Preliminary outline of operations for Lost City Expedition (September 2018)

Objective 1 (10 science days): Fluids from Lost City chimneys

The highest priority is to collect fluids from 4-5 very high priority sites (Markers 2, H, 3, C, B). Fluids from additional locations will be sampled if time permits.

We envision visiting two sites per dive collecting, at each:

-five 2L samples (~200 mL/min, 10 min per sample, ~1.5 hrs total per site),
-one 10L sample (50 min per sample, ~1 hr per site)
-five filters whose volume is limited only by clogging (~15-30 min per sample, ~2-4 hrs per site).
-Traditional and Mega GasTight samples (# depending on basket space, as many as possible)
-Major samples (# depending on basket space, as many as possible)
-Slurp of side of chimney (multi-chamber slurp sampler)
-Grab sample of chimney
-Temperature check with Jason temp probe
-Photo / video mosaic of chimney (as time permits)

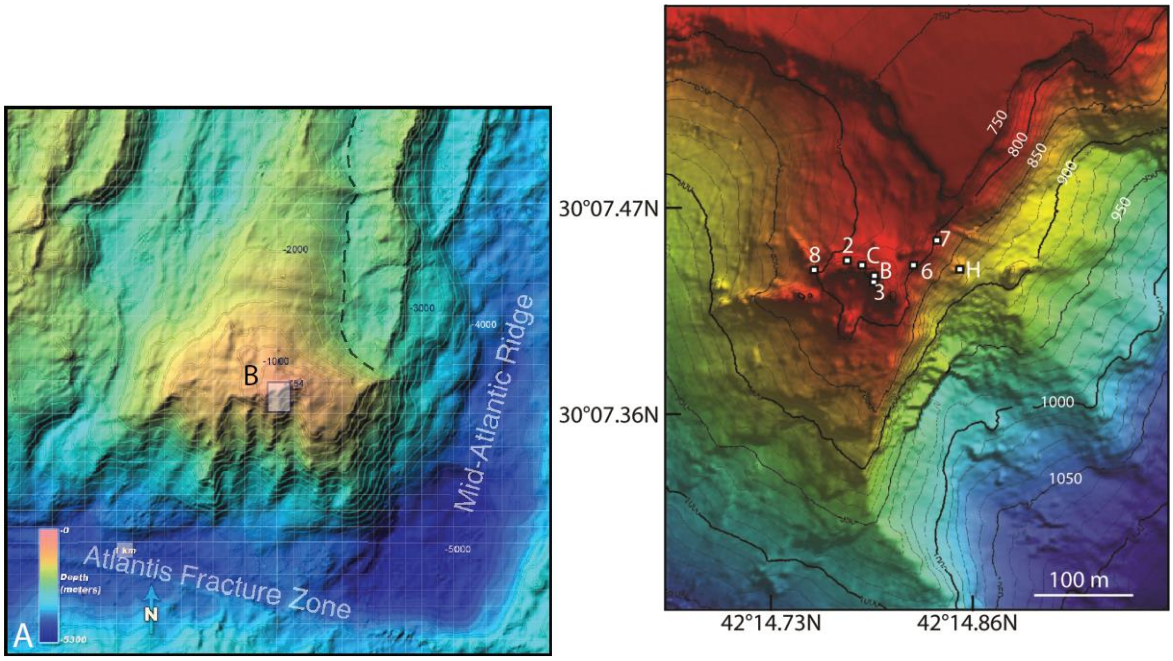


Figure 1. Map of Lost City Field (note: we have a 20-m gridded bathymetric map of the entire Atlantis Massif area that we can send)

Objective 1 Locations within the Lost City hydrothermal field							
Marker Number	From 2003 Alvin Dives 3862 - 3879 X	Y	Depth	From 2005 Hercules exedition Lat	Long	Depth	Sampling targets of highest priorities
2 (Imax)	6077	10043	764	30.12404	-42.11936	778.06	Highest prioritiy
H	6184	10034	860	30.12418	-42.11905	840.01	Highest prioritiy
500 (aka 3)	6098	10047	730	30.12407	-42.12013	729.24	Highest prioritiy
C	6094	10043	780	TBD	TBD	TBD	Highest prioritiy
B	6103	10038	742	30.12336	-42.12015	740.34	Highest prioritiy
6	6139	10046	777	30.12418	-42.11963	776.3	Sample as feasible
5	6128	10052	756	30.12399	-42.11949	765.77	Sample as feasible
4	6056	10037	780	TBD	TBD	TBD	Sample as feasible
9 (orP)	6086	10046	756	TBD	TBD	TBD	Sample as feasible
8	6047	10031	800	TBD	TBD	TBD	Sample as feasible
7	6169	10074	801	30.12411	-42.11917	815	Sample as feasible
G	6186	10104	756	TBD	TBD	TBD	Sample as feasible
A	6218	10044	883	TBD	TBD	TBD	Sample as feasible

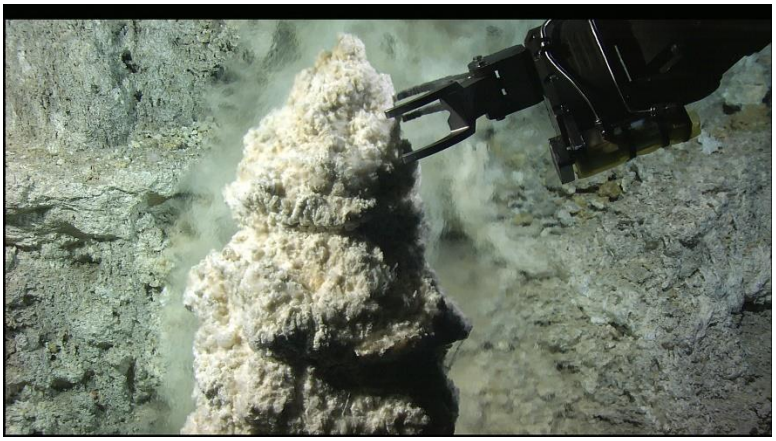


Figure 2. Marker B (aka Beehive)

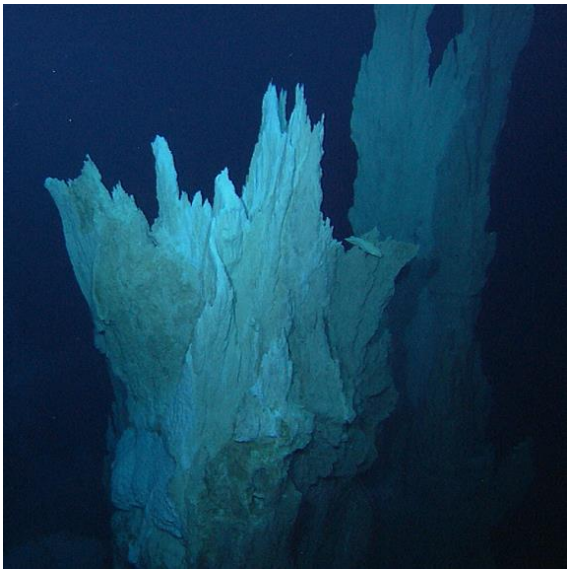


Figure 3. Marker H (I think)

Objective 2 (2 science days): Sample and Document Status of Boreholes from IODP Expedition 357

IODP Expedition 357 drilled 17 holes across the top of the Atlantis Massif. We would visit the drilling sites to visually document and, in some locations, collect fluid samples. We would like to have a downward looking camera / light on Jason to collect video of the seafloor while transiting from one location to another.

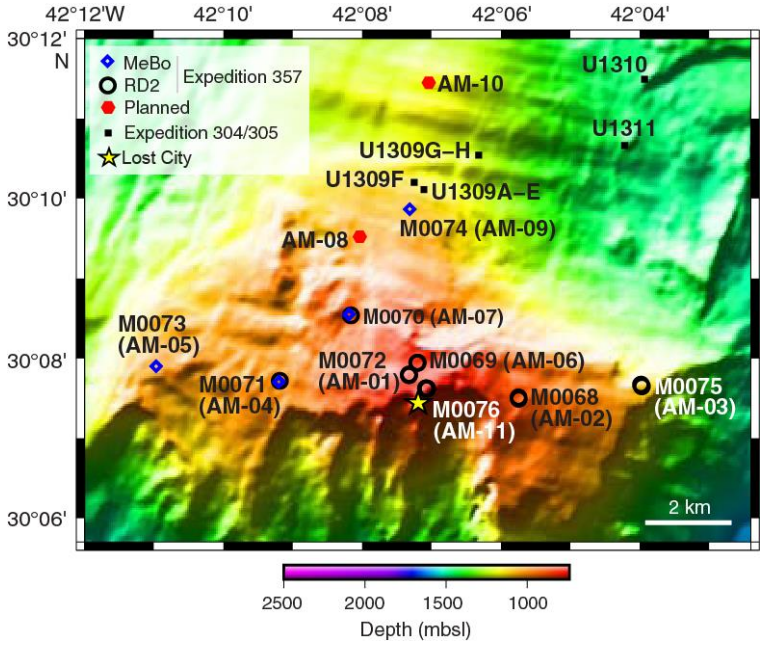


Figure 4. Map of Expedition 357 borehole locations

Highest priority is to visit the four locations where plugs were left in the boreholes to sample fluids. At each high priority site we would:

-Remove the protection cap from the borehole plug (Figure 5)
-Attach cap connector to the borehole plug. (We may construct something to make sampling from the side port of the cap connector easier). To connect:
    -cap has red marks to indicate alignment of cap pins to ball valve grooves
    -once aligned, cap is turned clockwise roughly 90 degrees until pin stops at end of groove
    -once mated, t-handle in the cap is rotated an additional 90 degrees clockwise to engage the bearings in the ball valve to open the valve mechanism
    -We'll bring an example ball valve so along with several of the caps so that the rotate-groove mechanism is clearer
-At the four sites with borehole plugs, collect fluids
    -Large volume sampler: two or three 2L samples, two or three filters. At two sites we would collect a 10 L sampler
    -GasTights, both traditional and Mega
    -Major sampler
-Visually document (video mosaic)
-Would like to try heat probe adjacent to some borehole locations

Figure 5. Protection cap (upper) left in the top of the borehole plugs. This will be removed before attaching the cap connector (lower)

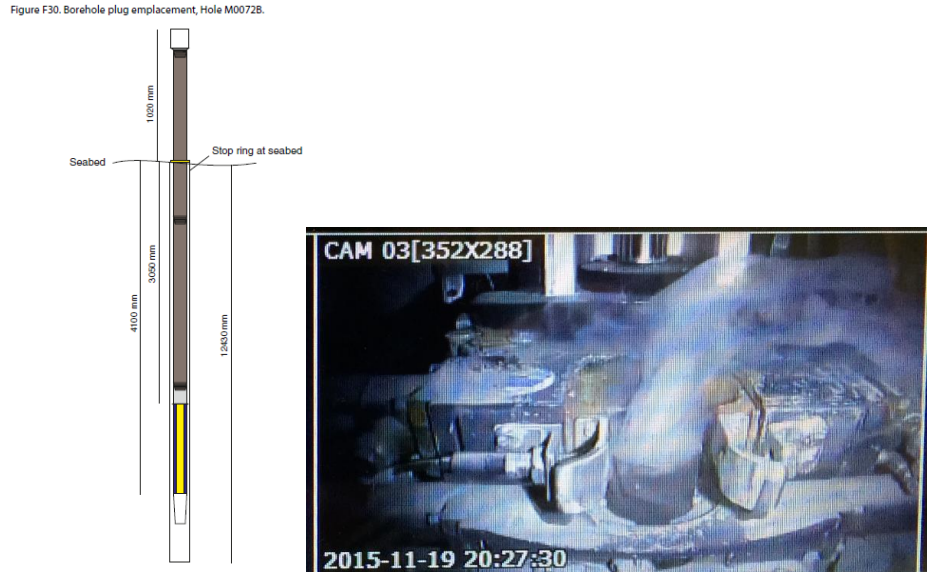


Figure 6. Schematic of borehole plug in M0072B. Screenshot of top of M0072B while drilling, before borehole plug was installed.

Table 2. Locations of Borehole Plugs (Objective 2)						
MSP Hole Identifier	Lat	Long	Water depth (m)	Equipment left in hole		
HIGHEST PRIORITY (COLLECT FLUIDS)						
M0072B	30^0 7.794	42^0 7.323	820.3	Borehold plug installed; 1020 mm above seabed		
M0068B	30^0 7.51	42^0 5.747	1102	Borehole plug installed, should be 1020 mm above seafloor; may have lifted out of borehole		
M0071B	30^0 7.716	42^0 9.187	1380	Borehole plug installed, stopped 1320 mm above seabed		
M0075B	30^0 7.65	42^0 3.97	1568	Borehole plug installed, stopped 920 mm above seabed		
LOWER PRIORITY (VISUSALLY DOCUMENT AS TIME PERMITS)						
Central Sites						
M0076A	30^0 7.623	42^0 7.076	768			
M0076B	30^0 7.621	42^0 7.065	768	7 x rods (1800 mm each), BHA (2400 mm)		
M0072A	30^0 7.791	42^0 7.323	820.3	none		
M0069A	30^0 7.944	42^0 7.202	850.9	8 x Rods (1800 mm), BHA (2400 mm)		
Northern Sites						
M0070A	30^0 8.553	42^0 8.188	1140.5	none		
M0070B	30^0 8.538	42^0 8.163	1140.5	none		
M0070C	30^0 8.544	42^0 8.194	1140.5	none		
M0074A	30^0 9.865	42^0 7.315	1550	none		
Western Sites						
M0071A	30^0 7.707	42^0 9.198	1390.8	none		
M0071C	30^0 7.7	42^0 9.206	1390	3 x rods (2350 mm each, BHA (3300 mm)		
M0073A	30^0 7.899	42^0 10.969	1430.2	none		
Eastern Sites						
M0068A	30^0 7.493	42^0 5.743	1102.7	none		
M0075A	30^0 7.669	42^0 3.981	1568	none		

M0068B M0075B M0071B

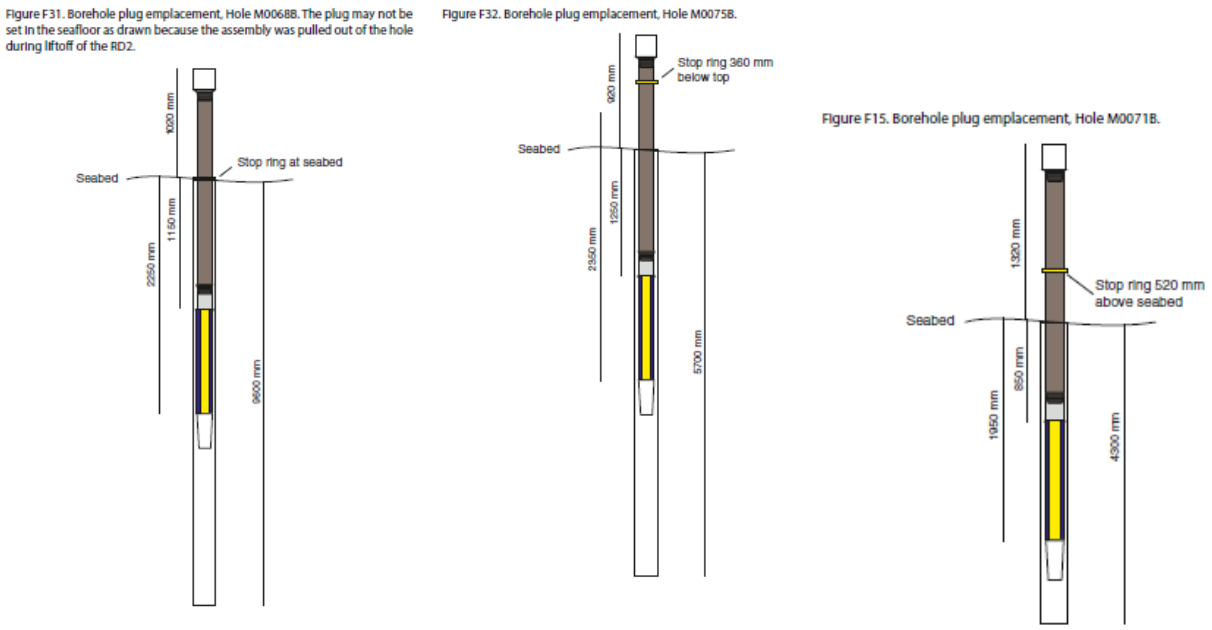


Figure 6. Borehole plugs installed in highest priority borehole sites (Objective 2)

M0069A M0076B M0071

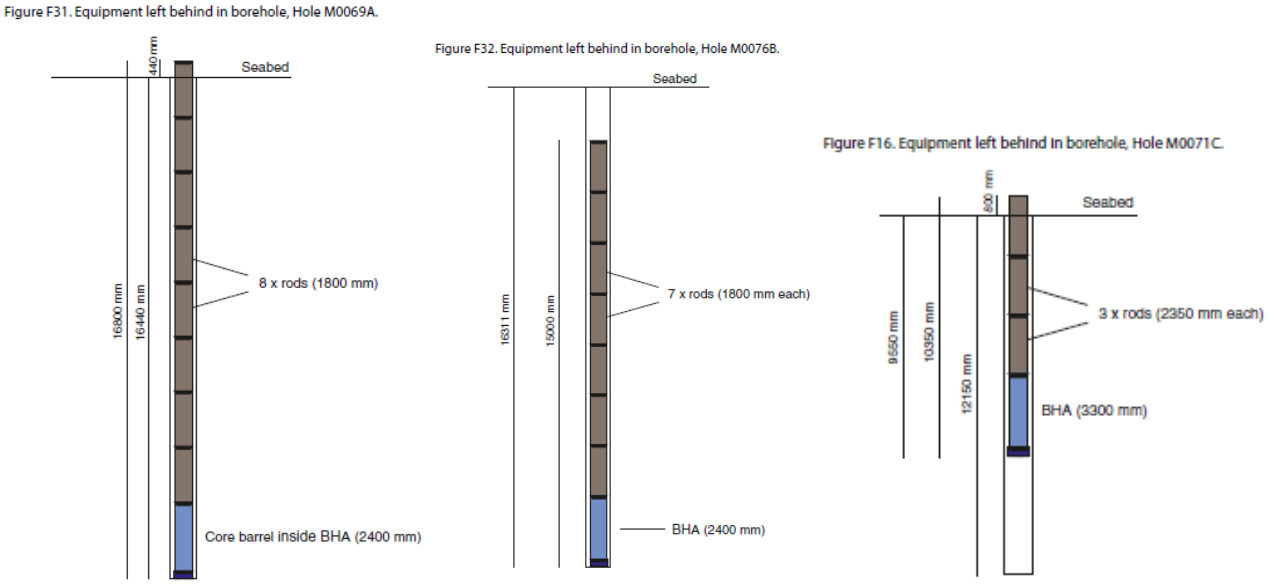


Figure 7. Drill string left behind in secondary priority borehole sites M0069A, M0076B, M0071C (Objective 2)

Additional Operations, Other information:

Elevators: Depending on basket space will use Elevators to cycle GasTights and Major samplers. Maximum of ~7 deployments during Expedition.

Jason configuration: Would like to discuss costs/benefits of 2-body vs single-body deployment mode. Is one deployment mode easier to launch in poor weather? Is there a substantial benefit to having downward camera on Medea while in the hydrothermal field? Would like to have regular science sled and a downward facing camera / light on Jason.

Video: Would like to record video 24/7. When doing mosaicking would like to turn off embedding.

CTD Casts: When Jason is not in the water we will do CTD / Niskin casts. Goal is to sample hydrothermal plume over Lost City, hunt for new / additional sites of venting

Equipment to be used with Jason:

A) Traditional GasTight samplers (contact: Marv Lilley, lilley@u.washington.edu)

Has equipment been used on Jason before:	yes

Please give a brief description of the equipment, intended purpose, cruise # it was last used

GasTights have been used numerous times

External pressure housing:	no
Air weight of equipment:	15.5 lbs
Water weight of equipment:	12 lbs
Data or power interface from vehicle:	no
Meet electrical requirements of Jason user manual?	N/A
Require hydraulic inputs?	Yes; hydraulic actuator
Require manipulation?	Yes
Deployed off vehicle	No
Disconnected from vehicle and left in situ?	No
Will the equipment be recovered by Jason?	Only if dropped
Does the equipment use any glass spheres, etc?	No

B) Traditional GasTight samplers (contact: Marv Lilley, lilley@u.washington.edu)

Has equipment been used on Jason before:	no

Please give a brief description of the equipment, intended purpose, cruise # it was last used

Design is similar to traditional GasTight samplers but with larger volume (1500 mL). Hydraulic actuator design will be the same. Still being designed and built

External pressure housing:	no
Air weight of equipment:	TBD
Water weight of equipment:	TBD
Data or power interface from vehicle:	no
Meet electrical requirements of Jason user manual?	N/A
Require hydraulic inputs?	Yes; hydraulic actuator
Require manipulation?	Yes

Deployed off vehicle No
Disconnected from vehicle and left in situ? No
Will the equipment be recovered by Jason? No
Does the equipment use any glass spheres, etc? No

C) Seabird CTD with additional sensors (contact: Marv Lilley, lilley@u.washington.edu)

Has equipment been used on Jason before: No
Please give a brief description of the equipment, intended purpose, cruise # it was last used

SeaBird CTD: SBE19plusV2 Seacat for constant monitoring of background water. May add a methane and eH sensor to it. May not bring if Jason CTD is used.

External pressure housing: Yes
Has the pressure case been tested per Alvin Pressure requirements? No; rated by Seabird to 7000 m
Air weight of equipment: 31 lbs
Water weight of equipment: 20 lbs
Data or power interface from vehicle: yes
Meet electrical requirements of Jason user manual? yes
Require hydraulic inputs? No
Require manipulation? No
Deployed off vehicle No
Disconnected from vehicle and left in situ? No
Will the equipment be recovered by Jason? No
Does the equipment use any glass spheres, etc? No

D) Large volume water sampler (contact: Susan Lang, slang@geol.sc.edu)

Has equipment been used on Jason before: no
Please give a brief description of the equipment, intended purpose, cruise # it was last used

Sampler used to collect large volumes of water; prototype tested on Alvin Dive 4829. General design is similar to Butterfield's beast sampler. A central controller in a pressure housing runs two pumps (one 4L/min, one 250 mL/min) and a 24-port valve, all from McLane. Controller is 24V, 2A and communications is RS232. I'll bring 10-ft pigtails for power and coms. During the test of the prototype, there were intermittent ground faults but only when the sub was at depth. Any recommendations on preventing this in the future, and how to test prior to our cruise, welcome. Electronics diagram and pressure test have been uploaded to the pre-cruise questionnaire portal. I'm designing the frame to occupy ~1/2 of the back sled such that multi-chamber slurp sampler can be used simultaneously.

External pressure housing: Yes
Has the pressure case been tested per Alvin Pressure requirements? Yes
Air weight of equipment: ~120 lbs + frame weight (TBD)
Water weight of equipment: Electronics: 31 lbs. Frame TBD
Data or power interface from vehicle: Yes
Meet electrical requirements of Jason user manual? Yes
Require hydraulic inputs? No
Require manipulation? Yes
Deployed off vehicle No

Disconnected from vehicle and left in situ? No
Will the equipment be recovered by Jason? No
Does the equipment use any glass spheres, etc? No

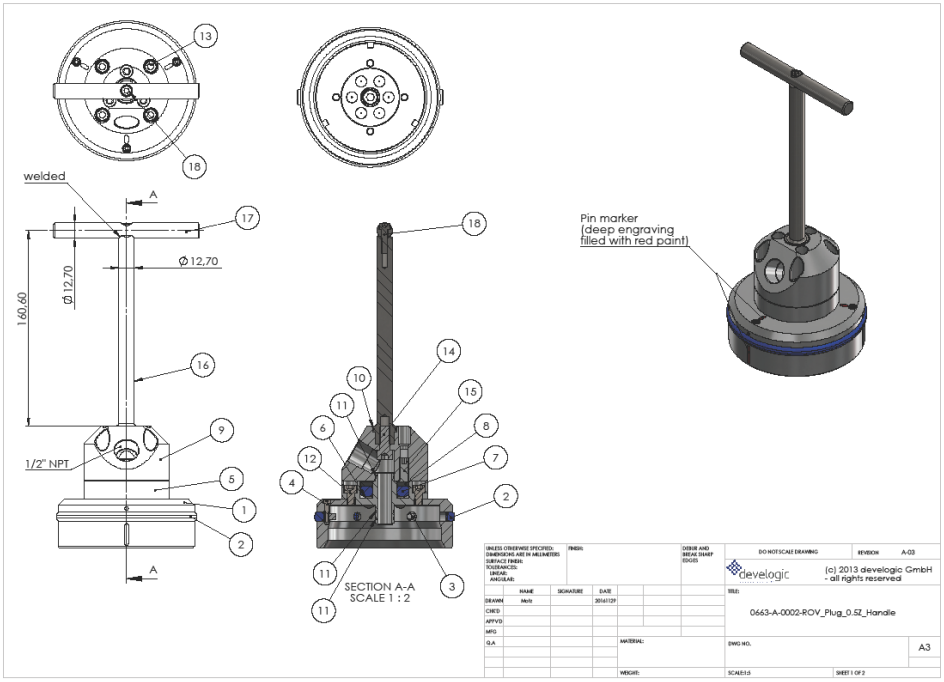
E) Top cap connector for borehole plugs (contact: Susan Lang, slang@geol.sc.edu, Beth Orcutt, borcutt@bigelow.org**)**

Has equipment been used on Jason before: no

Please give a brief description of the equipment, intended purpose, cruise # it was last used

Top cap connector will attach to the borehole plugs. T-handle is ½". To connect, top cap is placed on top of plug on seafloor and rotated 90 degrees. We may add something to the side port of the top cap to make it easier to sample with the fluid sampler / GasTights / etc

External pressure housing: No
Has the pressure case been tested per Alvin Pressure requirements? N/A
Air weight of equipment: TBD
Water weight of equipment: TBD
Data or power interface from vehicle: No
Meet electrical requirements of Jason user manual? No
Require hydraulic inputs? No
Require manipulation? Yes
Deployed off vehicle Yes
Disconnected from vehicle and left in situ? Maybe
Will the equipment be recovered by Jason? Maybe
Does the equipment use any glass spheres, etc? No


13
18
welded
A
17
Ø12,70
Ø12,70
160,60
16
9
1/2" NPT
5
1
2
A
18
14
10
11
15
6
8
12
7
4
2
11
3
11
SECTION A-A
SCALE 1 : 2
Pin marker
(deep engraving
filled with red paint)
UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN MILLIMETERS
SURFACE FINISH:
TOLERANCES:
LINEAR:
ANGULAR:
FINISH:
DEBUR AND
BREAK SHARP
EDGES
DO NOT SCALE DRAWING
REVISION
A-03
develogic
(c) 2013 develogic GmbH
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SIGNATURE
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CHK'D
APPV'D
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Q.A
MATERIAL:
WEIGHT:
TITLE:
0663-A-0002-ROV_Plug_0.5Z_Handle
DWG NO.
A3
SCALE:0.5
SHEET 1 OF 2