PROJECT SITUATION REPORT
DISC Drill 2011-12 Season

Project:	T-350-M				
Project Principal Investigator:		Dr. Charles Bentley			
Report No:	1	**for period**	11-14-11	**through**	11-20-11
Prepared by:	Kristina Dahnert			**Date:**	11-20-11

ICDS Personnel on Site:
Kristina Dahnert
Josh Goetz
Mike Jayred
Elizabeth Morton

ACTIVITIES DURING PERIOD

- Krissy, Josh, Mike and Elizabeth arrived in Christchurch on Monday, 11/14/11.
- Everyone attended clothing issue at the CDC on Tuesday, 11/15/11.
- On Tuesday night, we all took a bus tour of the Central Business District (CBD). The devastation around the square and the surrounding blocks is indescribable.
- All four of us flew to McMurdo (MCM) on Wednesday, 11/16/11, via C-17 as originally scheduled and landed on the sea ice runway.
- Met with new WAIS Divide Cargo Coordinator, Rafael Pizano. Rafael has worked in MCM for many years in various roles and is optimizing cargo planning to make use of each pound the Hercs can handle. One of the recent WAIS Divide flights had only 3 lbs. to spare!
- On Thursday, 11/17/11, we all completed our Crary Lab orientation, Field Environmental Brief, Science Inbrief and Crary Lab Walkthrough.
- Placed order and verified packaging of field camp beverage order.
- Took fire extinguishers to fire house for re-certification; later turned over to Haz Cargo.
- Assembled all sleep kits for T-350-M for the entire season (11 kits total). Sleep kits are again being given individual TCN numbers this season and will not be accepted at Bag Drag.
- Picked up and packed all Comms equipment.
- Packed remaining BFC gear, including thermoses, paper towels, batteries, etc.
- Attended snowmobile refresher training on Friday, 11/18/11, as well as the 4-hour Snow School refresher course.
- Checked in daily/every other day with Dean Einerson, Camp Manager at WAIS.
- As of this report, all 4 of us are manifested to fly to WAIS on Monday, 11/21/11, with Don Voigt as planned. We have TCNed all cargo currently in MCM, including the tower pendant and gantry crane VFD's which will fly with us. Rafael and Science Cargo will be briefed on cargo yet to arrive in MCM.

SAFETY

- Nothing to report

COMMENTS
(Problems, Concerns, Recommendations, Etc.)

- On Friday, 11/18/11, I spoke with Jim Ross the Supply Manager of Crary Lab in an effort to locate the DISC Drill Control Computer Rack. When it was not found inside the lab, it was discovered outside of Crary. This piece and all associated paperwork was very clearly labeled (6 stickers) as Do Not Freeze (DNF) upon departure from Madison. They are unable to determine how long the case was outside since arriving in MCM on 11/5/11. Temperatures in MCM have been pleasant (10-20F) and we anticipate the computers fared well, but it is an issue of concern. Crary was then asked to immediately move the case indoors, preferably to Science Cargo for re-TCNing for WAIS. One hour later we did notice the crate had been moved, but later found it outside again in the Science Cargo yard. Upon finding it outdoors for a second time, it was immediately taken inside Science Cargo. We reported this issue immediately to Cara Ferrier, our on-ice Point of Contact (POC) and an email was sent to both Cara and Jim Ross as a record of the event.

PROJECT SITUATION REPORT
DISC Drill 2011-12 Season

Project: T-350-M
Project Principal Investigator: Dr. Charles Bentley
Report No. 2 **for period:** 11-20-11 **through:** 11-26-11
Prepared by: Kristina Dahnert **Date:** 11-27-11

ACTIVITIES DURING PERIOD

- Tested the DISC Drill computer rack in McMurdo; both computers function well
- Spoke to Cara Ferrier about meeting incoming T-350-M personnel at the Chalet right after their McMurdo orientation. She will show everyone around town and verify people's training schedules. This will be particularly helpful for our new people coming down.
- Our original flight to WAIS scheduled for Monday, 11/21/11, was cancelled due to weather at WAIS Divide.
- Checked in with the IDDO Monday morning meeting on 11/22/11.
- Emailed most incoming drillers their McMurdo Snow School and Environmental training schedules, if known.
- Krissy, Josh, Mike, Elizabeth, Don Voigt (SCO), two riggers, one Comms tech, two IT personnel, and a sheet metal worker transported to the McMurdo airfield at 17:00 on Tuesday, 11/22/11. Departed McMurdo at 20:10 and landed at WAIS Divide at 23:35.
- Set up tents and unpacked personnel gear
- Transferred DNF cargo to Science Rac Tent
- Assessed Arch damage with Science Construction crew. Additional settling of floor at sides and ends of drilling Arch. Core processing side sustained very little, if any, damage or heaving. Drilling side sustained considerable heaving of floor panels between the core transfer truss and the slot entry hatch. This is the same area that sustained substantial heaving last season. At the start of the 2010-2011 season, a measurement from the side of the Arch to center line at the slot entry hatch showed 11" of elevation increase. This season, the same measurement showed 19" total rise in elevation.
- Carpenter crew removed several floor panels and underlying SIP panels to reduce elevation of the floor. 2x6's inserted underneath floor panels for stability.
- Carpenter crew also leveled sloping railings around drill slot prior to our arrival.
- Powered up drill tower and tilted toward vertical several inches at a time while shaving protruding spots in the slot wall on the screen cleaning side.
- Installed VFD's in both gantry cranes; both cranes powered up fine and moved down the rails for slot excavation purposes.
- Carpenter crew foreman, Doug 'Dog' Forsythe, has ordered shims from McMurdo for underneath the crane rails. This will provide the wheels with more ease of travel than in recent years.

- Unpacked, labeled and tested handheld radios, chargers, VHF base station, Iridium phone and other Comms equipment
- Leveled centrifuge
- WAIS Divide flight with most of the logging crew cancelled on Wednesday, 11/23/11 and Thursday, 11/24/11 due to weather in McMurdo
- Moved MECC into place and set up the interior
- Covered borehole casing for protection during cutting of snow blocks from the slot wall
- Leveled control room
- Dig out of the Arch back doors continues with excellent progress made this week. Excavated down to the base of the drill Arch doors. Efforts in the upcoming week will be to decrease the pitch of the driveway into the Arch and to groom an apron in the surrounding area. Most of the work is being done with the D4, as the 953 is on light duty due to worn cogs on the track. Parts should be arriving from Christchurch shortly.
- Placed fire extinguishers in the Arch and MECC
- Ventilation ducting removed from the slot for rework
- Carpenter crew began chainsawing side wall of the slot closest to the screen cleaning table. The other side was cut back last year and should be adequate for the remainder of the project.
- The kitchen staff invited volunteers to make pies for Thanksgiving dinner. The drillers and Don Voigt made two traditional pumpkin custard pies. They were delicious!
- A few from our group have battled illness this week, complete will congestion, coughing and sleepless nights, but morale is high and we're ready to keep moving.
- On Friday evening, everyone noticed it was getting a bit darker than normal in the Galley (we have 24 hours of daylight this time of year). Much to our surprise, there was a ¾ solar eclipse outside. Amazing!
- A delicious Thanksgiving dinner was enjoyed by all on Saturday, 11/26/11, complete with a 25 lb. turkey and all the fixin's!

SAFETY

- Nothing to report

COMMENTS
(Problems, Concerns, Recommendations, Etc.)

- Things are progressing very well at WAIS Divide Camp this season. Camp Manager Dean Einerson has a phenomenal crew on hand. Everyone is excited to be here and anxious to get the science activities rolling. At this point, we are waiting for the next flight to arrive with most of the logging personnel and the majority of our cargo (blue sonde crate and winch cabinet), as we have not had a flight since our arrival at WAIS Divide last Tuesday evening. Our priority at the moment is for the carpenters to finish excavation of the slot wall at the borehole end so that slot work will not disturb logging operations that are scheduled to

begin this week. Our second priority is full excavation of the Arch back doors so that cable upspooling and spooling operations can begin.

PROJECT SITUATION REPORT
DISC Drill 2011-12 Season

Project: T-350-M
Project Principal Investigator: Dr. Charles Bentley
Report No. 3 **for period:** 11-27-11 **through:** 12-3-11
Prepared by: Kristina Dahnert **Date:** 12-4-11

IDDO Personnel Onsite:

- Kristina Dahnert
- Josh Goetz
- Mike Jayred
- Elizabeth Morton (logging)
- Paul Sendelbach (arrived MCM on 12/1/11)

ACTIVITIES DURING PERIOD

- Sunday, 11/27/11, was a day off for everyone in camp
- Leveled and cleaned lathe and mill in MECC
- Borehole loggers (Anandakrishnan, Clow, Greschke, Kluskiewicz, Miller, Urban, Waddington) arrived at WAIS Divide on Tuesday, 11/29/11, along with the DISC Drill winch cabinet crate and the blue sonde crate.
- Orientation of Arch and nearby facilities held for all logging personnel
- Hole cut in Arch roof and roof logging sheave mounted in place; box built by carpenters to cover sheave and keep out blowing snow
- Logging winch tent erected and logging winch and levelwind assembled
- All four logging tools tested and are working well
- Final grooming behind Arch and ramp down into large drill side doors complete
- Slot excavation work completed on 12/1/11
- Additional borehole loggers (Bay, Peters) arrived at WAIS Divide on Thursday, 12/1/11
- Paul Sendelbach departed CONUS on 11/27/11, arrived in Christchurch on 11/29/11 and arrived in McMurdo on 12/1/11; pending flight schedules, he is scheduled for arrival at WAIS Divide on Tuesday, 12/6/11, as originally planned
- Removed new spool of drill cable from Arch
- Unpacked all cargo from DNF winch cabinet crate
- Unpacked necessary items from blue sonde crate
- Removed winch cabinet from crate with 953 stinger; set cabinet in place with blue crane and hooked up cables; have yet to power up
- Placed and hooked up Glassman power supply rack and drill control computer rack in control room; have yet to power up
- Organized control room
- Hung air monitor
- Set up freezer

- Crane rail shims arrived from McMurdo and are being installed; the project is ~75% complete at the time of this report
- Mounted borehole logging sheave at floor level across slot and centered logging winch cable over casing
- Along with assistance from Jay Johnson back at IDDO, we established a 'zero' depth reference for the borehole logging winch. This was calculated and checked using two methods. In essence, we needed to determine the exact length of the drill (without the drill set up at this point), as we know the historical offset for the drillers 'zero' to be 9.845m of drill hanging below floor level when floor level was originally measured as 'zero' back at the initiation of the DISC Drill project at WAIS Divide. The difficulty posed by this question is that the drill is the only zero reference we have for the Arch at WAIS Divide, as the floors, casing, etc. have badly and unpredictably heaved over the years.
    - At WAIS Divide, we reviewed upper sonde assembly drawings (anti-torque section + instrument section + motor pump section) and found this length to be 3.659m. The current screen barrel configuration was measured at 7.806m and the current core barrel configuration with J4 cutter head was measured at 3.800m to cutter tips. This produced a total drill length of 15.265m. The known historical offset of 9.845m was then subtracted from 15.265m equaling 5.420m. We then measured 5.420m down from where the top of the drill engages the soft limit switch on the drill tower. This was marked as the 'zero' for borehole logging.
    - Back in Madison, Jay Johnson, who has greater access to DISC Drill drawings was able to independently determine the length of the drill to be 15.268m (0.003m difference from our actual measurements onsite). The system works!
- Borehole logging began on Saturday, 12/3/11, around 15:30 with Gary Clow's temperature logger

SAFETY

- Chief Scientist Don Voigt, Camp Manager Dean Einerson and I keep monitoring changing safety concerns both within and around the Arch and camp. Blowing snow and new drifting continues to be an issue every few days, but the camp staff is keeping up with flagging of dangerous areas and cliffs. Camp is continuously groomed and rope lines strung between town buildings and tent city during inclement weather.

COMMENTS
(Problems, Concerns, Recommendations, Etc.)

- Borehole logging has begun! DISC Drill cable unspooling, spooling and termination operations should begin this next week.

PROJECT SITUATION REPORT
DISC Drill 2011-12 Season

Project: T-350-M
Project Principal Investigator: Dr. Charles Bentley
Report No. 4 **for period:** 12-4-11 **through:** 12-10-11
Prepared by: Kristina Dahnert **Date:** 12-11-11

IDDO Personnel Onsite:

- Kristina Dahnert
- Josh Goetz
- Mike Jayred
- Elizabeth Morton (logging)
- Paul Sendelbach
- Chuck Zander (arrived CHC on 12/10/11)

ACTIVITIES DURING PERIOD

- Sunday, 12/4/11, was a day off for everyone in camp except the logging winch operators (Clow, Morton, Urban)
- Crane rail shimming complete
- Ed Waddington gave a science talk after dinner on Monday, 12/5/11; this kicked off what will hopefully be a weekly Monday night science lecture series
- Mounted tower control cabinet on back of winch cabinet
- Camp staff and IDDO staff closely monitored generator temperatures this week, as the generators tend to overheat on high wind days
- Charged winch brake pump accumulator and set brake pump
- Placed and connected winch manual control station
- Powered up winch cabinet and control computers; trouble shooted communication issue with Yaskawas and watchdog timeout
- Re-leveled screen cleaning table and adjusted tilt arm for clearance with vibrator assembly
- Paul Sendelbach arrived at WAIS Divide on Wednesday, 12/7/11, at 22:00
- Chuck Zander departed CONUS on Thursday, 12/8/11, and arrived in Christchurch on Saturday, 12/10/11
- Science Construction crew (carpenters) returned to McMurdo on Thursday, 12/8/11
- Josh assisted Ed Waddington and Dan Kluskiewicz with disassembly of their ‘snake’ sonic logging tool; the tool encountered pressure difficulties and filled with borehole fluid around 2000 meters; repairs are being made
- Unspooled 3400m cable from winch drum and packaged reel for storage
- PIG (Pine Island Glacier) traverse arrived from Byrd Camp on Friday, 12/9/11, and departed for PIG on Saturday, 12/10/11, after some heavy equipment maintenance
- Temperature, optical, sonic and seismic logging in progress
- Installed Pengo cable tensioner and new spool of cable on levelwind

- Saturday night was made-to-order Stromboli night. As if that weren't enough, the cooks then came through the Galley serving homemade raspberry sorbet and homemade tiramisu!

SAFETY

- Chief Scientist Don Voigt, Camp Manager Dean Einerson and I keep monitoring changing safety concerns both within and around the Arch and camp. Winds have decreased over the last week and the camp and cargo lines have been groomed. Arch end doors are kept clear, despite continuous drifting, and flag lines for hazards are being maintained.
- As planned, the metal ventilation ducting was removed from the slot during the previous week due to bulging of the slot walls and compromised suction. We made a request to RPSC to reinstall flexible hose ducting instead of reworking the oversized metal ducting. This request was denied and plans have been made to have a tin knocker return to WAIS Divide sometime prior to borehole deepening to rework and reinstall the original ducting.

COMMENTS
(Problems, Concerns, Recommendations, Etc.)

- The 953 Cat is still on light duty, but has managed to make the limited picks necessary to allow for spooling operations, flight ops, etc. The Pisten Bully is down hard. Lines are to be replaced in it every 3 years or 3000 hours. While the McMurdo Heavy Shop had ordered all replacement lines, necessary O-rings were not ordered. The parts are coming from Reno, NV, but this has resulted in important lost time with a very important piece of camp grooming equipment. Poor weather earlier this week and downed equipment has made it increasingly difficult to maintain clear access to the core processing side of the Arch, but operators are doing whatever possible. A well-groomed driveway and cargo entry through the core processing side is not needed at this time, but a foot egress path is being maintained.

PROJECT SITUATION REPORT
DISC Drill 2011-12 Season

Project: T-350-M
Project Principal Investigator: Dr. Charles Bentley
Report No. 5 **for period:** 12-11-11 **through:** 12-17-11
Prepared by: Kristina Dahnert **Date:** 12-18-11

IDDO Personnel Onsite:

- Kristina Dahnert
- Josh Goetz
- Mike Jayred
- Elizabeth Morton (logging)
- Paul Sendelbach
- Chuck Zander (arrived at WAIS Divide on 12/16/11)

ACTIVITIES DURING PERIOD

- Worked on Sunday, 12/11/11, to prepare for cable spooling
- Issue encountered with lack of crown sheave encoder and levelwind encoder communication. While the load pins still read tension, a working levelwind encoder was needed prior to spooling on the new cable. A spare encoder was machined and installed. This encoder will be moved to the crown sheave for drilling operations and spare encoders are on order.
- Spooled new 4200 meter cable onto winch drum
- Installed fluid mixing tank batch controllers
- Installed centrifuge PLC and tested operation of the system
- Lagged down centrifuge
- Chuck Zander arrived in McMurdo on Monday, 12/12/11, and at WAIS Divide on Friday, 12/16/11
- Stretch test of logging cable conducted
- Night shift grooming of core processing side of Arch; access for heavy equipment now complete
- Unloaded blue sonde crate
- Torqued all screws on screen barrels
- Tightened core barrel set screws
- Fluid barrel berm excavated and barrel pumps and tools staged
- Fluid tank pad groomed above and outside of drill side doors
- Fluid bulk tanks filled, parked outside Arch and plumbed to building
- Fluid mixing tank and pump function tested
- Excavated snow around slot drip pans to relieve pressure and bowing; Re-leveled borehole drip pan
- Greased winch motors
- Torqued bolts on gantry cranes
- Parts received for 953 CAT and Pisten Bully; 953 repaired on Friday, 12/16/11
- Moose door dig out continues with excellent progress

- Thomas (tin knocker) and Tirzah (carpenter) arrived on Friday, 12/16/11, and started re-installation of slot ventilation on Saturday, 12/17/11
- Series of planned generator shutdowns occurred between 8:00pm on Friday night through 8:00am Saturday morning for seismic work
- Drill cable terminated and Farmor potted
- Round 1 of temperature, optical, sonic and seismic borehole logging complete! Round 2 will begin after borehole deepening.

SAFETY

- Weather remains pleasant, though a storm is forecasted for this week. Camp continues to be well-groomed and driveways into both ends of the Arch are excellent. Excavation of the third Arch egress (i.e. the Moose door) is in progress and will be completed in time for drilling operations to begin.

COMMENTS
(Problems, Concerns, Recommendations, Etc.)

- Round 1 of borehole logging is complete and had good success. All loggers are currently processing data. We will soon know how much further the borehole is to be deepened.
- Shortly after the 953 CAT was back up and running, the D4 CAT went down on Saturday afternoon. Our mechanic Shawn speculates this is an issue with fuel delivery in the CAT and parts are likely available in McMurdo.

PROJECT SITUATION REPORT
DISC Drill 2011-12 Season

Project: T-350-M
Project Principal Investigator: Dr. Charles Bentley
Report No. 6 **for period:** 12-18-11 **through:** 12-24-11
Prepared by: Kristina Dahnert **Date:** 12-25-11

IDDO Personnel Onsite:

- Kristina Dahnert
- Josh Goetz
- Mike Jayred
- Elizabeth Morton
- Paul Sendelbach
- Chuck Zander

ACTIVITIES DURING PERIOD

- Tested resistance between opposing ends of the drill cable; results are 14.1 on the outer conductor and 13.2 on the inner conductor
- Assembled drill on cable; current configuration is anti-torque section 'A', instrument section 'J', and motor pump section 'X'
- Drill powered up on bench; all communications gave a green light!
- Slot ventilation ducting installed
- Ventilation system VFD installed by camp electricians; system powered up and is working well
- Chip hopper placed near back doors of Arch; lids, vacuum hose and filter bags attached
- Chip vacuum system hooked up and tested
- Jig transit used to align core transfer trusses, FED (fluid extraction device) and core cutting table
- Reinstalled window on bulkhead wall between core processing and drilling sides of the Arch, as the window was removed and cut back for truss alignment purposes
- Overhead ventilation on bulkhead wall adjusted for clearance with yellow gantry crane
- New borehole fluid hose adaptor mounted on casing
- Hole cover switch wire repaired
- Installed new filter screen on crown sheave drip pan hose
- Borehole fluid level tested using two methods; recorded as 68.15 meters using Gary Clow's logging winch and as 68.58 meters using the DISC drill float/tape measure method
- Drill hung on tower and run down into borehole fluid for communications testing; all systems working well except the new WOB (weight on bit) sensor, which is retracted and reads 0 N when the tower is horizontal and extends and reads 20000 N (max) when the tower is tilted and the drill is hung vertically

- Screen drying box rewired to a new breaker and a switch installed, as the original cable had been recommissioned for borehole logging power
- General cleaning of Arch and drill slot
- Sent the drill down hole for the first time on Friday, 12/23/11. Pump set at 2100 rpm for the trip down and the cutters were turned on at 1530 meters for the smaller diameter portion of the borehole (between 1530m and the bottom, when the thinner kerf core barrel was originally deployed); substantial reaming encountered; several cutter dropouts, likely due to high reaming speed; pump function declined around 3170 meters and the drill was returned to the surface
- Second borehole trip initiated on Saturday, 12/24/11; cutters again turned on at 1530 meters; substantial reaming again encountered below 2500 meters and the feed rate slowed; time in borehole was approximately 6 hours, and thus the motors added heat to the borehole fluid; after several attempts, penetration was gained and approximately 0.759m of core was drilled. Upon return to the surface, the core dogs were found to be frozen closed (due to the increased heat and extended time down hole) and the core was left in the borehole.
- Sridhar Anandakrishnan presented a science talk at our Monday night science lecture series
- A delicious Christmas dinner was enjoyed on Christmas Eve, followed by a white elephant gift exchange

SAFETY

- Seasonal PM checklist and WAIS Startup safety checklist completed.
- Wind and blowing snow continue to plague WAIS Divide this season. The Pisten Bully is still down as well as the D4, so necessary snow removal around Arch doors is being done with the 953 bucket. Town is still kept in exceptional shape using the Tucker groomer.

COMMENTS
(Problems, Concerns, Recommendations, Etc.)

- The new WOB sensor is not working in anti-torque section ‘A’. While we have spare section ‘B’ onsite, we do not want to disassemble the cable from the drill simply to test section B at this time. Risk to the optical fibers outweighs the need to have a working WOB sensor at this time. Drill operations will continue using cable tension readout.
- Reaming of the borehole below 1530m has certainly been more extensive than anticipated and greater than in previous season. Borehole fluid density will be revisited, but clear travel has now been achieved to the bottom.

PROJECT SITUATION REPORT
DISC Drill 2011-12 Season

Project: T-350-M
Project Principal Investigator: Dr. Charles Bentley
Report No. 7 **for period:** 12-25-11 **through:** 12-31-11
Prepared by: Kristina Dahnert **Date:** 1-1-12

IDDO Personnel Onsite:

- Kristina Dahnert
- Josh Goetz
- Mike Jayred
- Elizabeth Morton
- Paul Sendelbach
- Chuck Zander
- Chris Gibson (arrived in McMurdo on 12/29/11)
- Jay Johnson (arrived in McMurdo on 12/29/11)

ACTIVITIES DURING PERIOD

- First things first…we have completed drilling of the WAIS Divide main borehole! On December 31, 2011, the final ice core was collected, a momentous occasion that was long in the making. Our initial deepening schedule consisted of drilling approximately 43 meters to a depth of 3375 meters after which Jakob Schwander's pinger was deployed down hole using Gary Clow's logging winch. Results were inconclusive and the pinger was only receiving reflections from the bottom of the borehole. The drill was then placed back on the tower and 30 more meters were drilled. The pinger was again deployed with inconclusive results. Per Chief Scientist Jeff Severinghaus, the main borehole has been completed at a driller's depth of 3405.077 meters. A small celebration was held upon receipt of the last core and was enjoyed by camp staff, core handlers, loggers and drillers.
- On Sunday, 12/25/11, two pressure transducers were installed in the DISC Drill screen barrel and sent to the bottom of the borehole. Results show that the borehole is only 21 meters underbalanced. This will be corrected by raising the fluid level to 47 meters.
- Chris Gibson and Jay Johnson arrived in Christchurch on Sunday, 12/25/11, Christmas Day.
- Reaming runs in the borehole were completed late last week and our first core was collected on Monday, 12/26/11.
- Drilled in two shifts of 12 hours each; the first shift team of Elizabeth, Krissy and Paul operated from 6:00am-6:00pm and the second shift team of Chuck, Josh and Mike ran from 6:00pm-6:00am. Drilling and two shift operations ran from Monday, 12/26/11 through Friday, 12/30/11.

- The levelwind assembly became stuck at one end of travel during a descent on Monday. The levelwind was driven off of the limit switches using the remote operator panel and the levelwind forks bent back to their original operating position. The levelwind has since been functioning well at usual tripping speeds.
- Due to the amount of cable filler shedding off of the new cable, the chips from the first two days of runs were coming up quite black. After centrifuging, these chips were then packed in barrels for transport back to McMurdo as 'dirty snow' as opposed to being disposed of in the chip hopper at WAIS Divide.
- Temperatures as recorded by the drill at the bottom of the hole continue to track Gary Clow's temperature profile with and offset of 1.5 degrees. The drill has been recording ~8ºC when arriving at bottom and -4ºC after coring is complete.
- The borehole loggers presented several talks and show-and-tell sessions at our Monday night science lecture series.
- Moose door excavation was completed in time for drilling of the first core
- Several fluid batches were mixed to the correct density and dumped into the borehole this week. On two occasions, the casing immediately popped up several inches after fluid dumping, causing interference with the hole cover. The hole cover and its central brushes were cut back and rubber strips installed across the front of the hole cover to prevent unwanted items from entering the borehole. Shortly after the second occasion of the casing popping up, the casing settled back down several inches.
    - In consultation with Jay Johnson and Chris Gibson in McMurdo, we believe that the warm temperatures at WAIS Divide in recent days and thus the 'warmer' temperatures of our drill fluid batches on the surface may be impacting the casing. It is possible that the 260 foot long casing begins to stretch when the warm fluid is added to the hole. Since the bottom of the casing has a larger diameter lip and is stabilized in the ice, stretching of the casing might be causing it to protrude further at the surface.
    - Since the drill tower and the configuration of the replicate drill will be shorter, we do not anticipate any further negative consequences should this behavior recur with future fluid dumps.
- Borehole camera, additional electrical parts hardigg, and replicate screen and core barrels received from McMurdo
- Major cleaning of the drill Arch including slot and winch drip pans; borehole drip pan releveled
- Organized MECC machine shop
- Chris Gibson and Jay Johnson flew to McMurdo on Wednesday, 12/28/11, on the C-17, but the flight circled McMurdo due to fog and boomeranged back to Christchurch. They then made it to McMurdo the next day (Thursday) via LC-130 Herc.
- Anti-torque section 'B' opened up to investigate the non-functioning weight-on-bit (WOB); this is believed to be a mismatched wiring issue; the engineering model will be modified and tested before actual drill sections are altered
- Fluid sample collected from the borehole; the density is as expected at .92
- New Year's Eve dinner and celebration held on Saturday night

SAFETY

- Daily safety checklists completed
- Visitor Safety Analysis forms completed for all Arch visitors
- Ventilation raised from 45 Hz to 50 Hz
- Arch emergency medical equipment demonstrated for drillers and core handlers; Arch evacuation protocol discussed with camp medical personnel

COMMENTS
(Problems, Concerns, Recommendations, Etc.)

- The D4 is still down, awaiting parts from McMurdo. Poor weather in McMurdo delayed flights from Christchurch earlier last week.
- The main borehole is complete! Thank you to everyone…and this is a very large group…for all of your support. We could not have asked for a better reason to celebrate on New Year's Eve.

PROJECT SITUATION REPORT
DISC Drill 2011-12 Season

Project: T-350-M
Project Principal Investigator: Dr. Charles Bentley
Report No. 8 **for period:** 1-1-12 **through:** 1-7-12
Prepared by: Jay Johnson **Date:** 1-8-12

IDDO Personnel Onsite:

- Kristina Dahnert
- Josh Goetz
- Mike Jayred
- Elizabeth Morton
- Paul Sendelbach
- Chuck Zander
- Chris Gibson (arrived at WSD on 1/3/12)
- Jay Johnson (arrived at WSD on 1/3/12)
- Nicolai Mortensen (arrived in McMurdo on 1/2/12)
- Steff Bo Hansen (arrived in McMurdo on1/4/12)

ACTIVITIES DURING PERIOD

- Chris and I arrived at WAIS Divide on Tuesday after the Monday flight to WAIS was canceled due to weather at WAIS.
- Nicolai was on a flight to WAIS on Thursday, but it was diverted to Byrd and then it returned to McMurdo due to weather at WAIS.
- Krissy and Paul were scheduled to leave this week along with the borehole logging team, but they are all still here due to poor weather canceling flights.
- Unpacked all replicate equipment.
- Modified the FED for use with the smaller diameter replicate core.
- Set up and aligned the core transfer truss for use with the replicate coring barrels and core.
- The WOB issue has been resolved. The problem was due to a wiring mismatch in the instrument sections. The K instrument section (for replicate coring) and engineering model have been corrected. The remaining replicate coring instrument sections will be updated as time permits.
- LabView code was modified to provide a faster update time for the WOB sensor.
- Logging was completed on Wednesday and the floor level sheave was removed.
- The K instrument section was fitted with a higher accuracy inclinometer that has .1 degree resolution. The firmware was also updated.
- The K instrument section was also fitted with a cable that can be pulled out of one of the vent plugs so the firmware can be changed without disassembling the instrument section. This will allow us to change the replicate coring firmware if needed without having to remove the drill from the tower.

- Instrument section K was reassembled and connected to the actuators and motor section for testing. The cutter and pump motor tested ok, but the actuators were not working. It was determined, when powering up, the I^2C bus would not establish communication. However, if the circuit was reset, actuator operation was regained. This reset has to be performed every time power is interrupted via a set of pins on the RCM board. This can be done through the programming lead that was added, however it means having to open up the vent plug and pulling out the lead each time the power is interrupted. Not very convenient. The original firmware was reloaded and the actuators worked, however the inclinometer would drift since the code was not correct for the updated sensor circuit. Chuck changed a clock setting to solve this problem. Now the I^2C bus has the same boot up issue as described above. Nicolai has been working with us from McMurdo to resolve the problem. Sridhar Anandakrishnan also helped on Saturday by using his expertise in C to trouble shoot the code.
- Assembled the borehole camera system. The fiber optic transceivers are not sending a signal over the drill cable. It looks like the combination of cable length and losses through the optical slip rings and connection are too much for the transceivers. We are working with people back at IDDO and also the IT and Coms groups in McMurdo to come up with a solution. If we are unable to get the fiber transmission working we are looking into a backup plan of recording the video on a device that can be placed in the camera pressure vessel.
- Removed a 1m truss section from the tower.
- Began setting up the tower rollers for the replicate drill.
- Set up the broaching head and bumpers.
- Assembled the replicate screen section. The screens didn't fit into the barrels because the centering pads were too thick, so they were set up on the lathe and turned down.
- The screen cleaning table was changed over for use with the replicate barrels.
- Made a photo inventory of our cargo. The inventory is broken down by where each piece is to go at the end of the season. This will make it easier for camp and RPSC personnel to identify items.
- Made up return shipping labels and blank inventory lists for returning equipment.
- The replicate sonde is fully assembled and will be ready to go on the tower after a few final screws are torqued. On Monday it will be placed on the tower along with the core and screen barrels for aligning of the tower rollers.
- Jeff Severinghaus requested that we bring the borehole fluid level up to 45m from the surface to pressure balance the hole. It was brought up to 46.7m on Saturday and will be brought up the remaining 2.4m once we refill the bulk fluid tanks.
- The slot drip pans were cleaned and a new hole cover was installed.

SAFETY

- Turned the ventilation system down to 45 Hz. Less ventilation is required when we are not drilling and it helps reduce the amount of snow that is pulled in through the air intakes.

- Elizabeth attended a three hour emergency response training with camp personnel.

COMMENTS
(Problems, Concerns, Recommendations, Etc.)

- The D4 is back up and running.
- The Piston Bully is still down.
- On Saturday night one of our two generators went down and it needs parts to be repaired. Our operations will continue as planned unless there is a failure of the second unit. A contingency plan has been put in place with camp and SCO for what to do if the second generator goes down.
- The wind and blowing snow continued throughout the week. Drifting around doors and tents requires frequent attention.
- We checked with Michael Davis and Cara Ferrier on the status of our request for Comair that was made on Oct. 13 with Deborah Roth. Neither of them found any record of the request being made. Cara is now working on it.

PROJECT SITUATION REPORT
DISC Drill 2011-12 Season

Project: T-350-M
Project Principal Investigator: Dr. Charles Bentley
Report No. 9 **for period:** 1-8-12 **through:** 1-14-12
Prepared by: Jay Johnson **Date:** 1-15-12

IDDO Personnel Onsite:

Kristina Dahnert (departed WSD on 1/9/12)
Josh Goetz
Mike Jayred
Elizabeth Morton
Paul Sendelbach (departed WSD on 1/9/12)
Chuck Zander
Chris Gibson
Jay Johnson
Nicolai Mortensen (arrived at WSD on 1/9/12)
Steffen Bo Hansen (arrived at WSD on1/10/12)

ACTIVITIES DURING PERIOD

- Krissy and Paul departed WAIS on Monday. They were scheduled to fly to CHC on Wednesday. However, due to flight cancellations they are still in MCM.
- Nicolai arrived at WAIS on Monday.
- Steff arrived at WAIS on Tuesday.
- The power up issue with the I^2C buss has been resolved with a hardware and software delay. The fix has been implemented on both instrument sections and the engineering model.
- The entire replicate drill was assembled on the bench.
- On the initial run down the hole, the pump quit working after just a few minutes of operation. Instrument section (section K) was removed and section L was swapped in. The screws retaining the heat sink bracket for the pump MDPU were found loss which resulted in a component burning out. This section has since been repaired and is fully operational.
- The replicate drill was configured with six screens and the broaching head and then lowered to 2500m (the highest borehole inclination is at ~1900m) to test the function of the spring loaded bumper. The screens came back empty. This means we have the bumper springs set high enough to keep the head from scraping the bore wall on the way down.
- A broken hall sensor wire for the cutter motor was found in the compensator piston of motor section Z. We were able to repair it without taking the motor section apart.
- We have been busy testing the actuators and making modifications to the firmware and LabView code. Through testing we have found the need to implement correction factors for each of the actuator arms so they each provide equal force for a given setting. Each actuator arm also requires a slightly different

amount of current to initiate movement. An offset has been implemented so all arms start moving at the same setting on the control.
- A software feature has been added that allows the actuators to keep the drill on a set compass heading even if the upper sonde rotates while doing a deviation.
- I gave several arch tours this week. The groups included an Air Guard flight crew, Deborah Roth, Dawn Needham, and several camp staff.
- The fluid tanks were filled and the hoses going between the tanks and arch were dug out.
- Tested the ability of the drill to find the high side of the hole. This was done using one and two actuator sections. Both methods work well. We also tested the repeatability of the system by raising or lowering the drill and then bringing it back to its original position and then repeating the test. We are confident we can find the high side of a hole within ±25°.
- The fail-safe mechanism on three of the six actuator arms was tripped during testing. This happened prior to implementing the force correction factors. All arms have been fitted with tighter springs to increase their capacity by 20%. This configuration was tested in Madison and is still within our safe working limits.
- Mike and Elizabeth started Eclipse drill training and testing. The drill is set up and they are currently at 15m. Steff helped get the drill dialed in and cutting properly.
- The Glassman would not power up on Saturday morning. After some troubleshooting we found one of the arms on the three poll breaker switch had broken off. We were able to make a repair and get it running again. Our back up unit is being shipped in from MCM in case it is needed.
- New transceivers for the borehole camera system are in transit and should arrive at WAIS next week. The current units were found to have been ordered incorrectly. As a backup, a digital video recorder that writes to a SD memory card has also been ordered and is in transit. With this unit we would not be able to see the video real time because the recorder would be in the down hole pressure vessel.
- Josh started testing the prototype hand auger.

SAFETY

- The weekly PM check list was completed.
- I did a thorough inspection of the winch system and tower hydraulics. Two hydraulic hoses that move with the tower are starting to rub on one of the drip pans. This is due to settling of the firn. We adjusted the drip pan to prevent further abrasion.
- Adjusted the pressure relief valve for tilting the tower vertical. Due to the shorter replicate drill and one meter of truss removed from the tower, the balance of the hydraulic system was off and it could not move the tower off of horizontal.
- A test of the winch E-stop system was conducted.
- The handrail between the control room and winch pit was attached to the control room to make it more secure. When making and breaking barrel connections operators lean on the rail so we wanted to make sure it wouldn’t fail.

COMMENTS
(Problems, Concerns, Recommendations, Etc.)

- The Piston Bully has been repaired.
- We have been asked by Julie Palais to reduce the amount of Comm Air allowance we have requested due to the delays with the Vessel this season.
- Yesterday Nicolai and I noticed a new sound coming from the large winch motor. We don't have a diagnosis yet, be we are concerned it may be a bearing. We will be watching is closely this coming week.

PROJECT SITUATION REPORT
DISC Drill 2011-12 Season

Project: T-350-M
Project Principal Investigator: Dr. Charles Bentley
Report No. 10 **for period:** 1-15-12 **through:** 1-21-12
Prepared by: Jay Johnson **Date:** 1-22-12

IDDO Personnel Onsite:

Josh Goetz
Mike Jayred
Elizabeth Morton
Chuck Zander
Chris Gibson
Jay Johnson
Nicolai Mortensen
Steffen Bo Hansen

ACTIVITIES DURING PERIOD

- The drip pan that goes from the winch to the slot was found to be rubbing on two of the hoses for the tower actuator. Snow was removed from under the pan to restore clearance.
- The first deviation is being run from 2976m 3001m. At this point we will start coring a partial diameter core. Full core diameter should be reached by 3003m. The target replicate core depth is from 3008m to 3048m “AIM 8”.
- Tested the broaching head with the three screen barrel. Using the side push method we were unable to get the head to cut even in the most aggressive cutting configuration. The screen barrel is a larger diameter than the upper portion of the drill, so we concluded that as the drill is pushed to the wall it flexes and the head ends up not contacting the wall. Different actuator forces were tried with no success.
- The broaching head was also tested using the initial angle (tilting the drill) approach. Again we were unable to initiate the cut. Overcoming the force of the bumper springs to get the cutter in contact with the wall is thought to be one of the factors. They were set as light as we were comfortable with to ensure the cutters do not contact the wall on the way down.
- Several test runs were done to determine the effects of the actuator forces and anti-torque setting on the tendency of the drill to stick slip. In a normal coring situation shoes are used to provide stable cutting by putting some of the drill weight on them. In the milling and broaching configurations for deviating there is no axial shoe, so we are relying on the drill to move smoothly at low cable speeds. The first tests were done with the anti-torques set up as they would be for coring and the actuators arms set up with ball end ends (these ends roll around the bore but slide axially). The initial angle approach was used and the cutter was not rotating. Different actuator force settings were tried. A cable speed of .2m/s was required for a smooth decent or accent. Next the ball ends were

replaced with rollers (made in the MECC) which roll axially. These reduced the stick slip only a slight amount. Then the upper actuator rollers were replaced with rollers that have a protruding knife edge for providing anti-torqueing. The anti-torque blades were loosened. This combination showed only slight improvements in stick slip, but greatly reduced how much the drill rotates while descending or ascending. The drill was rotating up to 120° in 25m and now it is no more than 25°.

The effect of the stick slip is that the cutter sees high intermittent loading which causes sudden orientation jumps (change in rotation of the sonde). The actuators are not able to react to such quick changes so the result is the orientation of the deviation changes. Using the final configuration described above, we were able to mill at .03m/s without the orientation of the sonde jumping around despite the stick slip.

- Tested the side milling head. Given the limited amount of time, we decided the best chance of success was to start with the initial angle approach. Side cutting depths of 2-4mm have been tried. Initially cable speeds of .1-.2m/s were tried. These high feed rates gave relatively smooth weight on bit (WOB), but they exceed the relief angle on the cutter teeth. With a cutter speed of 80 rpm the max feed rate should be .03m/s. This was also tried. With our current axial depth cut of 2mm little change in cutting performance was noticed over the .03-.2m/s feed range.
- For most of the runs we have been collecting fewer chips than expected. This means we are either not cutting as much as we think we are or we are not collecting the chips due to the high feed rates.
- A vacuuming run was done to see if there were chips left in the hole. The screens came back empty.
- Nicolai mapped the deviation on Friday night to try and determine how much cutting we have done. This was done by mounting the cutter mandrel with just a shoe directly to the sonde (no screen barrel). The short drill configuration makes it easier to see small angle changes. The drill is lowered to various depths in, above, and below, the deviation zone. At each depth the drill is tilted in a number of directions and the inclinations are recorded. He was not able to conclusively find a notch in the wall. There should have been a notch ~25mm deep if all milling passes were to depth. We believe this means the cutter head has not been engaging fully with the wall.
- On Saturday we again tested different actuator force settings to try and better place the cuter head against the wall. One milling pass was completed at .03m/s feed and we recovered the expected amount of chips.
- The hall sensor counts from the motors in the lower actuator section drift when the pump and cutter motors are running. These counts are used to determine the position of each arm. This means the drill will loss position over time. To get us by we are only running actuators in auto mode for one minute before retracting the arms and resetting the hall counts. We are working on trying to mitigate the problem.

- One of motor drives in the D actuator section locked up on Friday. We have not had a chance to open it up yet and determine what went wrong. The section was swapped out.
- While the sonde was on the bench to work on the hall sensor issue the MPS for the cutter and pump motors quit functioning. A space heater was being used to warm the wiring at the top of the motor section. Nicolai thinks the heat may have melted some the frost and ice chips around the motor wiring causing a short. The motor section was swapped out as a precautionary measure.
- Instrument section K was swapped in. This is the unit that the pump motor controller burned out in last week. It had been repaired but not tested yet since it has to be connected to the drill to do so. When swapped in it still was not working. Nicolai worked on it last night and found the problem wasn't in the instrument section, but was being caused by a shorted strain gage wire in the lower actuator section.
- On two different runs, the actuator arm fail safe mechanism on one of the lower arms was found tripped. We are trying to determine what is causing this.
- The cable vacuum has been set up and is working well. It is collecting about 13l per run.
- I am working on designing and fabricating a helical shoe for the face milling head.
- Mike and Elisabeth have completed drilling with the Eclipse drill. They got to 121.5m. They are now in the process of drying and packing the system.
- Josh did more testing of the prototype hand auger. It is drilling and transporting chips well, but having some difficulties collecting core. So far only the collet and tapered ID heads have been tested. Further testing will be done this next week.
- The replacement fiber optic transceivers have not arrived yet. They were to arrive on Thursday, but the flight was canceled due to weather. The parts are now scheduled for Monday. It would be very useful to have the camera right now to see what we have been doing.

SAFETY

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COMMENTS
(Problems, Concerns, Recommendations, Etc.)

- The repair of the switch on the Glassman has been holding up. The backup unit was shipped from McMurdo and is here in case we need it.
- Jeff and I have settled on the fluid level being brought up to 36m from the surface at the end of the season.

PROJECT SITUATION REPORT
DISC Drill 2011-12 Season

Project:	T-350-M				
Project Principal Investigator:		Dr. Charles Bentley			
Report No:	11	**for period**	1-22-12	**through**	1-31-12
Prepared by:	Jay Johnson			**Date:**	2-1-12

IDDO Personnel Onsite:	Josh Goetz Mike Jayred Elizabeth Morton Chuck Zander Chris Gibson Jay Johnson Nicolai Mortensen Steffen Bo Hansen (Departed WAIS on 1/23/12)

ACTIVITIES DURING PERIOD

- Steffen departed WAIS on Monday.
- Finished drying and packing the Eclipse drill.
- Started working two shifts on Monday.
- Gave a tour of the arch to Julie Palais (NSF), Sonia Esperansa (NSF), and Lindsay Powers (RPSC). They visited WAIS Monday on a turnaround flight.
- Designed and fabricated a helical shoe for our face mill cuter. The idea is that once a ledge is established in the wall the helical shoe will continuously control the axial feed of the cutter. Therefore, by being able to place weight on bit we can eliminate stick slip. The challenge thus far is we have not been successful at creating a good ledge to set the shoe on.
- The new fiber optic transceivers arrived on Monday. The new parts were installed and tested. The system was first tested with a 1m fiber optic lead and then connected to the drill cable. There was no noticeable loss in picture quality over the 4.1km cable.
- On Tuesday we ran the camera down the borehole. The first few hundred meters were cloudy and then the clarity improved. We took video of several sections of the borehole including the deviation we are working on and the bottom. The low side of the hole has a thin layer of chips clinging to it. We were able to verify that we have started a deviation and that it is orientated on the high side of the hole.
- Wednesday evening the drive for one of the arms on the upper actuator (actuator D) locked up. It looks to be a failure of the motor or gear reducer, because everything looked fine electrically. A different actuator section was swapped in.
- We are continuing to refine a set of cutting parameters and methods that result in successful cutting.

- Replaced the failed gear motor in actuator D so we have back-up actuator section.
- The coring head was attached directly to the pump, no screen section, to try and find or create a step in the borehole wall. None was found or created.
- Attached the milling head with face mill directly to the pump, no screen section, to try and find or create a step in the borehole wall. None was found or created.
- Seven drill runs were completed between Thursday morning and Friday evening. Each drill run consisted of up to 7 milling passes in the deviation zone.
- On Friday evening a chip collection and vacuuming run was done. The 10 micron fabric filter was put in the screen section to improve collection of fine particles. A second run was done on Saturday morning. A total of five screens full of chips were recovered.
- Friday night the temperature logging tool was lowered down the borehole to verify it can pass by the deviation zone without getting hung up. The cable tension never varied by more than 3 lbs. There was no problem passing the temperature logging tool by the deviation.
- On Saturday night the logging winch was packed.
- Saturday afternoon the camera was deployed down the borehole. The drill fluid clarity was not good due to all the activity in the borehole. The camera was left at 2800m overnight to monitor the fluid clarity. The clarity improved some overnight and the video logging run was completed on Sunday morning. The notch in the bore wall was noticeably deeper than when the camera was run on Tuesday.
- On Saturday afternoon the fluid level was measured and brought up to 36m (the fluid level was not measured after raising). On Sunday morning the level was checked again and found to be 42.6m. This means either was a measurement error was made or the casing leaks. The fluid level was checked a few times throughout the day and measured the same each time. On Sunday evening fluid was again added raising the level to 36.3m. The level was again checked on Monday morning and found to have dropped 0.5m to 36.7m overnight.
- Drilling operations were completed on Sunday morning and packing began.
- The weather was poor on Sunday morning and degraded to condition 2 by afternoon so we focused on packing indoors.
- The weather on Monday started out decent, but turned to condition 2 during the afternoon, and then improved again in the evening.
- The 150hp winch motor was removed and packed for return to Madison. The front bearing on the motor sounds dry even though it has received its regularly scheduled maintenance.
- Packed the MECC on Monday and it was moved to winter storage in the evening.
- All packing was completed by Monday evening.
- The remaining seven of us departed WAIS on Tuesday evening at 9:00pm.

SAFETY COMMENTS
(Problems, Concerns, Recommendations, Etc.)

- Tested the fire alarm system

- The 225kw generator was shut down for the season on Monday afternoon.
- We will be shipping the winch control cabinet home. There were a few instances where the computer and manual winch control lost control of the small winch motor while milling the deviation. The e-stop had to be used to stop the winch each time.
- As discussed above, the casing appears to leak somewhere between 37and 43m