GeoSierra

Newsletter

Winter/Spring 2006

GeoSierra Completes over 4500' linear feet of PRBs at Three (3) Sites in Texas & California

GeoSierra recently completed the construction of Permeable Reactive Barriers (PRBs) at three (3) sites using its azimuth controlled hydraulic fracturing technology. At the California site the PRB extended from a depth of 25 feet down to a depth of 115 feet below ground surface and was engineered in thickness ranging from 3 to 6 inches. The PRBs installed at the two (2) sites in Texas were constructed in areas of extremely tight access with numerous underground utilities, with one site being a narrow commercial street in the City of San Antonio in a densely populated area. The PRB at the other site was installed along, and within, an active railroad right-of-way. GeoSierra's *Trenchless* PRB technology was selected for all three (3) sites because of the deep installation requirement and the need to be minimally intrusive, in respect to utilities and provide a safe clean working environment close to neighborhood residents.

Individual Highlights:

During Construction and After Construction, off site Kelly AFB, San Antonio, TX

During Construction and After Construction, Railroad right-of-way, San Antonio, TX

During Construction and After Construction, California Bay Area Facility, Oakley, CA

Visit us at the Battelle Chlorinated Remediation Conference, Monterey, CA May 22-25, 2006

BOOTH #504

GSA Contract Holder

GeoSierra Completes Phase II PRB Installation in California Bay Area

GeoSierra completed the installation of a deep PRB totaling over 860 feet in length extending from 25 feet down to 115 feet in depth at a former chemical manufacturing site in the California Bay area. The PRB installation was the final second phase for the groundwater remedy at the site, with the first phase being a pilot PRB installed to full depth of 115 feet by GeoSierra in 2001. The PRB was installed by GeoSierra's azimuth controlled vertical hydraulic fracturing technology. The PRB consisted of two segments; an upper PRB segment 485 feet in length installed from a depth of 25 feet down to 55 feet and a lower PRB segment 375 feet in length installed from a depth of 50 feet down to a total depth of 115 feet. The upper PRB segment was located 100 feet upgradient of the lower, deeper PRB segment. Fifty four (54) frac casings were installed in six-inch boreholes drilled every 15-feet along the alignment of the PRB. Thirty (30) sub-surface resistivity strings for real time imaging of the injected PRB were installed down to a depth of 105 feet located approximately mid-way between the upper and lower PRB segments.

Deep PRB Site Location in California Bay Area

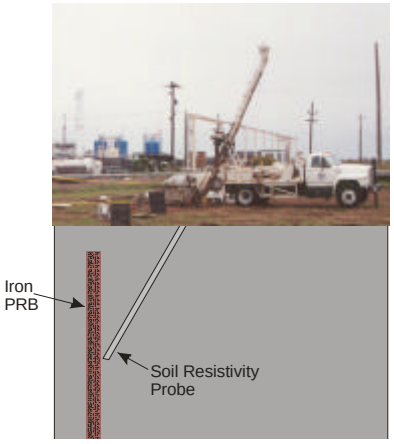
3rd Generation Mixing/Blending Unit with Vacuum Dust Control System

The constructed PRBs had a treatment depth extending from 25 to 115 feet below ground surface. The effective iron thickness of the PRB was 6 inches in the central section of the deeper PRB segment and 4-1/2 inches in the central portion of the upper PRB segment. The thickness of both PRB segments was 3 inches elsewhere. The PRB was installed in a highly permeable sequence of sands and gravel interspersed with thin clay layers in the 40 to 60 foot depth interval. The entire sequence was confined by a stiff clay layer in the upper 25 feet. A total of 1750 tons of iron filings were injected into the subsurface to complete both phases of the PRB.

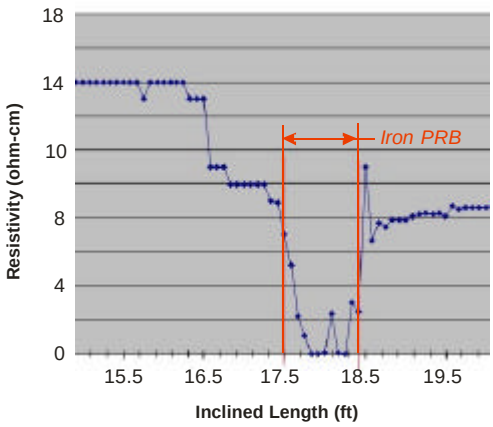
PRB quality assurance tests consisted of; 1) pre and post PRB hydraulic pulse interference tests conducted between up and down gradient PRB monitoring wells, 2) real time imaging of the injected PRB subsurface geometry with quantified PRB thickness determined from the imaged PRB geometry and injected iron tonnages and 3) inclined soil resistivity profiles at ten (10) locations to validate the precise PRB thickness at depth was within specifications.

Inclined Resistivity Profiling of PRB Thickness for Deep PRB in Bay Area

Deep inclined thickness profiling of the PRB installed at the former chemical manufacturing site in the Bay area was conducted at 30° to the vertical at ten (10) locations along the PRB alignment by a soil resistivity probe. The drill rig was offset from the PRB alignment to ensure the inclined profile intersected the PRB at the required depth. The inclined profile was first augered down to within 10 feet of the PRB and the soil resistivity probe pushed the remaining distance to intersect and quantify the PRB thickness at that location. All ten inclined thickness measurements met or exceeded the design thickness specification.



Inclined Profiling of PRB Thickness



Soil Resistivity Profile for Determining PRB Thickness

Regulatory Agencies & Private Section Attend Tours of PRB in Railroad Right-of-way

GeoSierra invited interested parties to visit the installation of a 1,500 feet long PRB along an active railroad right-of-way in San Antonio, TX. Three site tours were held with more than fifty people attending from the regulatory agencies and private sector. The attendees were impressed that such a large sub-surface project could be completed not only within the railroad right-of-way but with activities conducted less than 20 feet from the active railroad tracks. Many attendees commented on the safe, clean and efficient work environment of GeoSierra's *Trenchless* construction technology in such a highly restrictive location. It was obvious to all attendees that the PRB could only be installed by a *Trenchless* technology such as GeoSierra's.

The interested parties were able to view and discuss all of the aspects of GeoSierra's *Trenchless* PRB installation technology. Of particular interest was the versatility and efficiency of the new 3rd generation pumping and mixing equipment being confined to such a small working footprint.

Site Tours of PRB Installation in Railroad right-of-way

GeoSierra's real-time sub-surface imaging technology was demonstrated showing the clarity and resolution of injected sub-surface PRB segment's image and verifying it's coalescence with neighboring vertical segments.

GeoSierra Completes 1500' PRB in San Antonio Railroad Right-of-way

GeoSierra recently completed the installation of the 1,500 feet long PRB down to a depth of 39 feet in an active railroad right-of-way in San Antonio, TX. The PRB was constructed by GeoSierra's azimuth controlled vertical hydraulic fracturing technology. One hundred and forty (140) frac casings were installed in six-inch boreholes drilled every 11-feet along the alignment of the PRB. Fifty-one (51) sub-surface resistivity strings for real-time imaging of the injected PRB were installed down to a depth of 40 feet, approximately 12 feet laterally offset from the PRB alignment.

The constructed PRB is 1500 feet in length, with a treatment depth extending from 18 to 39 feet below ground surface. The engineered iron thickness of the PRB is 4-1/2 inches in the central section of the PRB and 3 inches elsewhere. The PRB was installed in a highly variable (both in thickness and permeability) gravel layer consisting of gravel and cobbles. A total of 429 tons of iron filings were injected into the subsurface to complete the PRB. The subsurface resistivity receivers provided real time imaging of the PRB installation during injection of the iron filings. The 3rd generation mixing and blending unit provided a safe clean environment with its vacuum controlled dust free system for all handling operations of the iron filings.

PRB quality assurance tests consisted of 1) pre and post PRB hydraulic pulse interference tests conducted between up and down gradient PRB monitoring wells and 2) real time imaging of the injected PRB subsurface geometry with quantified PRB thickness determined from the imaged PRB geometry and injected iron tonnages.

PRB Installation in Union Pacific Railroad right-of-way

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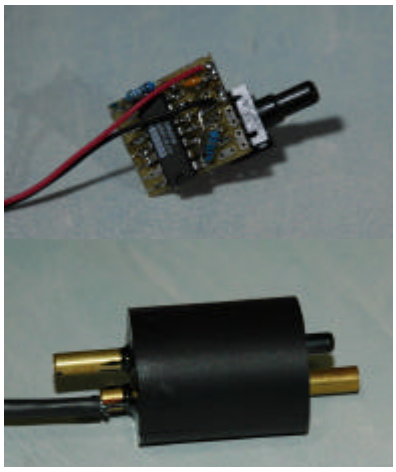
We're on the Web!
See us at:
www.geosierra.com

Look for our Video on the web site!

3rd Generation Hydraulic Pulse Interference Receiver Pressure Gage

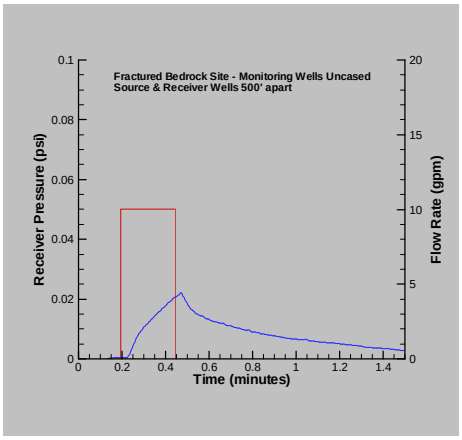
GeoSierra's 3rd generation hydraulic pulse interference receiver pressure gage consists of a high precision (1/10,000psi) differential wet/wet temperature compensated gold plated strain gage device. The gage is amplified and compensated with microcircuitry to provide a 4-20mA current amplitude over its full range. GeoSierra developed the microcircuit and encapsulates the device in a high density resin for use in hostile groundwater environments at depth. All of GeoSierra's pulse receiver strings contain the new 3rd generation gage. The gage has been used operationally in pulse interference tests at numerous sites for over eighteen (18) months without loss of functionality or precision.



3rd Generation Pulse Interference Pressure Gage

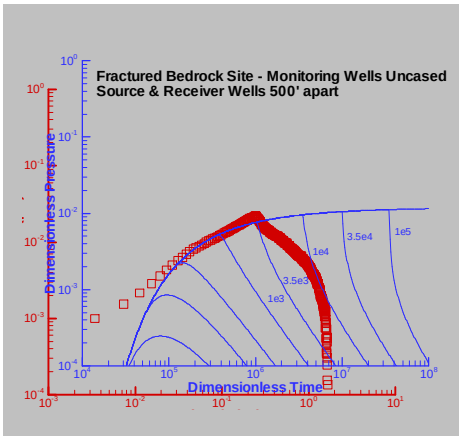
Characterizing Fractured Bedrock by the Hydraulic Pulse Interference Test

The hydraulic pulse interference test is ideal to hydraulically characterize fractured bedrock systems, determining hydraulic connectivity and transmissivity of the fracture network. Recent pulse tests on fractured dolomitic bedrock show the rapid response in uncased monitoring wells some 500' apart with minimal injection of water during the pulse interference test. The hydraulic connectivity of the fractured network at this site was quantified by numerous pulse test directional arrays between 11 wells. The transmissivity of the fracture network was determined directly from type curves generated specifically for the fractured system.



Pulse Receiver Well Pressure Response

Pulse Interference Test Setup for Fractured Bedrock Site



Type Curve Analysis of Pulse Test

About GeoSierra...

GeoSierra, a privately owned company, is based in Atlanta, GA. GeoSierra concentrates its expertise and technology focus on projects and services involving solutions for remediation of contaminated groundwater and soil. While we are capable of providing turnkey completion of projects from investigation, testing, design and construction, we frequently participate in teaming arrangements with other solution providers. We are always open to such teaming arrangements and recognize the added value such arrangements can often bring to a project. Application of GeoSierra's specialized deep PRB technologies have been instrumental in helping to successfully modify a number of soil and groundwater records of decisions (RODs). The results, in each case, have been substantial life cycle cost savings and accelerated cleanup times.