-STORE SAR is incorporated in revised Table 4.0.1.

RSI 6-2: Provide a thermal analysis that considers the effect on inlet air temperature at the proposed site conditions (e.g., array spacing pitch, hot ambient temperature) to the UMAX storage system due to air mass transfer (i.e., mixing of air) between the array of HI-STORE UMAX inlet and outlet vents.

According to Table 1.0.1 of the HI-STORE CIS SAR, the application is for an array of 500 UMAX systems, which are based on nearly co-located inlet and outlet vents. However, a thermal analysis of array effects (rather than a single system) that quantifies relevant boundary conditions (e.g., inlet vent air temperature, radiant energy view factors) for subsequent thermal analyses of the UMAX systems was not provided for review.

This information is needed to determine compliance with 10 CFR 72.122(h) and 72.128(a)(4).

Holtec Response:
Air inlet temperature mixing effects are reasonably addressed in the generic HI-STORM UMAX FSAR supporting the HI-STORE CIS SAR. The generic mixing effects evaluation is addressed in the HI-STORM UMAX FSAR Section 4.4.9. [

PROPRIETARY INFORMATION WITHHELD IN ACCORDANCE WITH 10CFR 2.390

]

[

PROPRIETARY INFORMATION WITHHELD IN ACCORDANCE WITH 10CFR 2.390

]

The evaluation above and cask array evaluation in HI-STORE CIS SAR Para 6.4.3.5 support the conclusion that safe storage of spent nuclear fuel in the HI-STORE CIS UMAX array is reasonably assured.

[1] Generic thermal parameters Q, Ta and p defined in HI-STORM UMAX FSAR Tables 2.1.8, 2.1.9, 2.3.6 and Section 1.4 bound corresponding HI-STORE CIS design parameters.

RSI 6-3: Provide a discussion in the HI-STORE SAR that evaluates the likelihood and consequences of rangeland fires on the proposed HI-STORE CIS site.

Chapter 2 of the HI-STORE SAR notes the occurrences of thunderstorms in the vicinity of the storage facility. Likewise, the chapter discusses the presence of vegetation (e.g., seasonal grasses between sporadic shrubs and forbs, Section 2.1.2). Recognizing that lightning often occurs during a thunderstorm and vegetation can be a fuel source, the accident analysis chapter should discuss the consequences of rangeland fires on the storage facility and any preventative measures that may already be incorporated in the facility design. Areas of discussion should include dimensions of fire breaks surrounding the pads and buildings (i.e., dimensions of crushed rock and gravel area) relative to the dimensions a fire can jump and measures to keep controlled area boundary free of vegetation. [Staff notes that other fires are discussed in Sections 15.3.1 (onsite initiated) and 15.3.17 (offsite initiated), and thermal evaluation is presented in Section 6.5.]

This information is needed to determine compliance with 10 CFR 72.122(b) and (c).

Holtec Response:
Rangeland fires do not pose a credible threat to the safety of spent nuclear fuel stored at the HI-STORE CIS facility as justified below:

- Fuel is stored in an underground cavity having no line of sight for radiation heating.
- The HI-STORE CIS facility is designed and operated as a vegetation-free storage area within the controlled area boundary.
- The ISFSI layout includes a substantial distance (over 500 ft) from the storage pads to the controlled area boundary.
- Site includes suitable width (approx. 3 dozer widths) of vegetation cleared land around the controlled area boundary.
- Due to large distances separating potential vegetation fires and UMAX storage modules fire heating reasonably bounded by design basis fire accidents postulated as all-engulfing fires.
- As evaluated above the HI-STORE CIS designed as a vegetation free facility renders fire-jump concerns non-credible.

The above evaluation is incorporated in the revised HI-STORE CIS SAR Chapter 6.

RSI 6-4: Provide the HI-STORE CIS Facility's Fire Protection Program Document.

Page 10-10 of the HI-STORE SAR mentions the "Fire Protection Program" (in addition, page 3-8, 6-40, 10-23, and 15-10 mention "Fire Protection"), but the document was not provided for the staff's review.

This information is needed to determine compliance with 10 CFR 72.122(c).

Holtec Response:
The requested document (HI-2177938R0) is submitted for staff review as an attachment to these RSI responses.

Obs 6-1: Provide thermal analyses that include ambient temperatures for the thermal model's boundary conditions that represent the average maximum temperature for the high temperature seasonal period (e.g., June, July, and August) and that reflect the effect of surrounding air temperatures from air outlet vents.

According to the FLUENT model provided for the HI-STORE SAR, the inlet boundary temperature for the normal conditions model was 16.67 deg C [62 deg F]. This temperature does not consider that during three months of the year, the average monthly maximum temperature ranges from 92.57 deg F to 93.62 deg F, as reported in Table 2.3.1 of the HI-STORE SAR. In addition, the model does not consider the potential effects on the temperature of air entering the UMAX system from the array of UMAX storage modules proposed for the HI-STORE facility.

This information is needed to determine compliance with 10 CFR 72.122(h) and 72.128(a)(4).

Holtec Response:
It is contextual to clarify that adoption of 62 deg. F ambient temperature subsumes the effect of cited summer temperatures as defined in the HI-STORM CIS SAR for evaluation of normal condition of storage. In accordance with this definition excerpted from "glossary of terms" below (emphasis added), the annual average temperature for the site is ascertained from site data and adopted as normal storage temperature.

> "**Normal Storage Condition** temperature refers to the integrated time <u>*average of the annual*</u> ambient temperature at an ISFSI site. It is used, as prescribed in ISG11Rev3 and NUREG-1536, as

> the reference air inlet temperature in the ventilated cask's thermal analysis for computing the fuel cladding temperature. In non-ventilated casks, it is used as the surrounding ambient temperature for the thermal analysis of the cask under the so-called normal condition of storage."

The above definition accords with the licensing basis for storage systems approved by the NRC under HI-STORM 100 (72-1014), HI-STORM FW (72-1032) and HI-STORM UMAX (72-1040) dockets.

Above said the underlying question in the NRC observation appears to relate to ambient temperature excursions. These are germane to all storage systems and addressed as required by NRC regulations as design basis off-normal and extreme ambient events. Such events are evaluated in HI-STORE CIS SAR Chapter 15. See also RSI 6-2 response.

Safety Analysis Report (SAR), Chapter 9, "Confinement Evaluation"

Obs 9-1: Incorporate Chapter 7, "Confinement Evaluation" of the HI-STORM FW FSAR by reference into the HI-STORE SAR.

Table 9.0.1, "Material Incorporated by Reference in this Chapter," of the HI-STORE SAR states, "the HI-STORM UMAX FSAR includes references to the HI-STORM FW FSAR, since both share the same canister models. However, since the HI-STORM UMAX FSAR includes relevant excerpts from the HI-STORM FW FSAR, no part of the HI-STORM FW FSAR needs to be incorporated by reference into the HI-STORE SAR in this chapter." The details of the canister confinement design and requirements for normal, off-normal, and hypothetical accident conditions are provided in the HI-STORM FW FSAR for the canister models, while only the evaluation is provided in the HI-STORM UMAX FSAR. Also, Chapter 7 of the HI-STORM FW FSAR describes the confinement design characteristics, structures, systems, and components (SSCs) important to safety, and confinement design basis for the two types of canisters proposed for approval in HI-STORE SAR.

This information is needed to determine compliance with 10 CFR 72.18 and 72.24(c)(3).

Holtec Response:
Table 9.0.1 has been revised to include reference to HI STORM FW for the details of the canister confinement design and requirements for normal, off-normal and hypothetical accident conditions. Specifically, Chapter 7 is included as incorporated by reference in the table. The actual subsections are 7.1.1, 7.1.2, 7.1.3 and 7.1.4.

Obs 9-2: Include specific references to the type of canisters for which confinement evaluations were made in Chapter 9, "Confinement Evaluation" of the HI-STORE SAR.

Section 9.0 of the HI-STORE SAR references, "canisters that are certified for storage in the HI-STORM UMAX docket (Docket #72-1040)." The specific canisters proposed for approval should be clearly identified within Chapter 9, "Confinement Evaluation," of the HI-STORE SAR, and be consistent with those identified in the facility's Technical Specifications.

This information is needed to determine compliance with 10 CFR 72.18 and 72.24(c)(3).

Holtec Response:
Subsection 9.2.1 was revised to refer to Table 1.0.4 of the HI-STORE SAR, which identifies the specific canisters for approval. These canisters also match those identified in the proposed Technical Specifications.

Obs 9-3: Provide a clear and specific reference to a figure(s), or provide the figure(s) in Chapter 9 of the HI-STORE SAR that shows the confinement boundary and redundant closure for each canister, in addition to the portions of the boundaries that are accessible and not accessible to the receipt inspection leakage rate testing.

The application does not contain nor makes reference to a figure or diagram that shows the confinement boundary and redundant closure for each canister. These figures should also show the portions of the confinement boundary and redundant closure that are accessible and not accessible to the receipt inspection leakage rate testing.

This information is needed to determine compliance with 10 CFR 72.18 and 72.24(c)(3).

Holtec Response:
As discussed in Section 9.2.1, confinement is provided by the MPC Enclosure Vessel. The confinement boundary (Enclosure Vessel) as defined in Chapter 7 in the HI-STORM FW FSAR [1.0.7] (incorporated by reference in the HI-STORE SAR, see Table 9.0.1) consists of the MPC shell, MPC baseplate, MPC lid, Vent and Drain Port Covers, MPC closure ring, and associated welds. Note that consistent with the HI-STORM FW FSAR no specific figures of the confinement boundary are provided, instead the names of the confinement boundary components are identified in Chapter 9, and the drawings in Chapter 1 show detailed drawings of these components. Although the HI-STORM UMAX confinement boundary includes the MPC lid to shell weld, this weld is covered with a redundant closure ring. As stated in Subsection 9.2.1, it is understood that the acceptance testing does not specifically test the lid to shell weld, the acceptance testing is able to determine that the combination of the redundant closure ring and lid to shell weld maintains confinement. For the remainder of the confinement boundary, the testing of the cavity space between the MPC and the transportation overpack provides assurance that the MPC maintains confinement. The acceptance testing of the MPC is performed using a port on the HI-STAR closure lid. A leakage rate/ backfill tool is installed to access this cavity for receipt leakage rate testing to confirm the integrity of the Enclosure Vessel, during receipt inspection.

Obs 9-4: Provide additional descriptions in Chapter 3, "Operations at the HI-STORE CIS Facility," and Chapter 10, "Conduct of Operations Evaluation," of the HI-STORE SAR that discuss the appropriate means to cover the opened vent/drain port of the transportation package, in addition to a description of the means to collect any radioactive material.

Subsection 9.2.2, "Operational Activities," of the HI-STORE SAR describes that one of the vent/drain ports of the transportation cask is opened to allow access to the small free volume between the canister and the cask. Subsection 9.2.2 of the HI-STORE SAR also states, "For this activity the port is covered by appropriate means […]" and if the volume contains any radioactive material, "appropriately collected." The appropriate means to cover the port cover, in addition to a description of the means to collect any radioactive material (e.g. sampling equipment, test method, test period, instrument sensitivity, qualification of sampling procedure that is written by qualified personnel, etc.) should be described in greater detail in Chapters 3 and 10 of the HI-STORE SAR to ensure no release of radioactive material and accurate sampling results.

This information is needed to determine compliance with 10 CFR 72.24(e), 72.44(c)(ii), and 72.128(a)(1).

Holtec Response:
To provide additional information on the measures that will be taken to ensure there is no release of radioactive material and the gas sample reflects the actual contents of the cask cavity, Step 10 of Section 10.3.3.1 is revised as follows (changes shown in italics):

> As a safety precaution, the HI-STAR closure lid access port cover is removed and sampling equipment is attached to test for the presence of Krypton-85. *The sampling equipment consists of a cover flange that allows remote opening of the closure lid port plug to ensure there is no release of radioactive material. The cover flange and gas sample canister is evacuated prior to opening the port plug to ensure the sample accurately reflects the cask cavity contents.* The cask cavity gas sample is handled in accordance with Radiation Protection directions by qualified personnel. Testing is

performed per pre-approved procedure, using appropriately calibrated equipment *that has been qualified for testing at expected concentration limits*, to confirm that the sample meets the acceptance criteria of Table 10.3.3. In the unlikely event that the Krypton-85 concentration exceeds the acceptance criteria, the canister transfer operations are terminated and site management is informed for disposition.

Obs 9-5: Revise the application to include the specific subsection(s) for the following chapters of the HI-STORE SAR:

a. In Section 9.1, "Acceptance Criteria," of the HI-STORE SAR, include the specific subsections of Chapter 4, "Design Criteria for the HI-STORE CIS Structures, Systems, and Components," that address the confinement acceptance criteria.
b. In Subsection 9.2.2, "Operational Activities," of the HI-STORE SAR, include the specific subsection(s) of Chapter 10, "Conduct of Operations Evaluation," that details the receipt inspection test, including instrumentation and acceptance criteria.
c. In Subsection 9.5.1, "Confinement Casks or Systems," of the HI-STORE SAR, include the specific subsections of Chapter 18, "Aging Management Program," of the HI-STORE SAR that address any potential degradation beyond the initial licensing period.

The specific subsections(s) described above were not detailed in the specific sections HI-STORE SAR, also described above. Regarding item b. above, there are two occurrences of the use of, "Chapter 10," in Subsection 9.2.2 of the HI-STORE SAR.

This information is needed to determine compliance with 10 CFR 72.24.

Holtec Response:

a. Section 9.1 was revised to include reference to section 4.3 of this SAR, which contains the acceptance criteria for confinement. .
b. Subsection 9.2.2 was revised to include reference to section 10.3 of this SAR.
c. Subsection 9.5.1 was revised to include reference to sections 18.5, 18.11, 18.12 and 18.14 of this SAR.

Obs 9-6: Describe the receipt inspection leakage rate testing of each canister to the leaktight acceptance criteria in accordance with ANSI N14.5-2014, "American National Standard for Radioactive Materials – Leakage Tests on Packages for Shipment," in Section 9.6, "Summary," of the HI-STORE SAR.

While Section 9.6 of the HI-STORE SAR states the confinement of all radioactive materials is provided by seal-welded canisters, loaded and closed under their original certification, it should also summarize that as part of the receipt inspection each canister is leak tested to the leaktight criteria in accordance with ANSI N14.5-2014 because the leakage rate testing, in part, demonstrates confinement integrity. Chapter 19 of the HI-STORE SAR references ANSI N14.5-2014, Paragraph 10.3.3.1, "Receipt and Inspection of Transportation Cask and Canister," which describes leakage rate testing of each canister, and Section 16.6 of Chapter 16, "Technical Specifications," which describes leakage rate testing to the ANSI N14.5-2014 leaktight criteria.

This information is needed to determine compliance with 10 CFR 72.24(g), 10 CFR72.44(c)(3)(ii), and 72.128(a)(1).

Holtec Response:
Section 9.6 was revised to include a statement that each canister is leakage rate tested to the leaktight criteria in accordance with Section 10.3 of the SAR.

Obs 9-7: Provide additional details in Paragraph 10.3.3.1, "Receipt and Inspection of Transportation Cask and Canister," of the HI-STORE SAR to describe the leakage rate testing.

In addition, the leakage rate testing should be described and referenced in the Technical Specifications. Details that should be included in Paragraph 10.3.3.1 may include:

- Leakage rate acceptance criterion and sensitivity for each canister (see American National Standards Institute (ANSI) N14.5-2014),
- The type of leakage rate test performed from ANSI N14.5 (e.g., reference the specific section from ANSI N14.5, Appendix A, "Leakage Test Methods and Procedures"),
- A description of the leakage rate testing procedures including instrumentation (e.g. a helium mass spectrometer) used,
- A statement that the leakage rate testing written procedures are developed and approved by personnel certified by the American Society of Nondestructive Testing (ASNT) as a Level III examiner for leakage testing,
- The expected amount of time and any time limit to complete the leakage rate testing of each canister,
- A description of how it is ensured the helium in the HI-STAR annulus space is adequately flushed with nitrogen,
- A description of actions that will be taken if a leakage rate test does not meet the acceptance criterion.

Leakage rate testing should be completely described, and referenced in the Technical Specifications, and tied to Chapter 10, "Conduct of Operations Evaluation," of the HI-STORE SAR to, in part, demonstrate confinement integrity.

This information is needed to determine compliance with 10CFR72.24(g), 72.44(c)(3)(ii), and 72.128(a)(1).

Holtec Response:
Steps 11 and 12 of Section 10.3.3.1 are revised as shown below to provide additional details of the canister leak testing procedure. Table 10.3.2 is also added, as referenced in Step 12:

11. The sampling equipment is removed, and the HI-STAR annulus space is evacuated and flushed with nitrogen using the sampling equipment connector. This process may be repeated several times, as determined by process experience and required by the approved test procedure, to ensure residual helium is flushed from the annulus space. Refer to Table 10.3.4 for process pressure limits.
12. The mass spectrometer leak test apparatus is attached to the sampling equipment connector and a leak test of the MPC is performed. Leakage rate testing is performed per procedures written and approved in accordance with the requirements of ANSI N14.5-2014 [10.3.3]. All testing is performed by qualified personnel in accordance with the Holtec QA program. The written and approved test procedures shall clearly define the test equipment arrangement. Leakage rate testing procedures shall be approved by an ASNT Level III specialist. The applicable recommended guidelines of SNT-TC-1A [10.3.2] shall be considered as minimum requirements. Canister leakage

test specifications are listed in Table 10.3.2. If a canister leak is detected, the canister transfer operations are terminated and site management is informed for disposition.

And Table 10.3.2 is added as follows:

Table 10.3.2 Canister Leakage Test Performance Specifications	
Reference Air Leakage Rate (L_R) Acceptance Criterion	2x10^{-7} ref-cm^3/s air (Leaktight as defined by ANSI N14.5-2014[10.3.3], using helium as tracer gas)
Leakage Rate Test Sensitivity	1x10^{-7} ref-cm^3/s air (½ of the leakage rate acceptance criterion per ANSI N14.5-2014 [10.3.3], using helium as tracer gas)
Type of Leakage Rate Test	A.5.4, per ANSI N14.5 [10.3.3], App. A
Instrument used	Helium mass spectrometer

Obs 9-8: Clarify or correct the following sentences in the HI-STORE SAR:

a. In Table 9.0.1, "Material Incorporated by Reference in this Chapter," of the HI-STORE SAR, "Further, the HI-STORM UMAX storage system used for storage if the canisters are principally the same as that in the HI-STORM UMAX FSAR."
b. In Section 9.1, "ACCEPTANCE CRITERIA," of the HI-STORE SAR, "The acceptance criteria for confinement evaluations for are presented in Chapter 4 of this SAR."
c. In Table 9.2.1, "Storage Systems," of the HI-STORE SAR, "All normal, off-normal and accident conditions relevant to confinement integrity for which the canister is certified in the HI-STORM UMAX docket are equal to less severe at the HI-STORE facility."
d. In Subsection 9.2.2, "Operational Activities," of the HI-STORE SAR, change "its" to "it is."
e. In Section 14.3, "LIQUID WASTE TREATMENT AND RETENTION," of the HI-STORE SAR, "Therefore leakage of radioactive material from the canisters is or non-credible."

These portions of the HI-STORE SAR above should be revised to ensure the meaning is clear.

This information is needed to determine compliance with 10 CFR 72.11(a).

Holtec Response:
The above sentences were revised to correct typographical errors to ensure the meaning is clear.

Safety Analysis Report (SAR), Chapter 10, "Conduct of Operations Evaluation"

Obs 10-1: Provide specific staffing requirements and explicitly define responsibilities for personnel, such as Radiation Safety Officer, that are responsible for radiation safety at the HI-STORE CIS Facility.

Table 10.1.1 of the SAR provides a staffing plan for the operation of the HI-STORE CIS. However, this table does not include a requirements for designating Radiation Safety Officer(s) and their responsibilities. Regulatory Guide (RG) 8.2, "Administrative Practices in Radiation Survey and Monitoring," describes methods that NRC staff considers acceptable for complying with regulations regarding radiation safety and protection, as prescribed in 10 CFR 20.2011, 20.1502, 20.2102, and 20.2103. The regulatory position for complying with these regulations includes establishing a Radiation Safety Officer (RSO). RG 8.2 further specifies the required training and qualification for the RSO. The applicant should provide specific staffing requirements and explicitly defined responsibilities for personnel, such as the RSO, who are responsible for radiation safety.

This information is necessary to determine compliance with 10 CFR 20.2011, 20.1502, 20.2102, and 20.2103.

Holtec Response:
The position of Site Radiation Protection Manager has been more fully described in Section 10.1.2 and minimum qualifications are added to Table 10.1.1. The Site Radiation Protection Manager will have overall responsibility for maintaining site operations in compliance with the site radiation protection program.

Safety Analysis Report (SAR), Chapter 10, "Conduct of Operations Evaluation"

RSI 11-1: Provide a Radiation Protection Program for the HI-STORE CIS facility that satisfies the requirements of 10 CFR Part 20.

NRC regulations in 10 CFR 20.1101(a) state that: "[e]ach licensee shall develop, document, and implement a radiation protection program commensurate with the scope and extent of licensed activities and sufficient to ensure compliance with the provisions of this part." However, the HI-STORE SAR does not include a description of the program that implements the Part 20 requirements for the HI-STORE CIS site. The SAR does not provide detailed specifications for organizational responsibilities, requirements for radiation survey equipment, nor does it identify qualifications for the personnel responsible for radiation protection. Further, the SAR does not include specific requirements for operator training and qualification, Radiation Work Permit administration, and dose monitoring and record management. Although the applicant discusses in various parts of the SAR its intention to follow as low as is reasonably achievable (ALARA) principles in operating the proposed HI-STORE CIS for storage of commercial spent nuclear fuel and the associated greater than Class C (GTCC) wastes in sealed metal spent fuel canisters for a period of 40 years, these statements do not constitute a Radiation Protection Program as required by the regulations.

This information is needed to determine compliance with 10 CFR 20.1101(a).

Holtec Response:
Section 11.4 is titled "Radiation Protection Program", which explains the structure of the radiation protection program. Chapter 10 contains the site organizational structure and is revised to include organizational responsibilities and training and qualification requirements for the Radiation Protection Manager and Radiation Protection Technicians. Table 10.1.1 is updated with the necessary qualifications of the Radiation Protection Manager (RPM) referred to in Reg. Guide 8.8 Rev. 3 which is synonymous with Radiation Safety Officer (RSO). Figure 10.4.2 is updated to show the organizational responsibilities of the RPM and Radiation Protection Technicians. Section 10.4.2 also contains the training and qualification requirements for the operators.

Examples of the radiation survey equipment to be used at the site are listed in Section 11.4.2. Information on Radiation Work Permit administration, dose monitoring, and record management are contained in Section 11.4 and more detailed information will be present in site specific procedures. These procedures ensure that occupational doses are below the limits required by 10 CFR 20.1201.

Obs 11-1: Provide a description of the radiation protection design features that account for the site-specific design and operational features of the HI-STORE CIS.

In Table 11.0.1, Item 2, the applicant states that, "[t]he HI-STORM UMAX radiation protection design features are the same as described in the HI-STORM UMAX FSAR and therefore the conclusions established therein that the radiation protection features ensure that the occupational dose as well as off-site dose from the ISFSI will be ALARA, remain unchanged in this SAR." However, the applicant does not provide a discussion or demonstration of how the generic radiation protection design features from the HI-STORM UMAX FSAR remain applicable to the site-specific design and operation characteristics of the HI-STORE CIS facility. The applicant should discuss how the radiation protection features of the HI-STORM UMAX FSAR considers for the site-specific dose rates in the areas that workers are expected to occupy and the duration of each operation.

This information is necessary to determine compliance with 10 CFR 72.24(e), 72.104, 72.126(a)(6), 72.126(d), and 10 CFR 20.1201, 20.1206, 20.1301, 20.1302, and 20.1406.

Holtec Response:
While Table 11.0.1 incorporates by reference general HI-STORM UMAX design and operational features, additional site-specific information is also provided in Section 11.2 “Radiation Protection Design Features”, in Subsection 11.1.2 “Design Considerations”, and in Subsection 11.1.3 “Operational Considerations”. Some examples of the radiation protection design features specific to the HI-STORE CIS site described in Subsection 11.1.2 are as follows. The site layout minimizes dose to workers residing in the security building and cask transfer building by positioning them a substantial distance from the ISFSI. Crew dose is minimized by designing adequate spacing between VVMs to permit workers to function efficiently thereby minimizing the time spent in the vicinity of the storage casks. In addition, the VVM temperature monitoring system allows for remote readouts to eliminate the dose associated with daily walkdowns and reading instrumentation located in the vicinity of the VVMs. More details regarding the specific radiation protection design features of the HI-STORE CIS site are included in the above mentioned sections.

Estimated crew dose for loading operations is provided in Table 11.3.1. A column has been added to Table 11.3.1 to refer to specific Figure 3.1.1 operational steps.

Obs 11-2: Provide estimated annual doses to occupational workers from the operation of the HI-STORE CIS.

In Table 11.0.1, the SAR lists *Estimated On-Site Cumulative Dose Assessment – Excavation Activities and accident site boundary dose limits* and *Estimated Exposures for Surveillance and Maintenance,* which provided estimates for the dose received for these operations. In addition, the applicant references the dose estimates from the HI-STORM UMAX VVM ISFSI system design as the estimated dose for the HI-STORE CIS operations. However, the SAR does not evaluate or justify in sufficient detail how the dose estimates from the generic HI-STORM UMAX FSAR adequately consider the site-specific design features and operations for the HI-STORE CIS. The application should provide estimates or evaluations of the estimated dose that account for site-specific design features and operations at the HI-STORE CIS facility.

This information is necessary to determine compliance with 10 CFR 20.1101, 20.1301, 20.1302, 20.1501(a), and 10 CFR 72.24(e), 72.104, and 72.126(d).

Holtec Response:
We believe it is sufficient to provide crew dose for a single cask loading in Table 11.3.1 and confirm the HI-STORE CIS facility will comply with 10 CFR 20.1201. This cask loading process represented in that table does take into account the specific operations that occur at the HI-STORE site, as shown in Figure 3.1.1. There will be a Radiation Protection Manager on-site whose job will be to ensure that occupational dose to a single worker does not exceed dose limits in 10CFR20.1201 or a lower site-specific administrative dose limit.

Safety Analysis Report (SAR), Chapter 17, "Material Considerations"

RSI 17-1: Supplement Chapter 17 of the SAR, "Materials Evaluation," to include the evaluation of the structures, systems, and components (SSCs) unique to the HI-STORE CIS (i.e., those SCCs not associated with the referenced UMAX and FW systems).

Chapter 17 of the HI-STORE SAR provides a detailed discussion of the ventilated vertical module (VVM) and multi-purpose canister (MPC) materials, and references the HI-STORM FW and UMAX safety analysis reports for specific materials information. However, discussion of site-specific important-to-safety components unique to the HI-STORE facility (e.g., transfer cask, lift yokes, components in the cask transfer building) is either limited or not present. To allow the staff to evaluate the materials of these SSCs, provide details of mechanical properties of all materials used, exposure environments, degradation modes, welding specifications, presence of bolting, coatings, chemical/galvanic reactions, and examination and testing.
This information is necessary to demonstrate compliance with 10 CFR 72.24(d).

Holtec Response:
SAR Chapter 17 is revised to include the evaluation of all the other ITS SSCs unique to HI-STORE CIS. List of the other SSCs, material types, exposure environments, degradation modes and mechanisms are discussed in Section 17.1, Tables 17.1.3, 17.1.4 and 17.1.5. Section 17.4.1 is revised to state that the mechanical properties of all the SSCs are discussed in Section 5.4 of SAR Chapter 5. As the other SSCs employ similar materials as to those employed in HI-STORM UMAX modules, welding specifications and requirements stated in Section 17.5 hold valid for all the SSCs employed at HI-STORE CIS. Sections 17.6, 17.7 and 17.11 were also revised appropriately to include other SSCs into the discussion. Section 17.13 is revised to state that all the ITS SSCs are inspected per scheduled intervals (Table 18.6.1) for general corrosion and/or mechanical damage.

RSI 17-2: Provide an evaluation of materials aging degradation for the transport cask lift yoke, lift beam, and tilt frame.

Chapter 18 of the SAR and the Holtec aging assessment document (HI-2167378) describe the activities that address aging of important-to-safety SSCs. Table 18.1.1 lists important to safety (ITS) SCCs and identifies these as requiring aging management. However, the aging evaluations do not include components associated with handling of the transport cask. SAR Chapter 5 and the drawings identify the transport cask lift yoke, lift beam, and tilt frame as ITS.

This information is necessary to demonstrate compliance with 10 CFR 72.120(d) and 72.122(b)(1).

Holtec Response:
Table 18.1.1 of SAR Chapter 18 is revised to include transport cask lift yoke, lift beam and tilt frame in the list of SSCs requiring aging management. Quantitative analysis of long-term fatigue on transport cask lift yoke and lift beam is discussed in SAR Chapter 5. The tilt frame is not a lifting device and its structural analysis is summarized in SAR Chapter 5. Creep is not of concern with transport cask lift yoke, lift beam and tilt frame as they are not subjected to elevated stress and high temperatures. Likewise, erosion is not of concern due to the absence of high fluid velocity to cause noticeable material loss. General corrosion of painted carbon steel surfaces at the ISFSI (including transport cask lift yoke, lift beam and tilt frame) is dealt within the maintenance program. Spalling is not a concern with components made of steel. The concern of stress corrosion cracking (SCC) in SSCs is addressed in Section 18.4. Table 18.6.1 is

revised to include transport cask lift yoke, lift beam and tilt frame. Section 18.10 is revised to include transport cask lift yoke and lift beam to the lifting device AMP while the tilt frame will be monitored per Section 18.11 (Tilt Frame AMP).

Similarly, Holtec aging assessment document (HI-2167378) is revised accordingly. Section 2.2, Tables 2-1 and 2-7 are revised to include transport cask lift yoke, lift beam and tilt frame in the scoping evaluation results and intended functions. Sections 3.11, 3.12 and Table 3-6 are revised to address the aging management review results corresponding to transport cask lift yoke, lift beam and tilt frame. Section 3.14 is appended to include Tilt Frame AMP. Lifting device AMP is revised to include transport cask lift yoke and lift beam while the tilt frame aging management is discussed in Tilt Frame AMP.

RSI 17-3: Provide details on the maintenance programs for SSCs other than the VVM for Chapter 10, "Conduct of Operations Evaluation" of the HI-STORE SAR.

Section 3.1.4.7 of the SAR states that periodic maintenance is required on the overhead crane, service cranes, transfer equipment, HI-TRAC CS transfer cask, and transportation casks. This section refers to SAR Chapter 10 for full details. However, Chapter 10 includes full details of maintenance activities only for the VVM (SAR Table 10.3.2). The SAR should fully describe any maintenance programs for all ITS SSCs. The staff notes that, in some cases the SAR lists a maintenance task (e.g., visual inspection of HI-TRAC cavity), but the purpose of the inspection, what parameters will be inspected, and the acceptance criteria are not provided. The staff also notes that the SAR sometimes leaves details of maintenance and inspection activities to be determined on a site-specific basis. All such site-specific determinations should be provided for the HI-STORE site. For example, SAR Table 10.3.2, "Maintenance Activities for the HI-STORM UMAX VVM," states "[…] frequencies for additional in-service inspections are determined on a site-specific basis." Also, SAR Section 17.11 states that "…the storage cask or canister should be evaluated by the licensee on a site-specific basis to determine the frequency for such inspections […]"

This information is necessary to demonstrate compliance with 10 CFR 72.120(d) and 72.122(b)(1).

Holtec Response:
Sections 10.3.6, 10.3.7 and 10.3.8 (shown below) are added to Chapter 10 to specify testing and maintenance requirements for ITS SSCs. These three additional sections cover all ITS equipment, except for the VVM, HI-TRAC CS, ISFSI slab and CTF, which are addressed in the revised Table 10.3.1 described below.

10.3.6 Maintenance Programs for ITS Lifting and Handling Equipment
Maintenance, inspection and testing of lifting equipment designed to ANSI 14.6 [1.2.4] shall be per the requirements of ANSI 14.6. Equipment designed to the requirements of ASME Section III, Subsection NF [4.5.1] shall be functionally tested prior to initial use and visually inspected for any degradation or damage prior to each cask transfer.

10.3.7 Maintenance Programs for ITS Crane Systems
Maintenance, inspection and testing of crane systems designed to ASME NOG-1 [3.0.1] shall per the requirements of ASME NOG-1.

10.3.8 Maintenance Program for HI-STAR 190 Cask
The maintenance program for the HI-STAR 190 Cask shall be as specified in the HI-STAR 190 SAR [1.3.6].

To better describe the purpose, parameters and acceptance criteria for maintenance inspections, a PURPOSE column is included in the maintenance activity table. Tables 10.3.1 and 10.3.2 are consolidated into Table 10.3.1. Additional information is added, where required, for clarification. Also, any accidental references to 'site-specific' determinations are removed and additional information is provided where needed. To provide guidance on acceptance criteria for visual inspections, the third paragraph of Section 10.3.4.1 is revised as follows (addition shown in italics):

> In service inspection for long-term interior and below-grade degradation shall be performed by visual inspection of accessible areas of the HI-STORM UMAX VVM. The frequency of this visual in-service inspection should be performed in accordance with Table 10.3.1. *Acceptance criteria for visual inspections shall be based on confirmation that the components continue to meet the licensing basis design requirements.*

Obs 17-1: The canister aging management program (AMP) does not describe either (1) the extent of coverage for the stress corrosion cracking (SCC) inspection/monitoring activities or (2) a technical basis for the adequacy of these activities.

The canister AMP includes visual inspections of the canisters, but it does not define a minimum coverage area (or weld length) for this inspection. The AMP also includes coupon testing for stress corrosion cracking, but it does not define the number of VVMs that will include coupons or how the VVMs will be selected for this monitoring. These details are needed to allow the staff to evaluate the effectiveness of these activities. In addition, the SAR should provide a technical basis that considers site halide measurements, environmental conditions, available estimates on crack growth rates, and operating experience to demonstrate that the frequency, number, and extent (coverage) of inspections or monitoring will be capable of identifying SCC prior to a loss of function.

This information is required to demonstrate compliance with 10 CFR 72.120(d) and 72.122(b)(1).

Holtec Response:
Section 18.5.1 of SAR Chapter 18 is revised to state that all the accessible weld areas of the canister(s) will be covered for SCC inspection/monitoring activities. Section 18.5.2 is revised to state that the test coupons will be installed in VVMs that contain oldest and coldest canisters and the selection criteria for coupon installation in additional VVMs at HI-STORE site will be re-evaluated as and when additional canisters are installed.

As described in Section 18.4 and Chapter 2, the ambient environment at the HI-STORE site has minuscule amount of salts and other airborne particulates known to be injurious to stainless steel. The minuscule concentration of halides in the air starves the canister's surface of an essential ingredient for initiating SCC. To identify SCC in canisters at HI-STORE CIS prior to a loss of function, Holtec, as discussed in Section 18.5 and EPRI report [18.5.1], will develop a set of criteria and associated canister ranking values that may be used to assess welded MPCs at the site with regard to the relative priority for inspections and other aging management actions. The results of the canister ranking will be used in the canister inspection selection criteria and in the development of the learning based AMP/operating experience.

Obs 17-3: The HI-STORE CIS SAR does not discuss whether the fatigue evaluations originally required by the design code for the UMAX and FW systems remain valid for the proposed 40-year storage term.

The American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) includes requirements to evaluate the potential for fatigue (or whether such an evaluation is necessary). For example, ASME Code Section III, Division 1, NB-3222.4 considers the effects of both mechanical and thermal cycling on the MPC confinement boundary. The HI-STORE SAR should clearly state whether the ASME Code-required fatigue evaluations that were originally performed for the UMAX and FW designs (certified for 20 years) remain valid for 40 years of storage.

This information is necessary to demonstrate compliance with 10 CFR 72.24(d) and 72.122(b)(1).

Holtec Response:
The fatigue evaluations for the HI-STORM FW and HI-STORM UMAX Systems, which are found in Subsection 3.1.2.5 of their respective FSARs, remain valid for the proposed 40-year storage term at the HI-STORE CIS Facility. This is because the passive nature and the large thermal inertia of these storage systems protect the MPC enclosure vessel from significant stress cycling. In fact, the amplitude of the stress cycles is well below the endurance limit of the stainless steel MPC, which means that the MPC has infinite fatigue life under long-term storage conditions.

Moreover, as shown in Table 6.3.1 of the HI-STORE SAR, the maximum MPC heat loads and the ambient temperature conditions applicable to the HI-STORE CIS Facility are less demanding than the corresponding values for which the HI-STORM UMAX System is certified. This reduces stress amplitudes in the MPC at the HI-STORE CIS Facility and further enhances the fatigue life of the MPC.

Subsection 5.1.4 of the HI-STORE SAR has been updated to clearly state, based on the above, that the ASME Code required fatigue evaluations that were originally performed for the UMAX and FW systems remain valid for the HI-STORE CIS Facility.

HI-STORE CIS Environmental Report (ER)

RSI ER-1 (General): Provide a schedule of all proposed construction phases.

ER Section 1.3, "The Proposed Action," states that the proposed action is a request for a license to construct and operate a CIS facility in Lea County and that Phase I would be associated with construction of a facility to store up to 5,000 MTUs. The ER also discusses that: "[p]hases 2 - 20 would occur over approximately 20 years" and store up to 100,000 MTUs at full capacity. Although the application provides a break-out discussion of Phases 2 -20, it is not clear if the construction phases will occur sequentially or if several phases will be constructed simultaneously. Therefore, the impacts from Phases 2-20 are not defined as bounding based on the expected construction schedule for the additional phases.

This information is needed to determine compliance with 10 CFR 51.45(b)(1).

Holtec Response:
Section 1.3 has been modified to include data on construction phasing as described. ER Table 1.3 identifies approximate construction durations for all phases of the CIS Facility. As stated in Section 4.0 of the ER, Phase 1 accounts for the greatest amount of construction because all support facilities (e.g., Cask Transfer Building, Security Building, and Administration Building) and supporting infrastructure (e.g., railroad spur and Site access road) would be constructed during that phase. As such, Phase 1 provides a bounding estimate for any construction impacts for any subsequent phases of construction. The construction phases will be performed in sequence.

RSI ER-2 (General): Provide publically available replacement pages for pages 38 and 39 of the ER.

Pages 38 and 39 of the ER contain information that is defined as sensitive. Information in the ER should be publicly available, unless it meets the criteria for withholding under 10 CFR 2.390.

This information is needed to determine compliance with 10 CFR 51.120.

Holtec Response:
Revised figures have been included to resolve any concerns with sensitive information.

RSI ER-3 (Transportation): Provide a map of the proposed site that includes the proposed access road and railroad spur and also provide a discussion of environmental impacts due to their construction.

ER Section 3.9, "Affected Environment – Transportation," and Section 4.9, "Environmental Impacts – Transportation," discuss the proposed transportation at and near the proposed site. Section 4.9.1, "Construction," mentions that Phase 1 would require a new access road from U.S. Highway 62/180 and a new railroad spur from the existing Carlsbad railroad spur that ends 3.8 miles west of the site. Figure 2.2.1, "Areal View of CIS Facility" does not appear to display the proposed access road or railroad spur. Additionally, Section 4.9.1 does not specify the impacts of construction of the new access road and railroad spur, but points to other sections within Chapter 4, "Environmental Impacts," for impacts. The individual resource impact sections do not specify the environmental impacts of the access road or railroad spur construction.

This information is needed to determine compliance with 10 CFR 51.45(b)(1).

Holtec Response:
Section 2.2.2 of the ER describes the Proposed Action to construct the CIS Facility and includes a description of the access road and rail spur that would be constructed during Phase I. As discussed in Section 4.0 of the ER, for the Proposed Action, the analysis addresses the potential impacts associated with construction, operations, and decontamination and decommissioning (D&D). Construction impacts are presented for Phase 1, which accounts for the greatest amount of construction because all support facilities (e.g., Cask Transfer Building, Security Building, and Administration Building) and supporting infrastructure (e.g., railroad spur and Site access road). The analysis in Sections 4.1 through 4.13 accounts for the construction impacts associated with the access road and railroad spur. For example, Section 4.1.1 accounts for the potential land use impacts of the access road and railroad spur as follows:

> Accounting for the Protected Area (i.e., the area within the security fence containing the ISFSI Pads and the Cask Transfer Building), Phase 1 construction would disturb approximately 119.4 acres. Of this disturbance, 6.2 acres would be associated with constructing the Site access road and relocating the existing road that currently runs through the site; 39.4 acres would be associated with constructing the railroad spur (emphasis added).

Similarly, the potential impacts to other resources, such as air quality and cultural resources and health and safety, include an analysis of the impacts of construction and operation of the access road and railroad spur, as they are defined as part of the Proposed Action.

A revised Figure 2.2.1 has been included.

RSI ER-4 (Meteorology): Provide monthly and annual wind roses and wind direction persistence summaries for all heights at which data is applicable.

ER Section 3.6, “Affected Environment – Climatology, Meteorology, Air Quality and Noise,” and Section 4.6, “Environmental Impacts - Climatology, Meteorology, Air Quality and Noise,” discuss the meteorology and air quality. Table 3.6.2, “Lea County Regional Airport Station All Wind Data,” provides wind speed and direction data but a measurement height is not specified. Figure 3.6.2, “Lea County Regional Airport Station All Wind Rose,” provides wind rose data compiled from 1948-2014, but not annual data.

This information is needed to determine compliance with 10 CFR 51.45(b)(1).

Holtec Response:
Available wind rose data was compiled and is presented in Appendix F of the ER (MRCC 2017). The meteorological tower wind data height was 10 meters (m).

Reference:

MRCC 2017 Midwestern Regional Climate Center Hobbs, Lea County Airport data. Available at: http://mrcc.isws.illinois.edu/CLIMATE/stnhourly3.jsp. Accessed July 17, 2017.

RSI ER-5 (Meteorology): Provide description of meteorological dispersion characteristics and topography of the site and its surrounding area.

ER Section 3.6.2, "Lea County Regional Airport Station All Wind Rose," describes the air quality of the region but does not discuss dispersion. Average mixing height is provided in Table 3.6.3, "Average Morning and Average Afternoon Mixing Heights," but stability class for the site vicinity is not provided in the ER. The topographic information for the site in the SAR or the ER is not adequate for dispersion analysis.

This information is needed to assess radiological impacts and non-radiological impacts from the proposed action and to determine compliance with 10 CFR 51.45(b)(1).

Holtec Response:
Using the following information ER Section 3.6.2 was revised to provide further data.

DISPERSION: For normal and off-normal conditions, an atmospheric dispersion coefficient is calculated using D-stability and a wind speed of 5m/sec and a 100m distance to the controlled area boundary. The controlled area boundary is more than 100m from the site so use of 100m is conservative. For accident conditions, a dispersion coefficient is calculated using F-stability and a wind speed of 1 m/sec. These atmospheric conditions are consistent with the guidance of NUREG-1536 (NRC 2010) and NUREG-1567 (NRC 2000). The smallest vertical plane cross-sectional area of one horizontal underground storage module (VVM) is conservatively used as the vertical plane cross-sectional area of the underground storage module (VVM): area = VVM Width X VVM Height; thus: 2.95m X 0.38m = 13.47m2 .

The atmospheric dispersion coefficients can be determined through selective use of Equations 1, 2, and 3 of Regulatory Guide 1.145 (NRC 1981) for ground-level relative concentrations at the plume centerline. For D-stability, 5 m/sec wind speed and a distance of 100m, the horizontal dispersion coefficient, σ_y, is 8m per Figure 1 of (NRC 1981). The vertical dispersion coefficient, σ_z, is 4.6m per Figure 2 of (NRC 1981). The correction factor at these conditions is determined to be 1.122 per Figure 3 of (NRC 1981).

For F-stability, 1 m/sec wind speed and a distance of 100m, the horizontal dispersion coefficient, σ_y, is 4m per Figure 1 of (NRC 1981). The vertical dispersion coefficient, σ_z, is 2.3m per Figure 2 of (NRC 1981). The correction factor at these conditions is 4 per Figure 3 of (NRC 1981).

With the three values of χ/Q determined, the higher χ/Q value of the first two (Equation 1 and Equation 2) is compared with the last one (Equation 3) and the lower of those two is evaluated as the appropriate atmospheric dispersion coefficient per in Regulatory Guide 1.145 (NRC 1981). The parameters used and the calculated atmospheric dispersion coefficients are summarized in Table 3.6.8.

STABILITY CLASS: Stability classes can be used to assess dispersion of materials released into the atmosphere. Dispersion of materials is affected by the stability class of the atmosphere. The Pasquill-Gifford stability categories (Table 3.6.9) are used to determine stability. Distributions of wind speed and direction, the amount of incoming solar radiation, and other factors are sued to determine the stability of the atmosphere. Pasquill-Gifford have defined atmospheric stability classes, each representing a different degree of turbulence in the atmosphere. When moderate to strong incoming solar radiation heats air near the ground, causing it to rise and generate large eddies, the atmosphere is considered unstable, or relatively turbulent. Unstable conditions are associated with atmospheric stability classes A and B. When solar radiation is relatively weak or absent, air near the surface has a reduced tendency to rise, and less turbulence develops. In this case, the atmosphere is considered stable, or less turbulent, and the stability class would be E or F. Stability classes D and C represent conditions of more neutral stability, or moderate turbulence. Neutral conditions are associated with relatively strong wind speeds and moderate solar radiation. Atmospheric stability classes are listed in ER Table 3.6.9 (UTED 2017).

Five years of data from the Hobbs, New Mexico area were used to determine the overall stability class of the area. Distributions of wind speed and direction, the amount of incoming solar radiation, and other factors are sued to determine the stability of the atmosphere. As shown in the summary in ER Table 3.6.10, stability class D is the prevalent stability class for the area.

References:

NRC 2010 Nuclear Regulatory Commission (NRC). NUREG-1536. Standard Review Plan for Spend Fuel Dry Storage Systems at a General License Facility. July 2010.

NRC 2000 Nuclear Regulatory Commission (NRC). NUREG-1567. Standard Review Plan for Spend Fuel Dry Storage Facilities. March 2000.

NRC 1981 Nuclear Regulatory Commission (NRC). NUREG / CR-2260. Technical Basis for Regulatory Guide 1.145, "Atmospheric Dispersion Models for Potential Accident Consequence Assessments at Nuclear Power Plants". October 1981.

UTED 2017 University of Toledo Atmospheric Stability Classification. Available at: http://www.eng.utoledo.edu/aprg/courses/iap/text/met/9_atmos_classify.html. Accessed July 17, 2017.

RSI ER-6 (Ecological Resources): Provide specific information identifying the area investigated during the 2016 ecological survey.

In ER Section 3.4, "Affected Environment – Ecology," and Section 4.4, "Environmental Impacts-Ecology," the description of ecological resources relies on information from an ecological study conducted in 2007 for the Eddy-Lea Energy Alliance (ELEA 2007) Global Nuclear Energy Project (see Observation ER-1, below). It is not clear if the in-field ecological survey completed in 2016 was performed for the entire project area. Section 3.4 of the ER states that the study in Appendix B only focuses on areas proposed for Phase 1 facilities, the rail spur, and the site access road.

This information is needed to determine compliance with 10 CFR 51.45(b)(1).

Holtec Response:
Section 3.4 was updated to include additional data about the ecological survey. The update includes information from the following. The ecological survey was conducted across the approximately 330-acre footprint that could be disturbed by the proposed CIS Facility (all phases), including the access road and railroad spur. Consequently, all areas that could be disturbed by the Project were surveyed. The 2016 ecological survey findings were consistent with the 2007 ecological survey, which surveyed the entire 1,040 acre parcel. Because there was nothing remarkable about the comparison of results, there was no need to survey a greater area, as the combined results of the 2007 and 2016 ecological surveys adequately characterize the ecological environment of the Site.

RSI ER-7 (Public and Occupational Health): Provide additional information describing the radiological characteristics for the site and its surroundings.

ER Section 3.12, "Recent Ecological Survey," does not provide an in-depth description of the radiological environment. It does not provide a description of major sources and levels of background radiation exposure, including natural and man-made sources; current sources and levels of exposure to radioactive materials; major sources and levels of chemical exposure, if any; or any applicable historical exposures to radioactive materials.

This information is needed to assess radiological impacts and to determine compliance with 10 CFR 51.45(b)(1).

Holtec Response:
Using the following information updates were made to ER Section 3.12.1. Table 3.12.1 provides a baseline for background exposure levels and is considered the best approximation of radiological conditions at the CIS Facility Site for the following reasons:

- The proposed CIS Facility Site has not been used previously for activities that involve radioactive materials, so there are no legacy activity issues.

- There will be no significant radiological doses from nuclear facilities in the vicinity because the maximally exposed individual (MEI) exposures at those facilities are small (see Table 5.2.3) and those facilities are relatively far away (e.g., the nearest nuclear facility, WIPP, is approximately 16 miles away).

- DOE established radiological monitoring programs in southeastern New Mexico prior to the WIPP project to determine the widespread impacts of nuclear testing at the Nevada Test Site on the background radiation. DOE estimated an annual dose of approximately 65 millirem is received from atmospheric particulate matter, ambient radiation, soil, surface water and sediment, groundwater, and biota. These values fall within expected ranges and do not indicate any unexpected environmental concentrations [NRC 2012b, Section 3.14.1].

- A major proportion of natural radiation comes from naturally occurring airborne sources such as radon and thoron (an isotope of radon). The proposed site is in an area characterized by radon concentrations of 2 to 4 picocuries per liter (pCi/L) and is defined as of moderate radon potential. Moderate radon potential indicates that one-third to one-half of the structures have more than 4 pCi/L of indoor radon. In May 2004, direct background radiation was measured by the NMED Radiation Control Bureau to be 8 to 10 microrad per hour, which corresponds to 70 to 88 millirem per year. The measured range falls within the NRC's estimation of the average annual direct background radiation for the United States [NRC, 2012, Section 3.12.1].

Based on natural and manmade sources, residents living near the proposed facility could be expected to receive, on average, an annual dose of approximately 620 millirem. The Ecological Survey provides an in-depth description of the ecological conditions at the site and is not intended to provide a description of the radiological conditions given that the site has never hosted any nuclear activities.

References:

NRC 2014 Nuclear Regulatory Commission (NRC). *Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel*. NUREG 2157. Available at: http://www.nrc.gov/reading-rm/doccollections/nuregs/staff/sr2157/. September 2014.

RSI ER-8 (Waste Management): Provide a description of the waste sources, types, quantities, storage location (if any), composition of solid, liquid, hazardous, radioactive, and mixed wastes expected for each phase of construction.

ER Section 3.11, "Affected Environment – Waste Management," and Section 4.11, "Environmental Impacts – Waste Management," of the ER do not provide description of the waste sources, types, quantities, storage location (if any), composition of solid, liquid, hazardous, radioactive, and mixed wastes expected for each phase.

This information is needed to determine compliance with 10 CFR 51.45(b)(1).

Holtec Response:
Section 4.11 has been updated with additional description of the waste quantities that are estimated to be produced during different phases of construction.

RSI ER-9 (Alternative Siting Process): Provide a discussion regarding the environmental impacts of the alternatives. Provide the referenced Appendices in ELEA 2007 (including the siting criteria, see RSI 2-1) or provide a location where this information is publicly available.

In ER Chapter 2.3, "Site Selection Process," the site selection process references ELEA 2007 Appendix 2C. This appendix is not readily available and the details of the impacts from alternate sites are not discussed in detail in the application.

This information is needed to determine compliance with 10CFR51.45(b)(3) and 51.70.

Holtec Response:
Additional discussion has been included in ER Section 1.2. As discussed in RSI 2-1 a full copy of the GNEP siting study has been provided with all appendices included.

Obs ER-1 (General): Provide information for each resource area confirming that the data conclusions in the 2007 ELEA reference is still valid or update the information for the period between 2007 and 2017.

In ER Chapter 3, "Affected Environment," several of the resource sections rely on data from the ELEA 2007 reference. The ER does not provide verification that the data from this reference, which supports the characterization of the current conditions, is up to date and still applicable. For some resource areas, characteristics may have changed or additional information may be available since the ELEA 2007 reference was completed.

This information is needed to determine compliance with 10 CFR 51.45(b).

Holtec Response:
The analyses in the ER were prepared based on the most relevant and most current data sources available. In general, data sources supporting the ER analyses are less than four years old. In cases where older data sources are used, those sources were considered to be the best available. Chapter 3 accurately reflects the current conditions at the site and the surroundings and provides a reasonable basis for estimating the potential environmental impacts of the Proposed Action and the No Action Alternative. Appendix A of the ER was prepared specifically to provide justifications and discussions for any data sources more than four years old.

Obs ER-2 (General): Provide a site map that includes topography and site features.

There is no overall site map showing topography and site features.

This information is needed for all resource areas and to determine compliance with 10 CFR 51.45(b).

Holtec Response:
ER Figures 3.4.1, 3.4.2, and 3.4.3 have been added.

Obs ER-3 (Mitigation): Provide a description of mitigation activities that effects the environmental impacts for each resource area.

Mitigation activities should be clearly stated in ER Chapter 6, "Mitigation Measures." The mitigation activities that are committed to by the applicant and are being accounted for in the impacts should be clearly defined and separated from those mitigation activities that are voluntary.

This information is needed to determine compliance with 10 CFR 51.45(c).

Holtec Response:
Additional clarifications have been added to ER Section 6 to clearly delineate the voluntary mitigation activities.