RV *Investigator* Voyage Summary

Voyage #:	**IN2016_V06**		
Voyage title:	Sustained monitoring of the EAC: mass, heat and freshwater transports		
Mobilisation:	Brisbane, Friday, 28 October 2016		
Depart:	Brisbane, 0800 Saturday, 29 October 2016		
Return:	Brisbane, 1300 Sunday, 13 November 2016 (16 Days)		
Demobilisation:	Brisbane, Monday , 14 November 2016		
Voyage Manager:	Tegan Sime	**Contact details:**	Tegan.Sime@csiro.au
Chief Scientist:	Bernadette Sloyan		
Affiliation:	CSIRO	**Contact details:**	Bernadette.Sloyan@csiro.au
Supplementary Principal Investigators:	Dr Remo Cossu (not on voyage)		
Project name:	Turbulence scales and horizontal variability in the surface layer of the Ocean		
Affiliation:	University of Queensland	**Contact details:**	r.cossu@uq.edu.au
Supplementary Principal Investigators:	Dr Eric Woehler and Nicholas Carlile		
Project name:	Spatial and temporal variability in the distribution and abundance of seabirds		
Affiliation:	Australasian Seabird Group (BirdLife Australia) and University of Tasmania	**Contact details:**	eric.woehler@gmail.com 0438 204 565 (EJW) Nicholas.Carlile@environment.nsw.gov.au , Mob:0419 909 707 (NJC)

Objectives and brief narrative of voyage

Scientific objectives

The East Australian Current (EAC) is a complex and highly energetic western boundary system in the south-western Pacific off eastern Australia. It closes the South Pacific subtropical gyre, transporting heat, salt and other nutrients southward and onto the continental shelf. Off Brisbane (27^{o}S) the EAC, is north of the high eddy variability region, approaches its maximum strength and is relatively uniform and coherent. The mooring array is located near the existing long-term XBT transect and satellite altimetry ground tracks. The aim of this observing system is to capture the mean and time-varying flow of the EAC.

This EAC mooring array is a component of IMOS. These observations will provide an intensive reference set of measurements of the EAC over a sustained period for improved understanding of the relationship of EAC with the basin-scale South Pacific gyre, its impact of the coastal marine ecosystem, and validation and interpretation of the current system in numerous climate and ocean models.

Voyage objectives

This voyage recovered and re-deployed an array of six full-depth current meter and property (temperature, salinity and pressure) moorings from the continental slope to the abyssal waters off Brisbane (27^{o}S). The observing system is designed to capture the mean and time-varying flow of the EAC. In order to resolve inter-annual and decadal signals we aim to maintain a long-term deployment of the array.

The following specific voyage objectives were:

1. Recover and deploy moorings at appropriate locations
2. Complete CTD/rosette stations at each mooring location, with LADCP
3. Complete a number of Ship ADCP sections along the mooring line

Results

This voyage achieved all science objectives. We successfully recovered and redeployed the six (6) IMOS/CSIRO East Australian Current moorings. At each mooring site we completed a CTD prior to and post mooring recovery and deployment, respectively. We completed three ship ADCP sections along the mooring line.

Seabird survey

More than 15 species of seabirds were observed, comprising almost 2000 individuals. The project surveyed an area of the EAC for which there were very few previous observations of seabirds at sea. Several unexpected species were observed, eg Wandering Albatross, normally observed over the Southern Ocean, and Tahiti Petrels which were unknown from the area. Observations of foraging behaviours, and of multi-species flocks and species' associations have identified novel research questions for the project and associated students.

All survey data will be lodged with GBIF early in 2017 once the data are processed and checked.

TurboMap

A total of 36 vertical and 14 horizontal profiles at the six different sites across the EAC were collected. Preliminary results reveal a significant density change in the upper ocean layer at a depth of 50 m. The density profiles vary between locations suggesting a dynamic surface mixed layer. The density depends mainly on the change in salinity but usually temperature and salinity profiles have a similar shape. Shear velocities indicate that the upper water column is more energetic and subjected to large shear stresses, which is more evident in vertical profiles of turbulence in the upper 200 m of the EAC.

The observations require a more robust analysis but the data already indicate an interesting variability across the EAC. After the analysis of the data the results will be disseminated in a scientific journal.

Voyage Narrative

We departed Brisbane at 0800 hrs on Saturday 29 October, after the 5-hour pilotage to Colandra we headed to the outside East Australian Current mooring (EAC_4800, M6) at 155.29 ^{o}E, 27.102 ^{o}S. We ran the ship ADCP systems in (drop keel at intermediate position) narrow-band bottom tracking mode during the pilotage and over the narrow continental shelf. Once we reached deeper water we change to narrow band with bottom tracking mode off. On the transit to the mooring site we completed mooring retrieval preparation deck work and the hydrochemistry team gave a sampling lesson to the CTD watch standers. We arrived at the mooring site at approximately 2030 hrs and began our first CTD station. The CTD 1 was completed in the earlier hours of the Sunday 30 October. An Argo float was deployed at the completion of the CTD station.

On Sunday 30 October, we enabled the mooring release and confirmed its position. A mooring toolbox was held on the bridge at 0630. Jamie Derrick, CSIRO mooring technician, outlined the hazards and control for the mooring retrieval. The mooring and deck crew met on the back deck at 0730 and we released the mooring. The mooring was sighted from the bridge and the Captain, Mike Watson, manoeuvred the vessel into position alongside the mooring line. We used the air gun to shoot the grapple hook to “catch” the mooring. We were successful on the second attempt. The mooring was secured to the back deck and the mooring recover began. The mooring was recovered 1500.

During the mooring recovery the DAP personnel processed the bottom track ship ADCP to confirm the angle of alignment of both the 75 kHz and 150 kHz units. There was a slight discrepancy between the initial 150 KHz angle of alignment of 44.35^{o} with the new bottom track angle of alignment of 44.72^{o}. We stopped the ADCP acquisition and corrected the angle of alignment of the 150 kHz to 44.72^{o} and restarted the acquisition. The angle of alignment of the 75 kHz from our bottom track data agreed with that already in the initialisation file (52.44^{o}). This was not changed.

On Monday 31 October, we began deployment of the EAC_4800 (M6) at 0750. Wind conditions were light northerly winds and moderate northward ocean current- we setup the ship-up 18 n.m from mooring location. (The RV Investigator must point into the wind, thus we needed to setup the ship to the south of the mooring location and run with the current.) During the first 90 minutes the current increased and it was clear that we would likely over shoot the mooring location. We decided to stop mooring deployment, recovery what had been laid-out and move the ship further south. The mooring was back on the deck by 1100 and the ship re-positioned 22 n.m to the south. Mooring deployment began again at 13:45 and was completed at approximately 1950. We then triangulated the mooring position and completed a CTD 2 station at the mooring site.

On Tuesday 1 November, we arrived at EAC_4700(M5) at 0500 and began CTD 3 before mooring recovery. CTD 3 was in the water at 0610 for a full depth cast to 4700m. Initially the cast went well until the CTD winch shutdown with 2700m of wire out on the downcast. It was found that the electric winch had overheated, because the fans in the winch room were not turned on. We had to wait for the winch to cool down before we could resume the CTD station. The CTD was completed at 1055 hrs and we directly moved to recovery of the mooring.

The ship was repositioned by 11:15 for mooring recovery, but visibility in rain showers delayed the release of the mooring. Eventually a clear patch in the rain showers appeared and the mooring was released. The top float was recovered to the vessel just after 1300. The mooring recovery went smoothly for the first hour (top 1000 m recovered), we then encountered a tangle of wire and dynex and huge “wuzzle” of mooring line. [Wuzzle = tangle of mooring line]. Large tangles were found over the next 2500 m of the mooring line; this slowed mooring recovery. Eventually we recovered the complete mooring to the back deck, except for a lost taped on temperature recorder. Mooring operations were completed by 20:50 hrs.

Overnight we moved to EAC_3200 (M4) mooring site. By 0730 on Wednesday 2 November CTD 4 was in the water. This was completed without incident and an Agro float was deployed at the completion of the station. We then moved back to EAC_4700 (M5) and completed a number of Turbo-Map profiles. The mooring and science teams were kept busy removing recovered wire and dynex from the net drum, winding on mooring line to the CSIRO winch, cleaning instruments and downloading data.

On Thursday 3 November we began deployment of EAC_4700 (M5) at 0730. On deployment of the first float package the deck crew noted that two floats were not buoyant. We decided to recover the mooring. Once back on the deck we found that two float were broken. These were replaced. During this deck work we assessed the setup distance and decided to reposition the vessel. The mooring deployment began again at just before 0900 hrs. The mooring deployment was completed without incident and the anchors were deployed at 14:13. We completed the mooring anchor triangulation and CTD 5 at 2215hrs. Overnight we transited to EAC_4200 (M4).

Friday 4 November, another day and another mooring operation. Today we recovered EAC_4200 (M4). The mooring was released at 0730 and the grapple hook was successful in hooking the mooring line. The first float package was secured onto the deck just after 0800hrs. During the mooring retrieval the net drum failed a number of times; the electrical engineer had to reset the electrical switch. Otherwise the mooring was recovered without incident and was completed just after 1300 hrs. While the turbo mapper was deployed during the afternoon, the mooring and science team cleaned instruments, reset and reordered the back deck. Turbulence profiles were completed by 1700 hrs and the ship transited to EAC_3200 (M3). We arrived at the mooring location and began CTD 6 at 1855 hrs. The CTD was completed at 2130 hrs. We then moved to EAC_2000 (M2).

At 0600hrs, on Saturday 4 November, we began CTD 7 at EAC_2000 location. This CTD was completed just before 0800. We then moved the short distance to EAC_500 (M1) and completed CTD 8 at 1000. We then moved slightly inshore on the mooring site and began a ship ADCP section from inshore of EAC_500 (M1) to EAC_4800 (M6). The ship ADCP line was completed at 9 knots. During the day the mooring team spooled on the wire and dynex and prepared the back deck for the next mooring deployment. After completion of the ship ADCP line we moved back to EAC_4200 (M4) site.

By 0400 Sunday 6 November, we were back at the EAC_4200 (M4) mooring site. The mooring deployment started at 0740hrs and went smoothly such that all mooring wire had been deployed by lunch. We towed the mooring for a few hours to get the mooring to the anchor site. The anchor was deployed approximately 1630 hrs. We completed the triangulation and CTD 9. We then moved to EAC_3200 (M3) mooring site.

At 07:35, on Monday 7 November, we release mooring EAC_3200 (M3) and began recovering the mooring. We missed the first attempt to grapple the mooring line and repositioned the vessel to try again. On the second attempt we were successful and the first float package was secured on the back deck at 0815. The mooring recovery was slowed due to a large amount of fishing line that had fouled the top of the mooring (0-600m). All fishing line and hook were removed as we recovered the mooring. We completed the recovery of the mooring at about 1400. During the mooring recovery the net drum continued to fail and had to be reset a number of times. The afternoon was spent removing ADCPs from syntactic spheres, clean mooring gear and floats, repacking containers and starting to download data. The turbo map was deployed during the afternoon

We stayed on site at EAC_3200 (M3) and deployed EAC_3200 (M3) on Tuesday 8 November. The mooring deployment began at 0740 and continued throughout the morning and early afternoon. The mooring was deployed at approximately 1330. The morning anchor position was found and CTD 10 was completed. Turbo Map operations were attempted but had to be suspended due to the risk of fouling the shaft and propellers given the amount of wind and current. Overnight, we moved slowly to EAC_500 (M1), ready for a planned mooring recovery.

At 0630, on Wednesday 9 November, we assessed the current and forecast weather conditions. We had northerly wind of 25 knots which was forecast to increase to 25-30 knots during the day. Tomorrows (Thursday 10 November) forecast is for lighter northerly wind at 15-20 knots at 0700 and easing during the day. Given the current wind conditions and forecast for the rest of the day, and tomorrows improving forecast we decided to delay recovery of the mooring until tomorrow. For the rest of the day, the mooring and science team undertook deck work: cleaning gear, deconstruction floatation, packing shipping container, completing off-winding of mooring line from the net drum. The ship engineers took the opportunity to work on the net drum to fault find the reason why the net drum is tripping the circuit breaker. They were still working on the net drum at 1800. Given the work on the net drum, we did not wind on the final two mooring lines to the CSIRO winch.

Thursday 10 November, the wind had decreased and we were ready for the recovery of EAC_500 (M1). From Iridium position reports, we know that at least the top float departed from the mooring in December 2015. However, the releases are still in the anchor position and standing vertically, so some floatation and mooring equipment is still attached. We released the mooring at 0735 and the ADCP syntactic sphere was sighted on the surface shortly after. As expected, we are missing the top float (including beacon, flasher and SBE37), but we had also lost the top float package (14 glass floats) and the Starmon mini at 60m and SBE37 at 80m. The mooring was back on board by 0930. Once the deck was secured we transited to EAC_2000 (M2). We arrived at EAC_2000 (M2) at 1000 and released the mooring at 1011 and it was sighted on the surface at 1017. Upon inspection of the mooring it was clear that the top float at 30m and large hydro float at 50 m were missing. We made three approaches to grapple the wire near the top syntactic float. These were all unsuccessful. After a discussion between Captain Mike Watson and mooring leader Jamie Derrick we decided to grapple the end float package. This was successful and we had the bottom float package and releases on the back deck by 1215. We secured the mooring line and had a break for lunch. The mooring operation continued at 1245 and final mooring float was retrieved by 1515. This mooring broke at the same depth as EAC_500 (M1). The top float (including beacon, flasher and SBE37) package, the large hydro-float and all instrument (temperature, salinity and pressure) above 90 m were lost. Both mooring lines showed damage just below the break – gouging of the plastic coat to the wire and some wire damage. After recovery of the mooring we started to unpack ADCPs from the syntactic spheres, clean floatation and instruments, download data, and deconstruct floatation packets and pack them into the two half height containers. Turbo mapping was undertaken in the afternoon. Overnight we move to EAC_500 (M1) mooring site.

Friday, 11 November weather conditions were light east – north east winds. We began deployment of the EAC_500 (M1) mooring at 0730. Mooring deployment was completed by 1015 and triangulation was completed by 1115. Given the favourable weather conditions we decided to move to EAC_2000 (M2) and deploy this mooring. EAC_2000 (M1) mooring deployment began at just after noon. The mooring anchor was deployed at 1530 and top float was below the surface at 1548. We then completed the mooring triangulation and CTD 11. After completion of the CTD we moved to EAC_500 (M1) location and completed our final CTD (CTD 12). Once CTD operations were completed we transited to the beginning of the Ship ADCP section and began this line at 7 knots. Along the ship ADCP line we deployed 7 XBTs.

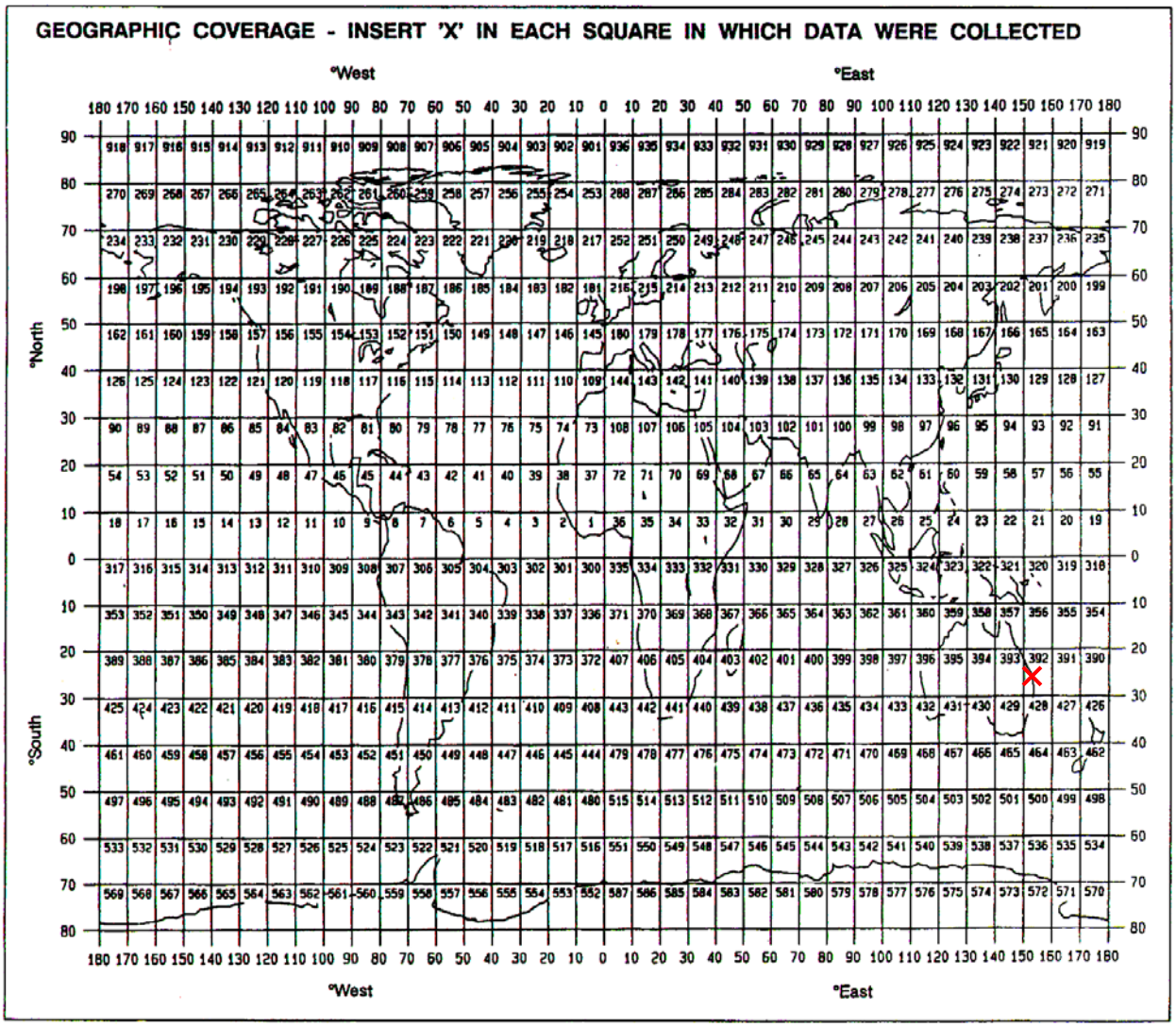
Saturday, 12 November we completed the outbound ship ADCP section. The Turbo map group undertook profiles from 0830 to approximately noon. We then started the inbound ship ADCP section. On the back deck the mooring team with help from the ships crew were busy packing mooring gear.

On Sunday 13 November we completed the inbound ship ADCP line in the early morning and began our transit to the pilot station. We picked up the pilot at 0830 and began our pilotage to Brisbane. We continued to pack our sea containers. We docked at Pinkenba wharf at approximately 1300.

Summary

All scientific objectives of the voyage were successfully completed. Moorings were recovered and deployed without incident. The mooring and sciences team, MNF, and ship master, officers and deck crew worked as a team to obtain this successful outcome.

Marsden Squares



Moorings, bottom mounted gear and drifting systems

Item No	PI See page above	APPROXIMATE POSITION						DATA TYPE enter code(s) from list on last page	DESCRIPTION
		LATITUDE			LONGITUDE				
		deg	min	N/S	deg	min	E/W		
1	Sloyan	27	14.940	S	155	18.030	E	H11, D01, D71	Recovered EAC_4800 (M_6) Deployed: 18 May 2015 Recovered: 30 October 2016 Figure 2 provide information on the instruments and depth on mooring.
2	Sloyan	27	06.414	S	155	17.256	E	H11, D01, D71	Deployment of EAC_4800 (M_6) Date : 31 October 2016. Figure x provides information on instruments and depth on mooring
3	Sloyan	27	12.474	S	154	38.814	E	H11, D01, D71	Recovery of EAC_4700 (M_5) Deployed : 19 May 2015 Recovered : 1 November 2016. Figure x provides information on instruments and depth on mooring
4	Sloyan	27	12.533	S	154	38.703	E	H11, D01, D71	Deployment of EAC_4700 (M_5) Date : 3 November 2016. Figure x provides information on instruments and depth on mooring
5	Sloyan	27	14.940	S	154	17.928	E	H11, D01, D71	Recovery of EAC_4200 (M_4) Deployed : 21 May 2015 Recovered : 4 November 2016. Figure x provides information on instruments and depth on mooring
6	Sloyan	27	14.344	S	154	17.461	E	H11, D01, D71	Deployment of EAC_4200 (M_4) Date : 6 November 2016. Figure x provides information on instruments and depth on mooring
7	Sloyan	27	16.980	S	154	8.136	E	H11, D01, D71	Recovery of EAC_3200 (M_3) Deployed : 22 May 2015 Recovered : 7 November 2016. Figure x provides information on instruments and depth on mooring
8	Sloyan	27	17.036	S	154	8.201	E	H11, D01, D71	Deployment of EAC_3200 (M_3) Date : 8 November 2016. Figure x provides information on instruments and depth on mooring

Item No	PI See page above	APPROXIMATE POSITION						DATA TYPE enter code(s) from list on last page	DESCRIPTION
		LATITUDE			LONGITUDE				
		deg	min	N/S	deg	min	E/W		
9	Sloyan	27	19.512	S	153	54.00	E	H11, D01, D71	Recovery of EAC_3200 (M_3) Deployed : 23 May 2015 Recovered : 10 November 2016. Figure x provides information on instruments and depth on mooring. Note the mooring had damage at 90 m and all instruments and floatation above this depth was lost
10	Sloyan	27	18.846	S	153	59.760	E	H11, D01, D71	Recovery of EAC_3200 (M_3) Deployed : 24 May 2015 Recovered : 10 November 2016. Figure x provides information on instruments and depth on mooring. Note the mooring had damage at 90 m and all instruments and floatation above this depth was lost
11	Sloyan	27	19.748	S	153	53.931	E	H11, D01, D71	Deployment of EAC_500 (M_1) Date : 11 November 2016. Figure x provides information on instruments and depth on mooring
12	Sloyan	27	19.048	S	154	0.101	E	H11, D01, D71	Deployment of EAC_2000 (M_2) Date : 11 November 2016. Figure x provides information on instruments and depth on mooring

Summary of Measurements and samples taken

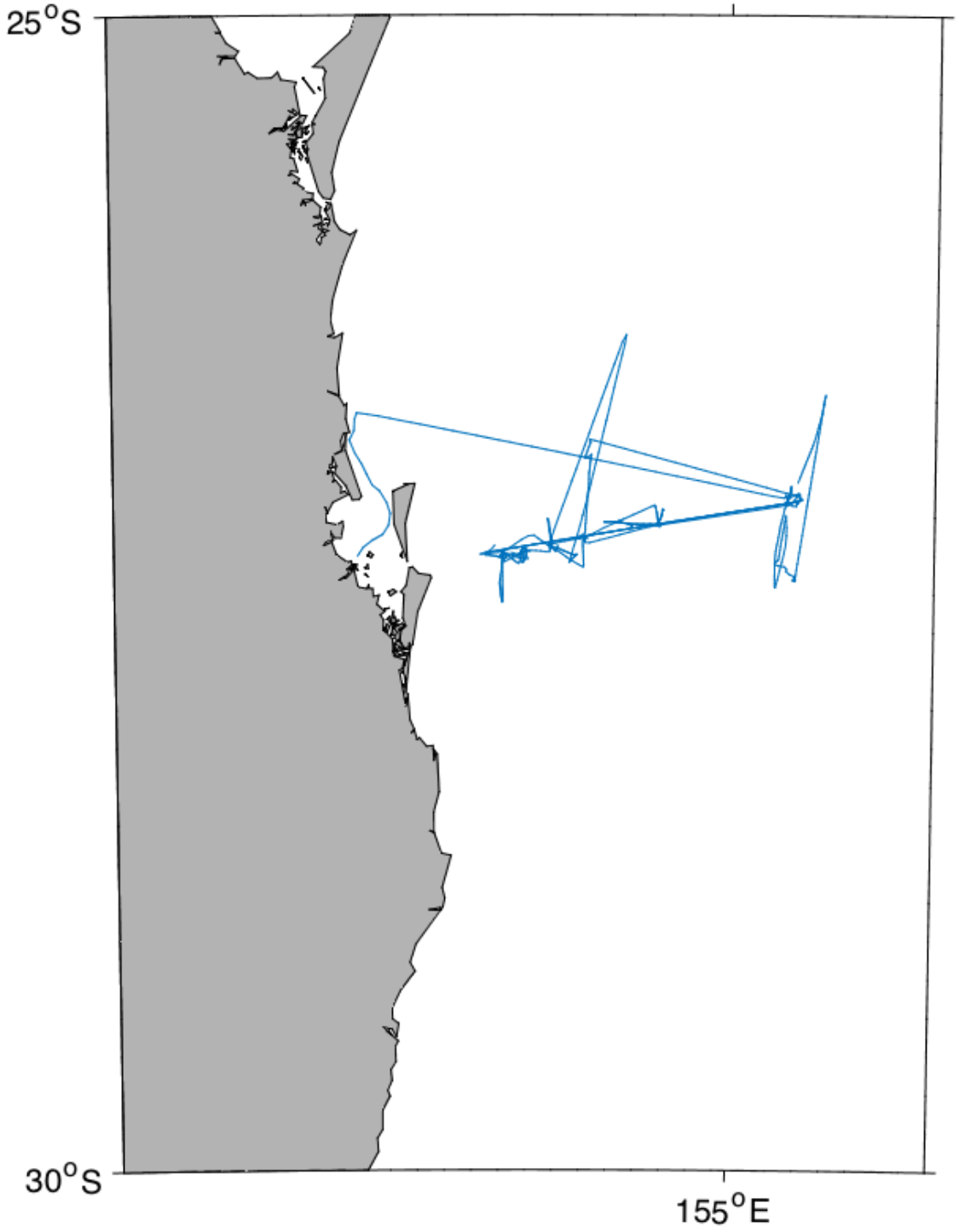
Item No.	PI see page above	NO see above	UNITS see above	DATA TYPE Enter code(s) from list at Appendix A	DESCRIPTION
1	Sloyan	12	CTD stations	H09,H10	24 bottle CTD/rosette was deployed. At each CTD station water samples were collected for nutrients, salinity and oxygen.
2	Cowley	2	Argo	D06	Profiling Argo float (Temperature, Salinity and Pressure)
3	Cahill	7	XBT	H11	7 XBT profiles
4	Woehler	c.2000	Seabirds	B25	Seabird observations collected between sunrise and sunset on every day of cruise. Almost 2000 individuals recorded from more than 15 species. All data are geo-referenced and will be lodged with GBIF in early 2017 following processing and checking.
5	Cossu	52	Turbulence Profiles	D90	Used TURBO MAP to undertake upper ocean turbulence profiles
6	Cossu	21	CTD profiles	H11	Used RBR CTD to undertake upper ocean temperature, salinity and pressure profiles.

Curation Report

Item No.	DESCRIPTION
1. Seabird observations	All data will be lodged with GBIF in early 2017 following processing and checking.

Track Chart

Voyage track



Personnel List

	Name	Organisation	Role
1.	Tegan Sime	CSIRO MNF	Voyage Manager
2.	Bernadette Sloyan	CSIRO O&A	Chief Scientist
3.	Jamie Derrick	CSIRO O&A	Mooring Leader
4.	Rebecca Cowley	CSIRO O&A	Mooring Data
5.	Jim La Duke	CSIRO O&A	Mooring Instrument Tech
6.	Curt Chalk	CSIRO O&A	Mooring Tech
7.	Madeleine Cahill	CSIRO O&A	CTD, Ship ADCP
8.	Quran Wu	CSIRO O&A	CTD, moorings
9.	Paula Conde Pardo	University of Tasmania	CTD, moorings
10.	Ana Berger	University of Tasmania	CTD, moorings
11.	Frances Cooke	CSIRO MNF	GSM support
12.	Rod Palmer	CSIRO MNF	SIT
13.	Will Ponsonby	CSIRO MNF	SIT
14.	Peter Hughes	CSIRO MNF	Hydrochem
15.	Stephen Tibben	CSIRO MNF	Hydrochem
16.	Pamela Brodie	CSIRO MNF	DAP
17.	Peter Shanks	CSIRO MNF	DAP
18.	Steve Van Graas	CSIRO MNF	DAP
19.	Eric Woehler	Birds Australia	Bird Watch
20.	Nicholas Carlile	Birds Australia	Bird Watch
21.	Penny Beaver	Birds Australia	Bird Watch
22.	David Spencer	University of Queensland	Turbulence Profiles
23.	Larissa Perez	University of Queensland	Turbulence Profiles
24.	Andrew Friedrichs	University of Queensland	Turbulence Profiles

Marine Crew

Name	Role
Michael Watson	Master
Roderick Quinn	Chief Mate
Adrian Koolhof	Second Mate
James Hokin	Third Mate
Gennady Gervasiev	Chief Engineer
Sam Benson	First Engineer
Ian McDonald	Second Engineer
Damian Wright	Third Engineer
Shane Kromcamp	Electrical Engineer
Alan Martin	Chief Caterer
Kyra Lade	Caterer
Rebecca Lee	Chief Cook
Matt Gardiner	Cook
Jonathan Lumb	Chief Integrated Rating
Dean Hingston	Integrated Rating
Christopher Dorling	Integrated Rating
Murray Lord	Integrated Rating
Darren Capon	Integrated Rating
Kel Lewis	Integrated Rating
Ryan Drennan	Integrated Rating

Acknowledgements

Signature

Your name	Bernadette Sloyan
Title	Chief Scientist
Signature	Bernadette Sloyan
Date:	16 December 2016

List of additional figures and documents

Appendix A CSR/ROSCOP Parameter CodeS

Appendix B Mooring Diagrams

Appendix A - CSR/ROSCOP Parameter CodeS

	METEOROLOGY
M01	Upper air observations
M02	Incident radiation
M05	Occasional standard measurements
M06	Routine standard measurements
M71	Atmospheric chemistry
M90	Other meteorological measurements

	PHYSICAL OCEANOGRAPHY
H71	Surface measurements underway (T,S)
H13	Bathythermograph
H09	Water bottle stations
H10	CTD stations
H11	Subsurface measurements underway (T,S)
H72	Thermistor chain
H16	Transparency (eg transmissometer)
H17	Optics (eg underwater light levels)
H73	Geochemical tracers (eg freons)
D01	Current meters
D71	Current profiler (eg ADCP)
D03	Currents measured from ship drift
D04	GEK
D05	Surface drifters/drifting buoys
D06	Neutrally buoyant floats

	MARINE BIOLOGY/FISHERIES
B01	Primary productivity
B02	Phytoplankton pigments (eg chlorophyll, fluorescence)
B71	Particulate organic matter (inc POC, PON)
B06	Dissolved organic matter (inc DOC)
B72	Biochemical measurements (eg lipids, amino acids)
B73	Sediment traps
B08	Phytoplankton
B09	Zooplankton
B03	Seston
B10	Neuston
B11	Nekton
B13	Eggs & larvae
B07	Pelagic bacteria/micro-organisms
B16	Benthic bacteria/micro-organisms
B17	Phytobenthos
B18	Zoobenthos
B25	Birds
B26	Mammals & reptiles
B14	Pelagic fish
B19	Demersal fish
B20	Molluscs
B21	Crustaceans
B28	Acoustic reflection on marine organisms

D09	Sea level (incl. Bottom pressure & inverted echosounder)
D72	Instrumented wave measurements
D90	Other physical oceanographic measurements

	CHEMICAL OCEANOGRAPHY
H21	Oxygen
H74	Carbon dioxide
H33	Other dissolved gases
H22	Phosphate
H23	Total - P
H24	Nitrate
H25	Nitrite
H75	Total - N
H76	Ammonia
H26	Silicate
H27	Alkalinity
H28	PH
H30	Trace elements
H31	Radioactivity
H32	Isotopes
H90	Other chemical oceanographic measurements

B37	Taggings
B64	Gear research
B65	Exploratory fishing
B90	Other biological/fisheries measurements

	MARINE GEOLOGY/GEOPHYSICS
G01	Dredge
G02	Grab
G03	Core - rock
G04	Core - soft bottom
G08	Bottom photography
G71	In-situ seafloor measurement/sampling
G72	Geophysical measurements made at depth
G73	Single-beam echosounding
G74	Multi-beam echosounding
G24	Long/short range side scan sonar
G75	Single channel seismic reflection
G76	Multichannel seismic reflection
G26	Seismic refraction
G27	Gravity measurements
G28	Magnetic measurements
G90	Other geological/geophysical measurements

	MARINE CONTAMINANTS/POLLUTION
P01	Suspended matter
P02	Trace metals
P03	Petroleum residues
P04	Chlorinated hydrocarbons
P05	Other dissolved substances
P12	Bottom deposits
P13	Contaminants in organisms
P90	Other contaminant measurements

Appendix B – MOORING DIAGRAMS

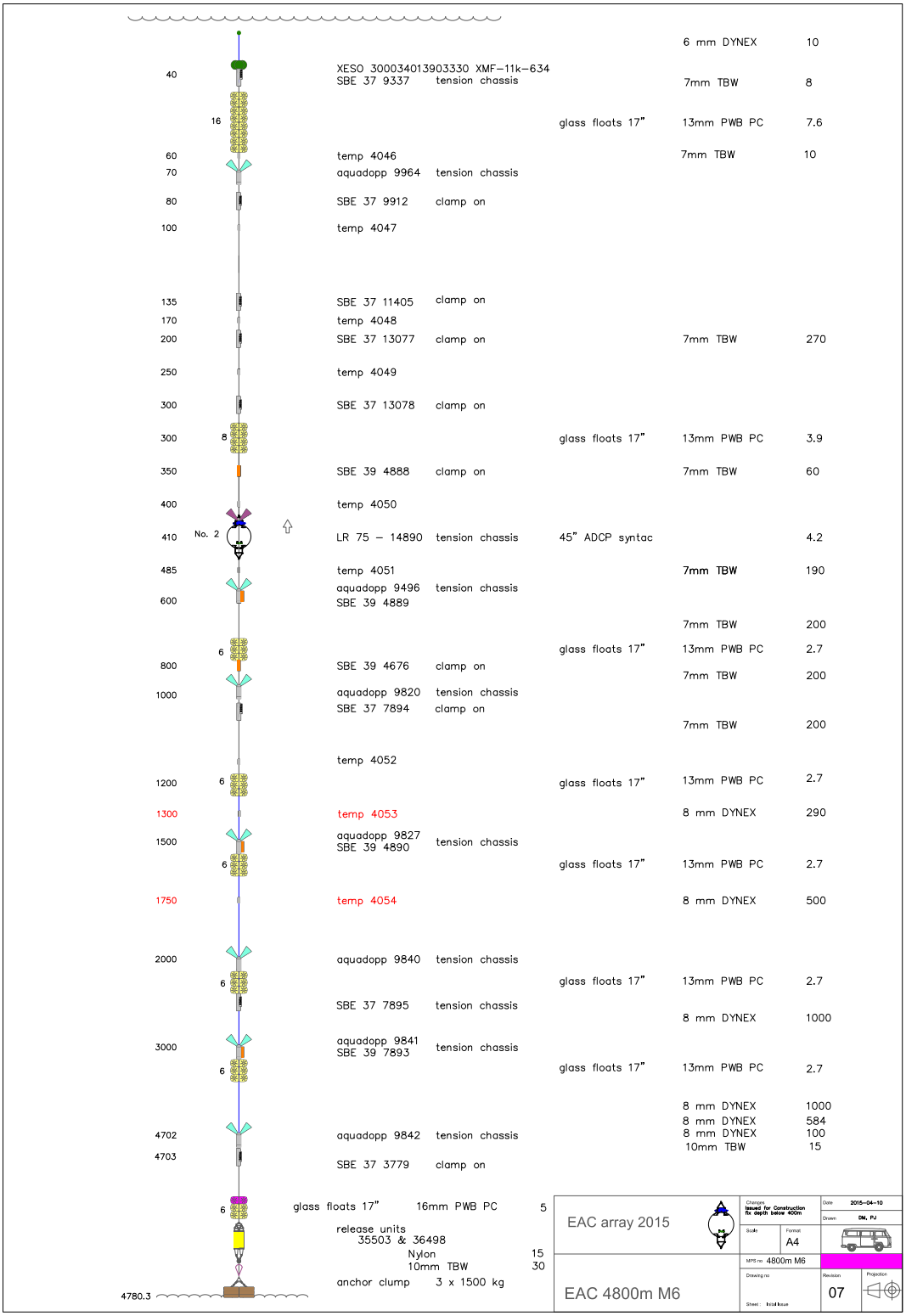


Figure 1. EAC_4800 (M_6) recovered on the voyage. The mooring provides a time series of temperature, salinity, pressure and currents are varying vertical resolution. Instruments types and deployment depth are noted. Instruments include Sea Bird Electronics 37 and 39 units and Starmon mini, RDI Acoustic Doppler Current Profile 75 kHz, and Nortec Aquadopp.

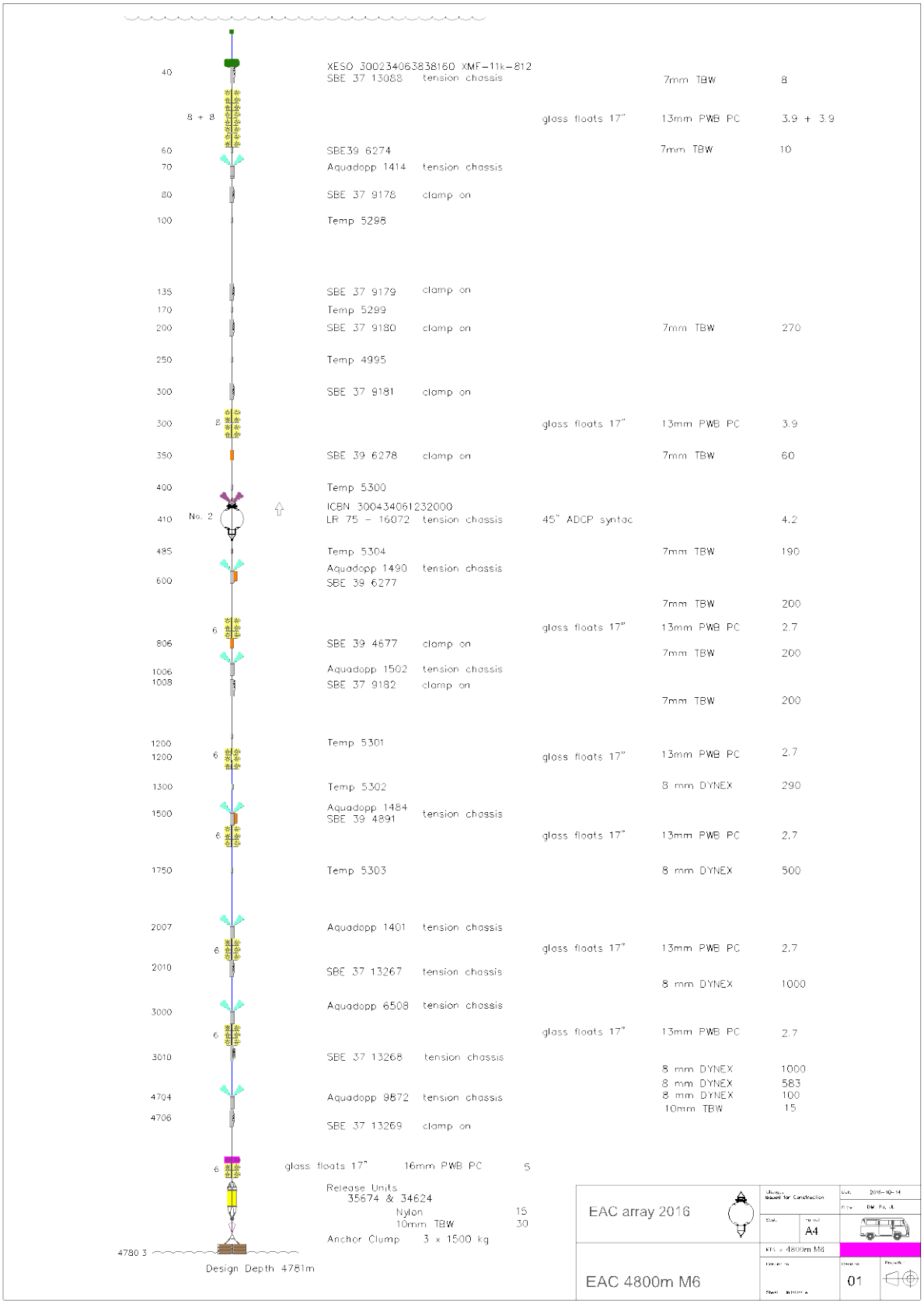


Figure 2. EAC_4800 (M6) deployed on the voyage. Diagram annotation as for figure 2.

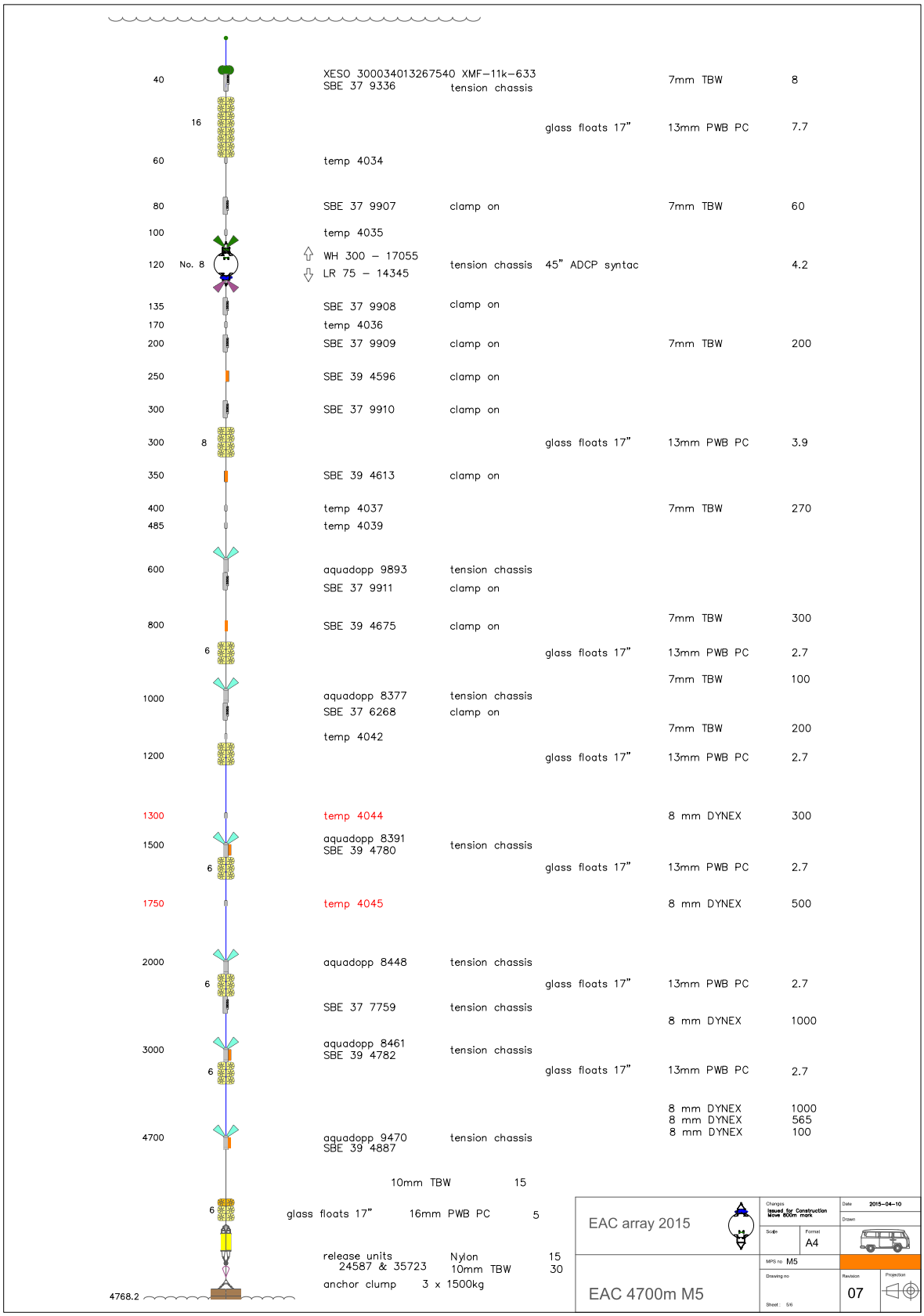


Figure 3. EAC_4700 (M5) recovered on the voyage. Diagram annotation as for figure 2, with the addition of an RDI ADCP 300 kHz unit.

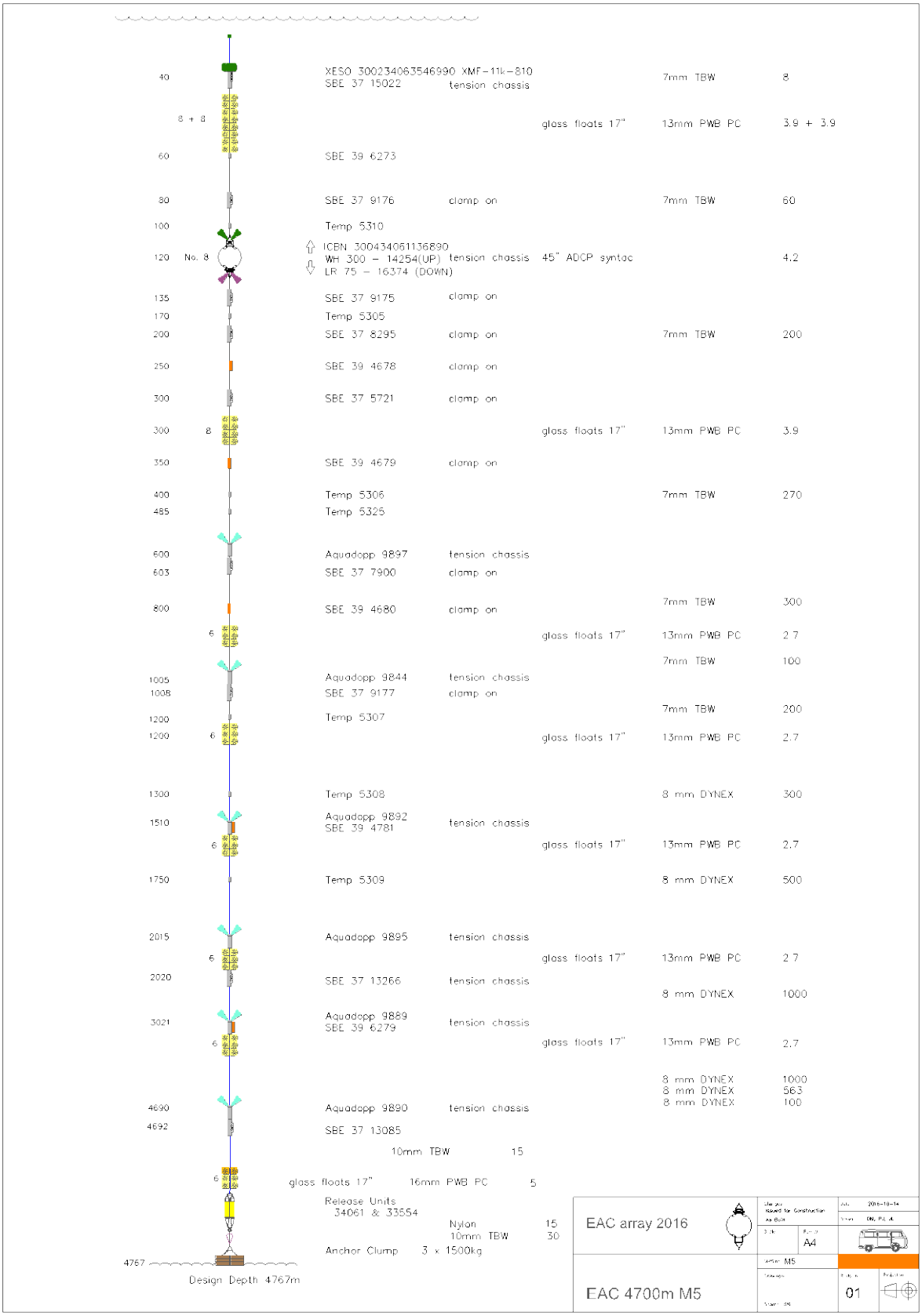


Figure 4. EAC_4700 (M5) deployed on the voyage. Diagram annotation as for figure 2, with the addition of an RDI ADCP 300 kHz unit.

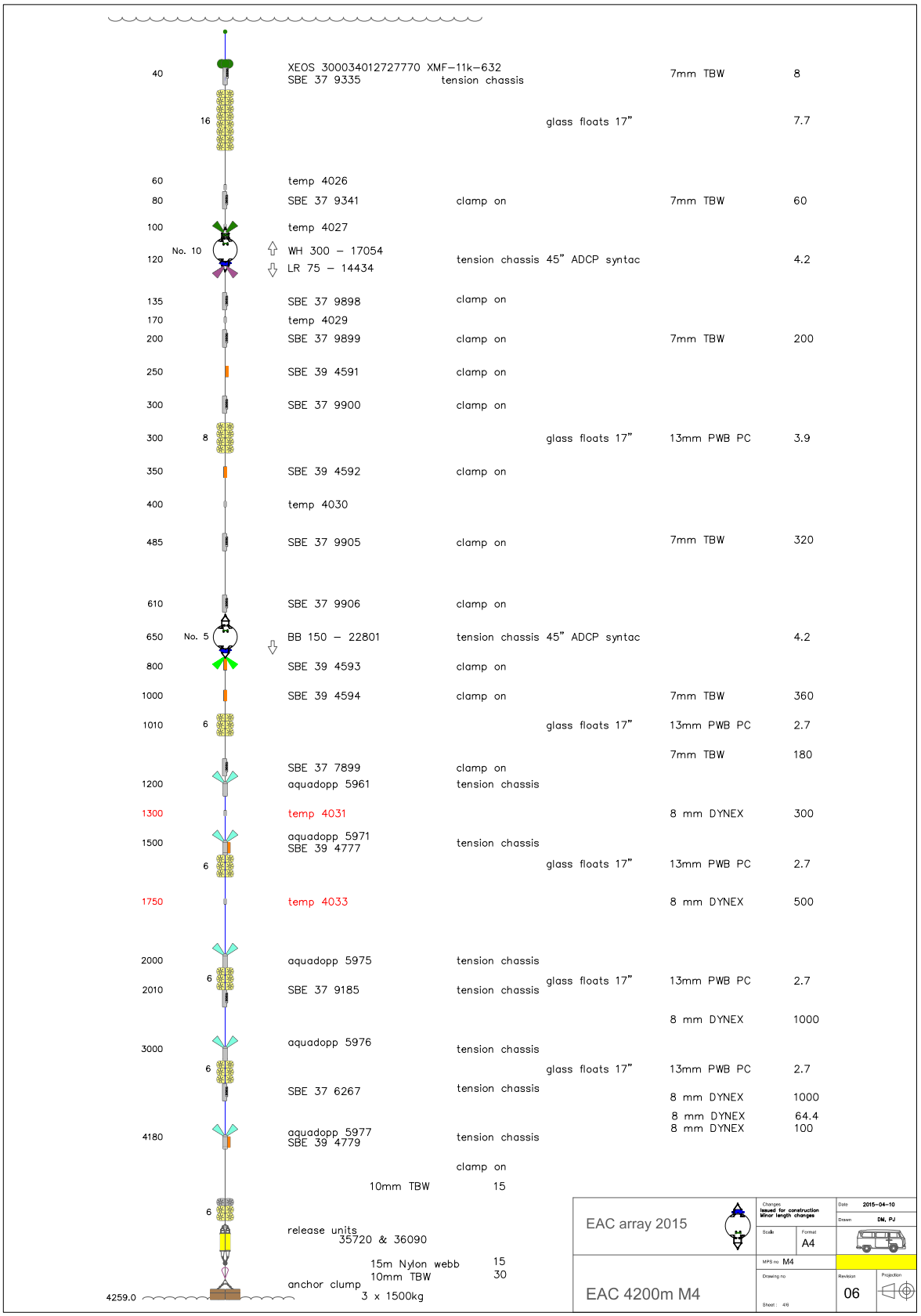


Figure 5. EAC_4200 (M4) recovered on the voyage. Diagram annotation as for figure 2, with the addition of an RDI ADCP 300 and 150 kHz unit.

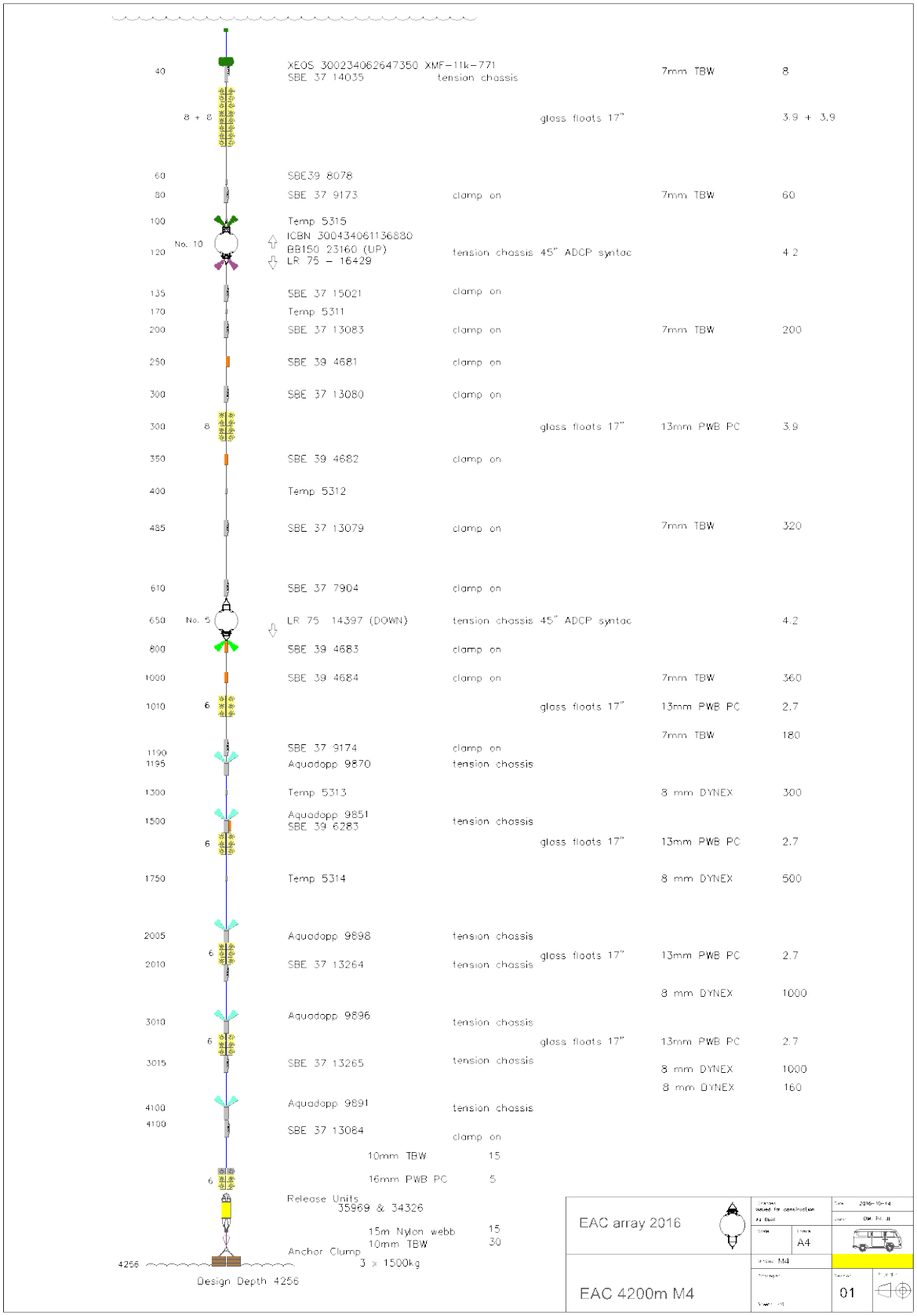


Figure 6. EAC_4200 (M4) deployed on the voyage. Diagram annotation as for figure 2, with the addition of an RDI ADCP 300 and 150 kHz unit.

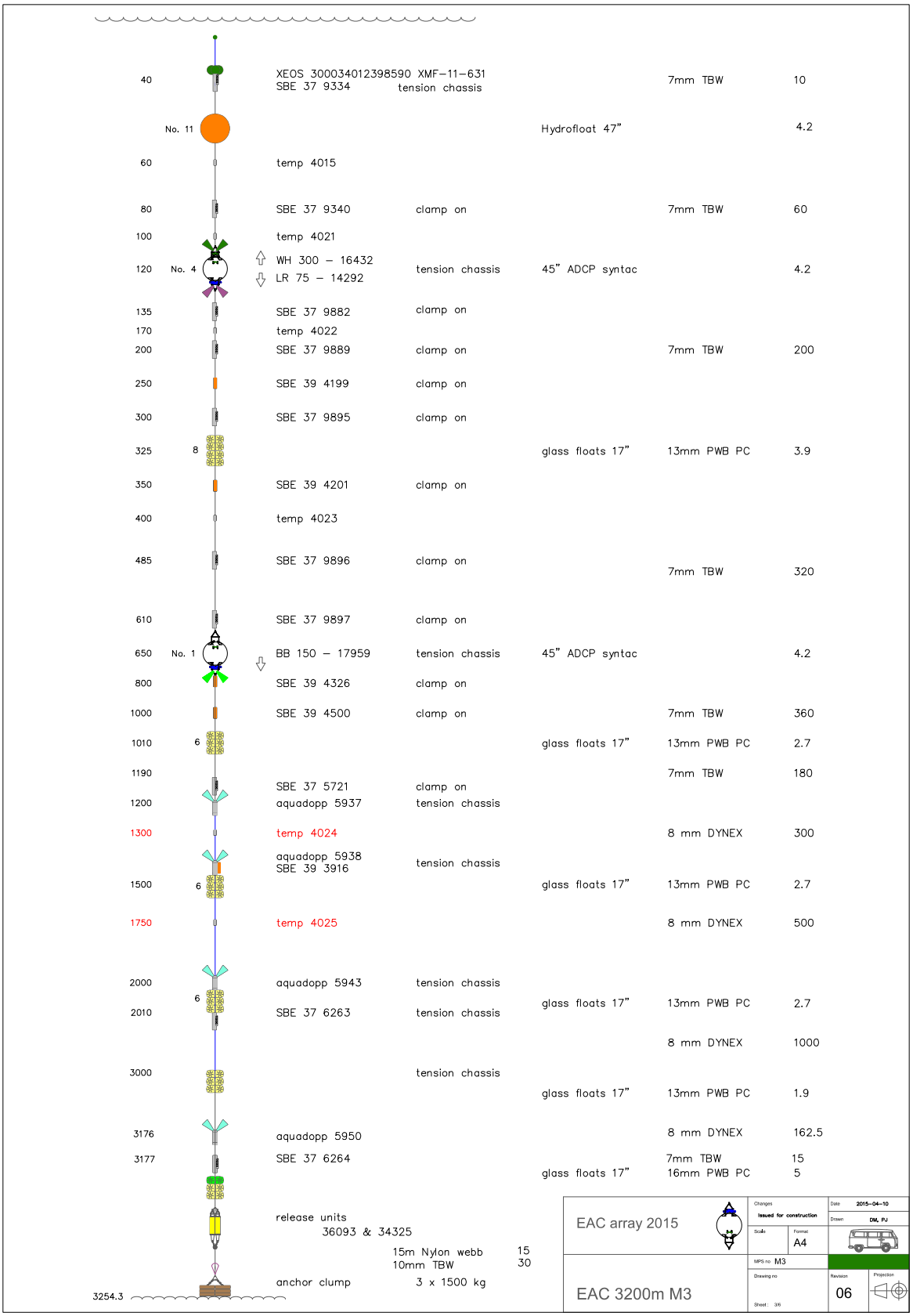


Figure 7. EAC_3200 (M3) recovered on the voyage. Diagram annotation as for figure 2, with the addition of an RDI ADCP 300 and 150 kHz unit.

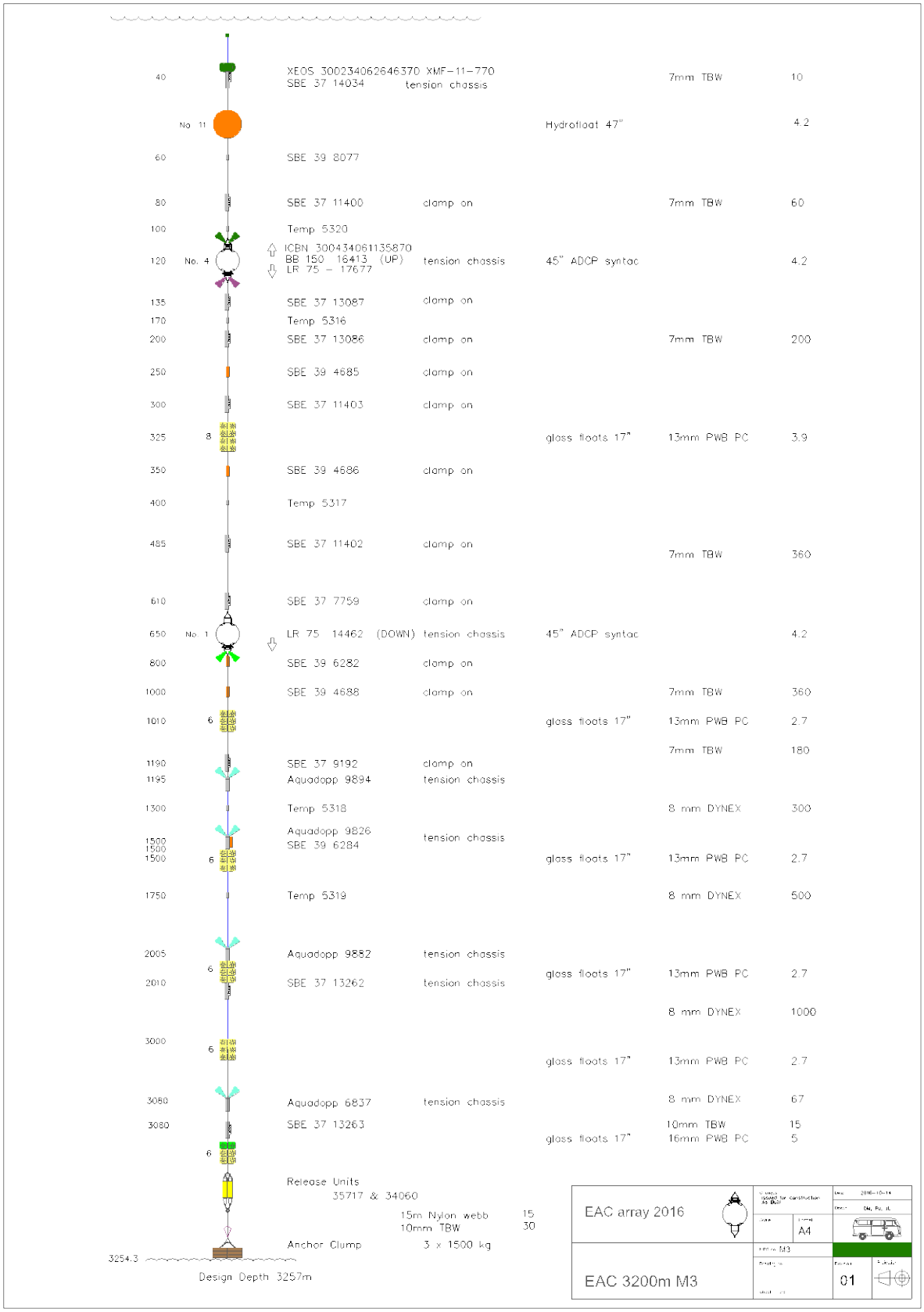


Figure 8. EAC_3200 (M3) deployed on the voyage. Diagram annotation as for figure 2, with the addition of an RDI ADCP 300 and 150 kHz unit.

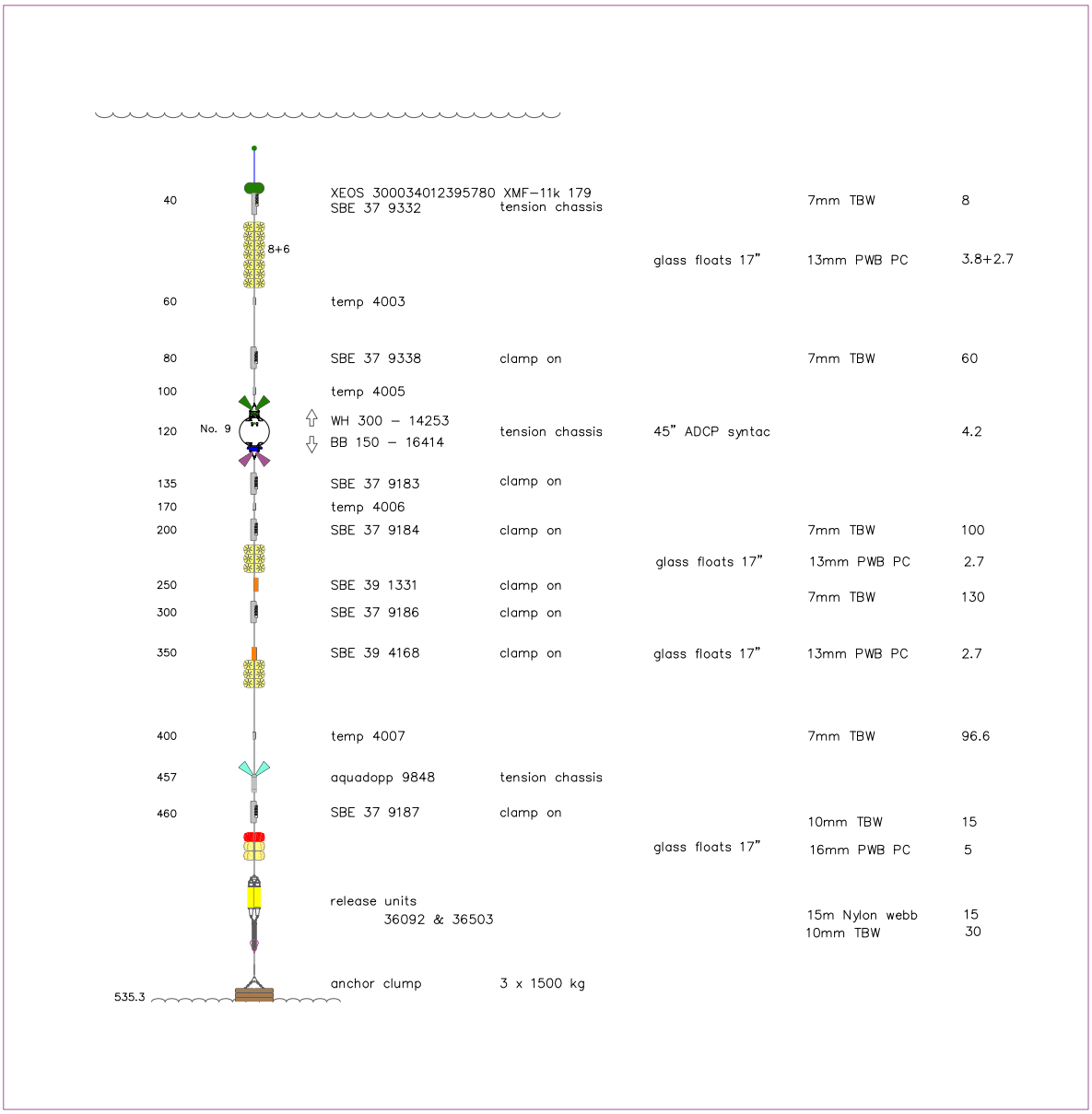


Figure 9. EAC_500 (M1) recovered on the voyage. Diagram annotation as for figure 2, with the addition of an RDI ADCP 300 and 150 kHz unit.

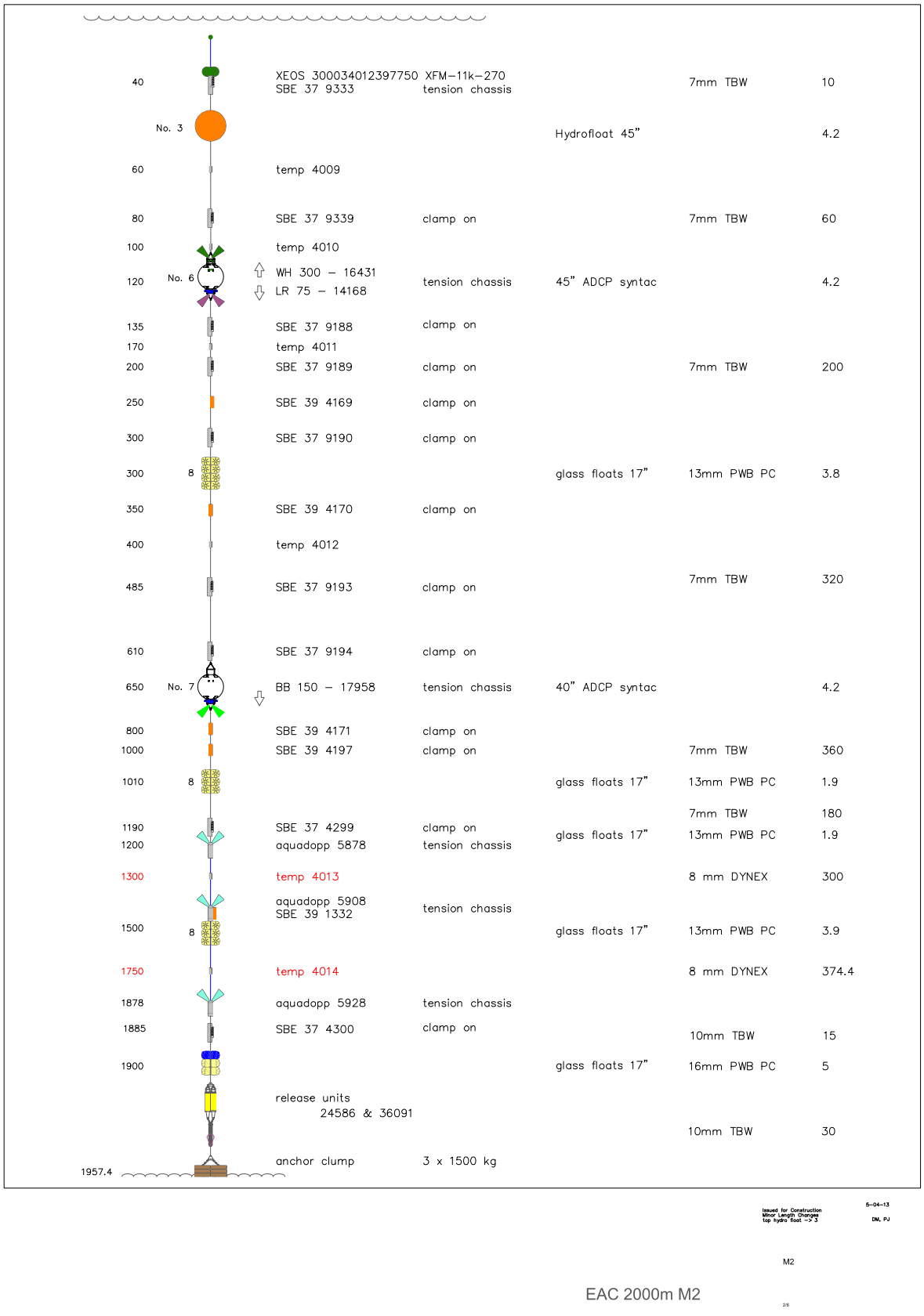


Figure 10. EAC_2000 (M1) recovered on the voyage. Diagram annotation as for figure 2, with the addition of an RDI ADCP 300 and 150 kHz unit.

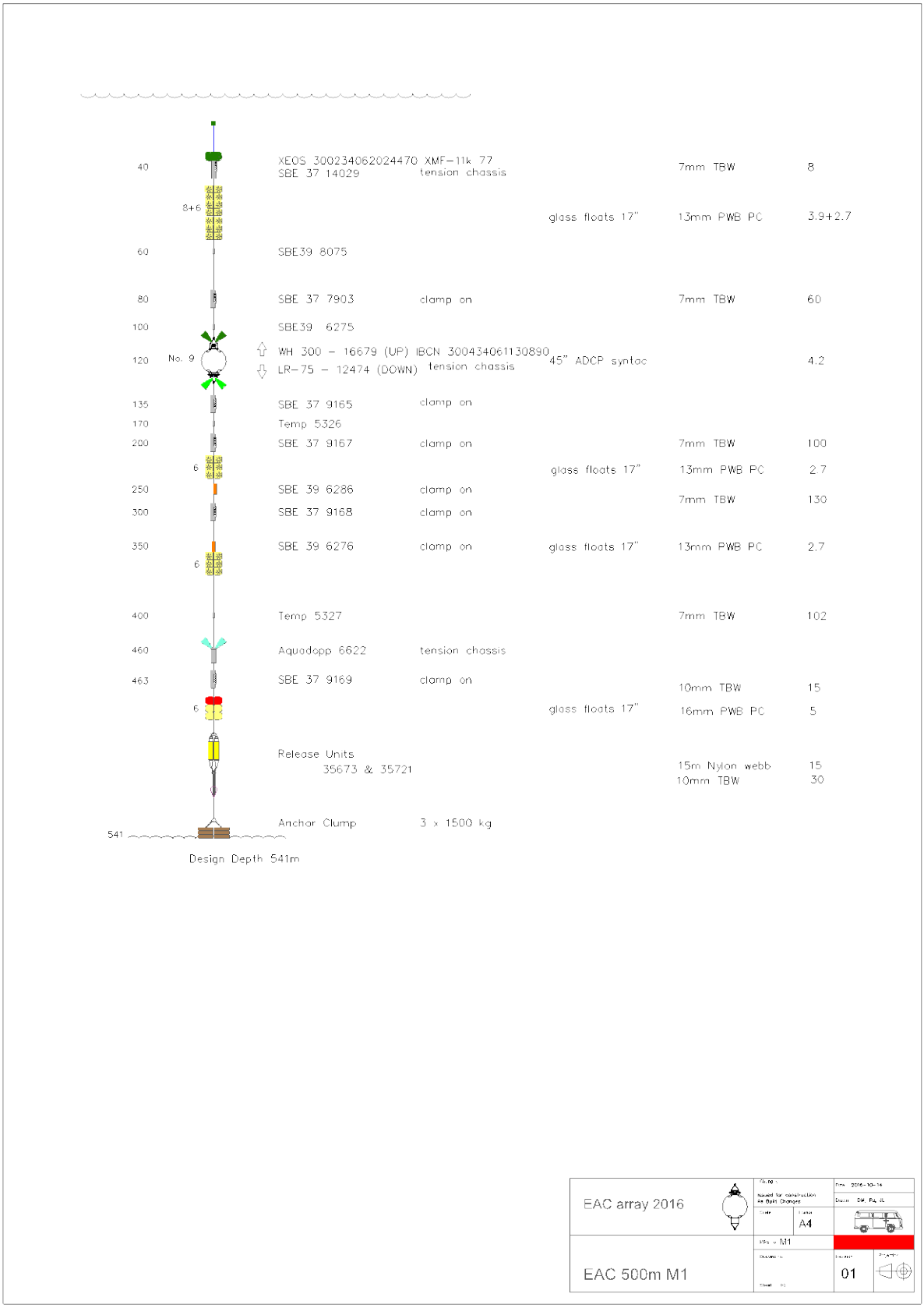


Figure 11. EAC_500 (M1) deployed on the voyage. Diagram annotation as for figure 2, with the addition of an RDI ADCP 300 and 150 kHz unit.

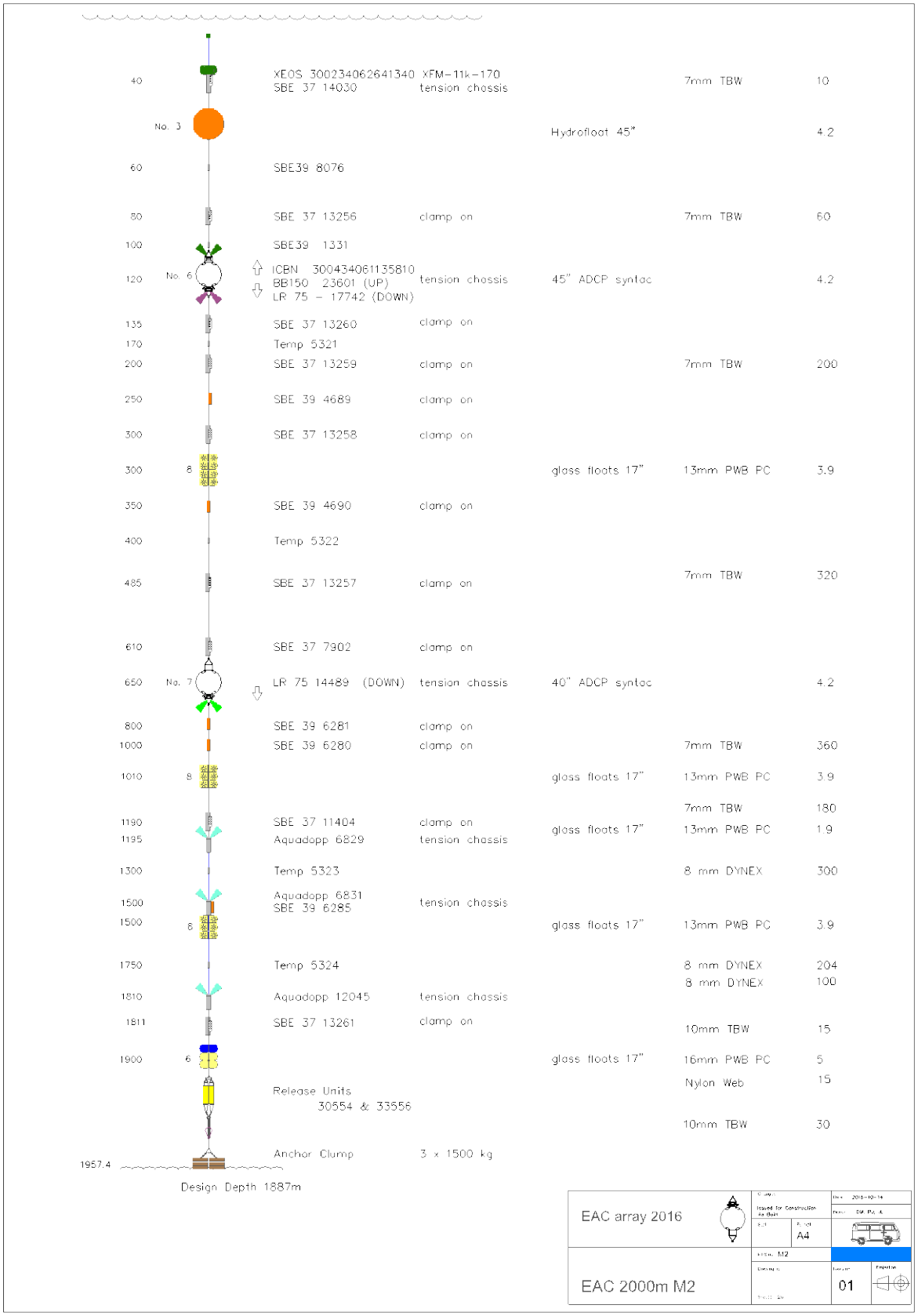


Figure 12. EAC_2000 (M2) deployed on the voyage. Diagram annotation as for figure 2, with the addition of an RDI ADCP 300 and 150 kHz unit.