GETTLER-RYAN INC.

July 7, 1999

Mr. Scott Seery
Alameda County Health Care Services Agency
1131 Harbor Bay Parkway, 2nd Floor
Alameda, California 94502

Subject: **Hydropunch™ Sampling Protocol**

Mr. Seery:

At your request, I am enclosing a brief description of groundwater sampling protocol utilizing hollow stem augers and Hydropunch™ technology. The Hydropunch™ tool is driven ahead of the augers in the undisturbed soils to the desired depth. The outer body of the sampling tool is then carefully retracted to expose the Hydropunch™ screen. A maximum of 5 feet of screen can be exposed at any one time. A depth-discrete water sample can then be collected by lowering a clean teflon bailer through the drill rods and into the Hydropunch™ tool. Upon collection of the sample, the body of the Hydropunch™ is removed from the boring after overdrilling the tool 0.5 to 2 feet, at which time soil sampling can be resumed. This procedure can be repeated to obtain additional depth-discrete water samples. The augers seal off formational water during drilling activities, thus the annulus of the augers do not fill with groundwater.

Prior to each use the hollow stem augers, drill rods, and Hydropunch™ sampling tool are cleaned by using a hot water pressure washer. All rinsate generated during drilling and sampling activities will be contained in properly labeled drums and stored on-site pending disposal.

Also enclosed is a schematic of a PowerPunch™ tool. The only difference between the PowerPunch and the Hydropunch™ is that the PowerPunch™ has a temporary well casing attached to the tool that can be left in the ground upon removal of the augers. The Hydropunch™ utilizes the drill rods to access the groundwater collection chamber.

Please call me at (925) 551-7555 if you should have any questions.

Sincerely,
Gettler-Ryan Inc.

Clyde J. Galantine
Project Geologist

Attachments: PowerPunch™ Schematic

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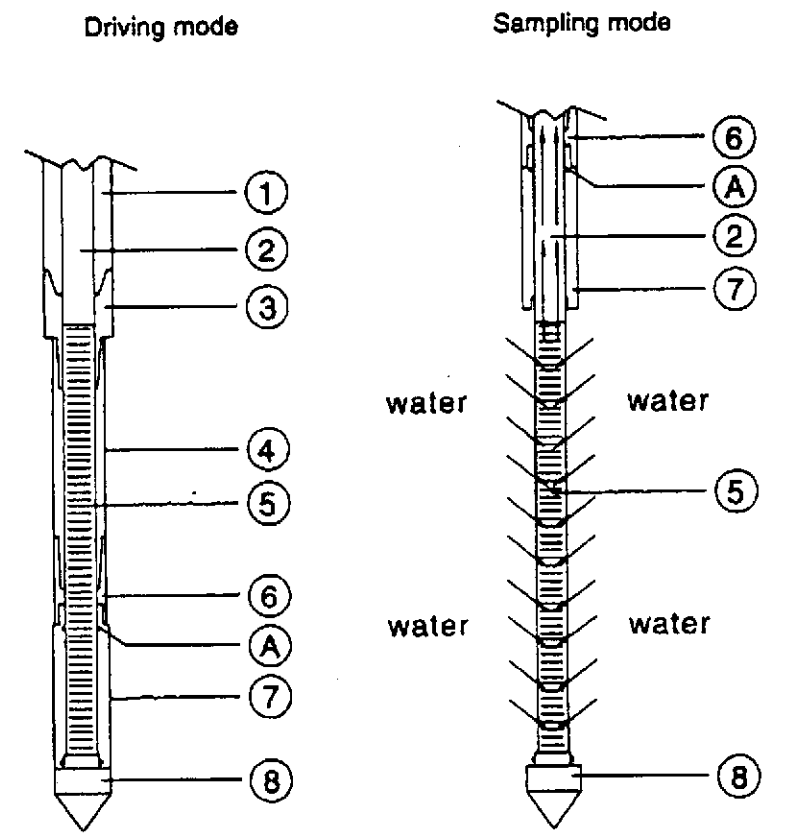
Groundwater Sampling and Pumping (continued)

PowerPunch™ Applications:

Water Sampling



1. Enviro Rod
2. PVC Riser
3. Drive Rod Adapter
   NWJ to Enviro Rod/Pin
   NW to Enviro Rod/Pin
   AW box to Enviro Rod/Pin
   Enviro Rod Pin to Geoprobe Rod/Pin
4. Rod/Screen Housing
5. PVC Screen
6. Release Collar
7. PowerPunch™ Body (includes internal seal)
8. Drive Point

A. Internal Seal

Groundwater Sampling

The PowerPunch™ is the only direct push tool which allows the installation and completion of a small diameter well, as well as the collection of one groundwater sample all in one pass! The PowerPunch™ features and internal seal which automatically seals the screen in place in the formation to collect a discreet water sample, so grouting is rarely necessary. It can collect a discreet water sample without requiring the drill/probe rod to be left in the ground.

In addition to being ideal for immediate one-time sampling, the PowerPunch™ can also be used in conditions which prevent the use of conventional direct-push water samplers. This happens when:

- the aquifer has slow or variable recharge rates (when it is composed of silty sand, silt, clay, or has thin water bearing zones). In low yield aquifers (anything but sands and gravel) it can take hours or days for the sampler to fill not only because of the slow recharge rate but also because any direct push sampler has a tendency to reduce the permeability of the formation it is sampling. As the tool advances, it moves the soil to the side and compacts it into the borehole walls. The PowerPunch™ is ideal in this case because it can be converted quickly to a small diameter well and be allowed to fill while the rod and drilling equipment are moved to the next location.
- additional sampling will be required at a later date.
- accurate groundwater elevation measurements are needed.

Only the PowerPunch™ lets you select a screen interval of any length up to 20 feet (6.1 m). Long screens mean less guesswork when screening the top of the aquifer or sampling thin water bearing zones.

A ½ inch bailer can be used for sampling.

PTS Laboratories, Inc. ◆ RBCA NOTES

General Definitions

August 1998

Moisture Content – ASTM D2216: The ratio of the mass of all volatile materials in the pore spaces of a soil sample to the mass of the non-volatile portion, expressed as a percent. The result *may* represent water weight *plus* hydrocarbon weight.

Density, dry bulk: API RP40: Total mass of dried sample per total volume.

Density, grain – API RP40: Mass per volume of solid particles or grains. Density is a function of the mineral composition of a particular sample and can be related to sample type, dependent on the percentage of accessory minerals. Common examples:

Sand Type	Apparent Density, g/cc
Quartz	2.65
Clean	2.54 – 2.65
Silty	2.60 – 2.63
Clayey	2.67 – 2.72

Porosity, effective-API RP40: The ratio of the volume of interconnected pore space to the total volume of the sample, expressed as percent. Porosity is highly variable dependent on the depositional environment, bedding, degree of induration etc. Common default values listed in modeling programs appear to be biased low. Effective porosity is completely addressed in our March 1997 RBCA Note - "Porosity." Please contact us for a copy.

Porosity, total – API RP40: Ratio of the total pore space to the total volume of the sample, expressed in percent. Total volume is determined utilizing helium porosimetry.

Pore Fluid Saturations – API RP40: Ratio of the pore fluids (water or hydrocarbon or both) to the pore space, expressed in percent. Samples are extracted in solvent at ~ 240°F to vaporize water which is condensed and collected. Saturations are determined gravimetrically for hydrocarbons and volumetrically for water.

Permeability – API RP40, ASTM D4525, EPA 9100, ASTM D5094: The property of a porous media to transmit fluids or gas using Darcy's Law. The types of permeability most commonly measured for RBCA parameter models are effective permeability, specific permeability and relative permeability. Permeability is addressed in our February 1998 RBCA Note - "Permeability."

Effective Permeability: Two phases present, usually one immobile. Native state air permeability is measured at immobile, or connate, water saturation which is representative of field conditions.

Specific Permeability: One phase present, fluid or gas, completely filling the interconnected pore space. Representative of conditions below the water table at 100% saturation. Usually higher than effective permeability for the same sample.

Intrinsic Permeability: Representative of the properties of the porous medium alone. Usually measured with a non-reactive fluid.

Relative Permeability: Ratio of effective permeabilities to a base permeability, typically an effective permeability at initial conditions. Used to describe two phase flow characteristics of displacing and displaced phases, such as water displacing hydrocarbons or air displacing water. Predictions of field flow behavior at various phase saturations can be derived from the laboratory data.

Permeabilities are affected by:

- Fluid saturations and distribution
- Soil-fluid interaction
- Pore size distribution and geometry (tortuosity)
- Sample handling

The best field representative permeability would be conducted using a sample large enough to represent the lithological variation within the target area, actual produced fluids (filtered to 0.45 micron) simulating actual conditions of temperature, overburden and flow rates. Many times these cannot be done due to lack of information, unproductive wells, etc. In the lab, care is taken to reduce, if not eliminate, deformation of the sample. Fluids are filtered to eliminate any possibility of permeability reduction due to fines migration. Flow rates are scaled to sample size to eliminate turbulent flow. Neutral (non-reactive) fluids such as depolarized kerosene can be utilized to determine specific permeability when native fluids are unavailable.

Questions? Call Larry Kunkel or Rick Young in California or Michael Mark Brady in Texas at the following numbers;

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Santa Fe Springs, CA 90670
Telephone: (562) 907-3607
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DATE PTS FILE #

CHAIN OF CUSTODY RECORD

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PTS Laboratories, Inc.
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Santa Fe Springs, CA 90670
Ph: (562) 907-3607 • Fax: (562) 907-3610

COMPANY	PROJECT MANAGER
PROJECT NAME	FAX NUMBER
PROJECT NUMBER	PHONE NUMBER
SITE LOCATION	ADDRESS
SAMPLER SIGNATURE	

PO#

SPECIAL HANDLING

24 HOURS 5 DAYS
72 HOURS NORMAL
OTHER

SAMPLE CONDITIONS

RECEIVED ON ICE YES/NO
SEALED YES/NO
OTHER YES/NO

ANALYSIS REQUEST

SAMPLE ID NUMBER	DATE	TIME	DEPTH, FT	PHYSICAL PROPERTIES PACKAGE, API RP40	MOISTURE CONTENT, ASTM D2216	POROSITY, API RP40	GRAIN DENSITY, API RP40	BULK DENSITY, ~~API RP40~~ ASTM D2937	AIR PERMEABILITY, API RP40	SPECIFIC RETENTION/YEILD ASTM D425	CATION EXCHANGE CAPACITY, EPA 9080	SOIL pH, EPA 9045	GRAIN SIZE: DRY, 400 MESH	GRAIN SIZE: WET/DRY, 20 MICRON	GRAIN SIZE: LASER, 1 MICRON + Sieve	HYDRAULIC CONDUCTIVITY, EPA 9100, API RP40	TOC: ~~EPA 9060~~ Walkley-Black	Permeability - ASTM D5084							NUMBER OF SAMPLES	COMMENTS
					X	X		X				X			X		X	X								

1. RELINQUISHED BY	2. RECEIVED BY	3. RELINQUISHED BY	4. RECEIVED BY
COMPANY	COMPANY	COMPANY	COMPANY
DATE TIME	DATE TIME	DATE TIME	DATE TIME