ATTACHMENT 12

LANDFILL 5 FACILITY DESCRIPTION

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1.0 Site Description

The UTTR is located approximately 70 miles west of Salt Lake City, Utah, on the west side of the Great Salt Lake in Box Elder and Tooele Counties. The UTTR is a remote military range managed by Hill Air Force Base (AFB) and used primarily for practice bombing and gunnery for military aircraft, testing military munitions, and open burn/open detonation (OB/OD) treatment of explosives and military propellants.

Landfill 5 is located on the eastern side of the North Range of the UTTR, approximately 5.5 miles northeast of the Oasis Complex, the administrative headquarters for the UTTR. The landfill is adjacent to the west side of the Box Elder County Road that provides access to the UTTR and extends northward from Interstate 80 to Lakeside, Utah.

2.0 Environmental Setting

2.1 Geology

Landfill 5 is located within the Basin and Range physiographic province that extends from the Wasatch Mountains in the east; to the Sierra Nevada Mountains in the west; into parts of Arizona, Texas, and New Mexico in the south; and into Idaho and Oregon to the north. Basin and Range topography is characterized by linear, north-south trending normal fault-block mountain ranges and valleys. Landfill 5 is situated on the northern portion of the Lakeside Mountains.

The landfill was constructed into Paleo-Lake Bonneville fine-grained lacustrine sediments deposited approximately 15,000 years ago on top of alluvial fans coming off the western slope of the Lakeside Mountains. The southwestern shoreline of the Great Salt Lake is located approximately 6 miles to the northeast of Landfill 5. The Great Salt Lake is a closed basin without an outlet to the sea. The climate surrounding Landfill 5 is semiarid desert with low seasonal rainfall totals typical for the Basin and Range.

2.2 Hydrogeology

Groundwater beneath Landfill 5 is present in alluvial deposits consisting predominantly of silt, sand, and gravel. The depth to groundwater in the vicinity of Landfill 5 is approximately 384 feet bgs. Groundwater elevations indicate a slight hydraulic gradient of approximately 0.0012 foot per foot.

Due to the relatively flat hydraulic gradient and depth of wells, the depth to groundwater requires large inclination corrections for water level measurements. This results in considerable uncertainty in the understanding of groundwater flow direction beneath Landfill 5. Although groundwater investigations using aquifer age dating and colloidal borescope techniques completed in 2005 and 2006 (CH2M HILL, 2006) provided additional insight on possible groundwater flow directions in the area, a definitive answer was not gained. However, the aquifer age dating using radiocarbon isotope techniques indicated that groundwater in the area

is quite old (approximately 14,000 years), supporting the concept that little modern surface water infiltrates to groundwater near Landfill 5. The current hypothesis is that the groundwater below Landfill 5 flows toward Sedal Pass to the northeast.

2.3 Water Quality

Water quality in the monitoring wells near Landfill 5 is generally poor, with total dissolved solids (TDS) concentrations ranging from about 900 to 1,620 milligrams per liter (mg/L). The average TDS concentration from Monitoring Wells MW-E, MW-H, MW I, and MW-J1 from 1989 through 2008 is 1,093 mg/L. An aquifer with groundwater having TDS concentrations in this range would typically be classified as Class II by the Utah Division of Water Quality. Major ion chemistry was plotted on Piper diagrams, which indicate that the groundwater is sodium-chloride-bicarbonate-type water (CH2M HILL, 1988).

3.0 Construction and Disposal History

Detailed accounts of the operational history of Landfill 5 were presented in the Conceptual Model Report for Landfill 5, Utah Test and Training Range (CH2M HILL, 2004). Landfill 5 was used by Hill AFB between 1976 and 1983 for the disposal of a variety of hazardous wastes, including organic solvents, acids and oxidizers, alkali, cyanide and other salt wastes, heavy metals, and wastewater treatment sludge. Disposal was discontinued in 1983, and the landfill was closed in 1988. The closure was approved by UDEQ and is documented in the Hill Air Force Base UTTR Landfill No. 5 Closure/Post-Closure Plan (Closure Plan) (CH2M HILL, 1988).

Historical records for Landfill 5 and the disposal cell geometry are provided in the Closure Plan (CH2M HILL, 1988). As presented in Figure 1, the Closure Plan describes six separate, unlined cells with cell dimensions of approximately 90 feet by 150 feet. Existing landfill records do not identify any markers used to survey the coordinates of the landfill cells. As a result, the locations of the cells beneath the cap were poorly delineated before a geophysical survey was conducted in 2003. According to the Closure Plan, no bottom liners were installed because of the arid climate, soil conditions, and the containerization of liquid wastes. A silt and clay layer, 10 to 25 feet thick, was observed in four shallow boreholes drilled around the perimeter of the landfill, and field permeability tests indicated that soils below depths of 200 feet had relatively low permeability coefficients of generally less than 20 feet per year (2×105 centimeters per second [cm/sec]).

As-built drawings of Landfill 5 show each cell was excavated to a depth of 15 feet bgs and is composed of two layers of waste material. Each layer is specified as being the depth of a 55-gallon drum (about 3 feet). The two layers are separated by 3 feet of native soil. Drums containing similar wastes were given a designated code letter ranging from A to D and were buried together within each cell layer. Wastes with different code letters were separated vertically and horizontally by at least 3 feet of native fill. Once a cell reached capacity, an additional 5 feet of native soil were used as top cover. The waste codes included the following types of waste:

- A—Beryllium (P015), Cadmium Waste (D006) and Pesticides (D017)

- B—Alkali (D002), Cyanide (P030) and Compatible Salts (P030)
- C—Acids (D002) and Oxidizers (D002)
- D—Organic Solvents (F001–F010, F012 and F017)

The disposal locations of the waste types in each cell as presented in the Closure Plan for the upper and lower layers of the landfill are shown in Figures 2 and 3. In addition to the waste type codes A to D, Figures 2 and 3 also show the disposal location of industrial wastewater treatment plant (IWTP) sludge.

Approximately 12,800 tons of wastes were deposited at Landfill 5. Of this total, approximately 750 tons of wastes were containerized in 55-gallon drums. Containerized waste includes metal wastes, pesticides, acids, and VOCs. Based on review of the manifests, about 300 tons of drummed liquid VOCs were placed in the landfill.

The bulk of the non-containerized waste consists of industrial wastewater treatment plant sludge and sand-blast media. Based on laboratory analysis, the industrial wastewater treatment plant sludge was estimated to contain 62 to 83 percent moisture, which is typical of sludge derived from water treatment processes. Liquids associated with this type of sludge are typically bound in the sludge matrix and generally are not mobile.

Documentation for the filling of Landfill 5 from 1976 through December 1981 was found to be incomplete. Hazardous waste quantities and disposal locations within the landfill cells are documented, but chemical analyses of the IWTP sludge are not available. In addition, beginning with the filling of the upper level of Cell B-2 in December 1981, the location and composition of the hazardous waste is largely unknown until January 17, 1983. Records of unknown materials deposited in the upper level of Cell B-2 include the chemistry of the electroplating sludge and an unknown combustible liquid. In 1982 and 1983, 573 tons and 1,161 tons, respectively, of unknown waste were disposed of in an undisclosed section of Landfill 5. Between March 2 and September 29, 1982, an additional 131.9 cubic yards of Grade 4 jet propulsion fuel-impregnated foam was deposited in an undisclosed location at Landfill 5. Disposal activities at Landfill 5 were discontinued in 1983.

A low-permeability cap was constructed for Landfill 5 in 1990 and consists of a GCL overlain by 2 feet of native soil. The GCL is composed of two geotextiles encapsulating a thin layer of bentonite and has a permeability of 1×10^{9} cm/sec. The cap is inspected on a regular basis. On March 14, 1998, an inspection on the surface of the landfill cap revealed numerous thin mud cracks, erosion rills, and gullies created by repeated wetting and drying cycles.

During the summer of 1998, the soil cap was scarified and recompacted to repair the mud cracks, rills, and gullies. Scarification of the cap was limited to the upper 2 to 4 inches of the native soil cover to prevent disturbance of the geosynthetic liner. The repair entailed approximately 240,000 square feet of landfill cap and is documented in the Utah Test and Training Range Landfill Number 5 Survey and Cap Repair Report (CH2M HILL, 1998). Revegetation of the cap and installation of five permanent settlement markers was conducted in

Spring 1999 and documented in the Inclination Survey of Landfill 5 Monitoring Wells and Cap Maintenance Report (CH2M HILL, 1999).

In February 2008, a shallow depression was observed in the northeast quadrant of Landfill 5 cap. The depression was visually monitored for several months and no additional subsidence was observed. The depression was filled in October of 2008 and a survey marker was buried to allow for the measurement of any further subsidence that may be observed. Monthly inspections of the landfill cap have not indicated any further problems with cap integrity.

4.0 References

CH2M HILL, 1988. *Hill Air Force Base UTTR Landfill No. 5 Closure/Post-closure Plan*. Final. Hill AFB, Utah. June.

CH2M HILL, 1998. *Utah Test and Training Range Landfill Number 5 Survey and Cap Repair Report. Final*. Hill AFB, Utah.

CH2M HILL, 1999. *Inclination Survey of Landfill 5 Monitoring Wells and Cap Maintenance Report. Final*. Hill AFB, Utah.

CH2M HILL, 2004. *Conceptual Model Report for Landfill 5, Utah Test and Training Range. Hill AFB Annex*, Utah. October.

CH2MHill, 2006. *Colloidal Borescope, Aquifer Age Dating, and Environmental Tracer Results, Landfill 5 and Thermal Treatment Unit, Utah Test and Training Range*. Technical Memorandum, February 28, 2006.

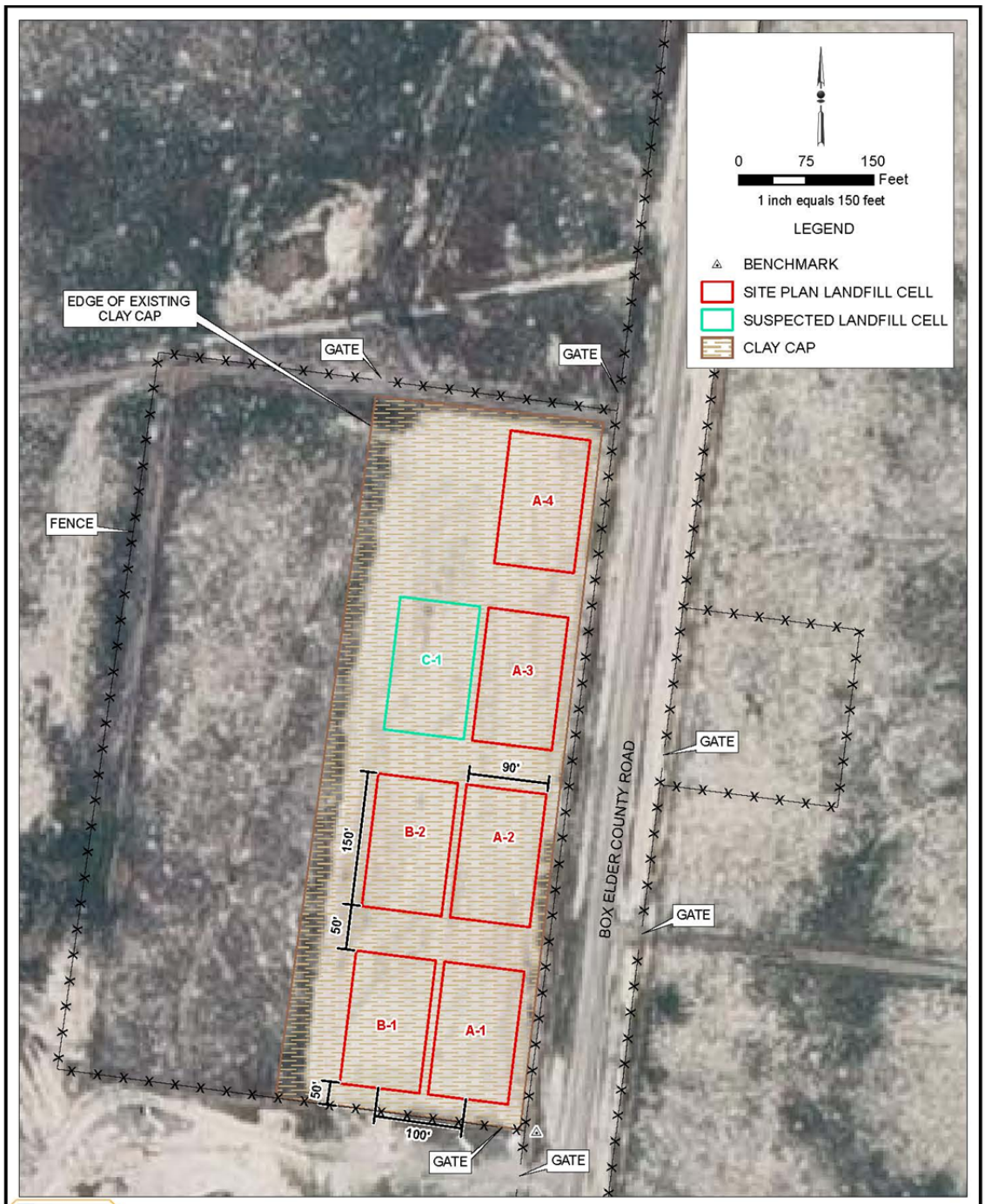

Figure 1
LANDFILL 5 SITE PLAN
UTAH TEST AND TRAINING RANGE

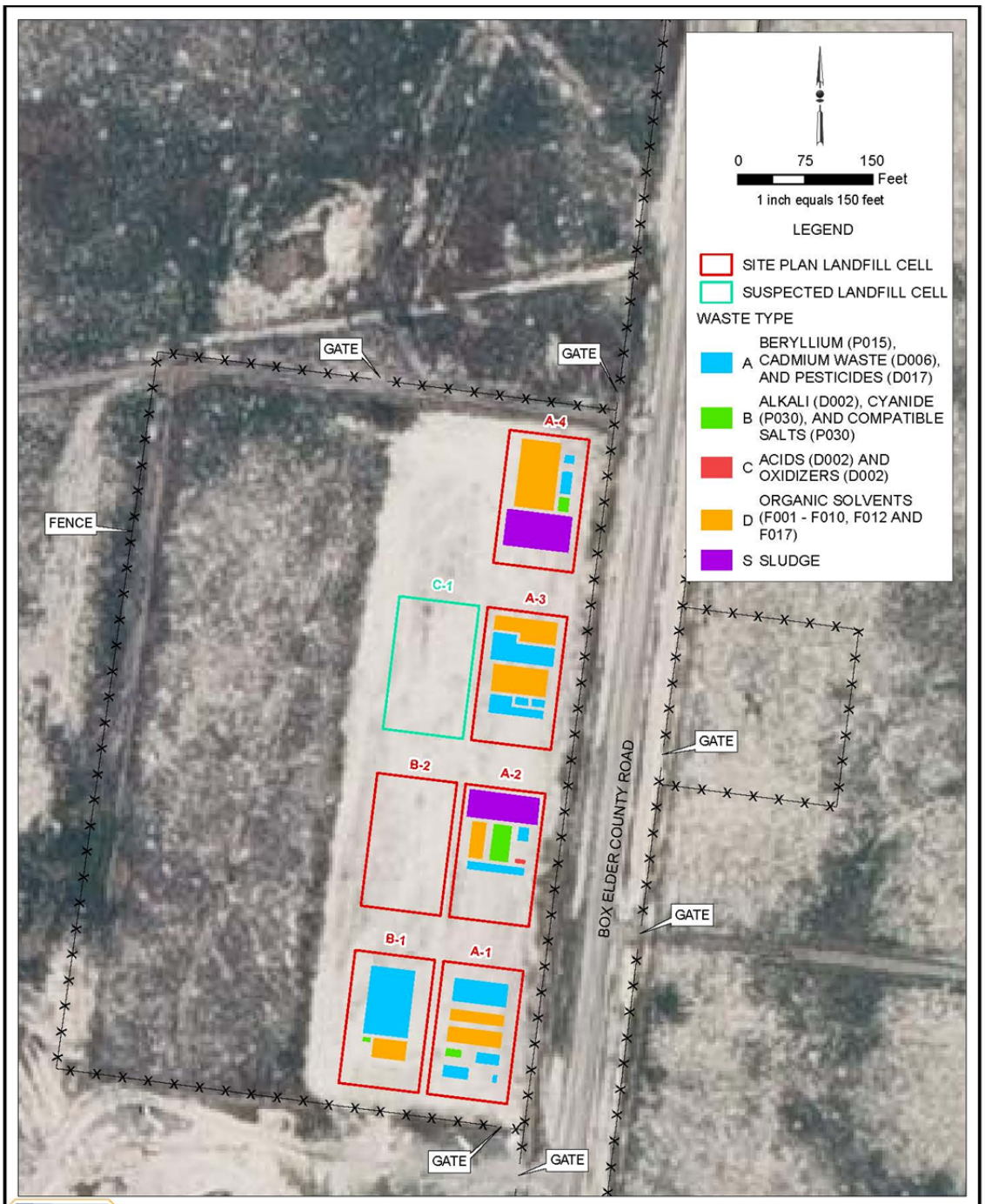

Figure 2
LANDFILL 5 WASTE LOCATION MAP-UPPER LEVEL
UTAH TEST AND TRAINING RANGE

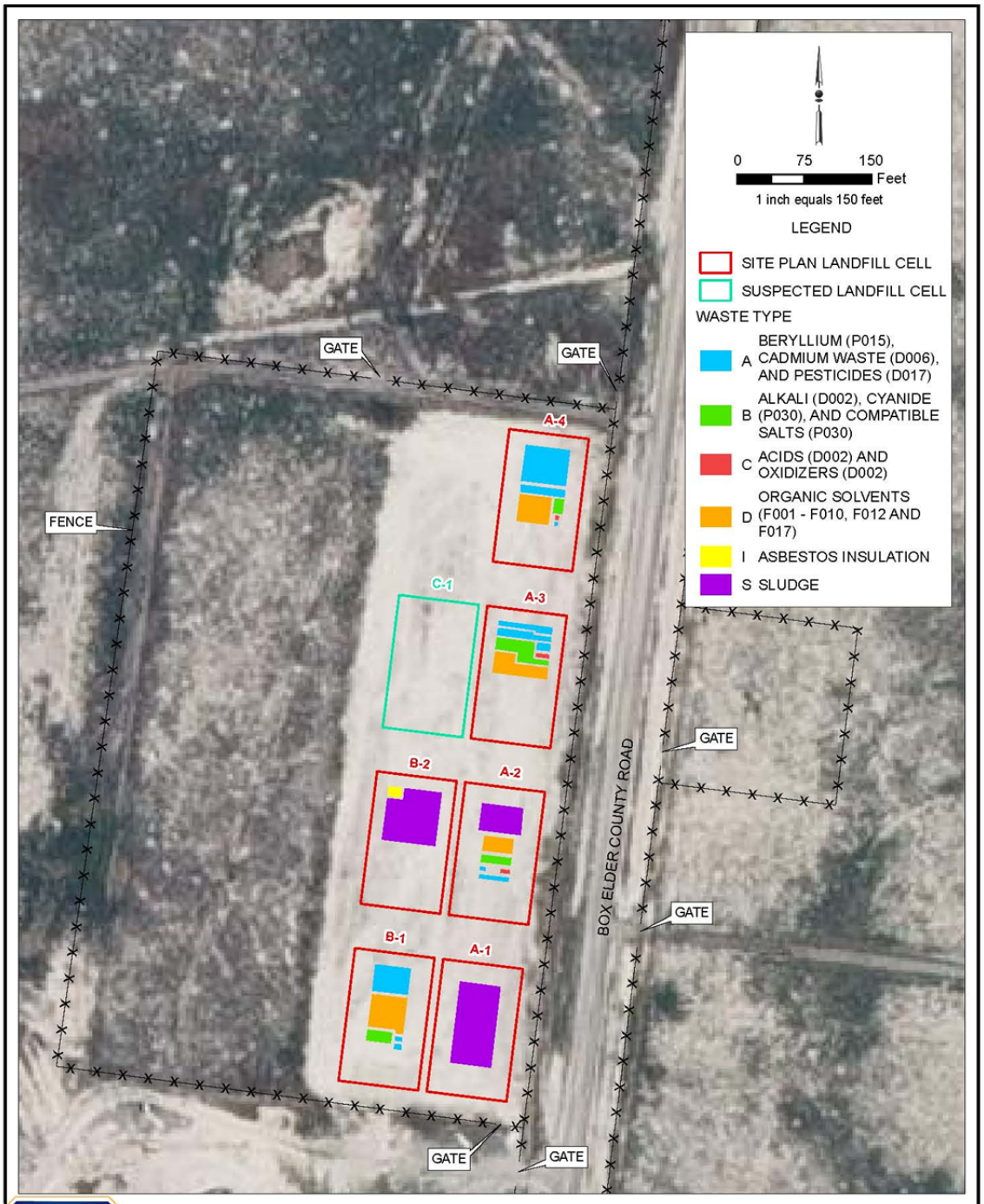

Figure 3
LANDFILL 5 WASTE LOCATION MAP-LOWER LEVEL
UTAH TEST AND TRAINING RANGE