

John Young

From: John K. Hopkins [johnhopkins@lanl.gov]
Sent: Tuesday, April 26, 2005 5:09 PM
To: 'John Young'
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Subject: MDA L chronology and recommendations

John

Based on our telecom today, the chronology of drilling borehole D at MDA L follows along with recommendation for completion of pore-gas sampling.

Your concurrence with the completion of the borehole at 660 ft and the following approach to pore-gas monitoring is requested so that we can release the drill crew.

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The planned drilling methodology for borehole D (BH-D) at MDA L was hollow stem auger to a depth of 300 ft bgs and then continued advancement of the borehole to a depth of 700 ft bgs via air rotary drilling methods.

The hollow stem auger portion of this hole was drilled from 12/3/04 to 12/9/05. Over this period the augers were advanced to a depth of 250 ft before meeting refusal due to auger binding on the sidewalls of the hole. The air rotary drill rig (Failing F-10) was then positioned over this hole on 1/14/05. The drill crew worked for several days attempting to clean out the slough in the bottom of the hole, and advance casing to 250 ft. However, circulation was repeatedly lost at a depth of 170 bgs. A downhole video survey of this borehole on 1/21/05 concluded that this borehole was forked at a depth of ~170 ft. This deviation in the borehole most likely occurred when the augers were pulled from a depth of 180 ft and readvanced the full length of the borehole after a pin was lost from the auger flights.

On 1/28/05 the drill rig was moved 10 ft to the west, and a 10 in. surface casing set to a depth of 10 ft. This borehole was assigned the designation BH-D2. The hole was advanced with a 9 3/4" tricone bit open hole to a depth of 190 ft. Eight inch casing was then tripped into this hole to a depth of 140 ft at which point it began binding significantly on the borehole walls. A drag bit was advanced out in front of the 8 in. casing in an attempt to advance it the full 190 ft, but was unsuccessful. Advancement of the 8 in. casing was abandoned on 2/18/05 at a depth of 140 ft.

An under-reaming hammer bit and 6 5/8 in. casing was then mobilized to the site (STRATEX drilling system). Drilling operations began with this system on 2/22/05. The borehole was quickly advanced to a depth of 250 ft by 2/25/05. The STRATEX system was then tripped out of the hole, and core pipe advanced into the hole for use with a wireline core barrel. The drill crew then attempted to core Unit 1g of the Tshirege, the Cerro Toledo interval, and the Otowi, but was unable to achieve core recovery. The poorly welded nature of these units is not conducive to air coring. Once the top of the Cerros del Rio basalt was reached at a depth of 387 ft bgs on 3/3/05, core recovery was achieved. The basalt was then cored to a depth of 420 ft bgs before circulation was lost. Over this interval core recovery varied from 20 to 80 %.

The STRATEX system was then readvanced into the hole, enabling the borehole to be advanced through the poorly circulating basalt. The 6 5/8 in. casing was advanced to a depth of 568 ft bgs before the shoe broke off the end of the casing on 3/24/05. A downhole video survey indicated that the shoe laid at a 40 degree angle at the end of the casing. To continue advancement of the borehole, the shoe would need to be cemented in place, then milled through. The first attempt to mill through the shoe was unsuccessful, and ended in the milling bit becoming stuck within the shoe. After freeing the drill bit, the only way to trip out the drill pipe was to back drill due to a small amount of cement that had been blown up the casing by the air introduced downhole. Up to this point the driller had been using 20 ft lengths of pipe when tripping in to speed up the process, and drilling with 10 ft lengths of pipe. However, the drill rig on site (Failing F-10) was not capable of back drilling 20 ft lengths of drill pipe. Therefore, a larger drill rig (SpeedStar 30K DH), with a 25 ft plus stroke, was mobilized over the hole to back drill the pipe out of the hole.

For the second attempt to mill out the shoe, an oilfield services contractor was brought on site as a consultant. Using this contractor's tooling, the shoe was successfully milled through on 4/21/05. The hole was advanced to a total depth of 597 ft bgs before the milling bit wore out. These tools were tripped out of the hole and a 5 1/4" downhole hammer was tripped in. This bit was then used to advance the borehole, via open hole drilling, to a depth of 660 ft. Over the last 60 ft, there were no air/cuttings returning to the surface and the bit penetrated several small rubble zones. In order to keep the bit free, each 20 ft length of pipe would be swept repeatedly until there were no "hang ups" on the full length of the stroke. After the 660-680 ft joint was screwed

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onto the drill string, and the air turned back on, the drill bit would not move. The following day a second air compressor was brought on site to increase the downhole pressure, and aid in unlocking the bit. This aided in successfully retrieving the drill string from the hole. As of 4/26/05 the bottom of BH-D2 was 659.69 ft bgs based upon geophysical survey.

Due to the instability of the open portion of the borehole beneath the casing at 568 ft bgs, we recommend the SUMMA canister sample planned to be collected at total depth be collected using a single packer at the bottom of the casing. This packer will seal the entire open portion of the borehole from the atmosphere and characterize VOC vapors present within the basalt from 568-660 ft bgs. Additionally, the borehole will not be advanced to 700 ft bgs. Geophysical logging will be completed on the borehole to provide further moisture content (neutron logging) and stratigraphy (natural gamma logging) data.

Summary

BH-D

10 in. casing - 0-10 ft bgs

Continuous core collected from - 10-250 ft bgs

BH-D2

10 in. casing - 0-10 ft bgs

8 in. casing - 0-140 ft bgs

6 5/8 in. casing - 0-568 ft bgs

Open hole - 568-660 ft bgs

Core collected from - 385-420 ft bgs