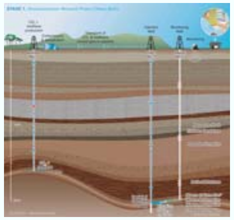
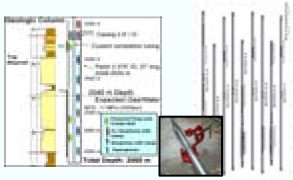

Australians partner with U.S. to bury Greenhouse Gas
Photo Gallery here
NEW!
CO2CRC Otway Basin Pilot Project
500 0 500 1000 Km



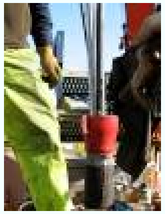
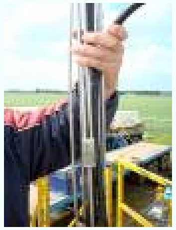






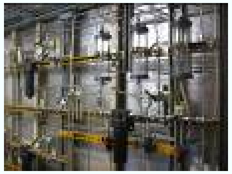


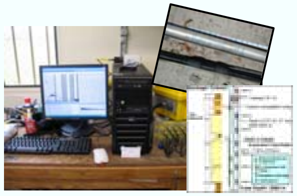


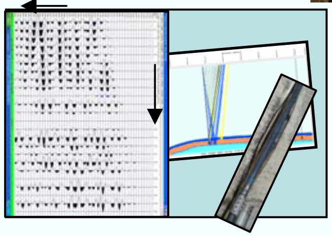









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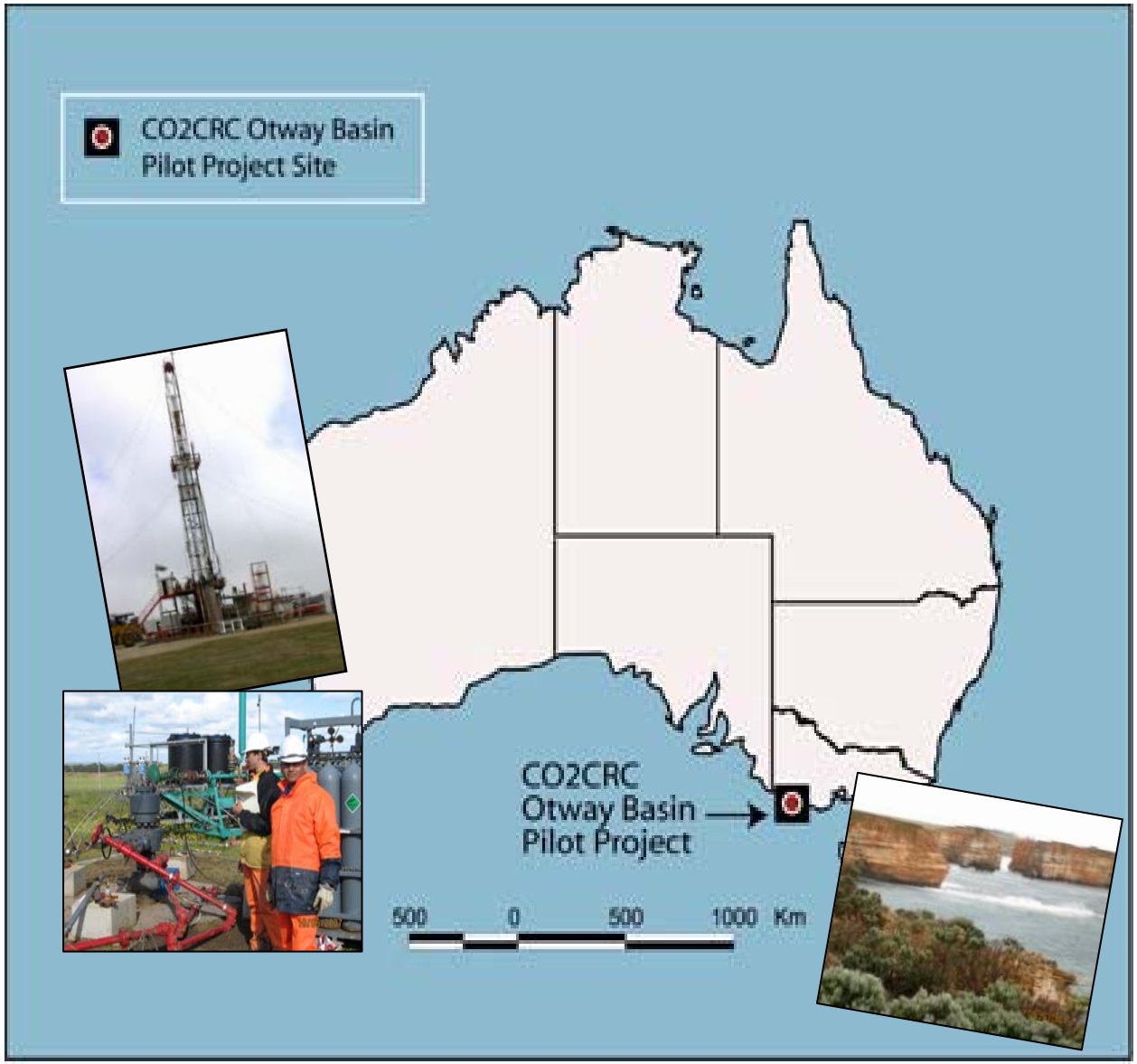

Australian CO2CRC Otway Project – aim is to store carbon dioxide in a depleted gas field ~ 2 km deep. U.S.- Australian collaboration is chronicled here. The project is endorsed by the Carbon Sequestration Leadership Forum.

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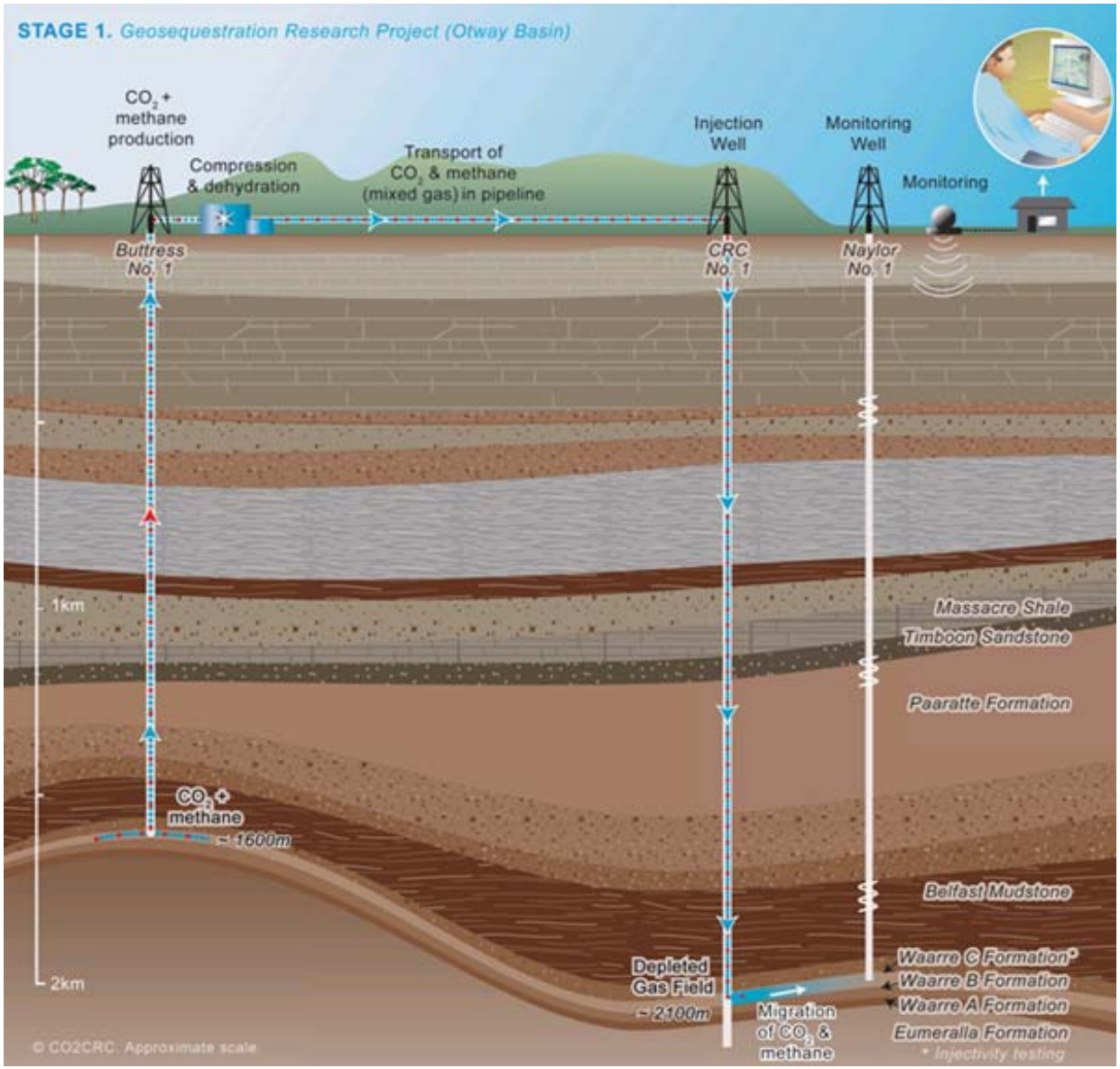

CO_2 is produced from Buttress-1, then compressed, transported several kilometers (km), and injected in CRC-1 at ~2 km depth. CO_2 injection rate planned at ~1kg/s with 100,000 tonnes stored over 2 yrs. Naylor-1 serves as a monitoring well.

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Naylor-1 monitors buried CO_2. Well bottomhole assembly (BHA) design and field completion was accomplished with Australian-U.S. collaboration in 2007. CO2CRC participants and DOE scientists from Lawrence Berkeley National Lab (LBNL) teamed to set a new standard for integrated monitoring of geologic storage of CO_2.

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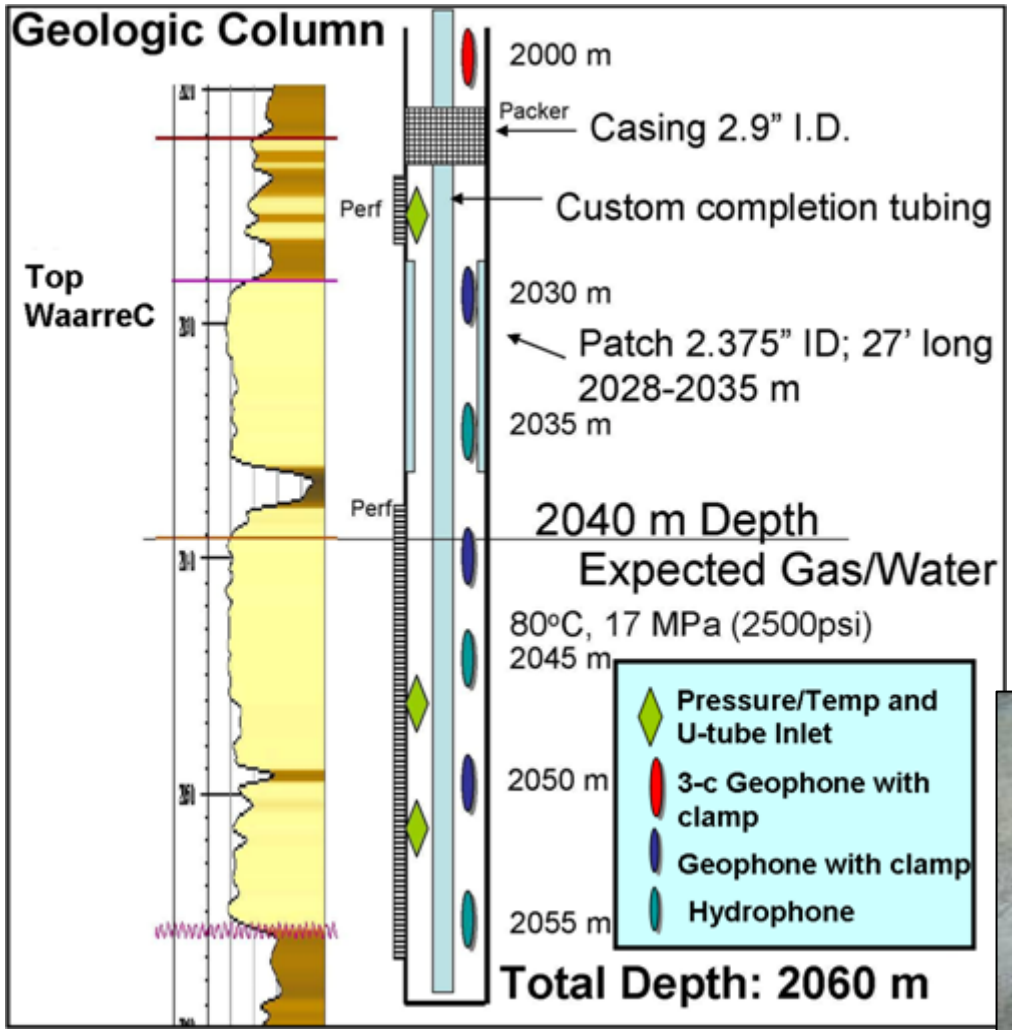

BHA was designed to monitor injection zone properties and fluids with pressure/temperature sensors and U-tube samplers. Additionally, BHA seismic sensors allow 3 seismic monitoring techniques: Offset vertical seismic profiling (OVSP) for reflection imaging; microseismic; and controlled source travel-times through CO_2 plume.

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Geophone in anchor

Months of design, reviews, fabrication, and testing at LBNL culminating in the shipment of the BHA components by sea from the U.S. to Australia in late July, 2007.

The Naylor-1 well pad during the start of workover operations in fall, 2007. The workover is being performed by a “crane package” consisting of a crane, a doghouse for the work crew, and a pump truck to maintain well control.

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The planned deployment strategy for the Naylor-1 BHA was to mount the preassembled BHA (arrow) on structural truss and lower into the well. Sandeep Sharma, Otway Project Manager (left), and Jim Underschultz, CO2CRC, shown in foreground.

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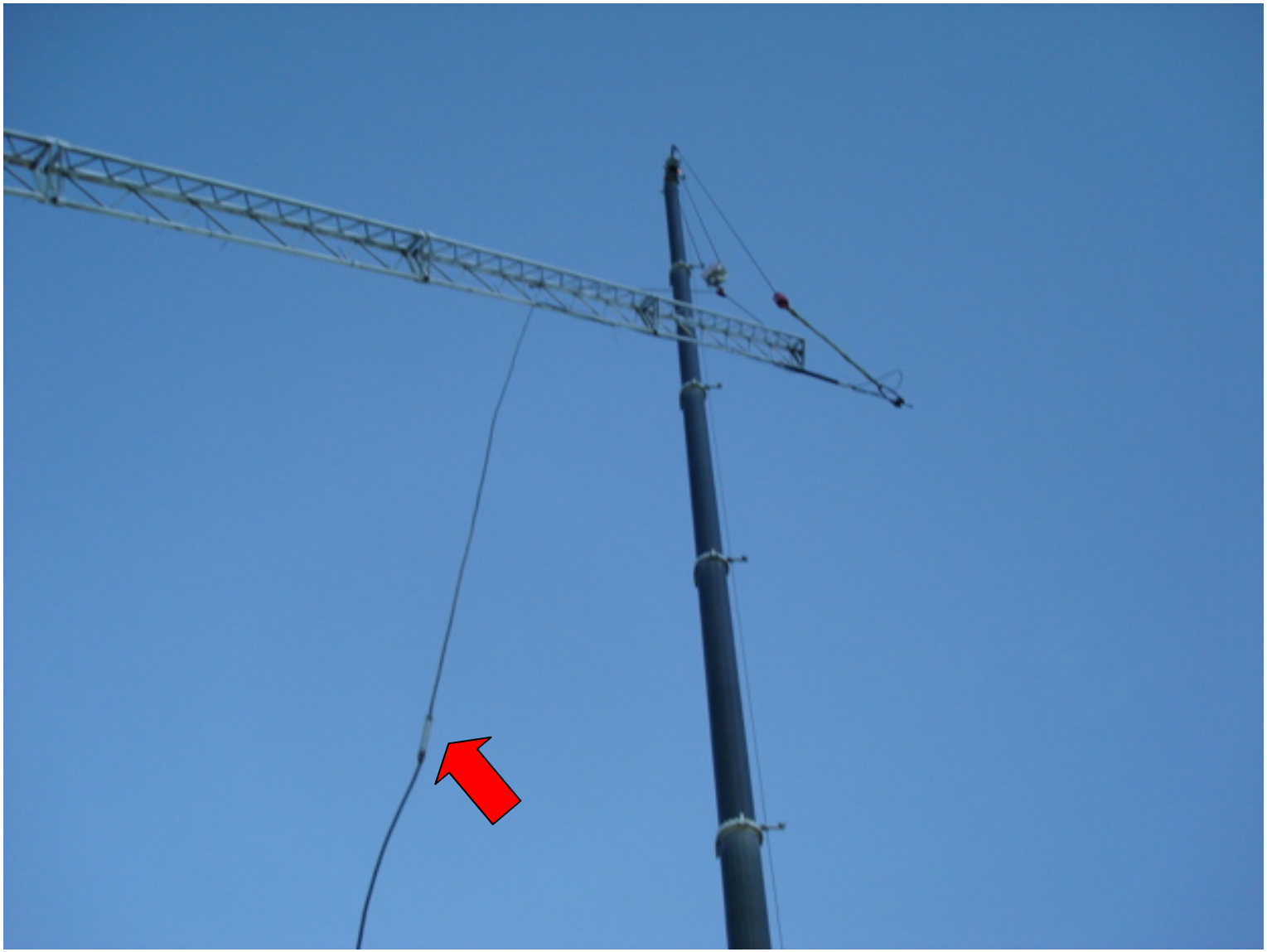
The evening of October 2, the truss/BHA was finished and ready for the critical lift into the Naylor-1 borehole, but high winds delayed the activity until the next morning.

Ulrike Schatch and Jim Underschultz, CO2CRC, guide the end of the BHA as it is being lifted in the air towards the wellhead.



The view looking up at the 150’ tall mast of the 70 ton crane while raising the BHA to vertical for lowering into Naylor-1. The BHA is only 2.25” in diameter and is strapped onto the support truss, which limits bending of the assembly. Seismic cable with 3-C geophone (arrow) seen below the truss; this sensor will later be installed stratigraphically above the packer.

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The BHA beginning its journey down the well. Below the rig floor the multiple levels of well control are shown from bottom to top: shear rams, blind rams, and hydril.

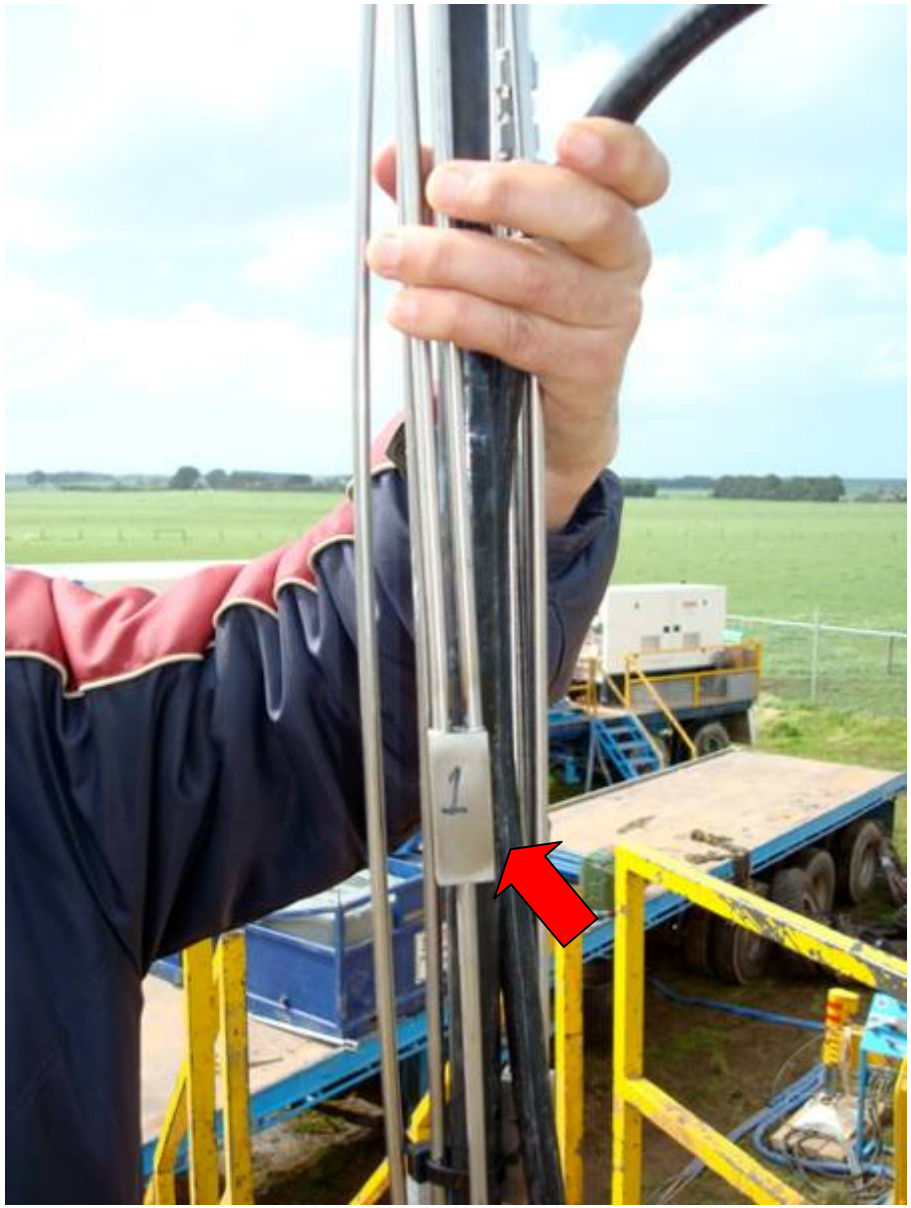
To lower the BHA down the well the rigger in the bucket truck is disconnecting the lower truss so that it can be lifted away and the BHA can be lowered into the well. This operation was repeated six times to get the entire BHA into Naylor-1.

Eleven spools hold the various control lines being lowered down Naylor-1. Each line is a continuous 2 km length, except the gas lift line, which is 800 m long.

A 25’ sucker rod is being passed up to the rig floor as the monitoring string continues to be lowered down the well.

Barry Freifeld, LBNL Principal Investigator, holds a joint protector as it is strapped onto the sucker rod using stainless steel bands. The joint protectors act as a centralizer and prevent the control lines and seismic cable from rubbing on the casing as they are lowered down the well.

A slotted bell serves as a landing plate for the sucker rod elevator. The slots allow the cables and control lines to be pulled aside so that they are not pinched as the elevator comes to rest on the top of the bell.



The “U” portion (arrow) of the #1 U-tube connecting the inlet filter and check valve to the “sample” and “drive” tubing that run up to the geochemical sampling container.

The entire 2 km string has just been landed and extra tubing has been cut off. Next the well control stack will need to be lifted away and the sucker rod hanger bushing needs to be landed.

LBNL’s Tom Daley feeds the seismic sensor cable through underground conduit after completing the wellhead. The seismic cable consists of a series of 24 hydrophone and geophone sensors used for OVSP, microseismic, and travel time monitoring.

Sandeep Sharma (Otway Project Manager, foreground) and Barry Freifeld, LBNL await the start of the N_2 gas lift to remove kill fluid from the well.

Once 30 bbls of fluid were lifted with the N_2 gas lift, the natural gas kicked in and lifted an additional 630 bbls of purge fluid. The methane gas is being flared inside a garbage skip while purge fluid collects in the bottom.

The completed wellhead showing the numerous lines required to operate the 3 downhole U-tubes, 2 pressure/temperature sensors, the pneumatic packer, and the seismic monitoring string.

The LBNL geochemical sampling and seismic recording office, assembled and shipped to the Otway Project site by LBNL. The long vertical stainless steel cylinders are for collecting high pressure fluids from the U-tube samplers. The capabilities deployed at the Naylor-1 monitoring well by this team of experts are a unique approach to integrated monitoring.

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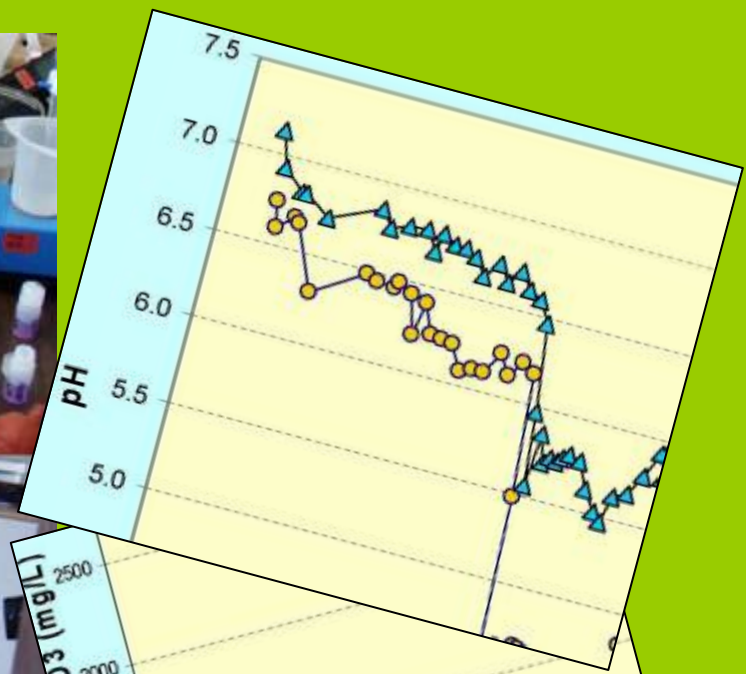
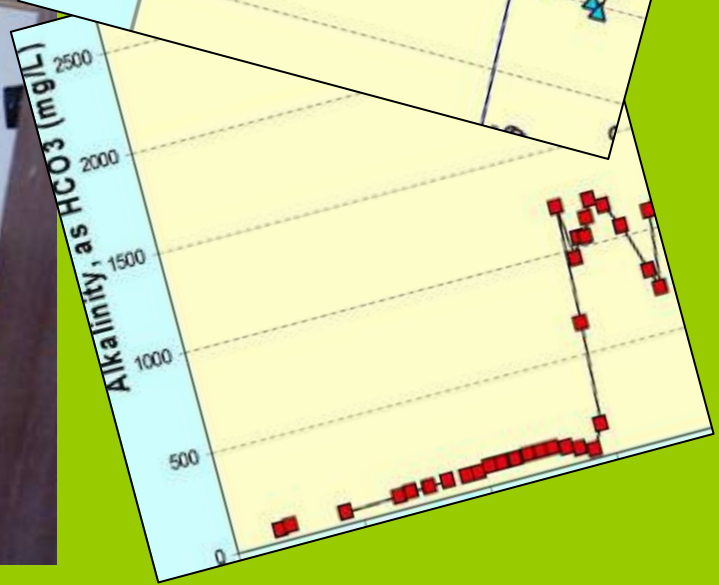
The inside of the geochemical sampling container, showing the plumbing required to operate the U-tube sampling system.





U-tube fluid sampling and pressure/temperature sensors will permit hydrologic and geochemical monitoring at the Naylor-1 well. Photos and data displays from the Frio,Texas brine pilot project that previously utilized a U-tube sampling system.

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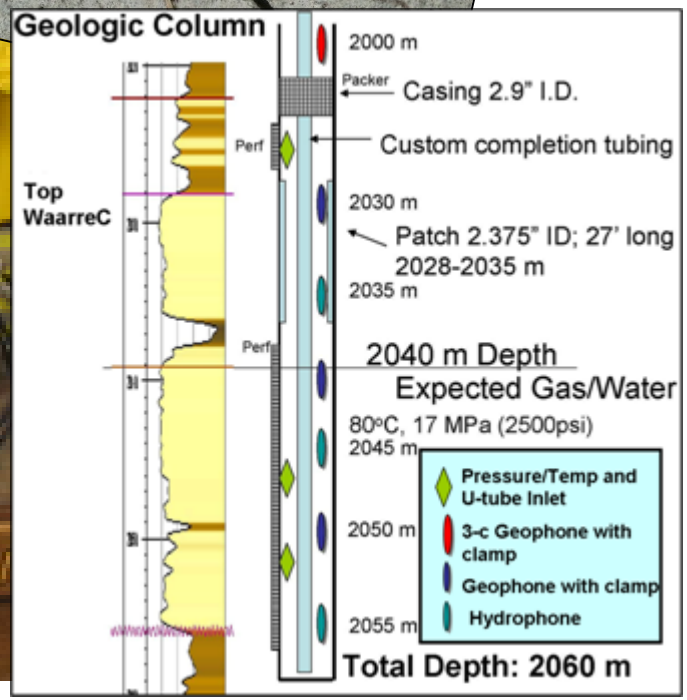

Multiple seismic sensors are deployed in the well and, during data acquisition, signals are stored on a recording system for processing. When fully functional, LBNL will access data real-time in the California lab through an internet connection.

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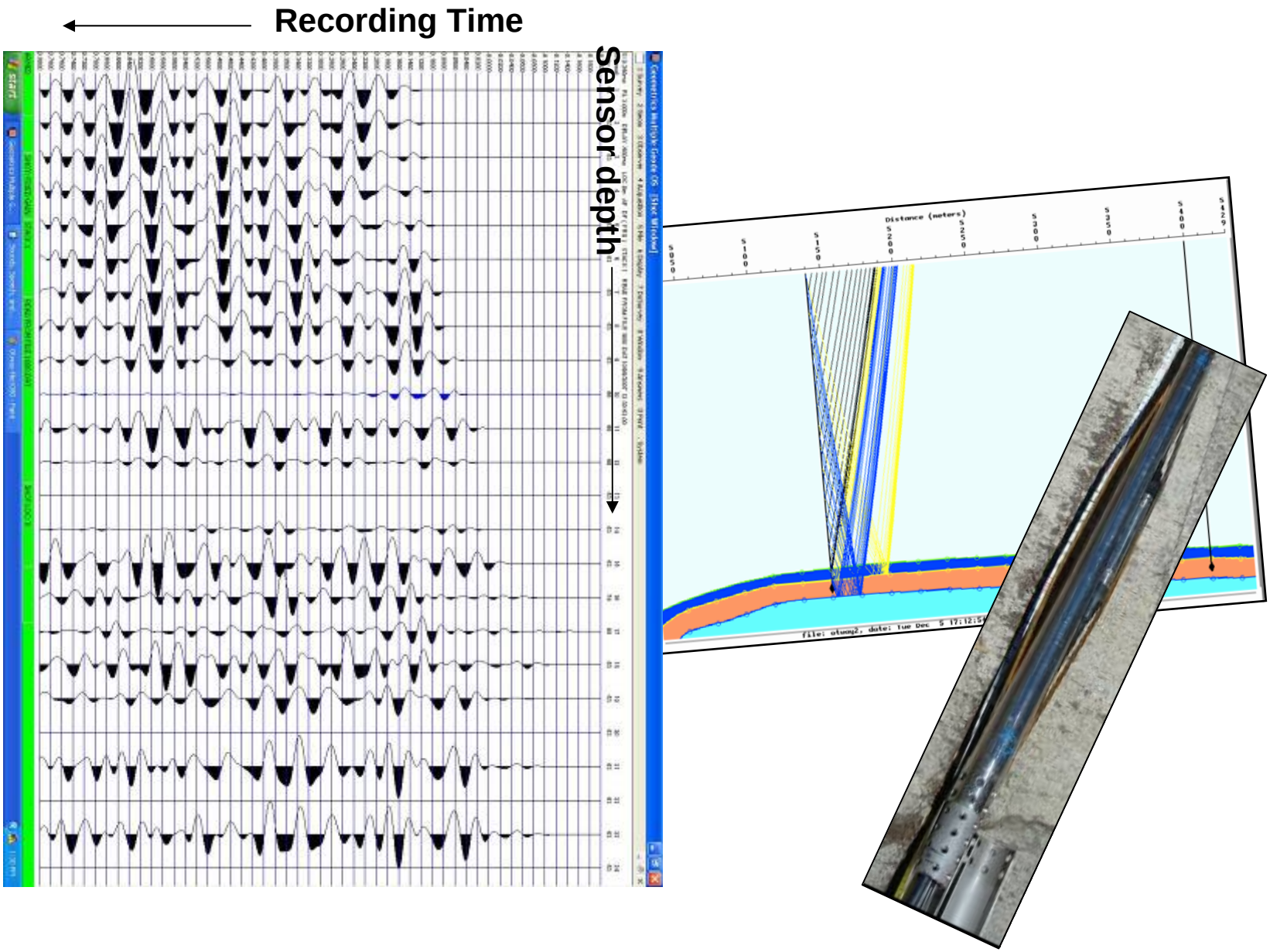
Tom Daley, LBNL geophysicist (left) and Don Sherlock, CO2CRC geophysicist, check out a truck mounted weight-drop source for generating seismic waves.



Naylor-1 seismic monitoring adds capabilities for spatial/temporal imaging of the CO_2 plume in addition to assessing integrity of the CO_2 storage reservoir.

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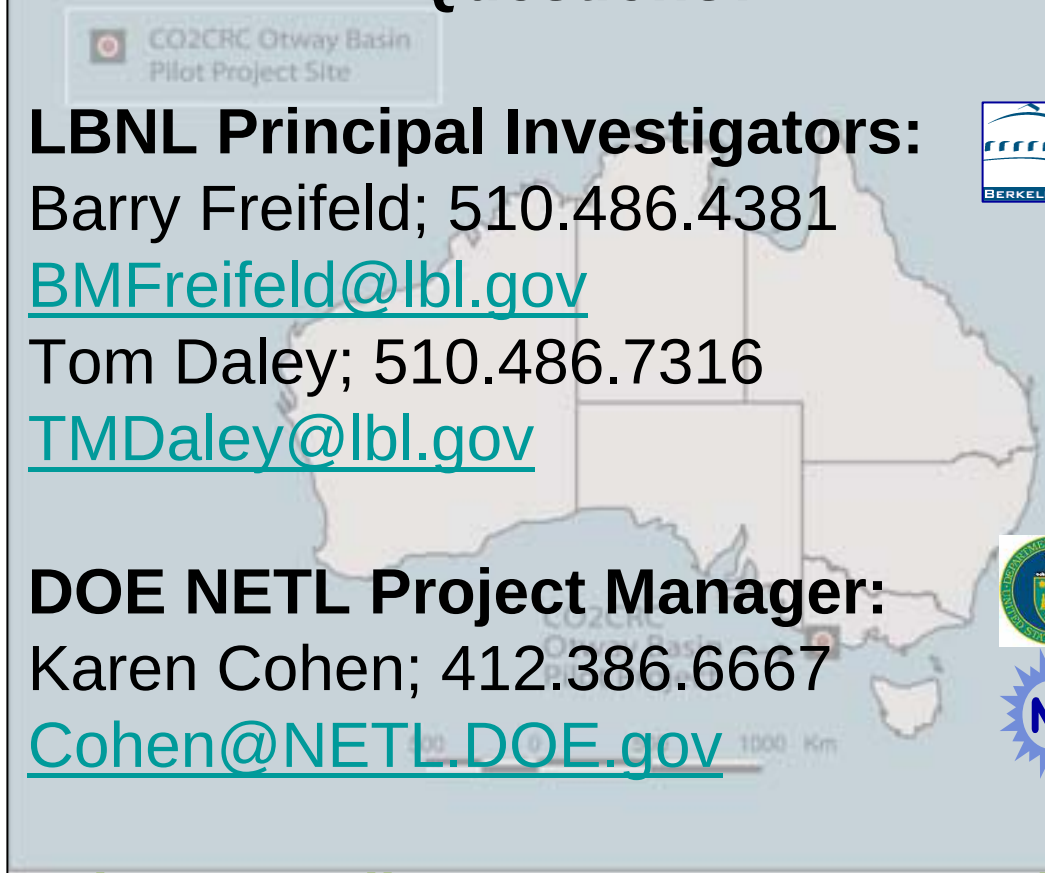
Barry Freifeld (left) and Tom Daley, LBNL, herald the success of the Naylor-1 monitoring string installation. After two weeks of international field collaboration, an Otway project major milestone is attained.

Questions?



LBNL Principal Investigators:
Barry Freifeld; 510.486.4381
BMFreifeld@lbl.gov
Tom Daley; 510.486.7316
TMDaley@lbl.gov

DOE NETL Project Manager:
Karen Cohen; 412.386.6667
Cohen@NETL.DOE.gov

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