Complex Seed Scenarios – Does AGC Work as Assumed in Multisource scenarios

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In 2022, Jacobs performed third-party validation seeding on behalf of the United States Army Corps of Engineers (USACE) in advance of a remedial design (RD) at the 548-acre Former Fort Huachuca Munitions Response Site 03 – Artillery/Mortar Range, Target Area A, located in Cochise County, Arizona. This work included placing, and then collecting, cued measurements over the more than 1,000 small industry standard objects (SISOs) used as seeds. All validation seeds were placed at a depth of either 0.15-meters (6 inches) below ground surface (bgs) or 0.08-meters (3 inches) bgs. Of the approximately 1,000 validation seeds, 100 were considered complex scenarios, meaning that two SISOs were placed as a pair in close proximity to each other with the goal of providing the USACE data with which to monitor the RD contractor’s performance in multisource scenarios. The complex seed pairs were placed at distances ranging from a minimum distance of 0.10 meter (3.9 inches) to a maximum distance of 0.41 meter (16.1 inches) apart. All SISOs placed as a complex pair were initially buried at a depth of 0.15 meter (6 inches). Forty-nine of the complex seed pairs were placed parallel to each other, while in a single complex scenario the seeds were placed perpendicular to one another.

The complex seed pairs presented an unexpected challenge during the classification process. Based on current industry understanding, multisource scenarios (assuming the sources have a minimum offset from each other) should be classifiable, especially when buried at depths that do not approach the sensor’s depth of reliable classification. However, following multiple rounds of cued measurements, approximately 20 percent of the complexly-located seeds failed to achieve a decision statistic of 0.9000--the classification acceptance criterion. Per the Quality Assurance Project Plan and the Validation Seed Plan, the decision was made to adjust the depth of the failing complex seed pairs to 0.08 m (3 inches) bgs. Following the adjustment in burial depth, all complex seeds successfully passed the specified acceptance criterion.

The high rate of initial failure of the complex seeds resulted in Jacobs performing data analysis to determine the root cause. During the analysis, it was discovered that, in the failing complex seed scenarios, the two SISOs often resolved as a single item that exhibited the expected polarizabilities of a SISO, but whose size was larger than expected. When the failing complex seeds were compared against the entire DoD library, they matched with high confidence to a rifle grenade rocket which has a decay similar to a SISO but is approximately two and a half times larger in size. The analyses ultimately suggest that the industry assumption that items in a multisource scenario can be reliably classified is not as robust as believed.

The findings associated with the analysis of the complexly-located validation seeds at Fort Huachuca raise questions about the effectiveness of advanced geophysical classification (AGC) in multisource scenarios industrywide. A determination needs to be made whether a change in the current classification process is needed, either solely, or in conjunction with a change in dig procedures to account for multisource scenarios. Additionally, consideration might need to be given as to whether targets of interest have been missed in multisource scenarios on a site-specific basis where AGC has been used as the final remedy.