

Adapting to the conditions

RAY COX OF LANDAIR SURVEYS SHARES A CASE STUDY OF A RECENT LANDFILL PROJECT WHERE CLAY SIDELINER DESIGN NEEDED TO TAKE INTO ACCOUNT LEGACY OVERHANGING ROCK WALLS.

It's standard industry practice to convert disused quarries into landfills. One of the key challenges in such a practice is making sure the clay liner design takes into account existing conditions to guarantee leachate/water table separation.

A recent, challenging project saw Landair Surveys use modern 3D laser scanning technology to offer a solution for sideliner design involving overhanging rock formations.

The subject site was an urban landfill within an old quarry site. The existing rock walls contained many significant overhangs that, if not taken into account in sideliner design, could compromise liner integrity. Reshaping the old quarry face was not an option in this situation, so the landfill operator engaged Landair Surveys to come up with a proposed foundational sideliner design that took into account rock overhangs and desired clay thickness.

The first step was to get an accurate portrayal of the legacy quarry face. Landair uses 3D laser scanning technology in other industry

applications to create virtual buildings/ structures that assist architects and engineers in their work. It was decided that this would also be the best technology to map the quarry face, thus creating a 400-metre virtual rock wall to interrogate. The virtual rock face highlights areas that contain major overhangs which can be turned into additional cross-section lines using the data and incorporated into the design. More than 200 million points were measured along twenty scanning locations creating a base point cloud to work from.

The second step involved cleaning and filtering the initial point cloud (the set of data points) to get to bare rock conditions. Vegetation and a pre-installed protective wire mesh were removed from the point cloud. The point cloud was then filtered to achieve a more workable point spacing of 50 millimetres. From this filtered point cloud, a 3D triangle mesh was created consisting of approximately eight million triangles.

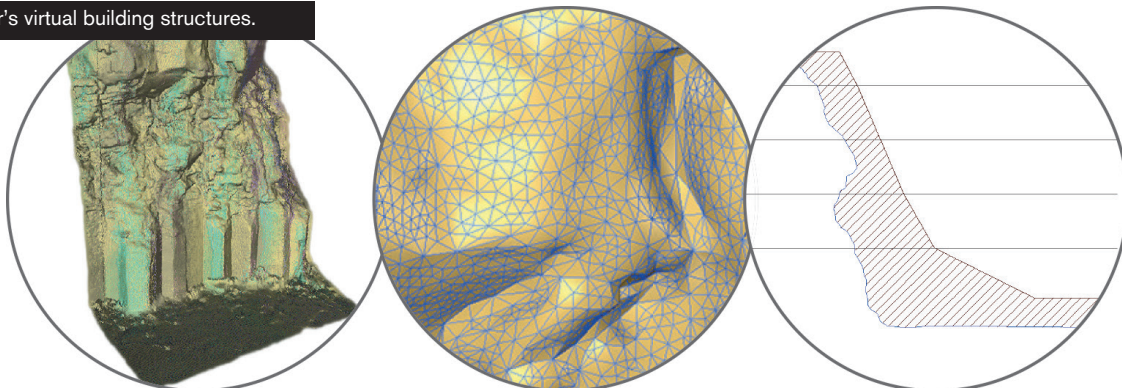
With the virtual rock face created, the next step in the process saw

Landair create major cross-section lines at 10-metre running chainages along the 400-metre face. These 10-metre cross-sections formed the general shape of the design sideliner. Overhangs and rock 'bulges' were isolated in the triangle mesh and separate cross-sections were created at each of these critical junctures and included in the sideliner base file.

The final step saw Landair create a provisional design surface based on rockface grades observed in the cross-sections. This foundational design was given to the landfill operator and their design engineers for cross-checking and comments. Based on the engineer's feedback, minor edits were undertaken to thickness levels and a final design plan was created for construction.

Landfill cell construction can sometimes bring up significant challenges and it pays to utilise all the technologies and skill sets available. By thinking outside the box Landair Surveys was able to utilise technology usually set aside for other industries to help solve a difficult design scenario. ■

Landair's virtual building structures.



Point cloud

Triangle mesh

Design cross-section