

Appendix 1. U.S. Geological Survey Drilling Notes Email

Communication

Appendix 1 is a reproduction of drilling-note email communications exchanged from May 6, 2021, to July 14, 2021. Date format is month/day/year (mm/dd/yyyy).

Abbreviations

CFA Central Facilities Area

DHH downhole hammer

ft feet

INTEC Idaho Nuclear Technology and Engineering Center

in. inch

NA not applicable

PDC polycrystalline diamond compact

RadCon Radiological Control Technician

RWP Radiological Work Permit

SS stainless steel

TAN Test Area North

TD total depth

USGS U.S. Geological Survey

WGS Waste Generator Services

WQ water quality

yds³ cubic yards

**USGS Drilling Notes Email Communication
(May 6, 2021 – July 20, 2021)**

Well Name
TAN-2336

Drill Rigs
CS 1500, SD300

Special Equipment
Mixing equipment,
Containment systems

Drilling System

| Diameter (inches) | Bit Type (type) | Method (description) | Rig (description) | Depth (feet) |
|----------------------|---|-------------------------|----------------------|-----------------|
| 10.0-in. | Auger | Dry | SD300 | 0-10.0 ft |
| 10.0-in. | Tri-cone (extension of hole opener) | Mud | SD300 | 10.0-34.0 ft |
| 20.0-in. | Hole opener | Mud | SD 300 | 0-31.8 ft |
| 4.9-in. | PQ-core | Air + Stiff foam | CS1500 | 34.0-210.0 ft |
| 15.0-in. | Down-hole hammer | Air + Stiff foam | SD300 | 34.0-118.0 ft |
| 13.8-in. | Tricone | Air + Stiff foam | SD300 | 118.0-210.0 ft |
| 4.9-in. | PQ-core | Air + Stiff foam | CS1500 | 210.0-256.0 ft |
| 9.9-in. | Tricone | Air + Stiff foam | CS1500 | 210.0-255.0 ft |

Final Borehole Diameters

| Diameter (inches) | Top Depth (feet) | Bottom Depth (feet) |
|----------------------|---------------------|------------------------|
| 20.0-in. | 0.0 ft | 31.8 ft |
| 15.0-in. | 31.8 ft | 118.0 ft |
| 13.8-in. | 118.0 ft | 210.0 ft |
| 9.9-in. | 210.0 ft | 255.0 ft |

Casing/Construction

| Diameter (inches) | Top Depth (feet) | Bottom Depth (feet) | Opening (feet) | Thickness (inches) |
|----------------------|---------------------|------------------------|--------------------------------------|-----------------------|
| 16-in. | +2.7 ft | 31.8ft | casing | 0.25-in. |
| 10-in. | +1.8 ft | 209.6 ft | casing | 0.25-in. |
| 10-in. | 210.0 ft | 255.0 ft | open hole | NA |
| 0.38-in | +2.5 ft | 202.0 ft | drilled holes (197.0 to 202.0 ft) | vapor line |

Construction Materials

| Material (type) | Top Depth (feet) | Bottom Depth (feet) | Amount (cubic yards) | Method (type) |
|---------------------------|---------------------|------------------------|-------------------------|------------------|
| Bentonite chip | 0.0 ft | 205.0 feet | 4.25 yds ³ | Poured |
| Silica sand (size 6-9) | 195.0 ft | 205.0 ft | 0.15 yds ³ | Poured |
| Bentonite chip | 205.0 ft | 210.0 ft | 0.07 yds ³ | Poured |

| Date (mm/dd/yyyy) | Depth (feet) | Driller Notes (Note of daily activity) |
|-----------------------------|------------------------|---|
| 5/6/2021 | 10ft | Arrived at 7am, pre shift, warm up equipment. |
| | | Pre-job with Jim and RADCON, review RWP. |
| | | Drilled 10ft with 10-in. hollow stem augers, samples pulled at 1ft and 10ft, taken to INTEC for inspection. |
| | | All tooling scanned clean and disassembled. |
| | | Put 10-in. tri-cone and collar in tower ready to drill Monday. |
| 5-10-2021 to 5-17-2021 | | Waiting on roll off dumpsters. |
| 5/17/2021 | 16ft | Check out equipment, wait on waste boxes. |
| | | Drilled down to 16 ft with 10-in. Tri-cone |
| 5/18/2021 | 31.8ft | Drill down 10in tri-cone to 34ft. |
| | | Switch over to 20-in. hole opener ream out hole to 31.8. Trip out |
| 5/19/2021 | | Trip back to bottom flush hole, couple feet of cuttings at the bottom. The hole was still open to bottom. |
| | | Trip out, break big tooling down, weld on tabs and put in 16-in. casing. |
| 5/20/2021 | | Seal backside of 16-in. casing. |
| | | Trip in 6in centralized casing, weld on diverter adapter. |
| | | Rig down sd300, move cs1500 over the hole, switch out trailers. |
| 5/24/2021 | 36ft | Finished rigging up. |
| | | Trip in PQ, blew out cuttings in 10 in hole, Drill 34-36ft. |
| 5/25/2021 | 84ft | Drilling PQ Air+Stiff foam PDC 9 cutter. |
| | | full runs, solid rock. Lost all returns. |
| 5/26/2021 | 94ft | Drilling having a hard time getting cuttings out of the hole. |
| | | Tried pumping more foam down and got stuck. |
| | | Working on stuck rods. |
| | | Got rods free. |
| 5/27/2021 | 112ft | Got good circ with foam. Pulling cuttings out. Drilled ahead. |
| 6/1/2021 | 198ft | Drill to 128ft Est lost all air to surface. Hole is staying clean, trip back 80ft. |
| 6/2/2021 | 210ft | Trip to bottom. Clean out hole. |
| | | Drill to 210ft clean out hole. Down hole survey source logs. |
| | | Trip out, switch rigs and trailers. |
| 6/3/2021 | 56ft | Finish setting up SD300, trip in hammer with 15-in. bit and reamer. |

| Date (mm/dd/yyyy) | Depth (feet) | Driller Notes (Note of daily activity) |
|-----------------------------|------------------------|--|
| 6/3/2021 | 56 ft | Reamed to 56ft. Tripped back into casing for the weekend. |
| 6/7/2021 | 106ft | Trip in flush hole, reamed to 106ft. Rig died trying to troubleshoot. |
| 6/8/2021 | 110ft | Mechanic found rig to have a bad ECM, installed temporary one Rods come free after ten minutes of trying, clean hole, Reamed 2ft. Hammer not firing right. |
| 6/9/2021 | 118ft | Slow pen rate. Trip out test fire hammer on surface. Foot valve broken. |
| 6/10/2021 | 127ft | Couldn't get 12-in. hammer apart to change foot valve. Switch over to 13.8 tri-cone. Trip in flush hole reaming ahead. |
| 6/14/2021 | 160ft | Reaming. |
| 6/15/2021 | 200ft | Reaming. |
| 6/16/2021 | 210ft | Reamed to 210ft, flush hole, trip out, install 100ft of 10-in. casing. |
| 6/17/2021 | | Finish installing 10-in. casing to 209.6ft with vapor line at 202ft. sealing hole according to well plan. |
| 6/21/2021 | | Move SD300 off hole, clean up around collar, lay down new containments, set up CS1500. Set up site for drilling 210 to 255 ft BLS. Setup containments, tarps, and diverters. Trip in 198ft. |
| 6/22/2021 | 256ft | Drill to TD, Trip back to casing wait on surveys, lost air to surface around 233ft. |
| 6/23/2021 | | Down hole surveys and logs, rig down CS1500. |
| 6/24/2021 | 255ft | Set up SD300, switch tooling to 9.98 tricone, ream out 210-255, Trip out 100ft. |
| 6/28/2021 | | Trip out, wash everything, clean up containment plastic, Drop off core at library. Took most of the equipment to CFA. |
| 6/29/2021 | | Install bollards and pour cement pad. |
| 7/7/2021 | | Video log well, install 2-in. injection line. Installed test pump |
| 7/13/2021 | | Installed sensors and tested pump. |
| 7/14/2021 | | Water sampling, aquifer testing. |
| 7/19/2021 | | Pull test up, pull 20ft off 2-in. injection line. Finish well head, install ready flow pump. |
| 7/20/2021 | | Cleared all equipment off site. |

Weekly Project Emails

Week 1 (May 3-6, 2021)

USGS Staff mobilized equipment to TAN and established the layout over two days. Equipment was setup and tested, barriers established, protective tarps were placed under equipment, and a containment was constructed at the location the drill bit enters the ground to capture cuttings. The drill site was mostly setup by Tuesday May 4, 2021. On Wednesday, we held a pre-job and walk-down of the drill site – no additional work was performed that day due to a pending work order. On Thursday, USGS ran 10-in. augers down to 10 ft BLS and puck samples were taken to INTEC for analysis. By 12:30PM samples had been analyzed and gamma spec. samples results were clean, direct scans and smears taken were also clean. RadCon surveyed the augers and did not detect any contamination from the auger drilling. USGS Staff changed over drill bits and have equipment staged to begin drilling Monday May 10, 2021. We will hold a brief meeting in the morning with WGS and RadCon to discuss plans and needs for the week and the USGS will perform rig inspections and safety inspections. We also anticipate bringing up additional equipment starting next week that includes an extendable boom forklift.

Week 2 (May 10-14, 2021)

USGS drilling crew conducted minor rig updates and performed equipment testing Monday and Tuesday. Additionally, USGS mobilized a forklift to the job site Monday. No drilling was done. We are on hold until this coming Monday (5/17) - waste containers are expected to show up at 9AM. As of today, we are slightly behind schedule due to unanticipated delays, but hope to make up some schedule time once drilling restarts.

Week 3 (May 17-20, 2021)

Waste containers were brought out to the site Monday morning around 9AM. Once delivered, the USGS drill crew drilled a 10-in. pilot hole down to 34 ft BLS, going a few feet into basalt. We had minor rig issues early in the week that required repair, but after changing out parts the rig is now working fine. On Tuesday (5/18) we drilled a 20-in. hole down to 31.8 ft BLS. We encountered boulders and cobbles in the surface sediment, so it took a little longer than anticipated to get through the media and also generated more fluid that was placed in waste containers. The 20-in. borehole stayed open after drilling and we lowered 16-in. casing down to 31.8 ft BLS. Thursday, we cut the 16-in. casing, so it now sits 1 ft above ground level and placed 31 bags of casing seal behind the 16-in. casing to seal the annular space. We placed 6-in. centralized casing down to 31.8 ft and welded on a diverter adapter. We also placed 2 bags of casing seal inside the 16-in. casing to help seal the bottom of the 6-in. and prevent material coming back up inside the 16-in. casing while drilling deeper. We changed over drill rigs from the SD300 to our coring rig (CS1500) and moved trailers around to setup our core system. We anticipate finishing the core rig setup next week before we begin coring.

Other notes: On Wednesday two USGS staff completed the Fluor fire watch and fire extinguisher training to allow us to perform hot work. Fluor fire safety visited the site on Wednesday morning to perform a walk down and went over the requirements to allow us to preform hot work.

Week 4 (May 24-27, 2021)

We cored from 34 to 112 ft BLS this week and so far, we have had good core recovery. We encountered some issues with the core system that required us to change out parts, but those issues have been resolved and we are in good shape to continue core drilling next week. Once we reach a depth of 210 ft BLS we plan to run geophysical source logs (neutron and gamma-gamma) before we ream the hole. We had some

issues with removing core cuttings that resulted in locking the rods in the hole for most of the day Wednesday, so we reconfigured the well head and modified how we divert the cuttings - this seems to be working better. We will return to core drilling Tuesday (6/1) and will revisit the schedule toward the end of next week once we get through the upper 210 ft. It sounds like waste boxes will be delivered next week and we plan to assist with off-loading those once the crew shows up.

Week 5 (June 1 – 3, 2021)

We cored from 112 to 210 ft BLS this week and have continued to have excellent core recovery. We encountered a thin sediment layer (about 1 ft) near 203 ft BLS that consisted of mostly sand (red/brown). We collected geophysical data (neutron/natural gamma/gamma-gamma) through the core rods on Wednesday before removing them. We changed over the CS1500 (core rig) to the SD300 to begin reaming the hole. On Thursday they were able to ream (15-in. hole) from 31.8 to 56 ft BLS. We pulled the bit back up inside the casing over the weekend and will resume reaming next week. We anticipate assisting with offloading the waste containers that are expected to show up Monday morning.

Week 6 (June 7 – 10, 2021)

This week we encountered some setbacks, our drill rig was down for almost 2 days. We were able to diagnose the issue and get the part replaced and the rig was back up and running on Tuesday afternoon. We also had issues our DHH bit (hammer bit) and did not have the tooling to disassemble the bit to make an onsite repair, so we changed over to a tri-cone drill bit. With all the problems, we were still able to ream the hole from 56 to 127 ft BLS. Changing over and testing bits required us to remove the diverter and well head configuration, so a lot of time was spent getting things back up and running after changing out equipment. We expect to re-start reaming on Monday next week. After reaming to 210 ft BLS, we plan to start getting 10-in. casing placed. We determined vapor port placement based on geophysical data collected. Lastly, we are discussing waste containment going into the next stage from 210 to 255 ft BLS with WGS and what is required before we restart drilling. After we get the 10-in. casing placed, we anticipate some time move tanks, clean equipment, and get containment systems setup before returning back to coring.

Week 7 (June 14 – 17, 2021)

This week we completed reaming down to 210 ft BLS. Afterwards we ran centralized 10-in. casing down to where we reamed. On Thursday we had most of the annular seal placed but ran short on casing seal. We placed 6-9 sand around the vapor port perforated section, similar to the well design sent out last week. We will wrap up placing casing seal on Monday then start to shift things around to restart the coring from 210 to 255 ft BLS. Most of the hot work was completed by Thursday morning, ahead of the new fire restrictions; however, we asked for an extension on the permit for small jobs as they come up. We will spend a time early next week getting the new waste boxes placed and containment established before we restart coring.

Week 8 (June 21 – 24, 2021)

Completed drilling – well completion depth is 255 ft BLS. Monday, we completed sealing the 10-in. casing, moving equipment around, and setting up waste containment for drilling from 210 to 255 ft. Tuesday we completed the core drilling from 210 to 255.8 ft BLS. Wednesday we collected geophysical logs, both in the cased section and in the open borehole. Thursday changed over rigs and completed the reaming to 255 ft BLS and pulled the bit back up inside casing for the weekend. We ended up filling 1 grey waste box, the other 2 are empty. The USGS did not detect elevated natural gamma in our geophysical data; furthermore, RadCon swipes and surveys have not detected radiation levels above

background at this location. We are working with RadCon and WGS drill core released and moved to the core library.

This coming week we will work on getting the site cleared. We will work on getting equipment cleaned and surveyed out. We will also work on building the well head in preparation for the aquifer test. The 20K gal. holding tank is scheduled for delivery July 7th. We plan to run a video of the well then set a temporary 5-hp submersible pump for well development and aquifer testing. Aquifer testing and QW sampling is scheduled for July 13th or 14th. Once the well development/aquifer test is complete, we will remove the pump and place a Redi-Flo2 pump in the well and turn the well over to Fluor.

Week 9 (June 28 – 30, 2021)

This week we worked on getting equipment cleaned, surveyed out, and mobilized back to CFA. We have the casing extended in preparation for the aquifer test, placed metal posts around the well, placed cement for a well pad. We have some follow-up work to do next week, but we plan to have the well ready to go for the planned well development, aquifer testing, and QW sampling scheduled out for July 13th or 14th. We plan to be back at TAN on Tuesday July 6th after the holiday weekend.

Week 10 (July 6 – 8, 2021)

We completed setup for the well development and aquifer test scheduled for next week. A 5hp submersible pump was set on 1-in. stainless steel (SS) line with intake near 246 ft BLS: additionally, 2-in. SS measurement line was placed down near 240 ft BLS. The SS pipe was pressure washed prior to lowering. We ran a borehole video before installing the pump and measurement line and the borehole is clear to bottom. After installation we tested the pump and output is approximately 30 gpm. We plan on conducting the aquifer test on Wednesday July 14th and will use the frac-tank to contain purge water from the test.

Week 11 (July 12 – 14, 2021)

We completed the well development and aquifer test on July 15, 2021. We generated approximately 5,900 gallons of water during the test. All purge water was contained in the 20K gallon holding tank. Water levels, pump rates, water temperature, specific conductance were collected throughout the test and water quality samples were collected at the end of the pump test. Results of the aquifer test and well development will be included in the final well report once reviewed.

Next week, we plan to remove the test pump and place a new low flow pump on Monday (July 19, 2021). We also plan to extend the 16-in. well casing that same day and turn the well over to Fluor.