

Case Study

Graniterock Quarry Environmental Study

California, USA

Willowstick helps an expanding quarry prevent damage to local rivers and aquifers

The problem

Graniterock, a Watsonville, California-based construction products and services company, manages a large quarry located near Monterey Bay, California. As the quarry has expanded and proceeded deeper into the ground, the company has needed to be more aware of the subsurface characteristics, in particular the groundwater flow paths that impact the water going to and from the quarry.

“The site was a quarry with a complex hydrogeology,” noted Jon Erskine, a senior scientist at Graniterock. “We needed to understand where their groundwater flow paths were coming from, where they were going and how much volume of water we might be producing as we lower and expand the quarry.”

Complicating the situation even more was a river located next to the quarry. Erskine worried that any exchange flow paths between the two would be a potential environmental hazard.

Protecting the quarry from the river and vice versa, plus being able to understand how the geology would change as the quarry expanded was critical. The key was finding where the groundwater paths were.

“We did a simple groundwater model to try and predict how much water was going to come into the quarry. The person that did the model predicted that water would be coming in from everywhere, instead of these discrete, fractured pathways. He estimated a lot of water would come in, which would be expensive to remove and would have an environmental impact on the river.



“This isn’t the case with most quarries, but because ours is so big and next to some sensitive water bodies, we really had to understand (the subsurface characteristics.)”

The right solution for the job

After the initial modeling, Erskine looked for something more concrete. After looking into seismic refraction and a geothermal surveying company that could provide limited data, he called upon Willowstick.

The Willowstick technology works by measuring magnetic fields generated by an AC current, which is applied using non-invasively placed electrodes. After multiple unobtrusive readings taken by a Willowstick surveyor, the data is applied to mathematical algorithms and used to create maps and 3D models of the subsurface groundwater paths.

"I first learned about Willowstick by reviewing another project I was over-seeing in Las Vegas," Erskine explained. "They were brought in by an engineering firm, and I remember seeing how the technology was used to map out groundwater pathways. I thought it would be very applicable to what we were wanting to do here, which was map out very complex, discrete water flow pathways."

"It's a very rich data set."

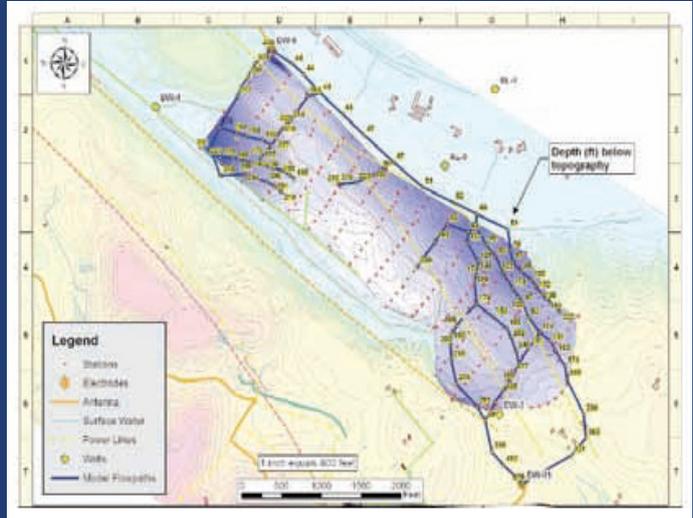
"Our corporate strategy was to do a pilot study before we jumped in with both feet," said Erskine. "We picked an area we felt we knew a lot about, and ran a test to see if the technology held up."

Not only did the technology hold up, but Erskine said it revealed a large groundwater pathway in the middle of the area that he had suspected was there, but had no prior confirmation. "The technology just nailed it," he said.

"We eventually did three or four surveys and mapped out the whole quarry," Erskine said. "We used the technology to figure out where we should put monitoring wells and pumping wells."

Within a matter of months, Erskine held a complete set of information that Willowstick surveys had pulled. In that data was every piece of significant information he would need about the subsurface water pathways, mapped out in clear and easy-to-understand form.

"It's been the best tool we've had for really identifying groundwater path-ways," Erskine said. "The more I dig through survey results the more little things I find that I didn't really appreciate before. **It's a very rich data set.**"



Confidence in the information

Erskine said he appreciates the confidence he has in the information pulled from the surveys. "We've designed our groundwater monitoring and characterization program based on the results of the Willowstick survey. Without the Willowstick data, we wouldn't have been able to build our understanding of how the site works. We would've had to go forward kind of willy nilly."

A key aspect of being confident in the information provided is knowing precisely where to place monitoring tools, which are costly to purchase and install.

"Each monitoring well we put out there is very, very expensive. Each one could cost up to \$100,000," Erskine noted. "This has helped us optimize where to put these things. If we had just guessed where to put them, we might have been misled by incorrect information."

Speed and agility of the surveys

Erskine also noted the speed and agility of the surveys, and the responsiveness of the Willowstick team to changing needs.

"I was very happy with the turnaround time, which was very quick. I liked the fact that when the guys (Willowstick engineers) were out in the field they were constantly updating me. We adjusted some surveys on the fly for better results, and they were very attentive. I was very impressed by the way that worked out."

In the end, what the data means for Erskine and Graniterock is total confidence in what lies beneath the vital quarry, and the ability to act on that data in a way that protects not only their investment, but the environment as well.

Enhancing the consultant's credibility and reputation

"We're looking for legitimacy with the regulatory agencies; we can go there and show them this data and the independent lines of evidence (such as subsequent tests) that say the same thing.

"The value is high quality data, which to us is really important. Because of that and the good work we do, we have good relationships with those agencies."