

# How to Tame a Wild Stockpile

**T**ake one everyday stockpile survey, bring it indoors and ramp up the conditions with dust, intense heat (131°F or 55°C) and the perils of fast-moving heavy machinery — suddenly that commonplace surveying job makes for one wild ride.

Every month surveyors from Hille Thompson & Delfos surveying company perform stockpile measurements under these conditions in the Karara iron-ore holding shed at Geraldton Port, Western Australia (WA). But they've managed to

Adnan Arslanagic of Haefeli-Lysnar and Edrick Delfos of HTD prepare for entry into the Karara holding shed for Trimble TX5 installation and setup.



BY FRANCES MORTIMER



The vast Karara shed stretches to 290 m (950 ft) in length.

tame the job—as much as possible—with a versatile 3D scanner.

Just north of Perth, WA, lies the city of Geraldton. At the city's heart is Geraldton Port, a bustling—and vigorously growing—terminal for the export and import of iron ores, grains, fuels, metals, mineral sands, talc, garnet and fertilizers. Karara Mining Ltd, a subsidiary of Gindalbie Metals, is a heavy user of Geraldton Port. As such, it owns and manages its own infrastructure at the port, including a dedicated berth, a 5000 tonnes (5500 ton) per hour ship loader, and an enormous 290 x 55 m (950 x 180 ft) holding shed.

### Respirator Masks Required

Conditions inside the Karara holding shed are hostile. No one entering the facility wants to stay for long. Built of iron and concrete, the shed is home to multiple stockpiles of iron ore woven between its towering columns.

Each day, four trainloads of iron ore are received at one end of the facility and redistributed along its length via an overhead conveyor system. Then, heavy machinery—one CAT D11, two CAT D10s and one Komatsu excavator—sort the ore by grade and shipping schedule, and feed it via three hoppers onto a side conveyor belt for loading onto ships.



The Karara shed walkway is located almost 35 m (120 ft) above ground, and is accessible by multiple flights of stairs, so the TX5 instrument's small size and weight were immediately an advantage.

All this activity and heavy machinery generate constant noise, vibration and dust inside the shed. Large extractor fans, which remove dust between train arrivals, also contribute to the tumult; respirator masks are necessary at all times. During peak summer

months, temperatures inside the shed roof—35 m (120 ft) above the ground—easily reach 55°C (130°F).

Into this harsh environment surveyors from HTD Surveys must venture every month in order to assist Karara Mining in tracking its iron-ore stocks. With only a brief window between trainloads, surveyors must set up prior to where the next train will dump, measure—sometimes the entire shed—and exit within just 90 minutes.

### From Total Stations to Spatial Imaging

Until recently, HTD used Trimble S6 total stations with Trimble Survey Controller™ software for stockpile measurement. Used in Robotic mode, the instrument provided a solid solution, according to Edrick Delfos, Managing Director at HTD. But in the harsh conditions of the Karara holding shed, HTD needed to remove its surveyors from the shed floor, both for their personal safety and to protect their surveying gear—for example, during one job the overhead conveyor dumped iron ore on a working Trimble S6. Additionally, the time constraints for each survey demanded the fastest possible technology solution.

So in December 2012, in partnership with Haefeli-Lysnar (HL), HTD acquired a Trimble TX5 3D scanner, a light and



Temperatures inside the shed reach as high as 55°C (130°F) and the air is clouded with dust at all times.

compact mid-range system that was an achievable purchase for HTD, a small to mid-size surveying company. For optimum data processing, they would use Trimble RealWorks® office software.

### Surveying from a New Perspective—Upside Down

In order to remove themselves from the holding shed floor, HTD accessed the gallery occupied by the overhead conveyor, which included a walkway, creating a scanner setup high above all activity (in 55°C (130°F) heat). At almost 35 m (120 ft) above ground, that meant carrying the Trimble TX5 up ten flights of stairs, so the instrument's small size and weight were immediately an advantage. The scanner was then suspended upside-down (the scanner does not need to be upright or level) on a purpose-built bracket attached to the handrails of the walkway. With scans required at 25 m (82 ft) intervals, the walkway made a perfect platform from which to do the survey.

Approximately 30 polystyrene balls of 300 mm (12 in) diameter were suspended from the roof rafters. These would function as permanent targets to provide the control needed to stitch together discrete scans. To further help registration, columns in the shed were labeled with large numbers to help identify scan location in the Trimble



Suspending the Trimble TX5 upside down from the shed's overhead walkway offers the HTD team many advantages, including greatly increased safety.

“The biggest benefits of the TX5 were its onboard data storage, Wi-Fi controllability, and its weight and size.”

RealWorks software. The scan would need to be inverted in the software due to the Trimble TX5 instrument's upside-down position. After the initial survey, the surveying team realized that due to the repetitiveness of the shed structure,

spacing the polystyrene balls in different configurations relative to each other would also improve the geometry and accuracy of the registration.

Because the Trimble TX5 was suspended below the walkway, it was not accessible, so HTD's surveyors controlled the instrument wirelessly via a tablet computer running the Android operating system; no bulky laptop was required. Collected data was stored onboard the instrument on an SD card, which was then used to transfer data to the office.

“It was critical that we be able to use Wi-Fi,” said Edrick Delfos, Managing Director at HTD. “The biggest benefits of the TX5 were its onboard data storage, Wi-Fi controllability, and its weight



From the Karara holding shed iron ore is transported directly to ships via a side conveyor.

and size. This project couldn't have been achieved with any other system."

Suspending the scanner from the walkway offered other benefits to HTD. For example, the scanner could measure a stockpile with one overhead scan; a total station would require three setups from different sides. So the scanning method was faster, and it delivered an image with no flat area represented at the top of the stockpile.

### Setup Eases Load on Surveyor, Delivers High-Quality Data

The Trimble TX5 collected the required data very quickly, with HTD able to complete its surveys in approximately 80 minutes—well within the 90-minute window between trains. A total station survey would take approximately three hours. The team also achieved excellent accuracy due to the number of shots taken via scanning versus total station measurement. The scanner observed points at approximately 50 mm (2 in) spacing and then the data was filtered

during processing. This produced a truer representation of the stockpile's shape than a conventional survey observing at 5–10 m (16–33 ft) spacing.

Another factor contributing to greater accuracy was decreased surveyor fatigue. Even in the extreme conditions of the shed, the Trimble TX5 system reduced the physical toll on the surveyor, increasing the ability to concentrate and make appropriate decisions, which also increased the likelihood of duplicated accuracy.

### What the Client Saw...and Didn't See

The deliverables prepared in RealWorks software for HTD's client included a simple contour plot superimposed onto a skeleton outline of the holding shed, and a corresponding numerical quantity of the volume. Registering and generating the deliverables took a very short time—15 to 20 minutes—with the data being usable in well within two hours of the survey. While the "how" of the

stockpile survey was significant to HTD, in reality the change in process had little impact on the client directly. What impacted the client most significantly was how invisible the survey became on site. Site supervisors, who were extremely safety conscious, had no need to interface with or monitor the HTD team at all, which enabled the supervisors to focus on other tasks.

The Trimble TX5 scanner now delivers for HTD each month at the Karara holding shed, plus the team finds it suitable for many other HTD projects. "We have found the TX5 to be very versatile," said Delfos. "We're confident we're going to use it consistently enough across our projects that we'll achieve a solid return on the machine very quickly." ■

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