Appendix J
Physical Resources

APPENDIX J PHYSICAL RESOURCES

The Tularosa Basin is a massive, 30 by 60 mile, graven valley between the San Andres Mountains (up to 8,965 feet MSL) on the west and the Sacramento Mountains (up to 9,695 feet MSL) on the east. The majority of the basin floor is between 3,900 feet and 4,100 feet MSL. It is filled with very deep alluvial deposits primarily derived from weathered limestones of the surrounding mountains. This fill has high levels of calcium and lesser levels of sulfur that have combined and absorbed water to produce 250 square miles of gypsum (hydrous calcium sulfate) flats and dunes.

Typical of areas with low precipitation, basin soils have little horizon development, high pH, and are susceptible to wind and water erosion. The soil temperature regime is thermic, having a mean annual temperature between 59 degrees Fahrenheit (°F) and 72°F; the soil moisture regime is aridic (dry) (SCS 1980).

Within the project area (see Figure 1.1-1), the predominant soil map unit is Holloman-Gypsum land-Yesum complex. This complex is composed of soils that are shallow, intermingled with deep, well-drained soils and areas of exposed gypsum, all underlain by a soft bedrock of completely calcified soils (caliche). In general, soil permeability is moderate, the available water-holding capacity is low, and the soils are very susceptible to wind erosion where the surface is bare. Because vegetation is not productive on these soils, blowing dust from bare soil is common. These soils provide poor quality roadfill material and have moderate to severe limitations for construction of buildings due to low soil strength and the shallow depth to bedrock, although the rock is soft enough to be rippable. For these sites, there is a high risk of corrosion of buried, uncoated steel, and concrete (SCS 1981).

Ground Water. The terrain at Holloman AFB is nearly level, with only a very slight overall slope to the southwest by sheet wash channels and arroyos that typically carry flow only after summer thunder storms. The base is crossed by several arroyos that flow intermittently, primarily with storm water runoff. This storm runoff generally sinks into the permeable soils before the water reaches the intermittent lakes (playas) on the west and southwest sides of the base. These runoff events recharge ground water that typically is less than 20 feet below the surface of Holloman AFB.

Holloman AFB relies on off-base sources of groundwater and mountain surface water to provide potable water to base personnel. Groundwater is obtained from five wellfields: the Boles, Escondido, San Andreas, Frenchy, and Douglas wellfields. The surface water is carried in 90 miles of pipline, from Bonito Lake in the White Mountains north of Ruidoso to Holloman AFB. A total of 15 groundwater wells draw water from the Bolson Aquifer located in the Tularosa Basin and are the primary source of potable water year-round (Holloman AFB 2003). There are two ground level storage tanks with a total storage capacity of 0.9 million gallons (MG) associated with the well fields. These two tanks feed the Boles Field Pumping Station.

The primary aquifer is increasingly saline with distance into the basin, variably saline with depth below surface, and classified non-potable. The only source of potable groundwater is perched plumes below the mouths of mountain canyons and the near-to-mountain margins of the major basin aquifer. Despite these quality problems, Tularosa Basin water has been extensively developed to provide water for drinking and irrigation (NMWQCC 2002). Because

of the water quality problems, the US Bureau of Reclamation has established a National Desalination Experiment Station in the Tularosa Basin near Holloman AFB.

Surface Water. Holloman AFB is located on the east side of the Tularosa Basin and on the west foot slope of the Sacramento Mountains escarpment. The Tularosa Basin is a closed basin, fed by ephemeral drainages. The Base is crossed by several arroyos that flow intermittently, primarily with storm water runoff. These arroyos include Lost River, Dillard Draw, Malone Draw, and several smaller tributaries. The arroyos generally drain in the southwest direction. Lost River is supplied by surface water flows, seeps, and springs (Holloman AFB 2001). Flows in many of the surface water drainages sink into the permeable soils before water reaches their outlets.

Surface water from Bonito Lake and springs in Fresnal Canyon and La Luz Canyon is transported through the pipelines to reservoirs at the city of Alamogordo's La Luz water treatment plant. At the La Luz plant, the water is filtered and chlorinated, and potable water for use by Holloman AFB is pumped through the city and Prather water lines to the Boles Field Pumping Station. Potable water is fed to the base from the Boles Field Pumping Station through two separate pipelines for storage, chlorination, and distribution within the base system. Average daily water demand is approximately 2.1 MGD with 8 percent (0.168 MGD) used by the golf course for irrigation (49 FW 2004).

Potable water storage on-base is provided by three tanks (Eagle Tower with 0.3 MG; Challenger Tank with 0.4 MG; North Area Tower with 0.25 MG) having a total capacity of 0.95 MG.

Stormwater, typically generated in the arid climate of New Mexico during the months of June through October, is conveyed through drainage channels, underground piping (storm sewer), and, in a few areas, by sheet flow on Holloman AFB. Base topography slopes slightly to the south-southwest and, correspondingly, storm water flows in a southerly direction across the base. Pollutants in storm water discharges from specified industrial areas are managed in compliance with NPDES requirements under a program administered by the USEPA to address industrial activities. Holloman AFB has an approved Stormwater Pollution Prevention Plan (SWPPP) that meets the requirements of the base-wide NPDES Multi-Sector General Permit for Industrial Activities (Holloman AFB 2001). Fourteen drainage areas, synonymous with outfall tributary areas or outfall areas, have been delineated for the areas of the base containing industrial activities. Eleven of these drainage areas have been identified as contributing to distinct discharges from the Holloman AFB to Waters of the U.S. (e.g., wetlands and flowing, and intermittently flowing, rivers, creeks, or streams). Two of the remaining drainage areas discharge to depressions in the ground (located on base) where storm water evaporates or percolates into the ground. A fourteenth drainage area drains mainly by sheet flow towards Waters of the U.S. (Holloman AFB 2001).

Waters of the U.S. that receive discharges from the identified drainage areas include Lake Holloman, Dillard Draw, Lost River, Ritas Draw, and three unnamed wetlands. Land development/construction sites disturbing one acre or more require an NPDES Stormwater General Permit for Small Construction. Each site must be covered by a site-specific SWPPP that addresses BMPs to reduce introduction of sediment and pollutant into the storm water.

Small construction activity that disturbs an area of one acre or larger must comply with the USEPA Phase II Stormwater General Permit for Small Construction. Compliance with the permit is intended to improve or maintain water quality by minimizing pollutants in storm

water runoff that is discharged into the drainage system. It requires issuance of a Notice of Intent, development and implementation of a site-specific SWPPP and an erosion and sediment control plan, and maintenance of control measures. The SWPPP and erosion and sediment control plan includes temporary and permanent stabilization of disturbed areas and the installation and maintenance of BMPs. The Stormwater General Permit for Small Construction requirement may be waived during periods of low rainfall (generally September through June at Holloman AFB) by calculating the Rainfall Erosivity Factor to determine whether the potential for polluted discharge is low enough to justify a waiver (USEPA 2001).

During development of the SWPPP, site evaluations of facilities were conducted to ensure that materials handling and pollution prevention procedures are adequate to ensure that there will be no contamination of surface water or groundwater due to activities on the base. BMPs are described in the SWPPP to provide guidance to minimize adverse effects on water quality. Annual monitoring and assessment of potential storm water pollution sources is required under the Stormwater General Permit for Small Construction.

Floodplains/Wetlands. Typically, issues relevant to water resources include the quality and quantity of downstream water bodies that could be affected and hazards associated with 100-year floodplains delineated in accordance with EO 11988, *Floodplain Management.* There are no designated 100-year floodplains in the area to be affected by the projects described in this EA. Any potential modifications to wetlands are addressed in accordance with EO 11990, *Protection of Wetlands*, which regulates development activities in or near streams.

There are approximately 780 acres of delineated wetlands on Holloman AFB. While there are no perennial streams on Holloman AFB, there are Waters of the U.S. that receive storm water discharges from the base including Lake Holloman, Dillard Draw, Ritas Draw, and Lost River (Holloman AFB 2001). Ritas Draw flows into Lost River, which sinks into the sand dunes of White Sands National Monument. Flows that reach Dillard Draw and Lake Holloman either infiltrate the soil or evaporate.

The existing airspace covers three Major Land Resource Areas as defined by the NRCS; the characteristics of each are discussed in Table J-1.

Table J-1. Major Land Resource Areas covered by proposed airspace (Page 1 of 2)

Major Land Resource Area	*% of ROI*	*Brief Description of Characteristics*
42: Southern Desertic Basins, Plains, and Mountains	46	About 1/3 federally owned (mainly in New Mexico), with most of the rangeland at low carrying capacity. Mean seal level elevations range from 2,625 feet (800 meters) to 8,530 feet (2,600 m) in the mountains. Broad desert basins and valleys are bordered by gently sloping to strongly sloping fans and terraces. Average annual precipitation ranges from approximately 8 inches (200 millimeters) to 13 inches (325 millimeters), most occurring from midspring to midautumn. With scarce surface water and low precipitation, the Rio Grande, Pecos River, and a few larger tributaries are the only perennial streams. Groundwater in deep valley fill provides most water for domestic, municipal, and livestock use. Most soils are well drained and medium textured, formed mainly in locally transported sediments on the smoothly sloping sites. Shallow soils occur on steep and broken hill slopes. This area supports desert grass-shrub vegetation with variations of plant communities, depending on landscape position, soils, and topography. Major physiographic features of the ROI in this MLRA include Jordana del Muerto, the Tularosa Basin with its lava flow, Gypsum Flats and Dunes, and Chupadera Mesa.
70: Pecos-Canadian Plains and Valleys	40	Located in Colorado and New Mexico, mostly in farms, ranches, or other private holdings. Some of the northern and eastern slopes of the high mesas in the north are covered by forest vegetation, but the total forested area is small. Elevation ranges from 3,940 feet (1,200 meters) to almost 7,900 feet (2,400 meters), increasing gradually from southeast to northwest. Most of these dissected high plains are gently sloping to rolling, but bands of steep slopes and rough broken land border the stream valleys. Average annual precipitation ranges from approximately 12 inches (300 millimeters) to 16 inches (400 millimeters), fluctuating widely from year to year. Water is scarce throughout the area because of low and erratic precipitation and few perennial streams. Groundwater in deep sand and gravel in the north and from limestone in the south provides water for domestic and agricultural purposes, but is scarce in areas where shale and sandstone are near the surface. Most soils are well drained and moderately fine to moderately coarse textured with mixed mineralogy. Vegetation is predominantly short and mid-height grasses, dominated by blue grama, western wheatgrass, and lesser amounts of black grama, galleta, New Mexico feathergrass, and a variety of shrubs, half shrubs, and forbs in the southern part. Scattered juniper and piñon with an understory of sideoats grama, bottlebrush squirreltail, and western wheatgrass grow on shallow soils and in escarpments. Major physiographic features of the ROI in this MLRA include the East slopes of the Capitan, White, Sacramento Mountains and Guadalupe Mountains.

Table J-1. Major Land Resource Areas covered by proposed airspace (Page 2 of 2)

Major Land Resource Area	*% of ROI*	*Brief Description of Characteristics*
39: Arizona and New Mexico Mountains	14	Located in parts of Arizona, Colorado, New Mexico, and Utah. Mostly covered with timber and woodlands. Most of this area is very hilly and mountainous, with an upland plateau dissected by deep canyons. Elevations can range from 4,590 feet (1400 meters) to 12,470 feet (3800 meters). Average annual precipitation is higher than MLRA 42, increasing with elevation, with larger streams and tributaries maintaining perennial flow. Groundwater is limited and usually occurs at great depth. At lower elevations, soils overlie mostly sedimentary rocks and old alluvium. Vegetation at lower elevations grade to chaparral and grassland. Major physiographic features of the ROI in this MLRA include the highlands of the Organ, San Andres, Oscura, Capitan, White, Sacramento and Guadalupe Mountains

Source: NRCS 1998

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