using small Unmanned aerial Systems to Characterize MEC contamination at the HUrricane Mesa Test Site Washington County, Utah

*William WL Baum, Parsons, Denver, CO, USA*

*Brett A Lyons, Parsons, Denver, CO, USA*

*Carrie M Ross, Parsons Denver, CO, USA*

*Kyle M Lindsay, USACE-SPK, Sacramento, CA, USA*

 *Carrie R Nelson, USACE-SPK, Sacramento, CA, USA*

The Hurricane Mesa Test Site (HMTS) is a formerly used defense site located in Washington County, Utah approximately 20 miles northeast of St. George, Utah. The HMTS has been used for supersonic aircraft escape system testing by several military agencies and civilian contractors since 1955. The USACE Sacramento District contracted Parsons to conduct a Remedial Investigation/Feasibility Study (RI/FS) at the HMTS to characterize the nature and extent of munitions related and aircraft escape system related contamination present at the site.

Hurricane Mesa is a relatively flat mesa top with sheer cliffs that drop approximately 1,000 to 1,500 feet to sloped and sometimes deep crenulations that reach outward in some locations as far as 3,000 feet before they touch the valley floor. Approximately 500 acres of the HTMS MRS contain steep terrain with greater than 30-degree slope, making 36% of the site inaccessible to terrestrial investigations. Parsons’ approach to performing MEC characterization of the inaccessible portions of the site was to collect aerial photogrammetry and thermal data using small Unmanned Aircraft Systems (sUAS; Drones).

Parsons successfully implemented a two-phased aerial survey approach for identifying munitions related and aircraft escape system related items of interests (IOIs) and characterizing the nature of the contamination across portions of the site that were inaccessible to terrestrial characterization surveys. Ground control points were placed across the site to tie the imagery to the project coordinate system and quality control checkpoints and seeds/simulants were placed to validate the positioning data and confirm the detectability of munitions items in the visible and thermal spectrums.

 As part of preliminary characterization, Parsons deployed a sUAS to collect 673 acres of ortho-photogrammetry and surface elevation data at an average of 100-ft agl. A data analyst generated a 2-cm resolution orthomosaic of geo-referenced images across the 673 covered acres. A data analyst reviewed the orthomosaic and identified 151 IOIs such as rockets, rocket motors & components, and JATO bottles. Parsons logged the types and locations of IOIs into a georeferenced database, calculated the estimated IOI density, and identified 2 areas with elevated IOI densities (HD Areas). The surface elevation data and locations of IOIs were used to design a flightpath for additional sUAS thermal and photogrammetry surveys. To better characterize the HD Areas, Parsons deployed another sUAS to collect 15.8 miles of thermal imagery transects and additional photogrammetry data at an average of 65-ft agl over the known locations of the identified IOIs with additional transect density within the HD areas. A data analyst reviewed the raw thermal emissivity images to identify thermal anomalies that were not identifiable in the Phase 1 visible spectrum imagery and reviewed the additional lower-elevation ortho-photogrammetry imagery to capture higher resolution images of the IOIs. Analysis of the Phase 2 thermal and orthophotography data identified 168 additional IOIs but the boundaries of the two HD areas did not change. The quantity and distribution of potentially-munitions related IOIs (potential MEC) within the 2 HD areas met the established criteria for characterizing them as HUAs.