Renewal Career Episode Report (CER) Example

Surveyor with a Mining Open Cut Endorsement

Board Note: *This CER is an example of how knowledge gained from attending a conference may be used to demonstrate acquired professional and/or technical competency in respect of a particular competency framework.*

Dates of Career Episode: 25/03/2023

Abstract:

- **I attended the 2022 Conference held by the Australian Institute of Mining Surveyors on May 27th at the Gold Coast in Queensland.**
- **Of the multiple sessions I attended there was one delivered by Jennifer Clear from CR Kennedy describing the technically challenging scanning of a 1000m deep mine shaft.**
- **The presentation covered the planning, field work and office analysis of the measured data and provided me with some ideas that may be suitable for a monitoring task back at my own operation.**
- **In this CER, I provide a summary of the conference presentation, a description of the problem and task at site and the procedure developed based on the use of similar technology and required outputs.**

S 2.1 Collect data by measurement.
Applicants will need to demonstrate that they:
i. Use adequate redundant measurements to validate data.
ii. Ensure measurements are legally traceable.
iii. Evaluate the various measurements methods and procedures available.
iv. Assess the effectiveness of the measurement method adopted.

S 2.2 Search and acquire existing data.
Applicants will need to demonstrate that they:
i. Extract required information from relevant geographic and land information records, survey data bases, and general information depositories.

S 2.4 Apply quality assurance principles.
Applicants will need to demonstrate that they:
i. Comply with an accepted quality assurance program.
ii. Rectify non-compliance with quality standards.

S 4.1 Can detect errors in existing data and field observations.
Applicants will need to demonstrate that they are able to:
i. Identify errors in data that is supplied by other parties.
ii. Use quality assurance processes to ensure that errors are detected and eliminated.

S 4.2 Understands the accuracy of existing data and creates new data with appropriate accuracy.
Applicants will need to demonstrate that they are able to:
i. Determine the accuracy and reliability of data.
ii. Determine the limitations of collected data.

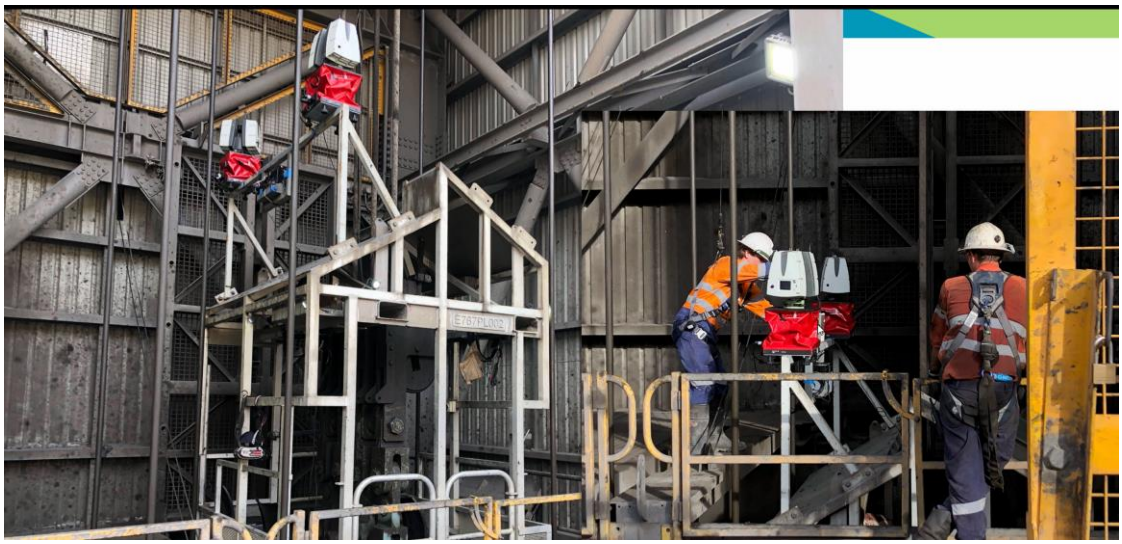
S 4.3 Can combine existing data with new survey data.
Applicants will need to demonstrate that they:
i. Are able to deduce or estimate the accuracy limitations of existing data sets.
ii. Do not use data sources of insufficient accuracy in survey products.

O 3 Plan, organise, direct and control tasks, people, and other resources.
Applicants will need to demonstrate that they are able to:
i. Set work objectives and prioritise activities.
ii. Determine work methods and procedures.
iii. Estimate times, costs, and resources.
iv. Compile work schedules and allocate resources.
v. **Establish project recording systems for surveying records and design changes.**

Scanning Presentation

The Ernest Henry mine is situated near Mt Isa in Queensland where it produces copper and some gold using the sub level caving underground technique. The main shaft there is around 1000m deep and 7m diameter and is used to haul people and some equipment.

There is an ongoing need to monitor any deformation of this shaft and in 2021 it was decided to conduct some scanning surveys of the shaft using 2 Leica P40 scanners mounted on the top of the haulage platform in the shaft (shown pictured below)

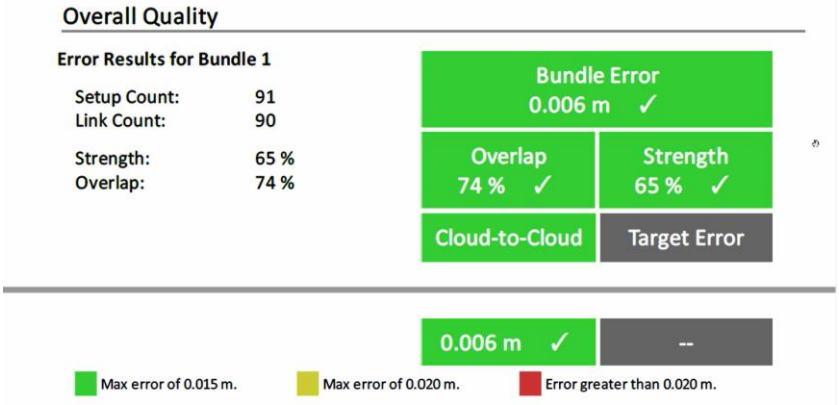


S2.1(i,iii, iv)

The scans were taken by alternate P40s at 6m intervals for the full depth of the shaft which meant there was one scan every 3m. This was necessary in order to achieve sufficient overlap in the point cloud registration and the small (7m) area of interest. Scan resolution was set to 12mm at 10m.

The registration phase of the 90 scann was completed using Cyclone 3D showing good overlap within the point cloud.

SiteMap 1

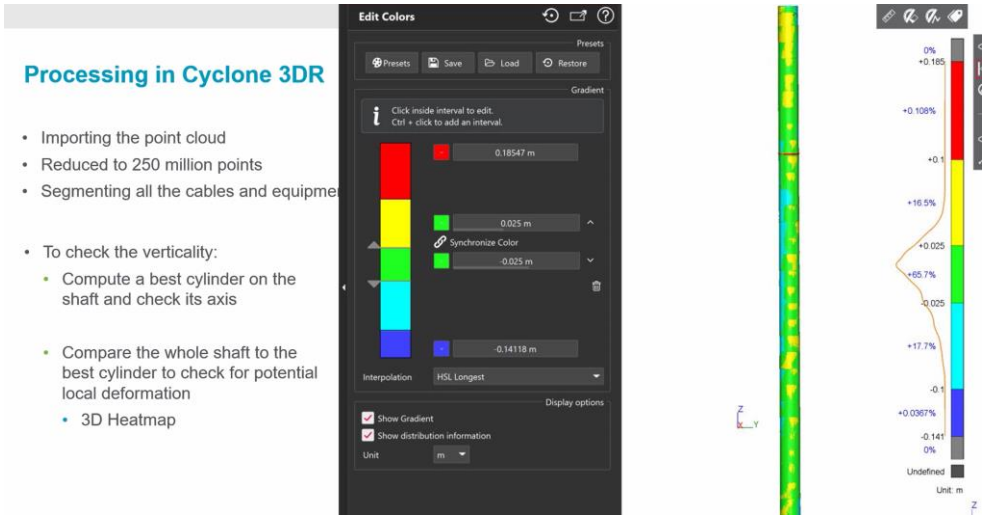


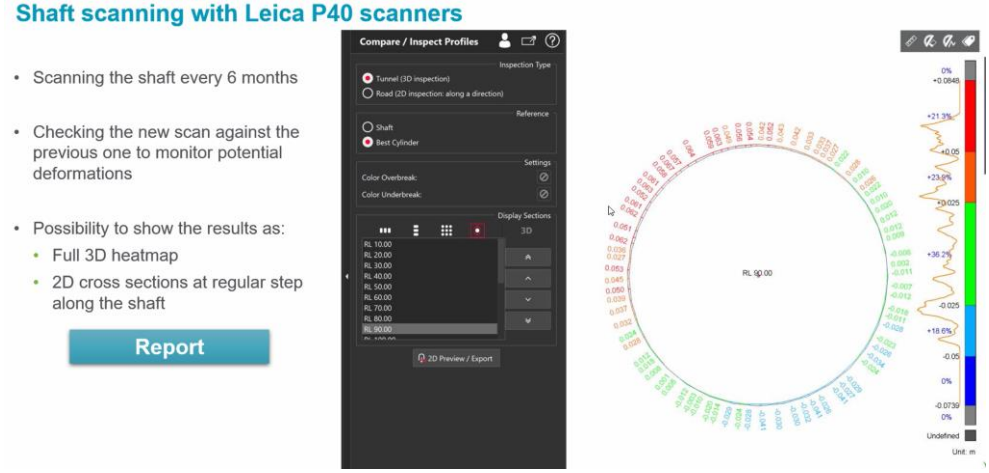
Next, a ‘best fit’ cylinder was created in the processing software which showed 174mm deviation from

S 4.2(i)

the vertical.

Other tools for analysis of the point cloud are available in Cyclone 3D which will be used to compare this data to subsequent 6 monthly scans of the shaft. For example, heat maps showing the differences or regular cross sections like as shown below.





Newlands Open Cut Wollombi Overpass

In 2017, Newlands Open Cut (approximately 25km from the town of Glenden) constructed an overpass to allow mine haul trucks to travel over the Nebo to Collinsville Road. The structure consisted of precast concrete panels forming a tunnel over the road and wing walls on each side of the tunnel as an abutment.

A condition of the approval for mining lease (ML70460) requires structural information as to the ongoing integrity of the overpass to be provided to the Department of Transport and Main Roads (TMR) every 6 months.

Part of this report includes a survey of 120 reflective targets installed on the underside of the arch glued directly onto the concrete structure.

S2.1(i)
S4.1(ii)

Owing to the age of these targets and the regular cleaning/removal of birds nests in their vicinity, several of these are destroyed or unreadable and it has been suggested that an entire new set be installed.

O3 (ii)

Instead of doing this and continuing the practice of reading to the reflectors with a Total Station I propose the use a high resolution scanner to supplement the Total Station measurements with comparisons between the 2 methods providing some redundant checks.

Based on the apparent functionality and convenience of using a high resolution scanner as shown in the CR Kennedy presentation, I propose to survey and analyse the data for the overpass in a similar manner.

O3 (iii), (iv)

The major difference will be the availability of deep driven and stable survey marks to register the point clouds. These control points will also allow for independent and redundant measurements to be taken to the remnant reflectors.

In terms of resources it will be possible to complete the field component of this job with 1 person over 6 hours. This allows sufficient time for setting up 3 tripods and targets over control stations multiple times, 4 resection positions each reading to any visible reflective targets. It includes 4 setups of the scanner but does not include the control traverse which will be considered seperately.

Calculations and reductions using Leica Infinity should take 3 hours. If budgeting for a contract surveyor as a comparison 1 day should be allowed at a senior surveyor rate.

O3 (v)

In summary, instead of replacing the damaged reflective targets I propose to survey as many of them as are remaining with a Total Station and also complete a survey using the high resolution scanner.

There exists a folder within the survey data structure for monitoring. Within this folder control listings and historical comparisons of the reflective target positions are stored. Any scanner, electronic field records and reports are to be kept here.

The 6 monthly monitoring report is also stored under the reports folder within this structure with copies sent to the approvals Superintendent.

A new procedure has been written to standardise the scanning and Total Station workflows (Appendix A – Newlands Proc. 2301)

S2.2 (i)

Topics include :

- Setup and verification.
  It will be necessary to complete a Total Station traverse between the 6 control points (3 on either side of the overpass) to detect any movement of the survey marks since the last survey. The control register for these plane grid points is located in the survey control database under the monitoring subsection.
  When positioning the Total Station using resections, a minimum of 3 control points are to be measured with a tripod mounted circular prism set over each point. This will allow analysis of the resection quality comparing residuals from the various solutions.

S2.4 (i), (ii)
S 4.1 (ii)
S4.2 (i), (ii)
S4.3 (i), (ii)

- Redundant measurements using the Leica TCRP 1201.
  Fundamental to any survey operations at the Newlands site is the need for redundant measurements and this principle is built into any survey procedure explaining various tasks. An analysis of the point cloud locations for the reflective targets is to be made with comparisons to the Total Station positions. Any differences greater than 5mm in either x,y or z are to be checked and remeasured if necessary.
- Scan registration.
- Cross section locations for the original and subsequent 6 monthly surveys.

Registrant's Name: _____

Registration No: _____

Current Registration: Surveyor with Mining Open Cut Endorsement_____

Registration & Endorsement Renewal Sought: Surveyor with Mining Open Cut Endorsement_____

Contact No: _____

Checklist

- ☐ I have included an abstract,
- ☐ I have included documentary evidence to support the details of my CER,
- ☐ I have fully described the methodology to undertake the work including references to quality assurance procedures,
- ☐ I have mapped my work description to the competency framework elements,

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