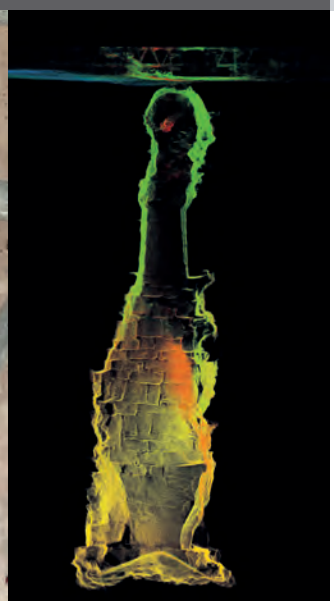
Case Study

Customer:
Clugston Survey

Project:
Surveying a sinkhole of unknown volume

Solution:
GeoSlam's ZEB-REVO RT



Surveying the unknown

Clugston Survey's Chris Shelley was able to find out exactly what a 600mm sinkhole opening was hiding thanks to GeoSLAM's ZEB REVO RT handheld scanner and a bit of help from KOREC.

The Florida sinkhole that swallowed a man…The Guatemalan sinkhole 30 stories deep…the Texas tar pit…Thankfully sinkholes in the UK are fairly unusual and rarely more than a few dozen feet deep.

A predominantly naturally occurring phenomenon, sinkholes tend to appear in the UK in areas of chalk or gypsum due to their high levels of water absorption causing the bedrock to dissolve, gradually falling into a hole until the surface layer is unable to sustain itself any longer. However, the main challenge for engineers dealing with sinkholes is the unknown. Until a thorough investigation has been completed, their depth and size can be disguised by a small surface diameter or a bottleneck and the risk of further collapse remains a threat.

These were exactly the challenges faced by Clugston Survey Services when they were recently contacted by a Lincolnshire based client when an unexpected sinkhole opened up in a grassed area within their gardens. The client requested that Clugston fully investigate what was happening below the ground and put a plan in place as to how the issue could be rectified.

Safety and data

For Clugston Principal Land and Building Surveyor, Chris Shelley, the immediate concern was how to create a working environment that would prioritise safety, removing any danger of further ground collapse, whilst still allowing the team to maximise the amount of data collected. The area was therefore fully tested and a scaffold platform designed and approved to go around the hole to provide a solid surface for the survey work and a winch.

With a safe environment established, Chris was left with the formidable task of collecting a full data set, to an unknown depth, through an access area just 600mm wide. However, he was already sure that he had the right tool for the job. As an advocate of GeoSLAM's ZEB REVO RT handheld system for scanning and visualisation, he knew that its small size, low weight, 30m range and ability to capture 43,000 points per second would make it a perfect choice. However, he decided two heads would be better than one as to how to get the best results. He therefore contacted KOREC's Regional Sales Director Neil Pollock, knowing he would be more than happy to help. Neil was able to suggest the use of a GeoSLAM cradle which allows for vertical deployment of the ZEB REVO into inaccessible areas/confined spaces and one was quickly supplied by KOREC.

Preparing for the underground survey

On the day of the survey, having no idea what they would encounter in the sinkhole, Chris initially lowered the winch on its own to get a better indication of depth and the likelihood of hitting any snags in order to make adjustments to find the cleanest path into the unknown. He then scanned the local area around the sinkhole, including pathways and properties within the vicinity, to provide an above ground point cloud with which to orientate the opening. Using the ZEB REVO's real time functionality, in conjunction with his mobile phone screen, Chris used the traffic light system to ensure accuracy was maintained throughout the survey whilst the screen display showed what had been scanned and where he needed to add depth to the point cloud. Consequently, Chris had full confidence in what he had captured whilst still on the site.

> "The ZEB REVO RT system performed brilliantly and gave me everything I expected of it."
>
> **Chris Shelley, Clugston Survey**

Into the void

Once Chris had captured sufficient above ground data, he attached the ZEB REVO to

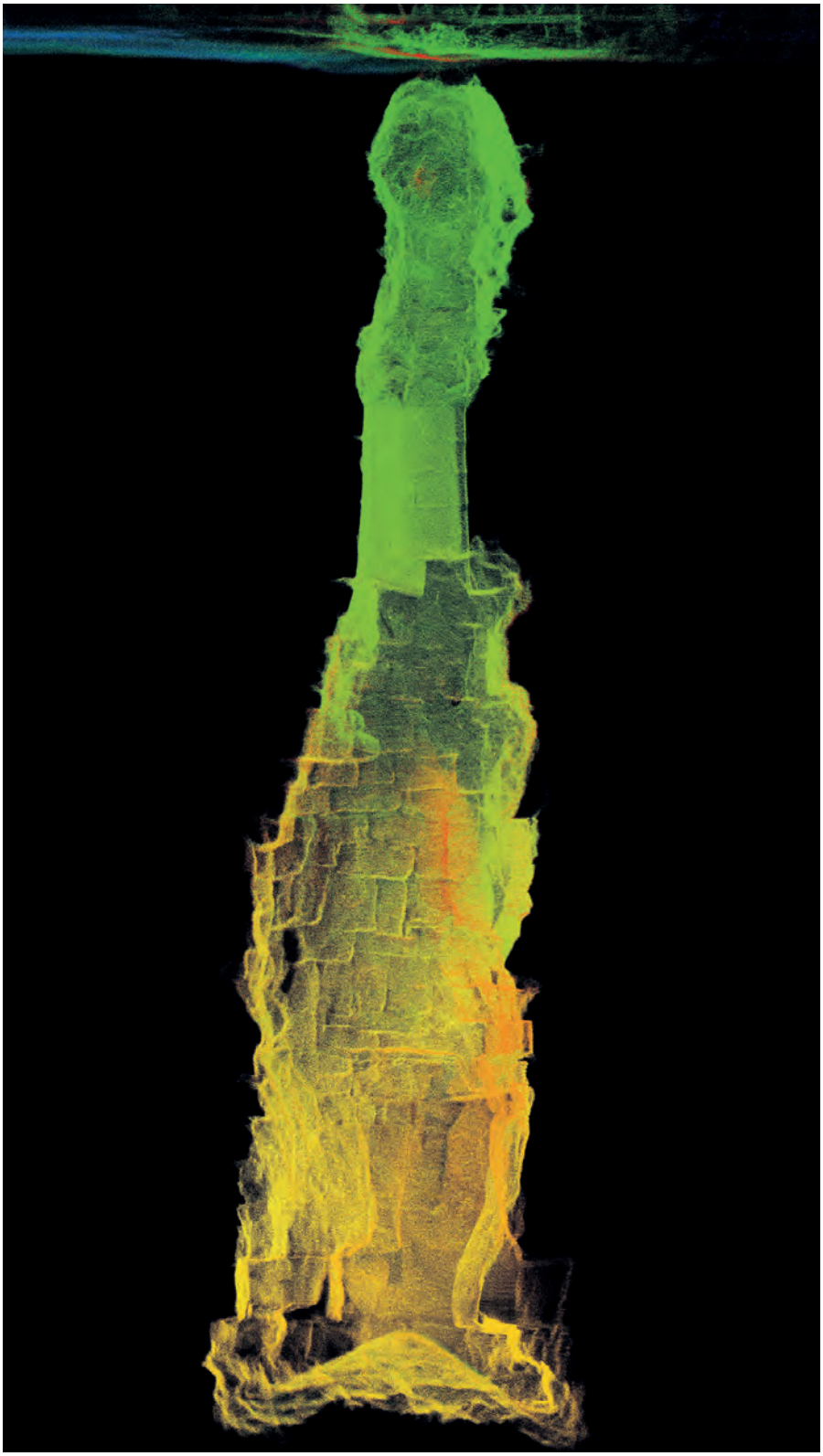
Project synopsis

Project: Surveying a sinkhole of unknown volume

System: GeoSLAM ZEB REVO RT with cradle for vertical deployment

Challenges: Ensuring that all safety requirements were covered whilst providing a full and timely data set

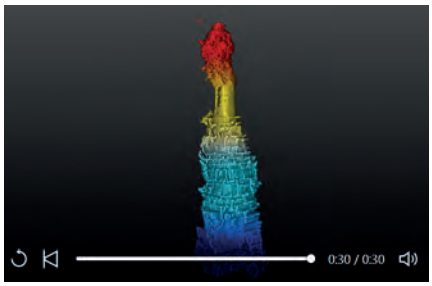
Highlights: Ability to show the client data in real-time allowing them to get ahead with their plans. Great support from KOREC.



the winch and slowly lowered it into the sinkhole whilst steadying the line and orientating the cradle to maximise the cloud to cloud connection. Above the ground, Chris used the real time feed to maintain accuracy and see what the scans were producing. Once the line hit the depth previously marked up on the control test, the ZEB REVO was given time to collect as much data as possible before being slowly raised to the surface. To ensure a good result the point cloud capture was carried out a second time.

By logging into the GeoSLAM Hub onsite (processing software for import, viewing and interrogating data and creating deliverables), Chris was able to reprocess the scans and access 100% of the points available in .LAS format. This also allowed Chris to show the client some early visual based results of what had until then, been a totally unknown factor.

Video deliverable



The final dataset was presented as 360° video footage along with isometric views, a plan topo survey, sections through the sinkhole in AutoCAD DWG format and void space volume information. The survey revealed that the sinkhole was around 10m deep, seven times larger than the opening and had man-made construction areas within it, possible an old, redundant man-hole.

Chris reports that the client was very satisfied with the output and a particular benefit of the decision to use the ZEB REVO RT system was the ability to see the results on the day through the point cloud which allowed them to get ahead with their plans for the sinkhole before the final data had been issued. He concludes, "the ZEB REVO RT system performed brilliantly and gave me everything I expected of it. I am a big believer in what the GeoSLAM team is doing and especially of the ZEB REVO. We also have a fantastic relationship with the team at KOREC who help us continually with anything we require from kit, to technical enquiries, to generally just being a friend of the company. Long may it continue!"

All information and photos kindly supplied by Chris Shelley, Principal Land and Building Surveyor for Clugston Survey Services.

About Clugston Survey Services

Based in North Lincolnshire, Clugston Survey provides nationwide coverage through an experienced, dedicated and specialist team of land, underground service and measured building survey professionals, all committed to providing an accurate and quality assured service using the most up to date technology, delivering data to an uncompromised standard of presentation. www.clugston.co.uk/survey-services/

Contact us:

Please do get in touch for further information on any of the products or services mentioned in this case study, a demonstration, support or just a chat about your requirements.

T: **0345 603 1214** / IRE: **01 456 4702**
E: **info@korecgroup.com**
www.korecgroup.com