Cultural Test Bed receives Reference Target Area

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In the summer of 1986, construction began on a luxury hotel at Kapalua on the Island of Maui, Hawaii. Plans called for a sprawling upscale resort to be built on the shoreline, where guests could enjoy the sounds of the surf and breathtaking tropical sunsets. Several months into the venture, however, work suddenly screeched to a halt. Graves had been unearthed — lots of them. The 13-acre construction site was also an ancient Hawaiian burial site.

After an intense series of deliberations, a land exchange was achieved in 1989. The construction site was abandoned, the graves protected. A redesigned version of the hotel was built on a hillside above the sea, and finally the hotel opened in October 1992.

In far too many instances, past projects (like the one described above) were undertaken blindly — with losses suffered by many. Irreplaceable cultural resources and archaeological sites were harmed or destroyed. Delays or changes in plans cost developers exorbitant amounts of money. Damaged infrastructure systems caused service interruptions to customers.

Ground-penetrating radar

To alleviate such problems, scientists have developed detection devices capable of non-intrusively locating subsurface features. Ground-penetrating radar,or GPR, is one such system. It uses radio waves to detect buried objects, just as X-rays image the internal structure of the body. Originally used to probe glacial ice, GPR is now used to study soils, rocks and man-made structures. Quite simply, GPR sensors record radio waves reflected from objects embedded in materials under investigation.

Low frequencies are used to detect objects buried deep within the ground. High frequencies are used to detect objects nearer the surface. Early units relied heavily on trained personnel to interpret readings recorded on paper. Newer units have built-in computer software to process data and facilitate interpretation.

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Workers place "targets" at the HAMMER Cultural Test Bed, to be used for training in the operation of ground-pentrating radar.

Partners in progress

Thanks to partnering efforts with Pacific Northwest National Laboratory, the Confederated Tribes of the Umatilla Indian Reservation and the Wanapum Indian Tribe, the Volpentest HAMMER Training and Education Center now has a 99-by-33-foot Reference Target Area in the southeast corner of its Cultural Test Bed. Those who wish to hone GPR skills will find the new hands-on prop very useful. The Reference Target Area, or RTA, contains known targets at known depths (between 1.5 and 3 feet) — each with its own "signature." Users who learn to associate "signatures" in the RTA with actual objects, should one day be able to detect those objects in real-world environments.

"This is a major step in our plan to develop a geophysical test bed," said Darby Stapp, PNNL director of the Hanford Cultural Resources Laboratory. "With the RTA, we can now begin enhancing our instrumentation and software. As researchers from across the country start coming to HAMMER to conduct investigations at the Cultural Test Bed, we will have the opportunity to work together to adapt these technologies so they can be used more frequently in cultural resource applications."

Reference Target Area is built

During the developmental phase of HAMMER's Reference Target Area, Stapp and others sought advice from PNNL geophysicist Gerry Sandness. Having built test beds at Hanford between 1976 and 1982, Sandness has a wealth of practical knowledge. One of his best-known test beds, "Little Egypt," was constructed in 1981. Although Little Egypt is a simulated buried-waste test bed — composed of pipelines, drums, wooden boxes, metallic and non-metallic spheres, flat plates and other objects — the process of constructing HAMMER's test bed was thought to be very much the same. So, after obtaining the required special permits and clearances for construction, HAMMER's project got under way in September 2001.

The design used for HAMMER's Reference Target Area incorporated information gathered by former HAMMER summer intern D'Lisa (Penney) Pinkham of the Nez Perce Indian Tribe. While at HAMMER, Pinkham researched characteristics of appropriate articles — sizes, shapes, quantities and burial depths, for instance.

It took a front-end loader only a day to prepare the site. It took nearly a week for "signature" items to be collected and carefully placed within it. Among other things, the large rectangular area contains fish carcasses, basalt and porous lava rock, river cobbles, copper pendants, animal carcasses, shells, historic bricks, bottles, cans and railroad ties in distinct configurations.

Covering the site was a labor of love. At first, soil was replaced manually, using shovels. Only when the soil was piled high enough to prevent "signature" disturbances was earth-moving equipment brought in. Finishing touches to the new prop included re-vegetation with native seeds from Fluor Hanford's re-vegetation supply.

Reference Target Area use

Hanford Site personnel, the Army Corps of Engineers, the Bonneville Power Administration, colleges, tribes and others involved in cultural resource protection activities are expected to be the biggest users of the Reference Target Area. Establishment and use of the prop will also enhance future grant opportunities for training and Cultural Test Bed expansion.

"For me, the Reference Target Area is a dream come true," said Confederated Tribes of the Umatilla Indian Reservation anthropologist Julie Longenecker. "If GPR technology can be advanced so subsurface features are easily recognizable, the chances of inadvertent discovery will be all but eliminated." ❖