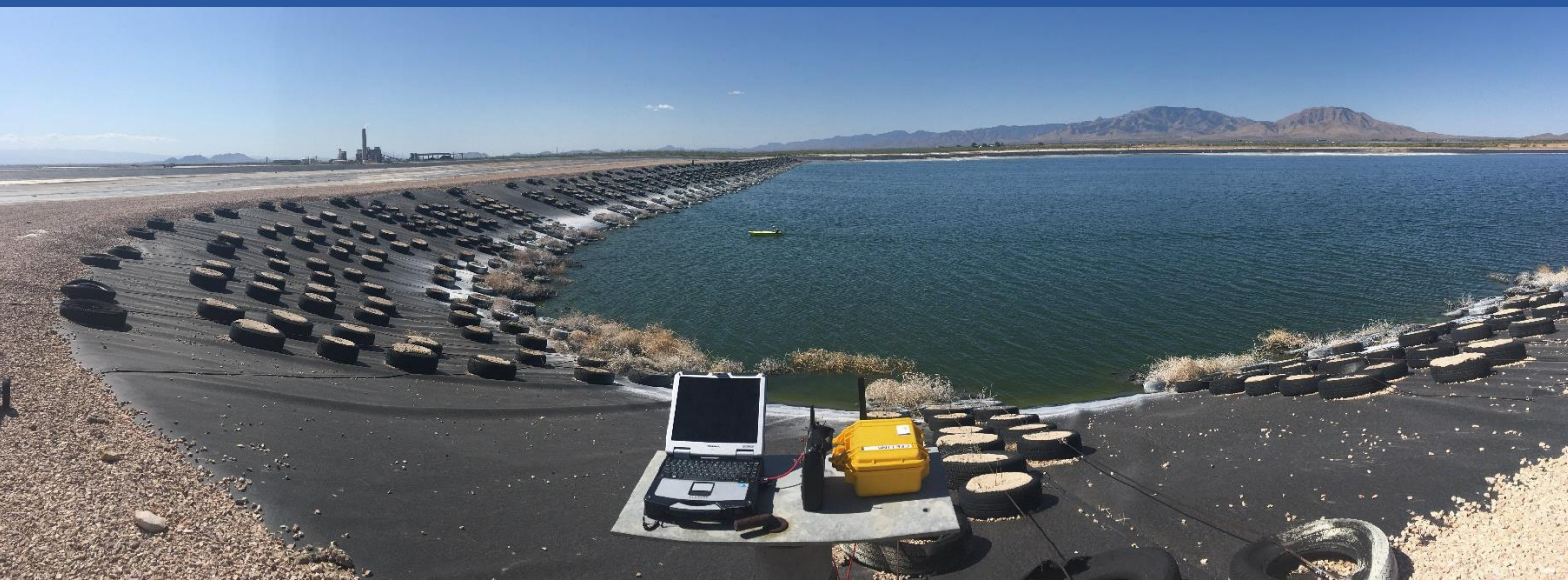
CEE HydroSystems™

CASE HISTORY



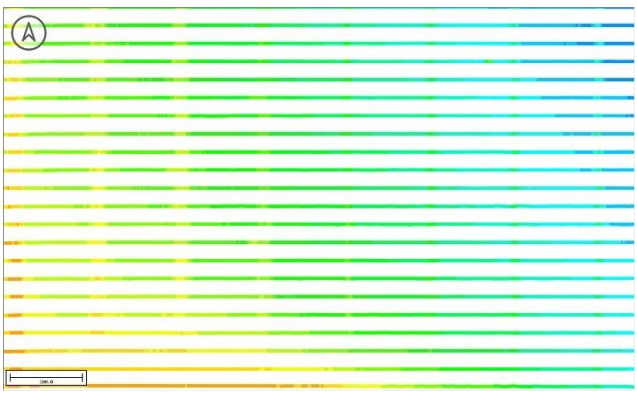
Automated Power Station Ash Pond Surveys with the CEE-USV™

In combination with drone flights to map the ash volume above the water, the CEE-USV™ allowed determination of water and ash volumes in three power station fly ash lagoons in Arizona, USA. For the larger lagoon, the CEE-PILOT™ autopilot effected spectacular survey lines and "hands free" surveying. For the smaller lagoons, real time drone video was used to navigate the boat through narrow channels and ensure full coverage in the bathymetric dataset.

To supply a site bathymetric survey of their power generation customers' fly ash lagoons, US consulting firm Bowman Consulting called in the CEE-USV™ with its fully integrated professional autopilot system (Dynautics Ltd).

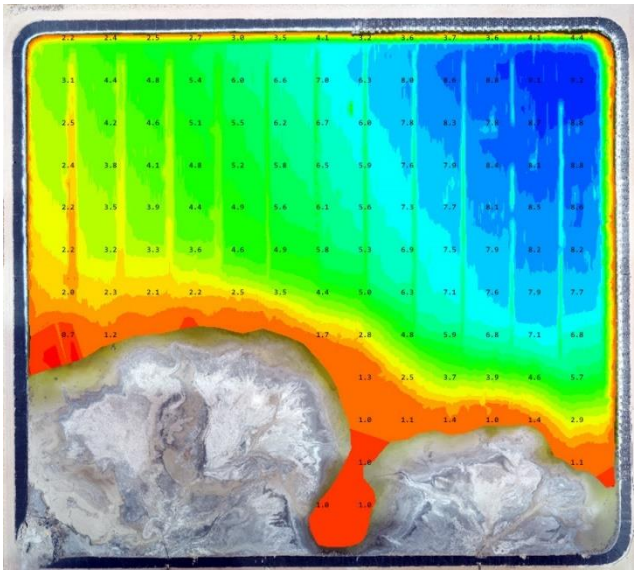
Fly ash is a byproduct of combusion in power generation, and consists of fused mineral impurites. It is often held in wet storage lagoons and these lagoons are surveyed regularly for regulatory compliance among other reasons.

The first lagoon was large with an unobstructed open water area, and a single long beach, making it ideal for a robotic autopilot-controlled survey pattern. A 25ft spaced east-west line plan was set up in the Hydromagic shore PC control and acquisition software, after the survey boundary was accurately established from imported drone ortho-photogrammetry images from the previous weeks' overflights.



Laser straight robotic survey lines at 25ft spacing.

After the USV was launched, the Hydromagic line plan was telemetered to the CEE-USV™ autopilot and the vehicle got down to business. With typical cross track error distances measured in just a few inches, the USV's remarkable survey line consistency allowed generation of a confidence-inspiring survey product for the site operator. When closer to the beach, manual control was engaged and the survey was concluded by a perimeter run across the 1ft contour to mark the edge of the survey, and fill-in back to the robotically-surveyed area..

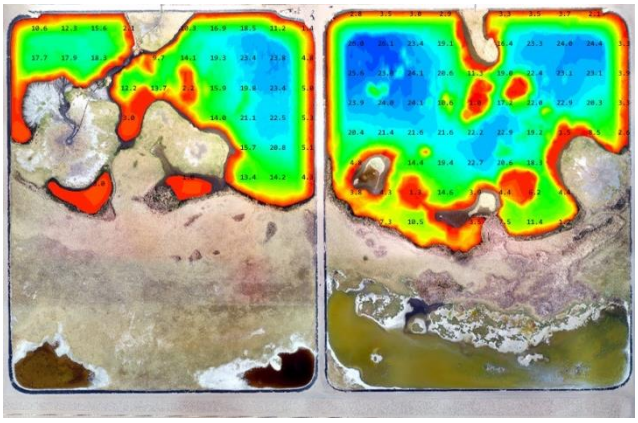


Hydromagic Matrix TIN model of large lagoon.

For the two smaller ponds, the situation was quite different. With only a small open water area to survey robotically, most of the survey was conducted with the CEE-USV™ in manual control. As there were some parts of the lagoon obscured from view by vegetation, a drone was used to supply real time overhead video of the site. The USV operator used the combination of Hydromagic real time depths and GNSS position from the on-board CEESCOPE LITE™ echo sounder with the drone video to maximize the available survey coverage. No USV on-board video can match a drone view!

Drone view of the CEE-USV™ on small lagoon.

Bowman were able to supply a detailed, accurate, and defensible dataset to the site operator, with Hydromagic results seamlessly fitting in with the rest of the survey data. When on site, safety was the top priority; the use of the USV eliminated on water personnel safety risks as well as providing an expedient two-day survey.



Ash ponds surveyed manually with drone assistance.