Preliminary Outline of Operations for North Pond Expedition (October 2017)

Given the need to recover the downhole instrument strings and to collect fluids from the formation using the Cowen fluid sampler that in attached to Jason II, we will need to conduct a number of dives – elevators will not work for many of these operations. The following is a rough dive plan that accomplishes the tasks listed in the table below. Note that this is an exercise to piece objectives and we know the plan will change.

Table 1. Dive Targets for North Pond Expedition 2017

Hole	Latitude	Longitude	Water Depth (m)	Penetration Depth (m)
395A	22°45.3519′N	46°04.8609′W	4482.5	664
U1382A	22°45.3531′N	46°04.8911′W	4482.9	210
U1383B	22°48.1328′N	22°48.1328′N	4413.9	89.64
U1383C	22°48.1241′N	46°03.1662′E	4413.9	331.5
Marker BD	22°49.2367′N	46°06.6507′E	4138.2	NA

Hole U1383B has a CORK-Lite that is ~25 m from U1383C. Marker BD is the 1 W/m^2 area. In the figure below the black lines represent casing (steel and fiberglass).

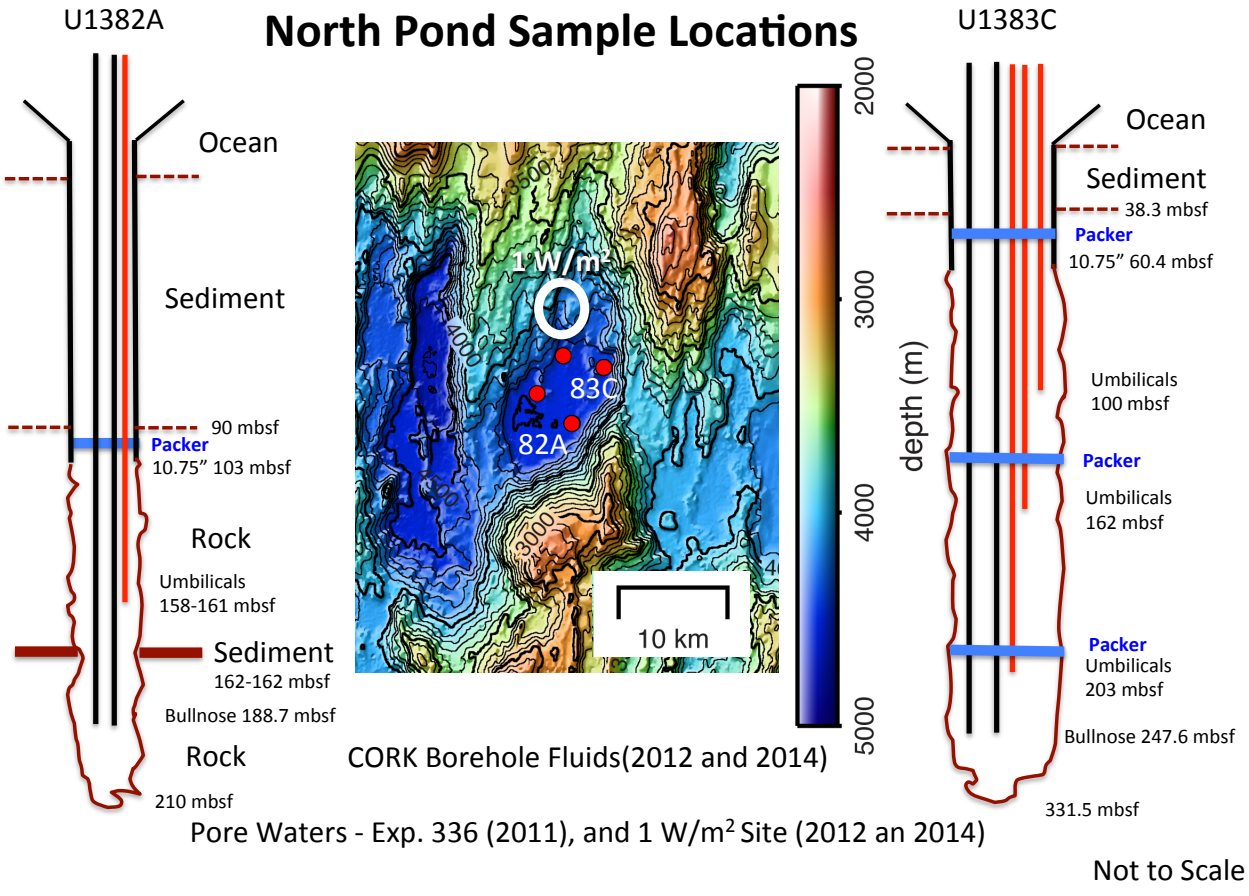


Table 2. Operations for North Pond Expedition 2017. The discharge site is the 1 W/m^2 area that is next to Marker BD.

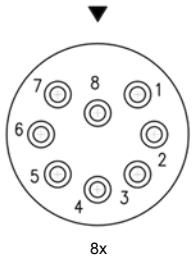
Operation	395A no wellhead	1382A 1 horizon	1383B CORK-Lite	1383C 3 horizons	Marker BD
download pressure	na	**YES**	**YES**	**YES**	na
recover pressure sensor	na	na	**YES**	na	na
recover downhole strings	**YES**	**YES**	**YES**	**YES**	na
sample fluids from umbilical	na	**YES**	na	**YES**	na
sample fluids from outflow	na	**YES**	**YES**	**YES**	na
3-day fluid Virus samplers	na	**YES**	na	**YES**	na
elevator	na	**YES**	na	**YES**	na
Wellhead OsmoSamplers	na	**YES**	na	**YES**	na
flow meter	na	**YES**	na	**YES**	na
Cs input - Gravity	na	na	**YES**	na	na
push cores	na	**YES**	na	na	**YES**
heat flow	na	**YES**	na	na	**YES**
Ship - CTD	na	**YES**	na	**YES**	na

Electrical Needs for Jason II – pressure download using ODI connector in swing-arm milk crate, heat flow for one or two dives, low temperature probe, Cowen fluid sampler with in-line DO sensor.

CORK ODI RS-422, AWM-8X-FS PIGTAIL THROUGH ALVIN TO INSIDE DB-9

AWM	function	DB9-FS	aka
1	from CORK +	3	Rx+
2	from CORK -	4	Rx-
3	unused	5	gnd
4	power +	-	not needed
5	power -	5	gnd
6	to CORK +	2	Tx+
7	to CORK -	1	Tx-
8	shield	5	gnd

AWM-8X-FS CONTACTS, FACE VIEW (from SeaCon All-Wet catalog):



Mechanical Need for Jason II operations – squeezer fluid samplers, running tools for the recovery of downhole strings and deployment of plugs, wellhead manipulations, push cores, niskin water sampler on Jason, and elevators.

Elevators. Currently we plan to recover one (maybe more) pressure logger, likely using an elevator.

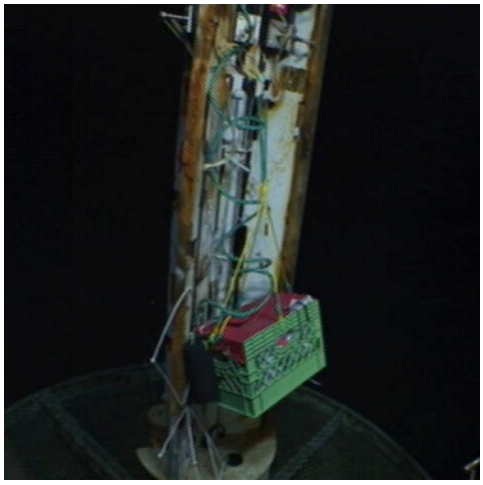
We may want to deploy a pumped filtration device (max 4 deployments) that would be mounted on an elevator and left for several days to sample fluids from the wellhead.

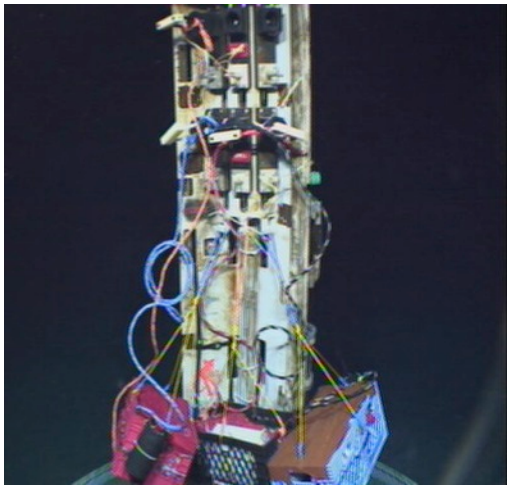
Total anticipated elevator deployments not to exceed 7 (3 pressure and 4 pump filtration).

CTD – at least two of them in the North Pond Basin.

Recovery of Wellhead OsmoSamplers

OsmoSampler packages consisting of an Acid-Addition OsmoSampler and two FLOCS were deployed and connected to each of the three horizons at 1383C (J2-766 and J2-771) and the one horizon at U1382A (J2-769). A fifth OsmoSampler package was deployed at U1383C in the deep horizon. This packaged included a FLOCS that was connected to the umbilical and one to bottom seawater. Given that the CORKs are over pressured, the valves were left open to the OsmoSampler intakes. Intakes were configured to allow formation water to vent freely after passing through the inlet comprised of PEAK tubing. Picture on the left is from J2-769 frame grab 4809 at U1382A. The picture on the right is from J2-771 frame grab 6032 at U1383C.





Downhole pulling and recovery tools

The Otis RS pulling tool for recovering the strings is small and light - 10 lbs in air as rigged, thus it weighs about 8-9 lbs in water.

The Otis GS running tool for redeploying the plugs is bigger. Keir's records show 74 lbs in water for GS+top plug at the beginning of a dive, then 25-30 lbs in water for just the Otis tool after it is released from the inserted top plug.

Some comments for reminders:

No modifications to the RS tool are required to use a T-Pill Pin release. Simply rotate the Shear Pin Cover to expose the Shear Pin (usually requires a hammer and punch). Dive the Shear Pin out of the tool using a T-Pull Pin configured as shown by the attached drawing OT3021 as a punch. Drive the T-Pull Pin through the tool body until it shoulders. Place a rubber band around the ends of the T-Pull Pin to prevent it from vibrating out. The rubber band is actually a belt and suspenders kind of thing. With the Core Spring left in place, it is compressed in the "unsheared" configuration and is pushing the Core upward. This action pinches the shear pin, holding it in place. We've used this configuration many times in the past with no problems.

To remove the T-Pull Pin, releasing the tool, twist the pin back and forth while pulling it.

To reset the tool, place it on the floor, or other solid surface, near an anchor point as shown by the attached sketch. The anchor point can be a heavy table rung, railing, or anything solid. Place a lever arm, 2 x 4 or whatever, on top of the tool as shown. Push down on the lever arm, compressing the Core Spring until the shear pin holes in the Core and Body align. Then, drive the T-Pull Pin in place.

The 2" RS pulling tool, PN 40RS1200, is the correct tool for pulling the L-CORK top plug. OJ6699 is the correct pull pin to be used with the 2" R

Tom suggested installing a safety release pull pin in the RS. I've attached a drawing of a pull pin that should work. To install it, rotate the shear pin cover (ref TIC catalog drawing) exposing the ends of the shear pin. Use the pull pin as a punch and drive the shear pin out of the RS, leaving the pull pin in it's place. Although the RS spring should prevent the pull pin from backing out, I like to take the belt and suspenders approach and wrap a rubber band around the pin and RS body as well.

The turned down portion of the T-Pull Pin must be 5/16 dia (0.3125 in), and about 3" long, to fit/work in the 2" RS. Note, the larger standard RS used by IDOP has a 3/8 dia shear pin, which requires the T-Pull Pin turned down section to be 3/8 dia. I think that is what is shown in your photo.

When installed in the L-CORK, the top of the top plug should be flush with the top of the L-CORK. The bottom of the 2" RS will only go into the top plug ~5-1/2" before it shoulders on the top plug release pin. So there should be no clearance issues with the pull pin.

I recommend keeping the RS core spring in place. Should you have to emergency release the RS by removing the pull pin, the core spring will force the latch dogs into the released position and hold them there. The only drawback is the core spring produces a relatively friction force on the pull pin that must be overcome when trying to extract the pull pin. In the past, Alvin has removed the release pull pin from a standard 3" RS, which has an even bigger core spring, with success. Note, the pilot may have to twist the pull pin while pulling on it, but it will come out.

In theory the dogs that hold the top plug in place are released with the GS pulling tool, but we wanted to make sure and released them manually, too. Note that both wellhead bolts need to be turned 3-3/4 turns CW to release the dogs. 3-3/4 turns CCW to latch the dogs

Deploy the top plug with the help of the Otis tool and a stack of 4 dive weights to overcome the pressure from flow out of the borehole

Wellhead Umbilicals

1382A

Umbilicals with internal stainless steel or Tefzel tubing were strapped to the outside of the casing and connected to miniscreens located at ~159–161.6 mbsf (see Fig. F1; Table T3). Nine miniscreens were deployed: two were attached to ½ inch diameter Tefzel tubing, one was attached to ¼ inch stainless steel tubing for pressure, and six were attached to stainless steel tubing bundles for geochemistry (three with ⅛ inch diameter and three with ¼ inch diameter). An additional ½ inch diameter stainless steel tube was used to inflate the packer, which has a check valve that opens at 25 psi (172 kPa).

1383C

Umbilicals with internal stainless steel or Tefzel tubing were strapped to the outside of the casing and connected to miniscreens located at ~100, 162, and 203 mbsf (see Fig. F2; Table T3). Four miniscreens were deployed at 203 mbsf. Three of these screens were attached to ½ inch diameter Tefzel tubing, ⅛ inch diameter stainless steel tubing, and ¼ inch diameter tubing, ending at the base of the 5½ inch casing. The ¼ inch stainless steel tubing and miniscreen for pressure monitoring were attached directly to the packer, ~3 m shallower than the other miniscreens. Miniscreen locations for the other two depths (100 and 162 mbsf) were staggered. The ½ inch diameter Tefzel tubing was positioned at the prescribed depth, which is ~1 m deeper than the ⅛ inch diameter stainless steel tubing and ¼ inch diameter tubing for geochemistry. These miniscreens were ~1 m deeper than the ¼ inch stainless steel tubing for pressure monitoring. A single ½ inch diameter stainless steel tube was used to inflate all three packers in series, and each has a check valve that opens at 25 psi (172 kPa).

Hole	Tubing sizes (inch)		Material	OD (inch)	ID (inch)
Umbilical:	Qty	Size			
395A					
Pressure/Inflate	1	1/2	SST	0.500	0.402
	3	1/4	SST	0.250	0.180
Chem	3	1/4	SST	0.250	0.180
	3	1/8	SST	0.125	0.085
MBIO	3	1/2	Tefzel	1.000	0.500
	3	1/2	Titanium	0.500	0.430
U1382A					
Pressure/Inflate	1	1/2	SST	0.500	0.402
	2	1/4	SST	0.250	0.180
Chem	3	1/4	SST	0.250	0.180
	3	1/8	SST	0.125	0.085
MBIO	2	1/2	Tefzel	1.000	0.500
	2	1/2	Titanium	0.500	0.430

U1383C					
Pressure/Inflate	1	1/2	SST	0.500	0.402
	3	1/4	SST	0.250	0.180
Chem	3	1/4	SST	0.250	0.180
	3	1/8	SST	0.125	0.085
MBIO	3	1/2	Tefzel	1.000	0.500
	3	1/2	Titanium	0.500	0.430

18 days on site (+/-) based on transit estimates – expect 2 days of weather.

Minimal operations – schedule will likely change daily

Dive 1 – find elevator and move to 1383B
- 1383B remove pressure line and deploy Cs
- 1383C pressure to bottom seawater
- 1383C fluid sampling of umbilicals 1 and 3
- 1383C one hour prior to download close the valve
- 1383C download pressure
- 1383C deploy 3-day virus samplers (each one is the size of a milk crate) and recover wellhead OsmoSamplers (4 are present – recover 3)
- 1383B download pressure logger data
- 1383B place pressure logger on elevator
- release elevator and recover Jason

Dive 2 - 395A Grapple downhole sampler

Dive 3 - 1382A pressure to bottom seawater
- 1382A fluid sampling of umbilical
- 1382A one hour prior to download close the valve
- 1382A download pressure
- 1382A deploy 3-day virus samplers and recover wellhead OsmoSampler (1)

Dive 4 - 1383C fluid sampling of umbilicals
- 1383C recover 3-day virus samplers
- 1383C recover downhole string

Dive 5 - 1383C fluid sampling of wellhead
- 1383C - deploy flow meter
- 1383B recover downhole string

Dive 6 – 395A Seal the borehole ??
- 1382A fluid sampling of umbilical
- 1382A recover 3-day virus samplers
- 1382A recover downhole string

Dive 7 – 1383B fluid sampling of wellhead
- 1383B seal borehole

1383C fluid sampling of wellhead
1383C recover flow meter
1383C pressure download
1383C seal borehole
1383C fluid sampling of umbilicals
1383C deploy 3-day virus samplers

Dive 8 – 1382A – fluid sampling of wellhead
1382A deploy flow meter
1382A push cores (12) and heat flow -100 m from wellhead
1382A recover flow meter
1382A Pressure download
1382A seal borehole
1382A deploy 3-day virus samplers

Dive 9 – discharge area – heat flow and push cores (12)

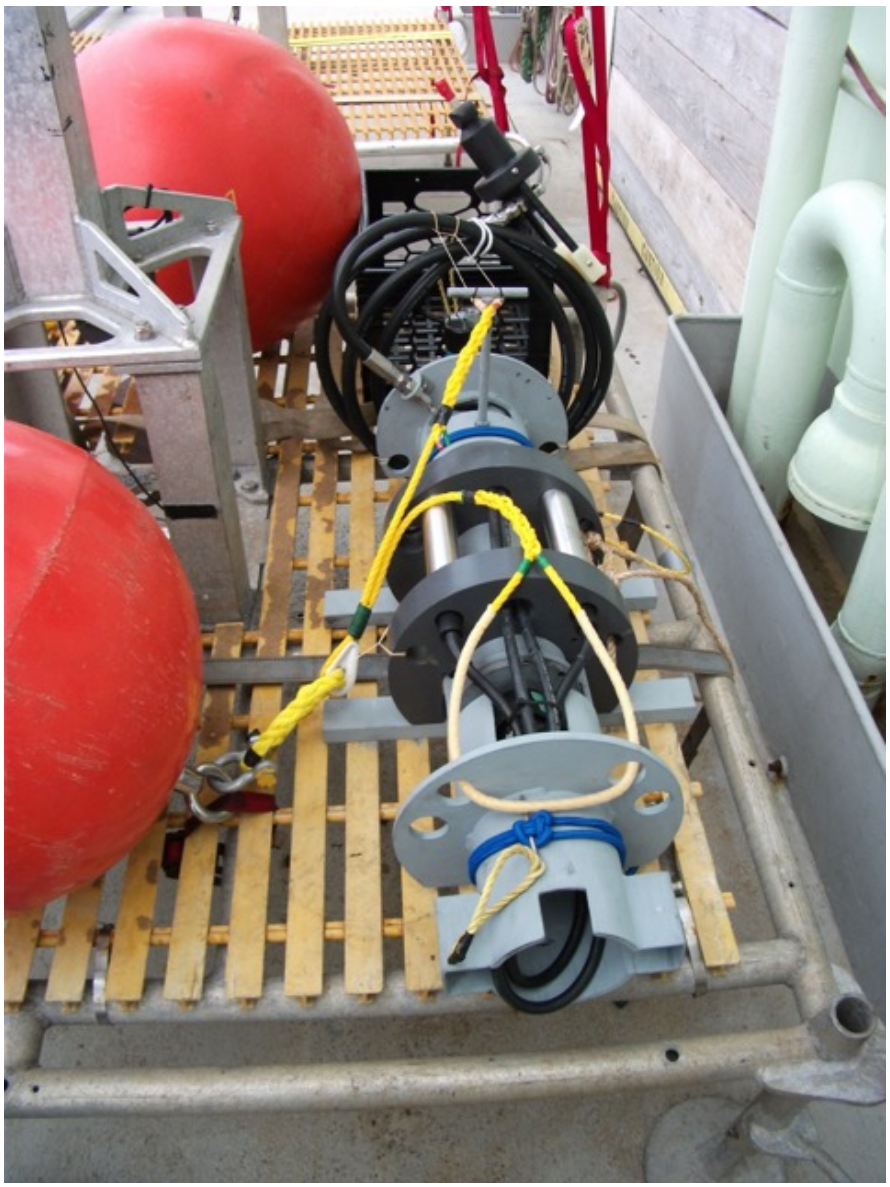
Dive 10 - 1383C fluid sampling of umbilicals
1383C recover 3-day virus samplers

Dive 11 – 1382A fluid sampling of umbilicals
1382A recover 3-day virus samplers

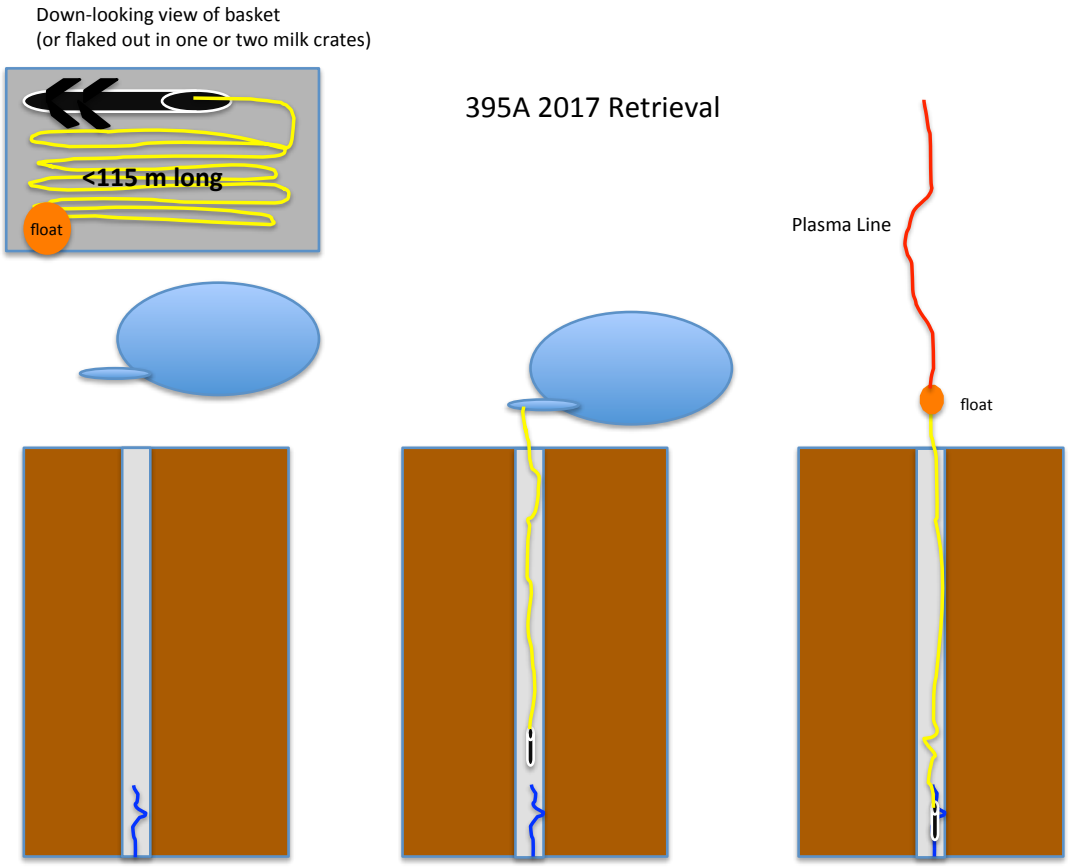
Additional operations – leave flow meter on 1382A for a longer period of time, additional deployment of flowmeter (for 8 hours) on 1383C, additional wellhead sampling of 1383B and 1383C for Cs, additional umbilical sampling.

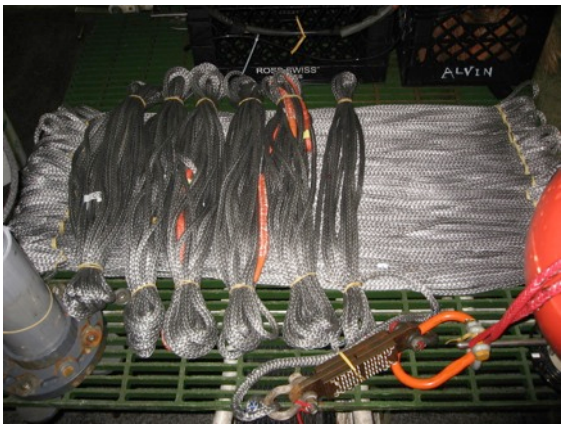
Pressure sensor will be recovered from 1383B.

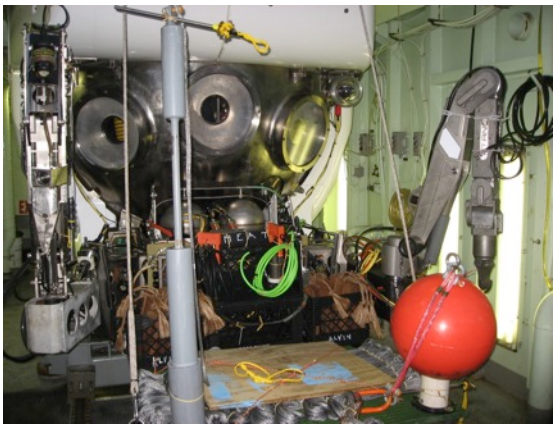
The CORK-Lite logger is the same as the logger we put on the 1027C platform in 2011. Andy's master compilation has 57 lbs weight (in water). In 2011, it was deployed on an elevator with one float (see attached pic), for net weight of 40 lbs when Jason was moving it.



Recover downhole string from 395A – Similar to operations in 2014 at Hole 1301A



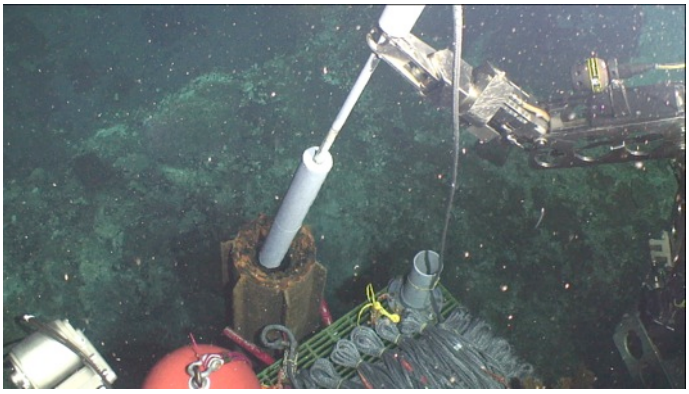




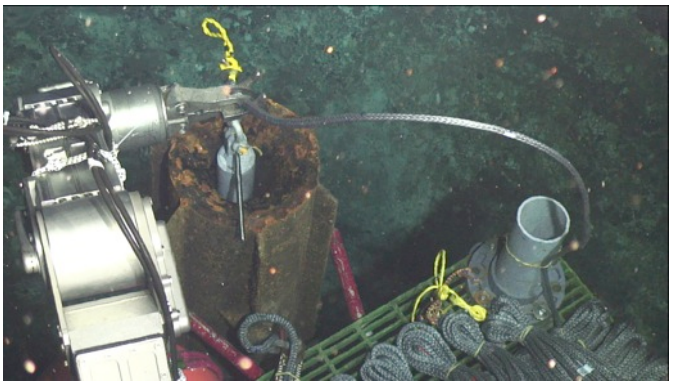
The basket before the dive. The fishing tool was developed by Tom Pettigrew for use in 1301A and 395A. The tool has numerous barbs and a sliding cover that helps to keep the line from coming off during retrieval. The fishing tool was attached to 270 m of 3/8" spectra and a 28 lb float. Note the Jannasch weak link. Operationally, the plywood covering the rope was released then the fishing tool was placed in the well and kept in place with a

pull pin. Then the float was released and the line spooled out over the fishing tool that was in the hole but held with the pin. Finally the pin was removed and the fishing tool descended into the hole. Alvin then used a manipulator to pull and release the line – making sure that it was "connected" with the rope below. Alvin then hooked the plasma line to the D-ring. Alvin was recovered and then the plasma line was recovered.

There are two harpoons. The one that Tom Pettigrew made weighs *** lbs in air. The other one weighs 110 lbs in air.

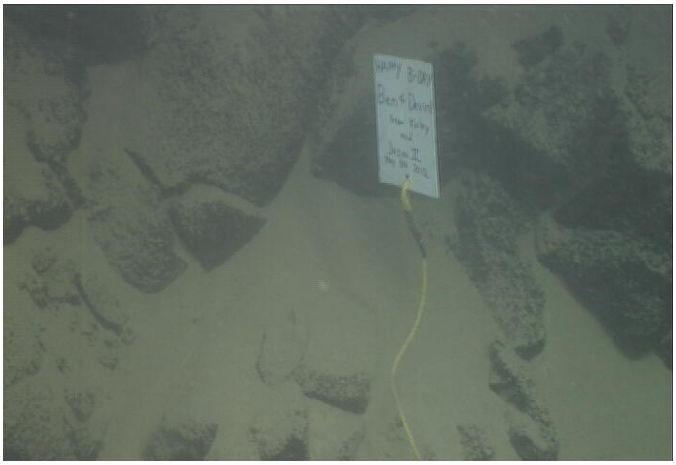


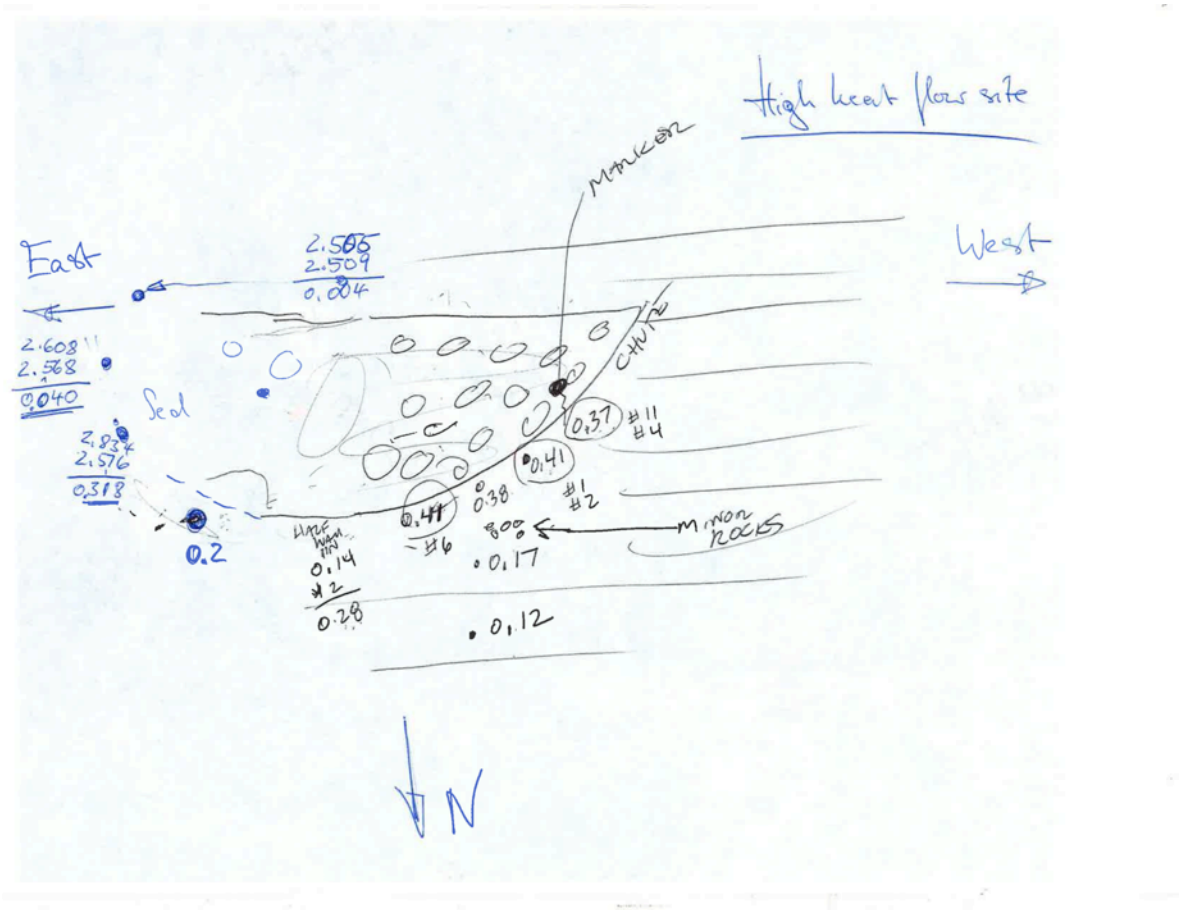
Fishing tool placed in the borehole

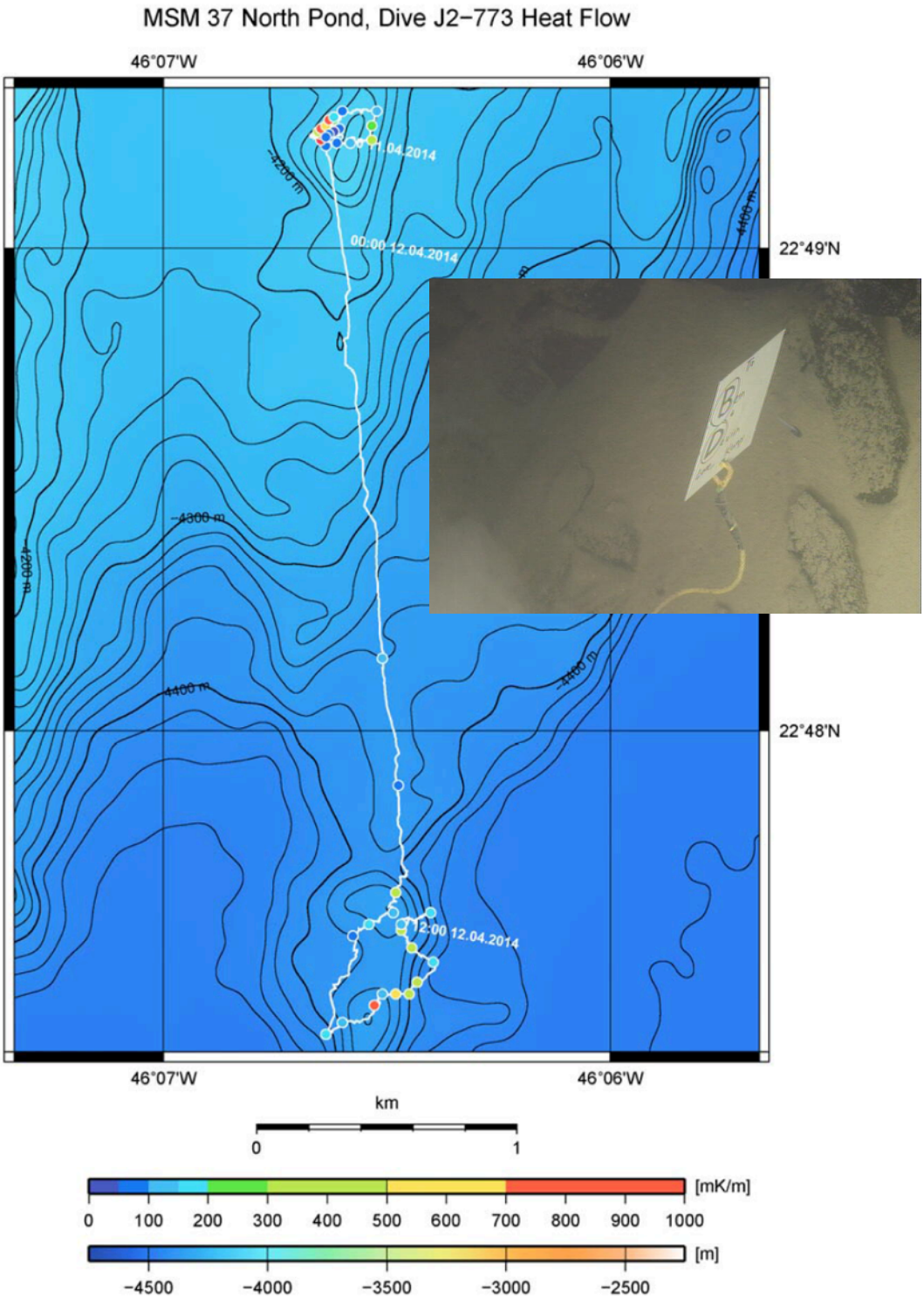


Fishing tool in the borehole with a pin keeping it from descending.

Marker BD is the 1 W/m2 site that was located in 2012 and surveyed in 2014. Marker BD can be found on the Jason Virtual Van – J2-773 – number 8343 - 4/11/14 17:34. Marker BD was placed on a rock outcrop. IN 2014 we surveyed around the outcrop taking push cores and making measurements of heat flow. Heat flow drastically drops off away from the outcrop. Highest heat flow is near the outcrop and near the marker. The following are frame grabs (the one on the right is from 8357).







Dive track for J2-773. The northern portion is the 1 W/m^2 area. The lower portion is a topographical high with associated high heat flow but not as high as the more northern site.

CORK-Lite U1383B (Deployed J2-626)- floats were cut at frame grab 2769 and rotated top seal at frame grab 2770.
The instrument package consists of three self-contained temperature recorders (1 Anteres and 2 Hobo probes) and seven OsmoSampler systems (Standard, Gas, Acid Addition, BOSS, Enrichment, and 2 each of the MBIO packages). The Standard OS included one 8-membrane pump and 3 teflon coils. The MBIO were identical to the Standard OS but included a FLOCS element at the intake before the Teflon tubing (Fig. 5.9). The Gas OS included one 8-membrane pump and 3 copper coils. The other three were made using 5 teflon coils, one 8-membrane pump, and one 2 membrane pump. Solutions that were added to the sample intake are as follows:

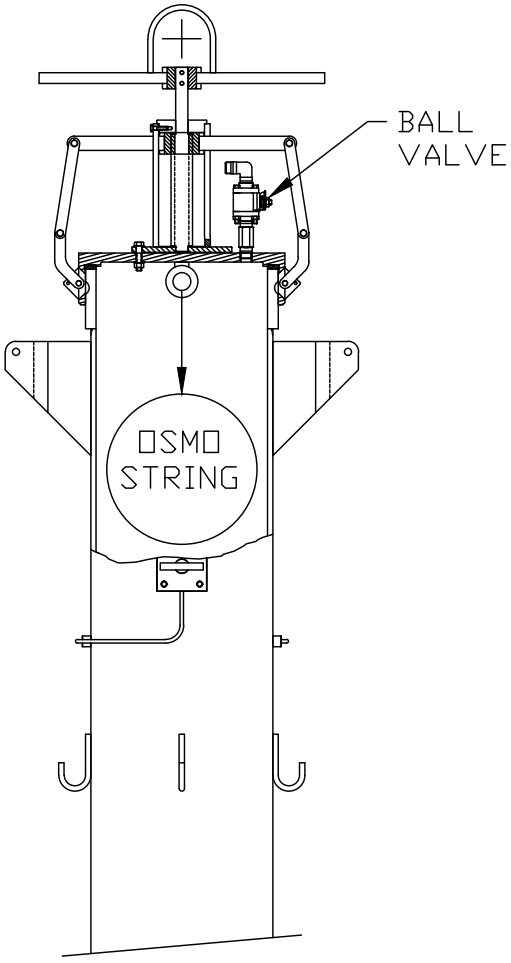
Acid Addition – 20 ml of 6N subboiled HCL/500 ml
BOSS – 75% RNA later and 2 ml of saturated $HgCl_2$ in 500 ml
Enrichment – 1.2 mM nitrate solution in sterile seawater solution

The three FLOCS units contained in the Enrichment and two MBIO packages were nearly identical to each other, and they were made using left-over materials for IODP Exp. 336. The mineral assemblages on the inside and outside of the FLOCS were also similar to those used during IODP Exp. 336. The enrichment package contained FLOCS chambers 106 and 107, and the MBIO packages contained FLOCS chambers 108, 109, 128, and 129.

The manipulator was used to center the cap and let it fall in position. The two ropes were cut and the top was spun 12 times to latch into the CORK-Lite body. All three valves were closed on the CORK-Lite.

*** For CORK-Lite: If the valve is open (vertical) then turn the valve counterclockwise to close finishing in the horizontal position.
*** Note for all chemistry and MBIO valves – turn clockwise to open
*** Note for pressure lines – if valve is open then turn clockwise 180 degrees

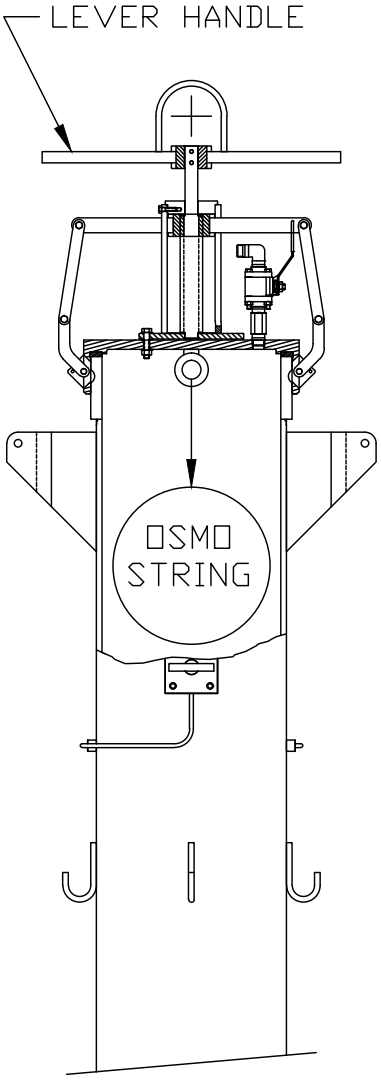
The following two figures are the last two steps in the deployment of the latch for the CORK-Lite. The third figure is the deployment layout for the OsmoSampler package in the borehole.



CAP DEPLOYMENT 6

CLOSE BALL VALVE

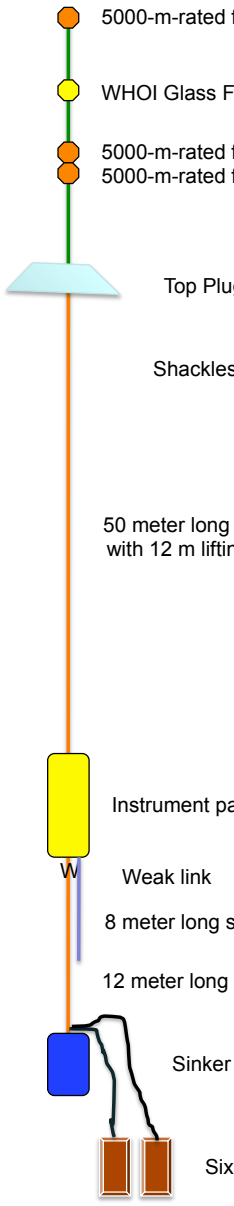
ROTATE HANDLE TO HORIZONTAL POSITION



CAP DEPLOYMENT 5

ROTATE LEVER HANDLE CLOCKWISE
TO LATCH AND SEAL CAP

1383B Deployment of Instrument String 2012



5000-m-rated foam float +57 lbs in seawater

green blue 0.5” polypro and 5 meters in length

WHOI Glass Floats and transponder +117 lbs wet

green blue 0.5” polypro and 5 meters in length

5000-m-rated foam float +57 lbs in seawater

5000-m-rated foam float +86 lbs in seawater

green blue 0.5” polypro and 5 meters in length

Top Plug -56 lbs

Shackles and D rings -6 lbs

Weight on Bottom
-240 lbs

Weight after Alvin Dive
Weights are released
- 48 lbs

50 meter long spectra
with 12 m lifting eyes

Instrument package -203 lbs

Weak link

8 meter long sample intake

12 meter long spectra

Sinker Bar -100 lbs

Six each Alvin weights (-192 lbs total)

with 2% stretch	Length m	Depth mbsf
top of plug cap	-4.7	
bottom of plug cap	-4.19	-4.2
spectra rope	50	46.8
length of osmo	5.54	52.3
length of intake srength	12	64.6
length of sinker bar	1.53	66.1
length of sample intake	8	60.4
Top of cement		49
sediment/base interfacee		52.8
bottom of casing		53.8
bottom of cement		57
bottom of 18" hole		67.8
bottom of 14.75" hole		89.9

Table 3. Downhole instrument string deployed in Hole 395A.

Item	Length (m)	Connector length (m)*	Bottom depth (mbsf)	FLOCS or O_2 probe ID	Temperature probe†
Bottom of plug**			–5.84		
Spectra‡**	58.25 (59.12)				
Sinker bar - 100 lb	1.52		54.8		
Spectra	58.66 (59.54)				
Landing seat, 3.375	111.5	0.16	111.66		
MBIO	5.73	0.16	117.55	88/89	A 1857001
Enrichment	5.2	0.16	122.91	78/79	
Standard	2.63	0.16	125.7		
Acid addition	5.2	0.16	131.06		
BOSS	5.2	0.16	136.42		
Oxygen probe	0.58	0.16	137.16	49	
Copper - Gas	2.63	0.16	139.95		O 9913815
Spectra	10.02 (10.17)				
Landing seat, 3.125	148.8	0.16	148.96		
Spectra rope	83.00 (84.25)	0.16	233.37		
MBIO	5.73	0.16	239.26	80/81	
Enrichment	5.2	0.16	244.62	86/87	
Standard	2.63	0.16	247.41		
Acid addition	5.2	0.16	252.77		
BOSS	5.2	0.16	258.13		
Copper - Gas	2.63	0.16	260.92		O 9413814
Spectra rope	146.00 (148.19)	0.16	409.27		
MBIO	5.73	0.16	415.16	84/85	A 1857002
Enrichment	5.2	0.16	420.52	74/75	
Standard	2.63	0.16	423.31		
Acid addition	5.2	0.16	428.67		
BOSS	5.2	0.16	434.03		
Oxygen probe	0.58	0.16	434.77	77	
Copper - Gas	2.63	0.16	437.56		O 9913816

Spectra rope	31.25 (31.72)				
Landing seat, 2.875	463.5	0.16	463.66		
Spectra rope	27.00 (27.41)	0.16	491.23		
MBIO	7.61	0.16	499	76/77	A 1857003
Enrichment	6.8	0.16	505.96	82/83	
Standard	3.43	0.16	509.55		
Acid addition	6.8	0.16	516.51		
BOSS	6.8	0.16	523.47		
Copper - Gas	3.43	0.16	527.06		O 9913813
Sinker bar - 150 lb	3.19	0.16	530.41		

* = a stainless steel coupler was used to join two packages and join packages to landing seats. † = temperature probes were purchased from Onset (O) and Antares (A); probes are located 53 cm from the top of the 2.875 inch diameter OsmoSampler packages and 60 cm from the top of 2.5 inch diameter packages. ‡ = Spectra lengths are given in measured units and expected lengths based on stretch within the hole (in parentheses); some downhole depths for Spectra are not given because additional line was used to ensure that the plugs could seat at the correct depths. ** = these depths refer to predeployment configuration; depths and lengths are not accurate considering that the CORK wellhead severed during deployment. Lifting loops were weaved every 12.5 m from the top plug. FLOCS = Flow-through Osmo Colonization System. MBIO = microbiology, BOSS = BioOsmoSampling System.

Table 4. Downhole instrument string deployed in Hole U1382A.

Item	Length (m)	Connector length (m)*	Depth (mbsf)	FLOCS or O_2 probe ID	Temperature probe†
Bottom of top plug			–6.45		
Spectra with hose	1 (1.02)		–5.43		
Small sinker bar - 10 lb	0.3		–5.13		
Spectra‡	39.5 (40.09)		34.96		
Middle sinker bar - 100 lb	1.524		36.49		
Spectra‡	66.2 (67.19)				
Landing seat, 3.375, coated			101.60		
Spectra‡	43.4 (44.05)		145.65		
MBIO OS	5.73	0.16	151.54	90/91	O 9913817
Enrichment OS	5.2	0.16	156.90	92/93	
Standard OS	2.63	0.16	159.69		
Oxygen probe	0.58	0.16	160.43	22004	
Acid-addition OS	5.2	0.16	165.79		
BOSS OS	5.2	0.16	171.15		
Copper OS - Gas	2.63	0.16	173.94		
Sinker bar - 150 lb	3.19	0.16	177.29		A 1857005

* = a stainless steel coupler was used to join two packages and join packages to the sinker bar. † = temperature probes were purchased from Onset (O) and Antares (A). Probes are located 53 cm from the top of the OsmoSampler packages. ‡ = Spectra lengths are given in measured units and expected lengths based on stretch within the hole (in parentheses); some downhole depths for Spectra are not given because additional line was used to ensure that the plugs could seat at the correct depths. Lifting loops were weaved at 10.5, 23, and 35.5 m for the 43.4 m long rope; 14.3, 26.8, 39.3, 51.8, and 64.3 m for the 66.2 m long rope; and 2, 14.5, and 27.5 for the 39.5 m long rope. FLOCS = Flow-through Osmo Colonization System. MBIO = microbiology, OS = OsmoSampler, BOSS = BioOsmoSampling System.

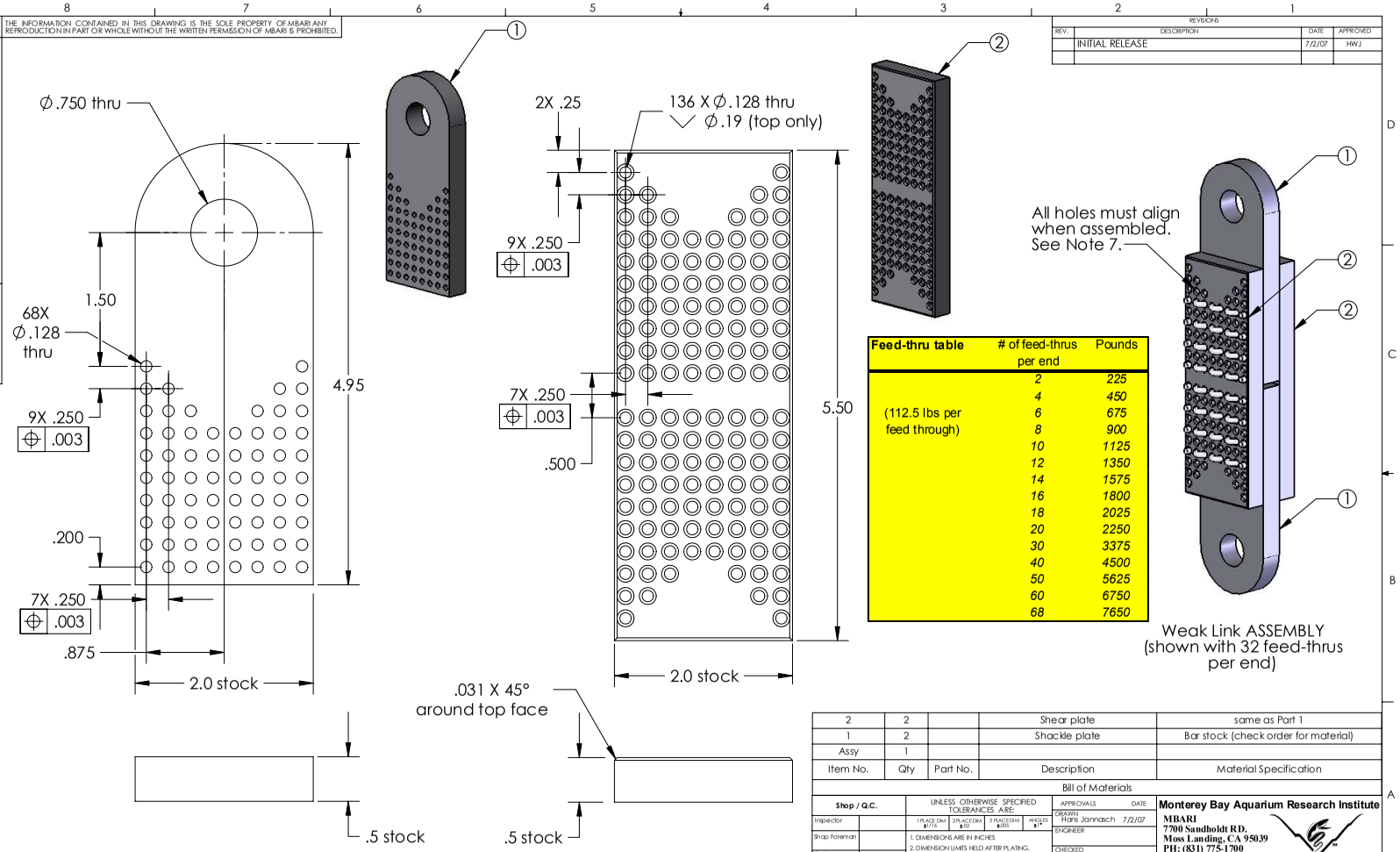
Table 5. Downhole instrument string deployed in Hole U1383C.

Item	Length (m)	Connector length (m)*	Depth (mbsf)	FLOCS or O_2 probe ID	Temperature probe†
Bottom of top plug			–6.45		
Spectra with hose	1 (1.02)		–5.43		
Small sinker bar - 10 lb	0.3		–5.13		
Spectra‡ (lifts at 12.5 m, 25 m)	33.6 (34.10)		28.97		
Middle sinker bar - 100 lb	1.524		30.49		
Spectra (lifts at 3.9 m, 16.4 m)	28.9 (29.33)				
Landing seat, 3.375, coated			58.40		
Spectra (lifts at 3.4 m, 15.9 m)	24.5 (24.87)		83.27		
MBIO OS	5.73	0.16	89.16	100/101	A 1857015
Enrichment OS	5.2	0.16	94.52	96/97	
Standard OS	2.63	0.16	97.31		
Acid-addition OS	5.2	0.16	102.67		
BOSS OS	5.2	0.16	108.03		
Oxygen probe	0.58	0.16	108.77	22022	
Copper OS - Gas	2.63	0.16	111.56		O 9944910
Spectra (lifts at 2.4 m, 14.9 m, 27.4 m)	35.0 (35.53)				
Landing Seat, 3.125, coated			145.70		
MBIO OS	5.73	0.16	151.59	102/103	A 1857006
Enrichment OS	5.2	0.16	156.95	98/99	
Standard OS	2.63	0.16	159.74		
Acid-addition OS	5.2	0.16	165.10		
BOSS OS	5.2	0.16	170.46		
Oxygen probe	0.58	0.16	171.20	22021	
Copper OS - Gas	2.63	0.16	173.99		O 9944709
Spectra (lifts at 2.6 m, 15.1 m)	26.4 (26.80)				

Landing Seat, 2.874, coated			199.90		
Spectra	4.0 (4.06)		203.96		
MBIO OS	7.61	0.16	211.73	104/105	A 185710
Enrichment OS	6.8	0.16	218.69	95/94	
Standard OS	3.43	0.16	222.28		
Acid-addition OS	6.8	0.16	229.24		
BOSS OS	6.8	0.16	236.20		
Copper OS - Gas	3.43	0.16	239.79		O 9944711
Sinker bar - 150 lb	3.19	0.16	243.14		

* = a stainless steel coupler was used to join two packages and join packages to the sinker bar and landing seat. † = temperature probes were purchased from Onset (O) and Antares (A); probes are located 53 cm from the top of the OsmoSampler packages except for A 185710 which was positioned 15 cm from the bottom of the OsmoSampler package. ‡ = Spectra lengths are given in measured units and expected lengths based on stretch within the hole (in parentheses); some downhole depths for Spectra are not given because additional line was used to ensure that the plugs could seat at the correct depths. Lifting loops were weaved at 10.5, 23, and 35.5 m for the 43.4 m long rope; 14.3, 26.8, 39.3, 51.8, and 64.3 m for the 66.2 m long rope; and 2, 14.5, and 27.5 for the 39.5 m long rope. FLOCS = Flow-through Osmo Colonization System. MBIO = microbiology, OS = OsmoSampler, BOSS = BioOsmoSampling System.

REVISIONS			
REV.	DESCRIPTION	DATE	APPROVED
	INITIAL RELEASE	7/2/07	HWJ



Feed-thru table	# of feed-thrus per end	Pounds
	2	225
	4	450
(112.5 lbs per feed through)	6	675
	8	900
	10	1125
	12	1350
	14	1575
	16	1800
	18	2025
	20	2250
	30	3375
	40	4500
	50	5625
	60	6750
	68	7650

Weak Link ASSEMBLY (shown with 32 feed-thrus per end)

Note 7. The purpose of the GD&T is to assure that any four pieces can be assembled as shown and that all overlying holes are concentric to within .003 in.

Item No.	Qty	Part No.	Description	Material Specification
Assy	1			
1	2		Shackle plate	Bar stock (check order for material)
2	2		Shear plate	same as Part 1

Bill of Materials

Shop / Q.C.		UNLESS OTHERWISE SPECIFIED TOLERANCES ARE:	APPROVALS	DATE	Monterey Bay Aquarium Research Institute
Inspector		1 PLACE DIM ±1/16 · 2 PLACE DIM ±.02 · 3 PLACE DIM ±.003 · ANGLES ±1°	DRAWN Hans Jannasch	7/2/07	MBARI 7700 Sandholdt RD. Moss Landing, CA 95039 PH: (831) 775-1700
Shop Foreman		1. DIMENSION IN INCHES	ENGINEER		
Engineer		2. DIMENSION LIMITS HELD AFTER PLATING.	CHECKED		
NEXT ASSY Description	NEXT ASSY Number	3. REMOVE BURRS AND SHARP EDGES .015 MAX.	PROJECT NO.	701615	194jahaWeakLink
		4. MACHINED FILLET RADII .010-.030.	PROJECT	Juan de Fuca 2	Weak Link for Polypro cord
		5. MACHINED DIAMETERS ON A COMMON CENTERLINE CONCENTRIC WITHIN .005			
		6. PERPENDICULARITY & PARALLELISM OF MACHINED SURFACES .002 PER INCH MAX .012 INCHES FOR SINGLE SURFACE			
Application		DO NOT SCALE DRAWING	WEIGHT		SIZE B · DWG. NO. 194jaha.DWG · REV. · SCALE 1:2 · CAD FILE: famada/chem/SWfiles · SHEET 1 OF 1