CEE HydroSystems™

CASE HISTORY

Trimble RTX Enables High-Precision Wastewater Sludge Comparison Surveys

Faced with the challenge of making accurate water level measurements during wastewater lagoon sludge surveys, Team Lab upgraded their positioning system to incorporate Trimble CenterPoint® RTX. Installed on the CEE-USV™, the RTX-enabled CEESCOPE™ provided convenient and accurate elevation data for evaluation of sludge management processes.

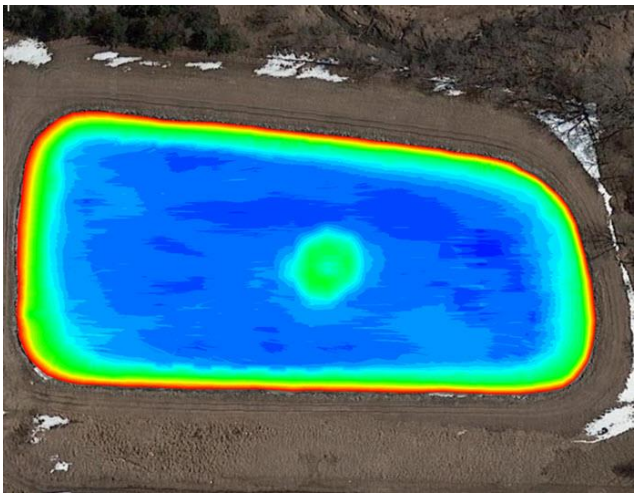
Team Lab (Minnesota, USA) has supported industrial and municipal waste water management since 1977. Team Lab supply chemical and biological treatment programs aimed at reducing the volume of sludge present in effluent lagoons. The accumulation of sludge reduces the effluent water's residence time in the lagoon, decreasing the effectiveness of the basin. Eventual mechanical removal of the hazardous accumulated sludge is an expensive operation.

In 2021, Team Lab commenced an effluent lagoon bathymetry program using the CEE-USV™ survey boat to monitor sludge levels in hundreds of wastewater lagoons, mostly in the upper midwest.

CEESCOPE LITE™ echo sounder with Trimble RTX.

The CEE-USV was initially supplied with an on-board integrated CEESCOPE™ echo sounder and GNSS that incorporated a differential-grade positioning system to give submeter horizontal accuracy. The first two years of surveys were largely to establish baseline sludge levels but as the

program progressed, more surveys were repeat surveys to monitor changes in sludge height and volume, often related to an active treatment program.



Wastewater lagoon depths depicted in Hydromagic.

The Problem:

The CEESCOPE can accurately map water depths to 0.1ft (2cm) accuracy. However any changes in the lagoon water level between surveys must be determined in order to measure sludge volume changes. Municipal waste water lagoons do not have level monitoring so to account for water level changes Team Lab had to manually measure the water height above the lagoon "true" bottom for each survey with a range pole.

So, despite having a remotely-operated boat in use for the depth survey there remained the requirement for the surveyor to go out on the water – with associated safety and efficiency drawbacks. As changes in sludge height may be the order of a few inches, errors in the water height measurement could have a big proportional impact on calculated sludge volumes. A better method was needed to account for the lagoon water level changes.

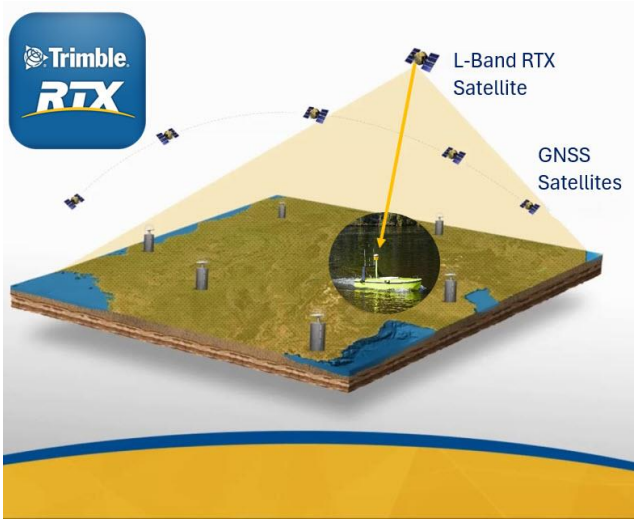
Setting up an RTK base station for precise heights at each of hundreds of lagoons was unrealistic in terms of the extra time needed. Using a network / VRS service to provide precise heights was not possible considering the potential for poor cell phone service at some sites. Crucially, Team Lab needed to have a system easily operable by their staff without demands for specialist knowledge or training.

The Solution:

In early 2025, Team Lab acquired a new RTK CEESCOPE incorporating the Trimble 9250 OEM receiver with L-Band CenterPoint® RTX. The goal was to use subscription corrections to allow accurate and automatic measurement of the lagoon water level during each survey, facilitating the most accurate inter-year comparisons.

Trimble 9250 OEM GNSS with GA830 antenna.

RTX corrections are a precise point positioning (PPP) solution where GNSS position data from multiple available constellations are corrected in real time by a separate corrections signal from a geostationary L-Band satellite, as received by the same GNSS antenna.



Trimble RTX L-Band PPP corrections system.

With vertical accuracy approaching 1” (2.5cm), the RTX system meets the requirements for wastewater sludge comparison surveys. With only a few minutes needed for accuracy to reach this specification, there is no time wasted waiting for the solution to converge.

Using Hydromagic acquisition software, RTK elevations are recorded throughout the survey with the robotic autopilot-controlled USV. To maximize accuracy during processing, all the water surface elevation measurements are averaged through the 0.5-2hr typical survey duration to provide a single water level value. This value is then applied to the entire depth dataset to give a final sludge elevation surface that may be compared in absolute terms with subsequent surveys.

The Benefits:

The CenterPoint RTX solution was a perfect fit for the TeamLab application as simplicity of operation is blended with the necessary high accuracy to determine small changes in sludge levels. After the lagoon true bottom below the sludge is established on the first survey while RTX is in use, no subsequent trips out onto the water are needed. With time-averaging further refining the dataset, Team Lab has built a capable and highly defensible monitoring program for their lagoon treatments.