How Seequent's web application, LF View, was used to aid collaboration for teams responding to the Rohingya refugee crisis.

SOUTHEASTERN BANGLADESH, SOUTH ASIA
In 2017, the United Nations High Commission for Refugees (UNHCR) requested geophysical surveys for an emergency water supply project in southeastern Bangladesh. Here, upwards of 800,000 Rohingya people were crammed into refugee camps and makeshift settlements, enduring a worsening health crisis because they didn’t have a reliable source of safe drinking water.

THE PROJECT

Advisian’s Global Geophysics Lead, Alastair McClymont, was part of the team tasked with completing the geophysical survey to help locate drilling targets for new water wells. The team used Seequent’s free web application, LF View, to help teams collaborate over geological modelling both locally and internationally.

Alastair explains, “We faced unique challenges of data acquisition within and around the camps and then had to rapidly analyse and disseminate this information to the stakeholders tasked with developing new water wells. View provided us with the platform to rapidly complete this and was a key aspect in our successful delivery of the project. I think people really ‘got it’ when we were in the camps and were able to use View to show on a laptop where a potential aquifer existed relative to their current location.”

SITUATION

Given the multiple sources of georeferenced information (well locations and approximate depths; electrical resistivity tomography (ERT) cross-sections; topography and aerial imagery), the team needed a way to integrate the information into a 3D geological model from which they could then use to make interpretations and visually communicate findings to the various stakeholders responsible for selecting new water well locations.

Stakeholders included staff from UNHCR and the International Organisation of Migration (IOM), and NGO drilling contractors.

Geological and Hydrogeological Setting

The geology of the Teknaf Peninsula comprises Miocene to Pliocene aged sedimentary rocks (sandstones, shales, and conglomerates) that were deposited in the Bengal Basin. This layered sequence of sedimentary rocks has been deformed by ongoing plate tectonics such that the sequences are folded and faulted and, in general, the bedrock units of the Teknaf Peninsula form an anticline that plunges to the north. Uplift and erosion of the anticline have left units of the Tipam Sandstone, Boka Bil, and Bhuban Formations exposed in the mountain chain that extends along the Teknaf Peninsula.

The Kutupalong and Balukhali makeshift settlements are located at the northern end of the peninsula, where the regional fold forms a ‘bathtub’ like syncline and Tipam sandstone units are exposed. The Nayapara and Leda camps are located on the coastal plains to the east of the north-south trending mountain ranges. The area surrounding the Nayapara and Leda camps is underlain by a cover sequence of intercalated alluvial fans from the mountains, and clay-rich Naf River estuarine deposits. Beneath the cover sequence, the bedrock units are understood to be either Tipam sandstone or more clay-rich sequences associated with the Boka Bil Formation. Although monsoon rains bring up to 4 500 mm of precipitation a year, during the pronounced dry season, which extends for 5 months between November and April, any rainfall has a negligible impact on recharge of groundwater aquifers or surface water reservoirs.
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Technical Lead, Paul Bauman, comments, “It was also much easier to communicate the results as 3D renderings rather than as disparate 2-D cross-sections that would need to be cross-referenced with a map, and borehole drilling logs”.

Upon completion of the field investigation in Bangladesh, the View projects were updated by Advisian staff in Canada, UNHCR staff in Geneva and NGO stakeholders in Bangladesh could then review progress via web browser on their local devices.

Alastair McClymont comments, “We also needed to use this model to make day to day decisions on proposed ERT line locations.”

With the widespread contamination of the shallow wells and consequent impending threat of waterborne diseases, there was an urgent need for aid agencies to develop water wells into deeper aquifers, less susceptible to surface contamination. In support of this the team undertook the geophysical survey within areas of the Kutupalong, Balukhali, Nayapara, and Leda Settlements.

RESPONSE

All data was imported into View, which enabled the team to have interactive 3D geological viewing of models via a web browser. LF View is a free web application that allows teams, both technical and non-technical to easily collaborate together over geological models. With View, users face no barrier to sharing and commenting on Leapfrog models even if they don’t have Leapfrog software or have never used it before.

The model was updated at the end of each day so that the project team could review the results and plan the next day’s activities before leaving the hotel each morning. Advisian’s

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ALASTAIR MCCLYMONT, ADVISIAN’S GLOBAL GEOPHYSICS LEAD

Advisian Geophysicists Colin Miazga and Chris Slater place ERT cable for a road crossing near Nayapara settlement.
Please click on any of the images below to visualise and explore the models and see for yourself how LF View breaks down barriers to communication and allows any permitted viewer to explore and visualise 3D material.

Figure 1:
View looking to the north of the Kutupalong mega camp, with ERT cross-sections hanging from the topography. A mosaic of UAV-based imagery is overlaid on the topography to show terrain obstacles and linear corridors between obstacles that were used to place ERT lines.

Figure 2:
Side on view of ERT cross-sections and some borehole lithology logs. Relatively high-resistivity layers (orange and red blobs) coincided with sand aquifer geology logged in the boreholes (yellow and orange segments), whereas low-resistivity layers (dark blue) coincided with clay aquitard units (blue segments).

Figure 3:
View looking to the north of Nayapara and Leda camps, showing ERT line locations (red lines) and borehole locations (blue circles). A mosaic of UAV-based imagery is overlaid on the topography to show terrain obstacles (shelters and trees) at the time of the ERT survey.

Figure 4:
View showing ERT cross-sections, where dark red blobs indicate two potential linear sandstone aquifers trending to the northwest.

Figure 5:
Slice view showing clusters of existing water wells (grey tubes) that coincide with resistive sandstone aquifers (red blobs).
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OUTCOME

View gave the teams, stakeholders and decision-makers timesaving ways to communicate, present and collaborate together around their data inside one easy to access online tool. Users were able to capture any aspect of their dynamic 3D geological model by creating a slide. Stories can be built around the slides by adding a title, description and adding annotations, both drawings and notes, which provide clarity or ask questions.

“Although we were only able to survey a relatively small area of the settlement, our 3D model showed that some of the discrete resistive anomalies, that are interpreted as moderately deep aquifers, appear on overlapping lines, suggesting that they are extensive away from the survey lines and would have significant groundwater storage. Based on our ERT results at Kutupalong, our immediate recommendation was to focus efforts on completing new water wells into the deeper aquifers we had identified. To help direct drilling operations, we provided maps to UNHCR with proposed drilling target locations.”

The team left Bangladesh having accomplished their mission to provide their UNHCR WASH colleagues with a list of proposed drilling targets for new water wells. Concludes Alastair McClymont, “We’ve since learned that drilling of at least one of our targets had hit a water-bearing sandy unit with better than expected yields. We also learned that the reservoir at Nayapara had been expanded, increasing the surface water storage for the camp.”

Amy Gerber, View Product Manager, comments, “It’s great that View has made an impact on such a worthwhile and challenging project. View has the capability to simplify the way people interact, communicate and collaborate, this is particularly relevant in situations such as this, where urgency is key. At Seequent, we help transform raw, complex data and give it a form that is easily communicated to stakeholders and collaborated on by remote teams. Having a common picture brings clarity to complexity and empowers everyone with knowledge.”

LF View is a rapidly evolving solution that has already introduced many new features since this project, including the ability to create a story through a slide presentation and allow stakeholders to give feedback in one place. Users can capture an aspect of their dynamic 3D geological model by creating a slide. Stories can be built by adding a title, description and using the embedded note function to ask questions or provide clarity directly onto slides.

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AMY GERBER, VIEW PRODUCT MANAGER
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