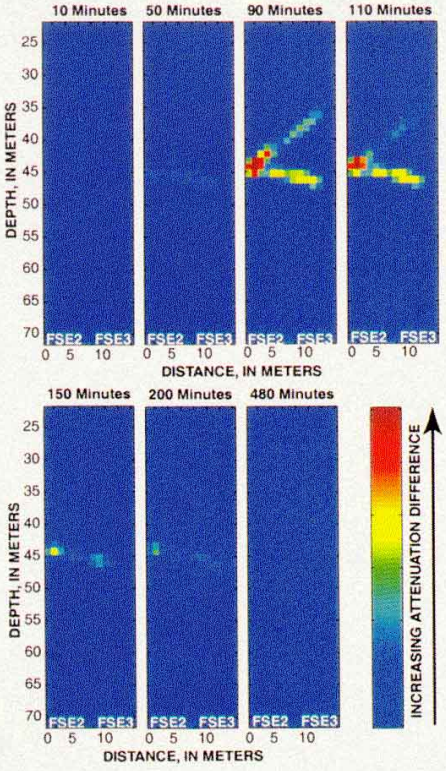

Figure 7. Time-lapse 100-megahertz attenuation-difference tomograms between FSE2 and FSE3 produced by using a sequential injection and incremental scanning method, Mirror Lake, Grafton County, New Hampshire.

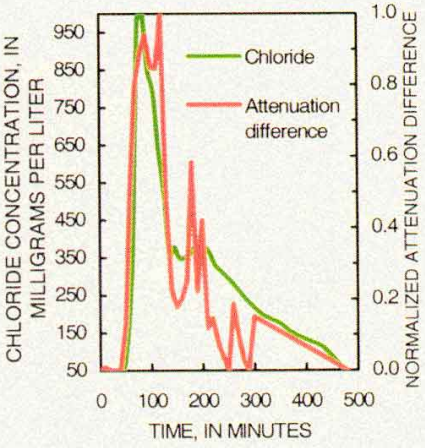

Figure 8. Chloride concentration in FSE4 and integrated radar attenuation difference in the FSE2 to FSE3 plane normalized to maximum and minimum values versus time, Mirror Lake, Grafton County, New Hampshire.

and others, 1996). Interpretation of the surface- and borehole-geophysical data showed that the blasting created an intensely fractured zone about 3-m wide, 50-m long, and 26-m deep. Cross-hole radar-velocity logs from a pair of boreholes that straddled the blasting zone are shown in figure 9. The logs show a decrease in radar velocity in the saturated zone after blast fracturing that outlines the depths affected by blasting. Before blasting, the secondary porosity of the bedrock was estimated at about 1 percent. Analysis of the radar-velocity logs indicates that the secondary porosity in the middle of the trench increased to more than 10 percent after blasting.

References

Lane, J.W., Jr., Haeni, F.P., Placzek, Gary, and Wright, D.L., 1996, Use of borehole-radar methods to detect saline tracer in fractured crystalline bedrock at Mirror Lake, Grafton County, New Hampshire, USA, *in* Sixth International Conference on Ground-Penetrating Radar (GPR '96), Sendai, Japan, September 30-October 3, 1996, Proceedings: Sendai, Japan, Tohoku University Department of Geoscience and Technology, p. 185-190.

Lane, J.W., Jr., Haeni, F.P., Soloyanis, Susan, Placzek, Gary, Williams, J.H., Johnson, C.D., Buursink, M.L., Joesten, P.K., and Knutson, K.D., 1996, Geophysical characterization of a fractured-bedrock aquifer and blast-fractured contaminant-recovery trench, *in* Bell, R.S., and Cramer, M.H., eds., Symposium on the Application of Geophysics to Engineering and Environmental Problems (SAGEEP '96), Keystone, Colo., April 28-May 2, 1996, Proceedings: Wheat Ridge, Colorado, Environmental and Engineering Geophysical Society, p.429-441.

Lane, J.W., Jr., Joesten, P.K., Haeni, F.P., Vendl, Mark, and Yeskis, Doug, 1998, Use of borehole-radar methods to monitor the movement of a saline tracer in carbonate rock at Belvidere, Illinois, *in* Bell, R.S. Powers, M.H., and Larson, Timothy, eds., Symposium of the Application of Geophysics to Environmental and Engineering Problems (SAGEEP '98), Chicago, Ill., March 22-26, 1998, Proceedings: Wheat Ridge, Colorado, Environmental and Engineering Geophysical Society, p. 323-332.

Lane, J.W. Jr., Wright, D.L., and Haeni, F.P., 1999, Borehole radar tomography using saline tracer injections to image fluid flow in fractured rock, *in* Morganwalp, D.W., and Buxton, H.T., eds., U.S. Geological Survey Toxic Substances Hydrology Program-Proceedings of the Technical Meeting, Charleston, South Carolina March 8-12, 1999: U.S. Geological Survey Water Resources Investigations Report 99-4018C, Vol. 3, p. 747-756.

Olsson, O., Falk, L., Forslund, O., Lundmark, L., and Sandberg, E., 1992, Borehole radar applied to the characterization of hydraulically conductive fracture zones in crystalline rock: Geophysical Prospecting, v. 40, p. 109-142.

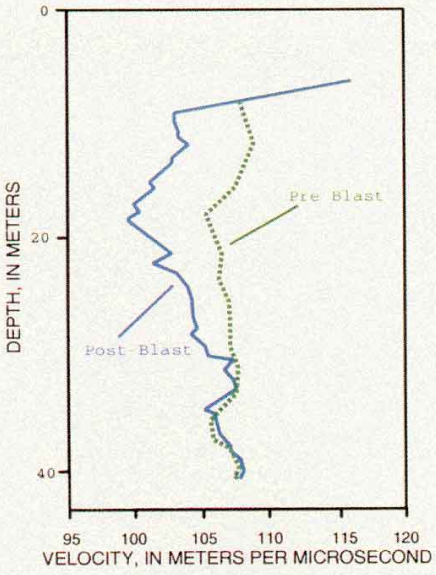

Figure 9. Horizontal level-run 22-megahertz cross-hole radar velocity plotted against depth between two test wells located across and perpendicular to trench axis, Loring, Maine.

-Kamini Singha, Kari Kimball, John W. Lane, Jr.

For further information, please contact:

Chief, Branch of Geophysical Applications and Support
U.S. Geological Survey
11 Sherman Place
Storrs Mansfield, CT 06268
(860) 487-7402
http://water.usgs.gov/ogw/bgas