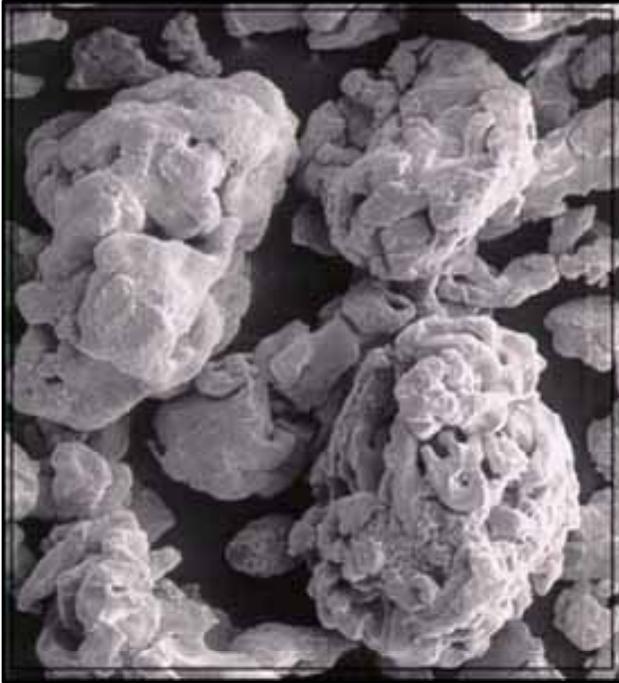


# SAN DIEGO ASSOCIATION OF GEOLOGISTS

[www.sandiegoeologists.org](http://www.sandiegoeologists.org)

## SDAG MEETING ANNOUNCEMENT

**WEDNESDAY, JUNE 18, 2003**



*Destruction of Chlorinated Solvents  
in Groundwater Using  
Zero-valent Iron Injection  
A Case Study from Hunters Point  
Shipyard, San Francisco*

*presented by*

**PATRICK BROOKS**  
ANTEON INTERNATIONAL  
CORPORATION

*Scanning electron micrograph of iron particles  
utilized in case study area*

**Where:** **Eva's Cocina & Cantina**  
6690 Mission Gorge Road  
San Diego, CA  
(619) 284-5874

**WHEN:** 6:00 pm – Social Hour  
7:00 pm – Dinner  
8:00 pm – Program

**Directions:** Go west on Friars Road, east of I-15 to Mission Gorge Road. Located 1/2 block East of Zion Ave. on the North side of Mission Gorge Road. Overlooking Admiral Baker Golf Course

**Dinner:** A Mexican Buffet to include Cheese Enchiladas, Beef Fajitas, Cesar salad, Sautéed Vegetables, Corn and Flour Tortillas, Mexican Style Rice, Refried Beans, Salsa Fresca, Guacamole and Sour Cream. Includes Soft Beverages, Coffee or Tea.

**Cost:** \$20 per person, students \$10 with ID

**Reservations:** Make your reservation online through the SDAG website at [www.sandiegoeologists.org](http://www.sandiegoeologists.org) or call the SDAG Reservation Line at: (619) 521-0165, ext. 190, **no later than 5PM Monday, June 16<sup>th</sup>**. Contact Margaret Eggers at (619) 521-0165, ext. 132 with any questions.

## **BIOGRAPHY**

Patrick Brooks earned a B.S. in Geology from the University of Utah, and a M.S. in Hydrology from the University of Arizona. He is president of SDAG; president of Aqualink Water Systems (a non-profit group dedicated to improving potable water supplies in Baja California); and a long-time consulting geologist in the San Diego area. He is currently employed by Anteon International Corporation where he manages environmental contractors performing cleanup and investigative work for the U. S. Navy.

## **ABSTRACT**

Destruction of Chlorinated Solvents in Groundwater Using Zero-valent Iron Injection – A Case Study from Hunters Point Shipyard, San Francisco

An innovative approach to inject zero-valent iron for the treatment of chlorinated volatile organics in the groundwater was demonstrated at an inactive Naval shipyard in northern California. The primary objective of the demonstration was to evaluate the technology's effectiveness in reducing and destroying chlorinated volatile organic compounds in the saturated zone.

Unlike the conventional permeable reactive barrier designs, the demonstrated process involved the injection of a high reactivity/purity zero-valent iron powder by a proprietary gas injection technique in conjunction with pneumatic fracturing for permeability enhancement within the treatment zone; thus allowing for an active remediation of "hot-spots" or source areas. While the chemistry of CVOC reduction by zero-valent iron has been well established and demonstrated, the remaining factor in its effectiveness at any particular site hinges on the ability to distribute the iron powder throughout the targeted zone.

The site geology and setting presented a particular challenge to the field implementation. The selected treatment zone resides in an inactive building in an area dotted with numerous borings, piezometers, monitoring wells and SVE wells remnants of various site investigations and remediation efforts. The treatment zone geology consists of varying thickness of fill materials underlain by weathered bedrock as well as more competent fractured rock.

Approximately 16,000 lbs of a food-grade "sponge" iron powder was successfully delivered in a form of a iron-water slurry via four injection wells in discrete 3-foot intervals isolated by a straddled packer assembly. The iron was injected from 30 feet bgs to approximately 9 feet bgs. Each injection was immediately preceded by the application of pneumatic fracturing to create and better inter-connect the existing fracture network resulting in an overall increase in the bulk permeability and more effective dispersion of the iron powder. Pneumatic fracturing and the iron slurry injection were conducted using compressed nitrogen gas as the carrier fluid. During the field implementation, injection parameters including pressure, flow volume, slurry thickness were frequently modified and optimized in response to the particular characteristics and depths of the injection zones.

TCE, the primary contaminant at the site, was detected in the groundwater at concentrations exceeding 80,000 micrograms/liter before the test began. The same well yielded a TCE concentration of 4 micrograms/liter 12 weeks after injection. TCE concentration reduction was less dramatic in other wells, but a 2 order of magnitude reduction was common. Potential mobility of the TCE groundwater plume was monitored as were the concentrations of several metals and arsenic.

## 2003 EXECUTIVE COMMITTEE

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**WEBMASTER** - Carolyn Glockhoff; Ph: (858) 549-3396; [carolion@znet.com](mailto:carolion@znet.com)

## ANNOUNCEMENTS:

### Upcoming 2003 Meetings - UPDATED SCHEDULE !!!

July 16	“Atmospheres and Oceans of the Terrestrial Planets”, Dr. Gary Peterson, SDSU
August 20	“Gustay Groundwater Investigation”, Barry Pulver, San Diego RWQCB
September 17	“Ridge-trench Interactions and the Ongoing Capture of the Baja California Microplate”, by John Fletcher, Departamento de Geologia, CICESE, Ensanada, Baja California.
October	SDAG Annual Fieldtrip – Pegmatites of San Diego County
November	TBD
December 17 <sup>th</sup>	Holiday Meeting, San Diego Natural History Museum

## POSITIONS AVAILABLE:

- **ENV America Incorporated**, an environmental engineering, consulting and construction firm, is seeking geologists and engineers for its offices in Irvine and San Diego:
  - Entry level geologists and civil engineers
  - Staff- and project-level geologists and civil engineers with experience in remediation design and construction.

The ideal candidate will be a client-focused team player, and possess outstanding analytical abilities, proficiency with software and computers, a Bachelors or Masters Degree in a relevant field, excellent writing skills, and a strong ability to concisely and clearly communicate technical information to technical and non-technical audiences. Send your letter of interest and resume to Tom Mulder, ENV America Incorporated, 2247 San Diego Avenue, Suite 135, San Diego, CA 92110, or e-mail [tmulder@envamerica.com](mailto:tmulder@envamerica.com). (5/03)

### (MORE) POSITIONS AVAILABLE:

- **Kleinfelder** has an outstanding career opportunity for a qualified project geotechnical engineer in our San Diego Office. This position is ideal for the right motivated individual interested in excelling professionally. Teamplayers and client-focused individuals who are comfortable and capable of practicing advanced geotechnical engineering techniques will be considered. The primary responsibilities will be to coordinate, analyze, and compile reports for geotechnical projects including shallow and deep foundations, slope stabilization, soil mechanics, and construction observation. Ideal candidates for the project engineer position will possess 4 to 8 years of progressive geotechnical engineering experience, an M.S. degree in civil (geotechnical emphasis) engineering, a P.E. or the ability to register in California within one year, and exceptional verbal and written communication skills. Ideal project level candidates will also be results - oriented, creative in applying technology for highly diverse designs and projects, and have some experience in proposal preparation and client management. For additional information please contact: Bob Stroh, RG, CEG, Project Engineering Geologist, Kleinfelder, Inc., 5015 Shoreham Place San Diego, California 92122 858.320.2270 direct.

### **POSITIONS WANTED:**

Matthew Sisk, a new SDAG member is looking for an entry-level geology/geology related position in San Diego County. Matthew is a recent graduate of New Jersey City University, with a BS in Geology. Contact Matthew at [Matthewmb77@aol.com](mailto:Matthewmb77@aol.com).

### ***SDAG's 2003 Field Trip:***

Plans for the San Diego Association of Geologists 2003 Field Trip are taking shape. The annual field trip will be held October 25th and 26th. The theme of the trip is "**The Elsinore fault and gem bearing pegmatites between Palomar Mountain and the Coyote Mountains, San Diego County, California**". Tid bits: We plan on visiting a great exposure of the Elsinore fault Saturday morning followed by Lunch at Menghini Winery. We will Camp at Agua Caliente county park Saturday night. More juicy details forthcoming.

If you can contribute a paper pertaining to the geology, geomorphology, mining, history, or biology of the general area in which the field trip will take place, please consider submitting it for publication in the guidebook. The trip and guidebook will be a joint effort of the San Diego Association of Geologists and the South Coast Geological Society. (There will be two field trips.) For more information, please contact Monte Murbach ([mmurbach@petra-inc.com](mailto:mmurbach@petra-inc.com))

**DO YOU HAVE AN ANNOUNCEMENT??** Do you have an event, job opening, field trip or other announcement you would like to share with our members?? Just call or email our SDAG Secretary, Margaret Eggers at 619-521-0165 OR [meggers@hargis.com](mailto:meggers@hargis.com).

**SDAG NEWSLETTER IS DIGITAL!** If we don't have your e-mail address, or your email address changes, or if you have problems with the electronic format please contact Margaret Eggers at [meggers@hargis.com](mailto:meggers@hargis.com), or call at 619-521-0165, ext. 132.

**SDAG Wear:** - Monte has a variety of shirts, hats, visors and even a nice vest with the SDAG logo. A small selection is available for purchase at the meetings; all SDAG wear can be ordered from Monte.

## *2003 CORPORATE SPONSORS*

### **THANK YOU TO ALL OUR 2003 SPONSORS!!**

A significant portion of the SDAG operating and scholarship budget is provided by corporate sponsorship. Please consider becoming a Corporate Sponsor for 2003! In addition to monthly recognition for your contribution, you will be entitled to a free internet "link" from the SDAG Website, and all Corporate Sponsors are listed in the front of the annual SDAG Field Trip Volume.

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**San Diego Association of Geologists  
c/o Margaret R. Eggers, PhD, CHG  
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