

China – US Segment 7

California Post Installation Burial
Verification Survey 2015

Completion Report

CS Wave Venture & ST204 ROV
07th July 2015 – 09th September 2015



Global Marine

Systems



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Abbreviations

The following abbreviations may be used in this report:

1st	First Splice/Joint	km	Kilometres
2nd	Second Splice/Joint	kN	Kilo Newton
A	Ampere	KP	Kilometre Point
A/C	Alter Course	Kpa	Kilo Pascal
AOG	Arrived on ground of repair	kt	Knot(s)
APO	Amount Paid Out	kV	Kilovolt(s)
APU	Amount Picked Up	LARS	Launch and Recovery System
BAS	Burial Assessment Survey	Lat	Latitude position in Degrees and Minutes
BJT	Beach Joint	LCE	Linear Cable Engine
BMH	Beach Manhole	LCF	Large Core Fibre
BRH	Bight Release Hook (acoustic bight release hook)	LEAF	Large Effective Area Fibre
BU	Branching Unit (Usually followed by a number e.g. BU2)	LFES	Loop Fibre End Seal
CB	Cable buoy - usually with a number after it to identify it - i.e. CB1	LI	Laid-in splice
CCE	Chief Cable Engineer	Long	Longitude position in Degrees and Minutes
C-OTDR	Coherent Optical Time Domain Reflectometer	LPCFF	Long Prong Cutting Flatfish Grapnel
CPO	Commence Pay Out	LPFF	Long Prong Flatfish Grapnel
CPT	Cone Penetrometer Test	LPHFF	Long Prong Holding Flatfish Grapnel
CPU	Commence Pick Up	LR	Large Rennie Grapnel
CR	Conductor Resistance	LRB	Large Round Bottom Grapnel
CS	Cable Ship	LSP	Long Sliding Prong Grapnel
CSF	Cut Shifted Fibre	LW	Light Weight Cable
CTC	Cable Terminating Cubicle	LWA	Light Wire Armour
CTE	Cable Terminating Equipment	LWM	Low Water Mark
DA	Double Armour	LWP	Light Weight Protected
DCC	Distance Cross Course	LWS	Light Weight Screened
DCF	Dispersion Compensated Fibre	m	Metre(s)
DEC	Dispersion Equalisation Cable	M/V	Motor Vessel
DG	Grapnel Drive (Usually followed by a number e.g. DG1)	MOB	Man Over Board Boat
DGPS	Differential Global Positioning System	NCR	Non-conformance report
DOB	Depth of Burial	NDSF	Non-Dispersion Shifted Fibre
DOHB	Draw Off Hold Back	nm	Nautical Mile(s)
DOL	Distance Off Line	NOTS	Nominal Operating Tensile Strength
DOW	Depth of Water	NPTS	Nominal Permanent Tensile Strength
DP	Dynamic Positioning	NTTS	Nominal Transient Tensile Strength
DPR	Daily Progress Report	OOU	Out of use cable
DPSO	Deputy Power Safety Officer	OOS	Out of service cable
DSF	Dispersion Shifted Fibre	OPSO	Overall Power Safety Officer
DWP	Deep Water Protected Cable	OSPT	Offshore Superintendent
EBAS	Electronic Burial Assessment Survey	OTDR	Optical Time Domain Reflectometer
ETA	Expected time of arrival	PAS	Plough Assessment Survey
ETD	Expected time of departure	PCB	Printed Circuit Board
ETO	Electrical Technical Officer	PD	Plough Down
FFP	Flexible Fall Pipe	PEFL	Pulse Echo Fault Locator
FFPV	Flexible Fall Pipe Vessel	PEU	Passive Equalizer Unit
FJB	Factory Joint Box	PFE	Power Feed Equipment
fm	fathom(s)	PGU	Protection Grounding Unit
FP	Fibre Pair (Usually preceded by a number e.g. 2FP)	PKP	Plough Kilometre Point
FRC	Fast Rescue Craft	PLDN	Plough Down
FS	Final Splice	PLGR	Pre Lay Grapnel Run
FWD	Forward (Usually applies to +ve CR tests on cables)	PLB	Post Lay Burial
G	Gifford Grapnels (usually preceded by a number e.g. 2G)	PLI	Post Lay Inspection
GMSL	Global Marine Systems Limited	PLIB	Post Lay Inspection and Burial
Grap	Grapnel	PLUP	Plough Up
GPS	Global Positioning System	PO	Pay Out
HAZID	Hazardous operations identification	POL	Point on Line
HD	Holding Drive	PSBR	Power System Branch Repair Unit
HDD	Horizontally Drilled Duct	PSM	Power Safety Message
HDPE	High Density Polyethylene	PSO	Power Safety Officer
HPR	Hydro Acoustic Position Reference	PSPU	Power Supply Protection Unit
HPU	Electro Hydraulic Power Unit	PU	Pick Up
IC	Insulation Capacitance	QA	Quality Assurance
IMO	International Maritime Organization	QHSE	Quality, Health, Safety & Environment
IOR	Index of Refraction	R	Repeater (usually followed by a number e.g. R06)
IR	Insulation Resistance	RA	Rock Armour
ITRF	International Terrestrial Reference Framework	RAB	Remote Amplifier Box
JB	Joint Box	RC	Route clearance
JT	Joint		
REV	Reverse (Can be used on -ve CR tests on cables or		



	refers sometimes to grapnels)
RFPA	Ready for Provisional Acceptance
RFPS	Ready for Provisional Service
RFS	Ready for Service (commercial acceptance)
RG	Reversed Gifford Grapnels
RIB	Rigid Inflatable Boat
Roto	Reading on the foredeck mechanical rotometers
ROV	Remotely operated vehicle
RPL	Route Position List
SA	Single Armour
SAH	Single Armour Heavy
SAL	Single Armour Light
SAM	Single Armour Medium
Sdg	Sounding Depth of Water
SDH	Synchronous Digital Hierarchy
SLD	Straight Line Diagram
LLI	System Load and Lay Instructions
SMF	Single Mode Fibre
SPA	Special Application Cable
SPHFF	Short Prong Holding Flatfish Grapnel
SPO	Stop Pay Out
SPU	Stop Pick Up
SSE	Senior Submersibles Engineer
SSP	Short Sliding Prong Grapnel
Stbd	Starboard
t.b.a.	To be advised
TPSO	Terminal Power Safety Officer
Trans	Transition
TSS	TSS(UK)Ltd, manufacture of cable detection
UC	Universal Coupling
UJ	Universal Joint
USBL	Ultra Short Baseline
UTM	Universal Transverse Mercator
UTS	Ultimate Tensile Strength
V	Volt(s)
VO	Variation Order
VOR	Variation Order Request
VRU	Vertical Reference Unit
WDM	Wavelength Division Multiplexing
WGS	World Geodetic System
WoW	Waiting on Weather
Wx	Weather Conditions
XRB	Extended Round Bottom Grapnel



1.0 Executive Summary

Global Marine Systems were engaged by AT&T and Verizon under the North America Zone 2012 Agreement (NAZ) to conduct burial verification surveys on eight submarine cables off the coast of California. The Cable Ship Wave Venture and ST204 Remotely Operated Vehicle were mobilised in Victoria, British Columbia and departed on the 7th July 2015.

The ROV Post Installation Burial Verification Survey of the China – US Seg 7 commenced on the 28th July and a total route distance of 94.137km was surveyed. Burial results, based on the supplied smoothing model, are summarised below (where *well-buried* is > 50 cm below mean seabed level, *intermediate burial* is between 50cm and 0cm, and *exposed* is ≤ 0 cm below mean seabed level):

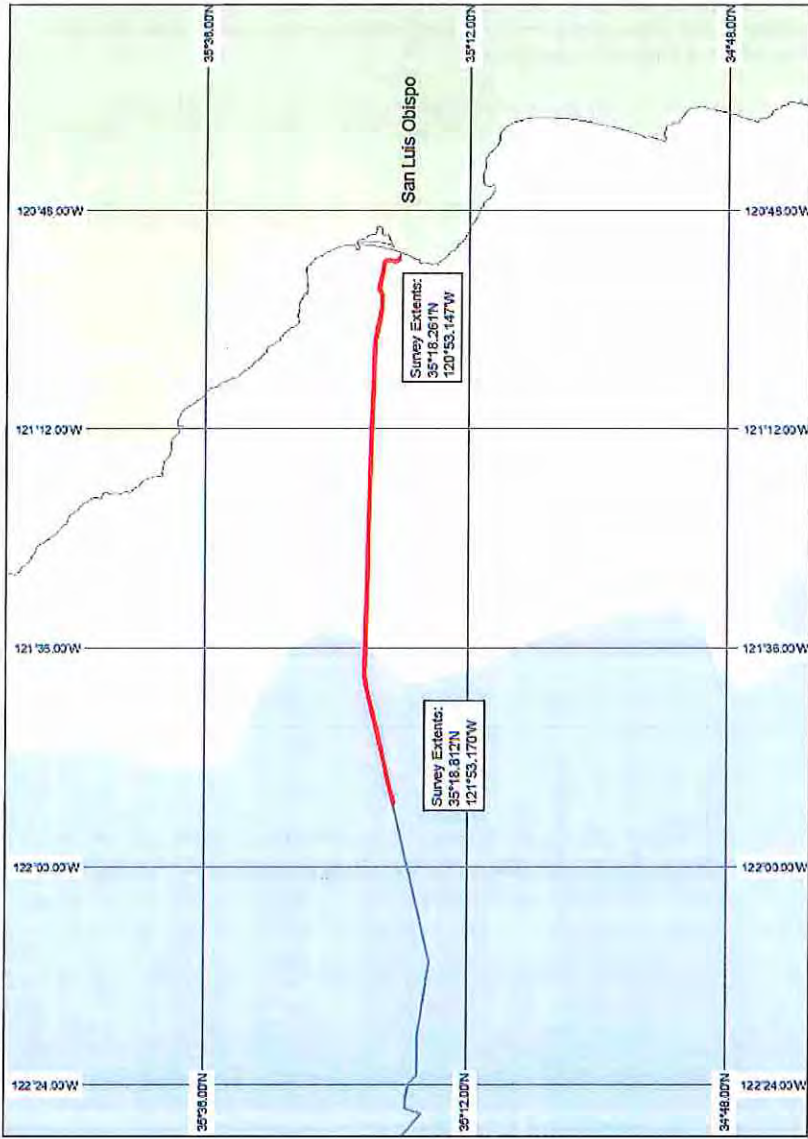
Well Buried	Intermediate burial	Exposed	Total
80.373km	12.985km	0.779km	94.137km
85.4%	13.8%	0.8%	100.0%

The general burial trend agrees with the 2010 survey and there is no evidence of any significant changes to the cable's status since installation. Any differences in reported burial depths or exposure lengths are likely due to differences in data acquisition and reporting methods.

No areas of exposed cable were assessed as being suitable for retro-burial due to seabed composition.

2.0 Location Map

The location of the survey is presented on the following map.





3.0 Operational Overview

3.1 Introduction

As part of the permitting conditions for seven fibre optic cables installed off California in 2000 and the AAG cable system installed in 2009, the Cable Owners (AT&T and Verizon) are required to carry out a post installation inspection to determine the burial status of the cables.

The survey is required along the entire length of each cable from the seaward ends of the directional bores to a water depth of 1000 fathoms (1850m).

It is required for post-lay cable burial verification survey to occur every five years beginning in 2010, or after events that may cause buried cable to daylight. The survey shall be conducted by an ROV equipped with video and still cameras and by a third party agreed to by the permitting agencies. A report providing verification of cable burial shall be submitted to the permitting agencies. The cable owner must submit a plan for approval to the CSLC and CCC staff for remediation of any segments where previously buried cable has become unburied as soon as possible, but not to exceed 30 days, after survey completion (the survey shall be considered complete as of the last day of survey work actually occurring in the field). This plan shall include a proposed schedule for completion of the necessary work, including the retrieval of fishing gear snagged on a cable.

In order to allow the Cable Owners to comply with the permit conditions, the California Coastal Commission and the California State Lands Commission have approved the following regulations / contingency plans;

- (1) ROV Survey Protocol (17th Sept 2002),
- (2) Cable Re-Burial Plan (19th Dec 2002) ("Re-Burial Plan"),
- (3) Fishing Gear Retrieval Plan (19th Dec 2002) ("Gear Plan"),

To meet the needs of the Cable Owners, GMSL shall:

- Survey, provide photo documentation, compare results against Cable Owner provided as-built data, and report the depth of burial for six in-service cables at Morro Bay and for two in-service submarine cables at Manchester, California. Survey data is required for each cable from the seaward ends of the directional bores (approximately 10m water depth) to the 1,850 m depth contour. See Table 1 for the cable route lengths of each cable to the 1,850 m water depth.
- Provide project documentation as defined in this Scope of Work
- Complete the above survey task and final report.
- Rebury cables to 0.5 m or greater, if possible, where the cables are determined to be newly exposed in accordance with the Re-Burial Plan.
- Remove bottom trawl fishing gear in the vicinity of the submarine cables if feasible in accordance with the Gear Plan.

During this operation GMSL shall also follow the requirements set by the Marine Mammal Consulting Group (MMCG) to reduce the impact on marine wildlife.

The General Permit provides that Marine Wildlife Monitors (MWMs) will not be required on-board vessels conducting survey activities such as Japan-US. However, three GMSL crew members have been trained as Designated Crew Member Monitors (DCMM) by two of MMCG's Marine Wildlife Monitors (MWM) to perform the typical functions of a MWM.

DCMM duties;

The DCMM shall have the authority to stop operations if, in the opinion of the DCMM, project operations have the potential to threaten or "take" a marine mammal or turtle.

The DCMM will be present at the highest practical vantage point on the vessel and will use binoculars with magnification of at least 7 and an objective lens diameter of at least 50 to observe the surrounding area, and night vision goggles during nighttime operations.



Further information can be found in Appendix H - Marine Wildlife Mitigation Monitoring Report.

3.2 Scheduling of Work

CS Wave Venture commenced survey operations in July 2015 with AAG cable system scheduled as the first cable route for survey operations. The operations were subject to the vessel obligations to the NAZ Submarine Cable Maintenance Services contract. The whole OBVS operation was carried out on an interruptible basis to meet these obligations.

The survey operation was planned to be carried out in the following sequence as per the SOW:

System	Landing	Route km to 1,850 meter water depth
AAG Seg. 5	Morro Bay	95
Japan - US S 1	Morro Bay	96
China - US S7	Morro Bay	94
Southern Cross D	Morro Bay	97
China - US E	Morro Bay	100
Japan - US S 9	Morro Bay	95
Japan - US S 8	Manchester	67
Japan - US S 9	Manchester	37

Section 4.0 shows the initial POW and operational POW

3.3 Operational Synopsis

July 2015

The vessel departed Esquimalt Graving Dock, Victoria BC, Canada on the 7th July 2015 and arrived at San Francisco, USA on the 10th July 2015. The vessel then completed US state port clearance, embarked one cable representative, one GMSL project manager and two Marine Wildlife representatives.

At 22:48 on the 10th July the vessel then made passage to AAG Seg 5 cable route, specifically position Lat: 35° 16.4 N Long: 120° 59.3 W where the vessel could carry-out survey equipment calibrations requirements, *further details can be found in the Mobilisation and Calibration Report*. The survey suite mobilisation was completed on the 12th July.

Due to the SOW the China - US Seg 7 Survey operations commenced on the 28th July at 16:06 after completion of AAG Seg 5 & Japan - US Seg 1 operations.

China - US Seg 7 operations began with a transit survey of the route whilst checking for fishing gear. During the transit survey the vessel broke away from China - US Seg 7 to complete a small section of survey work on Japan - US Seg 1. The vessel deviated from the route at 21:24 on the 28th July. The additional work on Japan - US Seg 1 was completed at 23:06 on the 28th July. On completion of Japan - US Seg 1 the vessel returned to China - US Seg 7 and continued the transit survey until 01:35 on the 29th July. During the transit survey the onboard PSO's instructed the terminal staff of San Luis Obispo to apply a tone frequency of 25Hz. Once the vessel was in a DOW of 30m the ROV team were instructed to launch the ST 204, this occurred at 01:54 on the 29th July.

At 02:19 on the 29th the ROV acquired the cable in a large boulder field and began tracking the cable east towards the shore end using the TSS 350 tracking system. Once the ROV reached KP 1.341 the HPR became unreliable due to depth of water therefore from this position heading east the ROV continued a visual survey only. At 08:49 on the 29th the ROV reached its most easterly point at KP 1.258. On completion of the inshore survey operations the ROV was recovered to deck and the vessel transited to KP 7.000. At 10:52 on the 29th the vessel was at KP 7.000 and launched the ROV. The ROV team acquired the cable at 11:28 and tracked the cable east towards the initial survey position KP 3.827. The vessel then recovered the ROV and relocated back to KP 7.000, the survey operation commenced from KP 7.000 at 19:30 29th July heading west until the end of the Survey route at contour line 1850m. During this survey section an area of cable appeared to be configured in a loop which caused difficulty in acquiring accurate burial data. The vessel would be required to re-visit this area for second survey pass heading west to east. At 09:46 on the 5th August the ROV reached its most westerly survey position KP 95.429 and at this position the ROV was instructed to recover deck. Once the ROV was safely on deck the vessel commenced passage towards the Southern Cross cable route to commence the initial fishing gear transit survey.



The transit survey on Southern Cross was suspended to conduct an additional survey on the loop configuration at KP 8.720 on China - US Seg 7 route. At 14:58 on the 5th August the vessel reached the location and commenced the final survey operation on China-US Seg 7. The ROV acquired the cable at 16:05 and began tracking the cable east to a KP of 8.448. The ROV reached KP 8.448 at 17:03; at this position and time the survey was declared as complete. At 17:06 the ROV was instructed to recover to deck and at 17:12 the vessel secured the ROV to deck and commenced passage back to the Southern Cross cable route.

Throughout the survey areas of exposed cable and fishing gear/debris were logged and processed, this processed data generated burial reports/graphs which were presented every 24hours to the onboard representative. With data in hand the representative would be able to compare the data to previous data acquired from 2010 and earlier Survey operations.

Accurate daily events and timings can be found in Section 7.0 – Vessel & ROV diary of events

Survey information can be found in Section 5.0 – China – US Seg 7 Survey Results

On completion of the Japan US Seg 9 survey, Manchester terminal station removed the tone from the cable systems and at 1025L on the 31st August 2015 the vessel commenced passage to San Francisco for clearing out of US waters and to take bunkers/provisions and disembark the customer representative.

Arriving in anchorage 9, San Francisco at 2105L the same evening and bunkering commenced at daybreak the following morning. With the crew changes, bunkering and provisioning completed the vessel departed at 2047L on the 2nd September 2015 for Victoria, Canada.

Acting on PMs instructions, at 1345L on the 5th September 2015, the vessel deviated to another operation and reporting was suspended. Reporting re-commenced on the 8th September 2015 at 2200L when the vessel re-joined the planned passage route. Passage was completed with the vessel alongside at 0648L on the 9th September 2015 and reporting ceased completely.



3.4 Summary of Key Events

DATE	EVENT
7 th July 2015	Departed Victoria, Canada for passage to San Francisco
8 th July 2015	Interrupted Passage for ROV trials, resumed passage
10 th July 2015	Completed passage to San Francisco, Cleared US custom and coastguard inspection. Embarked Cable Representative, Marine Mammal Observers and GMSL Project Manager. Commenced passage to AAG Seg 5 Survey route
11 th July 2015	Completed passage to AAG Seg 5 cable route 25Hz Tone application requested. Commenced Survey and ROV calibrations
12 th July 2015	Completed Survey and ROV calibrations Commenced AAG Seg 5 survey
19 th July 2015	AAG survey suspended Commenced Japan – US Seg 1 Survey operations
20 th July 2015	Japan – US Seg 1 Survey suspended Recommenced AAG Seg 5 Survey
21 st July 2015	AAG Survey operations completed Disembark 2 x MMO and GMSL PM Commenced Japan – US Seg 7 ROV survey Operations
28 th July	Completed Japan – US Seg 1 Survey Operations Commenced China – US Seg 7 Completed Transit to Cable route Commenced Survey Transit
29 th July	Completed Survey transit Commenced ROV Survey Operations ROV downtime Recommenced survey operations
30 th July	ROV maintenance
2 nd August	ROV maintenance
4 th August	ROV downtime ROV maintenance
5 th August	Commenced Southern Cross Seg D Transit Commenced Southern Cross Seg D Survey Transit Suspended Southern Cross Seg D Survey Transit Completed China US Seg 7 Survey Operations
31 st August 2015	Commence passage to San Francisco 1025L Arrive San Francisco
1 st September 2015	Commence Bunkering and crew changes
2 nd September 2015	Commence passage to Victoria
5 th September 2015	Deviation to attend Endeavour Ridge CWG
8 th September 2015	Resume passage to Victoria Canada
9 th September 2015	Arrival in Victoria - reporting ceases

3.5 Senior Personnel

Captain	John Tollady
Chief Cable Engineer	David Davies
Lead Surveyor	Steven Smith
Surveyor	John Collins, Neal Ashcroft
Navigational Officer	Lyn Ramacula
Chief Systems Engineer (Subsea)	Gregory Wills



3.6 Customer Representatives

Company	Name	Date Joined	Date Departed
Worldwide Marine Engineering Services on behalf of AT&T & Verizon	Kevin Chin	10 th July 2015	2 nd September 2015



4.0 Plan of Work

The initial Plan of Work is presented below for the whole of the California Post Installation Burial Verification Survey:

Operational Plan of Work					Issue 8 Commander/SSE/COE J Tollady / G Wilfs / D.Davies
All times are local					
No	Action	Commence	Data entry Duration (Hours)	Complete	
1	Alongside Victoria			07/07/2015 08:06	
2	Pilotage out	07/07/2015 08:06	0.9	07/07/2015 09:00	
3	Passage to San Francisco	07/07/2015 09:00	22.8	08/07/2015 07:48	
4	Interrupt passage for ROV test dive	08/07/2015 07:48	5.0	08/07/2015 12:48	
5	Resume passage to San Francisco	08/07/2015 12:48	44.4	10/07/2015 09:12	
6	Pilotage in, clear ship into US.	10/07/2015 09:12	11.8	10/07/2015 21:00	By boat; customer reps join. Clearance completed at anchor within SF; USCG may decide to inspect vessel = 12 hour(?) delay
7	Pilotage out	10/07/2015 21:00	1.8	10/07/2015 22:48	
8	Transit to inshore end of AAG Seg 5	10/07/2015 22:48	18.2	11/07/2015 17:00	
9	Conduct HPR Calibration in 100m of water	11/07/2015 17:00	30.8	12/07/2015 23:48	
10	Survey AAG out from KP4111 to 1850m contour	12/07/2015 23:48	165.4	19/07/2015 21:10	Approx 89km Survey of original 95km. Includes locating the cable
11	Recover ROV and complete passage to Japan - US Seg 1	19/07/2015 21:10	1.6	19/07/2015 22:48	1 hour in 24 (cumulative)
12	Transit Japan-US Seg 1 checking for fishing gear	19/07/2015 22:48	5.3	20/07/2015 04:06	
13	Interrupt Japan - US Transit Survey for AAG Survey and transit	20/07/2015 04:06	2.7	20/07/2015 06:48	0.300km Survey area
	Recommence Japan - US Transit Survey	20/07/2015 06:48	3.8	20/07/2015 10:36	
13	Relocate to AAG Seg 5 15m contour line	20/07/2015 10:36	0.2	20/07/2015 10:48	Remaining 7km survey of original 95km plus additional areas
14	Survey AAG out from 15m contour to KP 4111 + additional areas	20/07/2015 10:48	18.3	21/07/2015 05:07	
15	Recover ROV to deck and relocate to Japan-US Seg 1	21/07/2015 05:07	2.5	21/07/2015 07:36	
16	Survey Japan-US Seg 1 shore end to 1850m	21/07/2015 07:36	177.0	28/07/2015 16:36	96km
17	Contingency for ROV maintenance time	28/07/2015 16:36	7.0	28/07/2015 23:36	
18	Recover ROV to deck and transit to Ch-US Seg 7 shore end checking for fishing gear	28/07/2015 23:36	7.0	29/07/2015 06:36	
19	Interrupt China - US Seg 7 transit Survey for completion of Japan - US Seg 1 Survey (200m Skip)	29/07/2015 06:36	4.0	29/07/2015 10:36	Fishing gear skip
20	Resume China - US Seg 7 Transit Survey to inshore end	29/07/2015 10:36	5.0	29/07/2015 15:36	
21	Survey Ch-US Seg 7 inshore to 1850 contour	29/07/2015 15:36	157.0	05/08/2015 04:36	94km
22	Contingency for ROV maintenance time	05/08/2015 04:36	7.0	05/08/2015 11:36	1 hour in 24 (cumulative)
23	Recover ROV to deck and transit to SX Seg D checking for fishing gear	05/08/2015 11:36	12.0	05/08/2015 23:36	
24	Survey SX Seg D 15m to cut off point for Port Call	05/08/2015 23:36	15.4	06/08/2015 15:00	Survey approx 14km of SX before transit to San Francisco
25	Transit to San Francisco	06/08/2015 15:00	16.0	07/08/2015 07:00	
26	Pilotage in	07/08/2015 07:00	2.0	07/08/2015 09:00	
27	Load Fuel, Water, Stores, Crew reliefs.	07/08/2015 09:00	24.0	08/08/2015 09:00	At Anchor
28	Pilotage out	08/08/2015 09:00	2.0	08/08/2015 11:00	
29	Transit to Morro Bay / SX Seg D Break off point	08/08/2015 11:00	16.0	09/08/2015 03:00	
30	Resume SX Survey Break off point to 1850m contour	09/08/2015 03:00	138.3	14/08/2015 21:18	Survey remaining 89km
31	Recover ROV to deck and commence Transit survey of China-US seg E checking for fishing gear	14/08/2015 21:18	12.0	15/08/2015 09:18	
32	Survey China - US Seg E 15m to 1850m	15/08/2015 09:18	167.0	22/08/2015 08:18	100km
33	Contingency for ROV maintenance time	22/08/2015 08:18	7.0	22/08/2015 15:18	1 hour in 24 (cumulative)
34	Recover ROV to deck and transit survey to shore end Japan-US seg 9 checking for fishing gear	22/08/2015 15:18	12.0	23/08/2015 03:18	
35	Survey Japan - US seg 9 15m to 1850m	23/08/2015 03:18	159.0	29/08/2015 18:18	95km
36	Contingency for ROV maintenance time	29/08/2015 18:18	7.0	30/08/2015 01:18	1 hour in 24 (cumulative)
37	Transit to Pt Arena	30/08/2015 01:18	22	30/08/2015 23:18	
38	Transit Survey Japan - US Seg 8	30/08/2015 23:18	8	31/08/2015 07:18	
39	Set up ship in DP at inshore end of Japan - US Seg 8	31/08/2015 07:18	2	31/08/2015 09:18	
40	Launch ROV. Survey Inspection to 1850m contour	31/08/2015 09:18	112	05/09/2015 01:18	67km
41	Contingency for ROV maintenance time	05/09/2015 01:18	5	05/09/2015 06:18	1 hour in 24 (cumulative)
42	Recover ROV to deck and transit survey Japan-US seg 9 towards shore end checking for fishing gear	05/09/2015 06:18	8	05/09/2015 14:18	
43	Launch ROV. Survey Japan - US Seg 9	05/09/2015 14:18	63	08/09/2015 05:18	37km
44	Contingency for ROV maintenance time	08/09/2015 05:18	2.5	08/09/2015 07:48	1 hour in 24 (cumulative)
45	Recover ROV. Transit to San Francisco	08/09/2015 07:48	8.0	08/09/2015 15:48	
46	Pilotage in	08/09/2015 15:48	2.0	08/09/2015 17:48	
47	Personnel transfers. Load Fuel.	08/09/2015 17:48	12.0	09/09/2015 05:48	At anchor; clear out of US
48	Pilotage out	09/09/2015 05:48	2.0	09/09/2015 07:48	
49	Transit to Victoria	09/09/2015 07:48	63.0	11/09/2015 22:48	
50	Pilotage inbound	11/09/2015 22:48	1.0	11/09/2015 23:48	
51	Resume NAZ standby	11/09/2015 23:48			



4.1 Operational Plan of Work

Operational Plan of Work					Commander/SSE/CCE
All times are local					J Tollady / G Wils / D.Davies
No	Action	Commence	Data entry		
			Duration (Hours)	Complete	
1	Alongside Victoria			07/07/2015 08:06	
2	Pilotage out	07/07/2015 08:06	0.9	07/07/2015 09:00	
3	Passage to San Francisco	07/07/2015 09:00	22.8	08/07/2015 07:48	
4	Interrupt passage for ROV test dive	08/07/2015 07:48	5.0	08/07/2015 12:48	
5	Resume passage to San Francisco	08/07/2015 12:48	44.4	10/07/2015 09:12	
6	Pilotage in, clear ship into US.	10/07/2015 09:12	11.8	10/07/2015 21:00	By boat; customer reps join. Clearance completed at anchor within SF; USCG may decide to inspect vessel = 12 hour(?) delay
7	Pilotage out	10/07/2015 21:00	1.8	10/07/2015 22:48	
8	Transit to inshore end of AAG Seg 5	10/07/2015 22:48	18.2	11/07/2015 17:00	
9	Conduct HPR Calibration in 100m of water	11/07/2015 17:00	30.8	12/07/2015 23:48	
10	Survey AAG out from KP4111 to 1850m contour	12/07/2015 23:48	165.4	19/07/2015 21:10	Approx 88km Survey of original 95km. Includes locating the cable and repeatability tests.
11	Recover ROV and complete passage to Japan - US Seg 1	19/07/2015 21:10	1.6	19/07/2015 22:48	
12	Transit Japan-US Seg 1 checking for fishing gear	19/07/2015 22:48	5.3	20/07/2015 04:06	
13	Interrupt Japan - US Transit Survey for AAG Survey and transit	20/07/2015 04:06	2.7	20/07/2015 06:48	0.300km Survey area
14	Recommence Japan - US Transit Survey	20/07/2015 06:48	3.8	20/07/2015 10:36	
15	Relocate to AAG Seg 5 15m contour line	20/07/2015 10:36	0.2	20/07/2015 10:48	Remaining 7km survey of original 95km plus additional areas
16	Survey AAG out from 15m contour to KP 4111 + additional areas	20/07/2015 10:48	18.3	21/07/2015 05:07	
17	Recover ROV to deck and relocate to Japan-US Seg 1	21/07/2015 05:07	2.5	21/07/2015 07:36	
18	Survey Japan-US Seg 1 shore end to 1850m	21/07/2015 07:36	176.5	28/07/2015 16:06	96km - Commence ROV Survey Operations
19	Recover ROV to deck and transit to Ch-US Seg 7 shore end checking for fishing gear	28/07/2015 16:06	5.9	28/07/2015 21:24	Start of China - US Seg 7 Survey Report
20	Interrupt China - US Seg 7 transit Survey for completion of Japan - US Seg 1 Survey (200m Sklp)	28/07/2015 21:24	1.7	28/07/2015 23:06	
21	Resume China - US Seg 7 Transit Survey to inshore end	28/07/2015 23:06	3.2	29/07/2015 02:19	
22	Survey Ch-US Seg 7 inshore to 1850 contour	29/07/2015 02:19	169.5	05/08/2015 03:48	94km
23	Contingency for ROV maintenance time	05/08/2015 03:48	7.0	05/08/2015 10:48	1 hour in 24 (cumulative)
24	Recover ROV to deck and transit to SX Seg D checking for fishing gear	05/08/2015 10:48	4.1	05/08/2015 14:54	
25	Interrupt SX Transit Survey for completion of China - US Seg 7 Survey (200m Sklp)	05/08/2015 14:54	2.3	05/08/2015 17:12	End of China - US Seg 7 Survey Report
26	Resume SX Transit Survey to Inshore end	05/08/2015 17:12	0.8	05/08/2015 18:00	
27	Survey SX Seg D 15m to cut off point for Port Call	05/08/2015 18:00	21.0	06/08/2015 15:00	Survey approx 17km of SX before transit to San Francisco
28	Transit to San Francisco	06/08/2015 15:00	16.0	07/08/2015 07:00	
29	Pilotage In	07/08/2015 07:00	2.0	07/08/2015 09:00	
30	Load Fuel, Water, Stores, Crew reliefs.	07/08/2015 09:00	24.0	08/08/2015 09:00	At Anchor
31	Pilotage out	08/08/2015 09:00	2.0	08/08/2015 11:00	
32	Transit to Morro Bay / SX Seg D Break off point	08/08/2015 11:00	16.0	09/08/2015 03:00	
33	Resume SX Survey Break off point to 1850m contour	09/08/2015 03:00	138.3	14/08/2015 21:18	Survey remaining 83km
34	Recover ROV to deck and commence Transit survey of China-US seg E checking for fishing gear	14/08/2015 21:18	12.0	15/08/2015 09:18	
35	Survey China - US Seg E 15m to 1850m	15/08/2015 09:18	167.0	22/08/2015 08:18	100km
36	Contingency for ROV maintenance time	22/08/2015 08:18	7.0	22/08/2015 15:18	1 hour in 24 (cumulative)
37	Recover ROV to deck and transit survey to shore end Japan-US seg 9 checking for fishing gear	22/08/2015 15:18	12.0	23/08/2015 03:18	
38	Survey Japan - US seg 9 15m to 1850m	23/08/2015 03:18	159.0	29/08/2015 18:18	95km
39	Contingency for ROV maintenance time	29/08/2015 18:18	7.0	30/08/2015 01:18	1 hour in 24 (cumulative)
40	Transit to Pt Arena	30/08/2015 01:18	22	30/08/2015 23:18	
41	Transit Survey Japan - US Seg 8	30/08/2015 23:18	8	31/08/2015 07:18	
42	Set up ship in DP at inshore end of Japan - US Seg 8	31/08/2015 07:18	2	31/08/2015 09:18	
43	Launch ROV. Survey Inspection to 1850m contour	31/08/2015 09:18	112	05/09/2015 01:18	67km
44	Contingency for ROV maintenance time	05/09/2015 01:18	5	05/09/2015 06:18	1 hour in 24 (cumulative)
45	Recover ROV to deck and transit survey Japan-US seg 9 towards shore end checking for fishing gear	05/09/2015 06:18	8	05/09/2015 14:18	
46	Launch ROV. Survey Japan - US Seg 9	05/09/2015 14:18	63	08/09/2015 05:18	37km
47	Contingency for ROV maintenance time	08/09/2015 05:18	2.5	08/09/2015 07:48	1 hour in 24 (cumulative)
48	Recover ROV. Transit to San Francisco	08/09/2015 07:48	8.0	08/09/2015 15:48	
49	Pilotage In	08/09/2015 15:48	2.0	08/09/2015 17:48	
50	Personnel transfers. Load Fuel.	08/09/2015 17:48	12.0	09/09/2015 05:48	At anchor; clear out of US
51	Pilotage out	09/09/2015 05:48	2.0	09/09/2015 07:48	
52	Transit to Victoria	09/09/2015 07:48	63.0	11/09/2015 22:48	
53	Pilotage Inbound	11/09/2015 22:48	1.0	11/09/2015 23:48	
54	Resume NAZ standby	11/09/2015 23:48			



4.2 Method of Procedure

No	Action	Vessel actions	San Luis Obispo	Morro Bay	San Luis Obispo	Morro Bay	San Luis Obispo	Morro Bay	Manchester	Manchester
1	Aboardside Victoria									
2	Pilots out									
3	Passage to San Francisco									
4	Passage to San Francisco									
5	Resume passage to San Francisco									
6	Pilots in, clear ship into US									
7	Pilots out									
8	Begin test of AAG Seg 5									
9	Conduct HPR Calibration in 180° of water									
10	Survey AAG out from KP-4111 to 1850m contour									
11	Recover ROV and complete passage to Japan - US Seg 1									
12	Transit to Japan-US Seg 1 checking for fishing gear									
13	Transit to Japan-US Seg 1 checking for fishing gear									
14	Resume survey Japan - US Transit Survey and Transit									
15	Relocate to AAG Seg 5 15m contour line									
16	Survey AAG out from 15m contour to KP 4111 = additional areas									
17	Recover ROV to deck and relocate to Japan-US Seg 1	Send PSM remove 17Hz tone, Send PSM for 17Hz tone	Remove 17Hz tone							
18	Survey Japan-US Seg 1 shore end to 1850m									
19	Contingency for ROV maintenance time									
20	Recover ROV to deck and transit to CH-US Seg 7 shore end checking for fishing gear									
21	Interrupt China - US Seg 7 transit Survey for completion of Japan - US Seg 1 Survey (200m Skp)									
22	Resume China - US Seg 7 Transit Survey to inshore end									
23	Survey CH-US Seg 7 inshore to 1850 contour									
24	Contingency for ROV maintenance time									
25	Recover ROV to deck and transit to SX Seg D checking for fishing gear									
26	Survey SX Seg D 15m to cut off point for Port Call									
27	Transit to San Francisco									
28	Pilots in									
29	Pilots out									
30	Water, Stems, Chew reliefs.									
31	Transit to Morro Bay / SX Seg D Break off point									
32	Resume SX Survey Break off point to 1850m contour									
33	Recover ROV to deck and commence Transit survey of China-US seg E checking for fishing gear									
34	Survey China - US Seg E 15m to 1850m									
35	Contingency for ROV maintenance time									
36	Recover ROV to deck and transit survey to shore end Japan-US seg 9 checking for fishing gear									
37	Survey Japan - US seg 9 15m to 1850m									
38	Contingency for ROV maintenance time									
39	Transit to Pt Arena									
40	Transit Survey Japan - US Seg 9									
41	Survey Japan - US Seg 9									
42	Launch ROV Survey Inspection to 1850m contour									
43	Contingency for ROV maintenance time									
44	Recover ROV to deck and transit survey Japan-US seg 9 towards shore end checking for fishing gear									
45	Launch ROV Survey Japan - US Seg 9									
46	Contingency for ROV maintenance time									
47	Recover ROV, Transit to San Francisco									
48	Pilots in									
49	Personal transfers, Load Fuel.									
50	Transit to Victoria									
51	Pilots inbound									
52	Resume NAZ standby									

5.0 Survey Results

5.1 China – US Seg 7 2015 Burial Verification Survey

This survey consisting of approximately 94.2km of buried cable was undertaken between the 29th July and 5th August 2015.

For convenience of the reporting below, the survey is split into approximately 10km sites from the start of the survey at KP1.241.

A short description of each site in KP (not chronological) order follows:

Site 1: KP1.241 to KP11.241

The survey of this section of cable was conducted from KP3.818 heading inshore initially. Once the ROV had reached the bore pipe exit the vessel relocated to KP7.000 to survey inshore again towards KP3.818. This was then followed by another transit to KP7.000 to continue the survey offshore. The survey was conducted in this manner due to concerns about the condition of the cable on a rock outcrop at KP3.679.

The seabed was comprised of soft sandy patches interspersed with rocky outcrops. One significant outcrop worthy of note was between KP3.542 and KP3.815.

At the bore pipe exit the seabed appears to be soft sand with areas of pebbles. At this location the water depth of 13m prevented the ROV being picked up consistently on the vessels HPR system so the survey here was with TSS350 and visual only. The cable is generally buried to 40 to 50cm apart from at cable crossings where the burial shallows to 30cm. The CH-US Seg 7 cable crosses J-US Seg 1 at KP2.142 and is crossed by AAG Seg 5 at KP3.911, none of the cables were observed in the area so all are considered to be buried.

A short length of abandoned rope was spotted at KP3.629.

In an area of large rock outcroppings at KP3.679 the cable was seen to be damaged. Video and still photographs of the damage were taken and appear to show broken and splayed armour wiring. The damage appeared to be of some age as it was also covered in marine growth. Once clear of the rock outcrop the seabed returned to sandy silt.

Continuing further offshore the cable began a series of S-bends at KP8.492, these continued until KP8.701. Within this section of S-bends possible cable loops were detected at two locations, KP8.507 and KP8.553 as noted in previous surveys. The cable was not seen but is close to the seabed surface in both locations.

All areas of cable exposure are listed in the 'Points of Interest' table that follows this summary.



Cable suspended over rock KP3.613



Abandoned rope KP3.629



Cable damage on rock outcrop KP3.679



Cable suspended over rock KP3.680



End of rock outcrop Kp3.685

Site 2: KP11.241 to KP21.241

Far fewer rocks were evident within this area and the seabed was mostly soft sand waves. Water depth steadily increased through the area from 95m. to 250m. The burial depth recorded ranged between 50 and 75cm up to KP15.500. At this point the cable went deeper into burial and averaged approximately 130cm. This would agree with the system RPL which has KP15.482 as a plough launch position.

There was little in the way of debris to report within this area, the only items of note being two plastic buckets at KP14.440 and KP16.054.



Plastic bucket at KP14.440

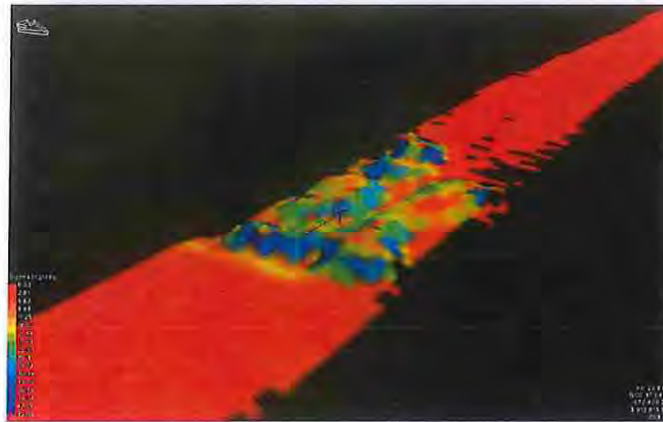


Plastic bucket at KP16.054

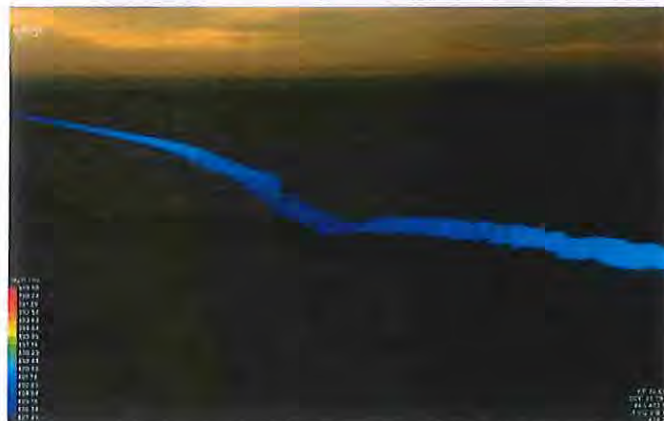
Site 3: KP21.241 to KP31.241

The seabed was largely flat and featureless sand/silt gently sloping offshore. Cable burial within the area started at approximately 125cm. and slowly increased to 140cm. at the end of the section. There were neither cable exposures nor items of debris noted within the area. The only seabed feature of note was when the ROV had to briefly come off the route to pass around a large rock or mud mound on the route at KP 23.650. This also coincided with a change in the seabed to a much softer, muddier type.

During post processing of the collected data a seabed depression was noted at KP30.665. This was also confirmed in the logged ROV vehicle pitch. With the information available to the vessel, on board personnel were unable to determine if this is a recent seabed feature. Cable burial depth in the vicinity of the depression was 140cm.



Mound of mud on cable route KP23.650



Seabed depression KP30.665

Site 4: KP31.241 to KP41.241

Intermittent soft, muddy patches continued into this area causing the ROV some difficulty negotiating and also reducing visibility on the seabed.

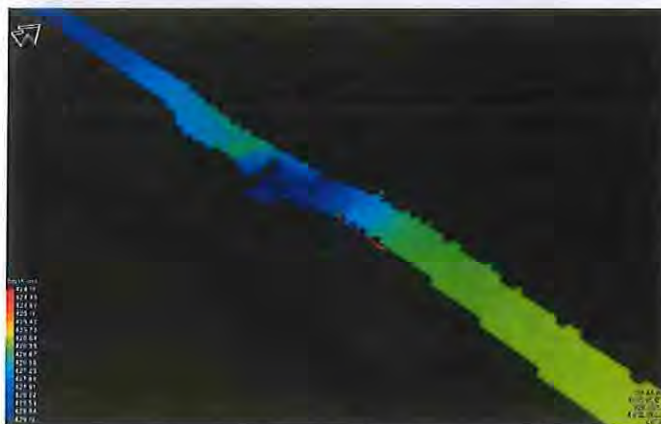
The water depth continued to steadily increase from 400m. to 530m. and the cable burial depth continued to increase from 140 to 160cm.

No items of debris were observed.

During post processing of the collected data two seabed depressions were noted at KP31.389 and KP32.590. This was also confirmed in the logged ROV vehicle pitch. With the information available to the vessel, on board personnel were unable to determine if these are recent seabed features.



Seabed depression KP31.389



Seabed depression KP32.590

Site 5: KP41.241 to KP51.241

This area was characterised by consistent plough burial up until the final half kilometre. The seabed was fine sand / silt with pebbles. Plough burial remained at 160cm up to KP50.700 where the plough had been recovered during the cable installation. Beyond KP55.700 the seabed became extremely soft with poor visibility. The burial depth at the plough up position initially reduced to the point that the cable was exposed before increasing to a depth of 75cm. The length of the cable exposure was approximately 6m. The water depth through the area was 530m to 750m.

Site 6: KP51.241 to KP61.241

The burial depth of the cable between plough up and plough down positions continued to average 75cm. The seabed remained extremely soft sand and silts as far as KP54.600 when it became much firmer and the visibility improved. No items of debris or natural obstructions were seen in the area. Water depth through this area gradually increased from 750m. to 920m.

Site 7: KP61.241 to KP71.241

The seabed within this area was characterised by very soft sandy silts. For much of the area a berm of plough spoil, pushed out by the plough during cable installation caused the ROV difficulty tracking the cable. The cable was tracked offset from the centre of the TSS350 display to prevent the port skid of the ROV getting caught up in the berm.

The cable burial depth throughout was fairly constant at approximately 125cm whilst the water depth steadily increased from 920m to 1015m.

There were no items of debris, obstacles or cable exposures to report.

Site 8: KP71.241 to KP81.241

Although this area of seabed continued as sandy / silts there was evidence of a harder underlying layer evidenced by the cable being visible on occasion within a shallow trench. The fact that the trench remains since installation indicates the lack of any seabed movement in the area. The presence of the shallow trench meant that debris began to appear on the cable route. At KP 71.548 there was a section of plastic sheeting, at KP73.359 the ROV passed close to a bundle (1m. x 2m) of rope and netting and at KP74.414 a further section of plastic sheeting was seen.

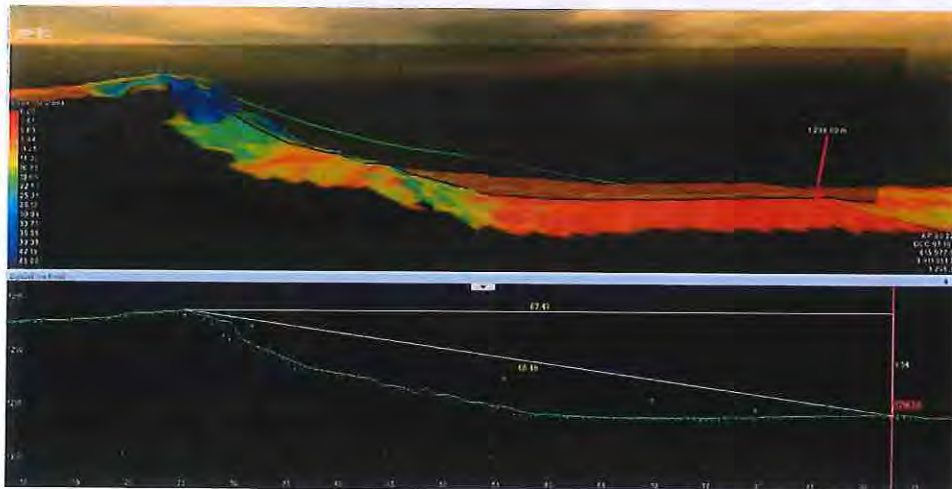
The cable was observed to be exposed in several locations as listed in the 'Points of Interest' table below. At these exposures the cable was mostly seen to be laid in the shallow trench however there were some suspensions on the route. Notable amongst the suspensions was when the cable was laid over a rock ridge at KP80.307, this suspension being approximately 58m in length and 4m high at the ridge, and also another similar suspension at KP81.015 measuring 68m long with 10m. height increase at the touchdown point.



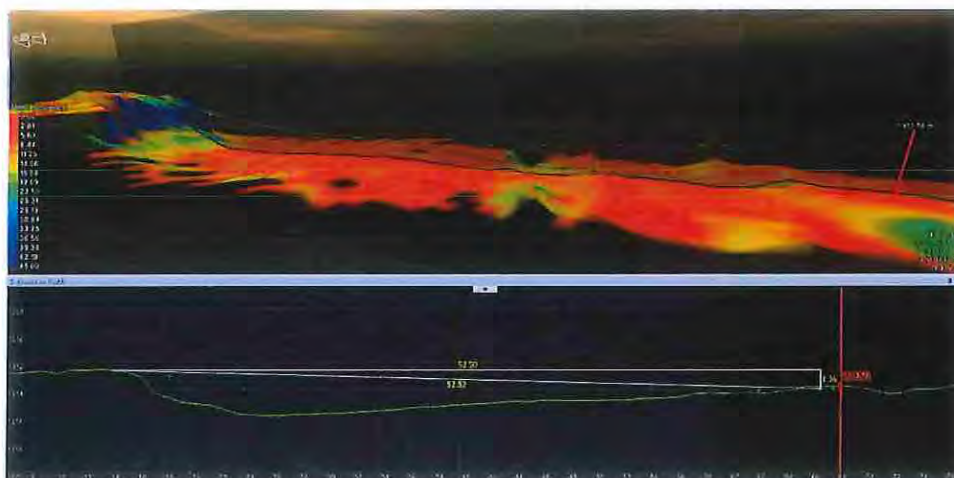
Rope and nets at KP73.359



Plastic sheeting KP74.414



Suspension at rock ridge KP80.307



Suspension at rock ridge KP81.015

Site 9: KP81.241 to KP91.241

As the cable route progressed into site 9 the seabed became much firmer and the incidences of rocky outcrops increased. This meant that cable burial reduced and there were further cable exposures and suspensions which are listed within the 'Points of Interest' table below. Notable amongst the suspensions are where the cable passes over a series of three rocky ridges at KP90.430, KP90.650 and KP90.765. These suspensions are depicted below using modelling software.

The seabed continued to indicate a firm lower layer with a veneer of soft sandy silt up until KP 85.000 when burial increased to 60cm, without any further cable exposures within the area. Water depth through this area gradually increased from 1320m to 1680m.

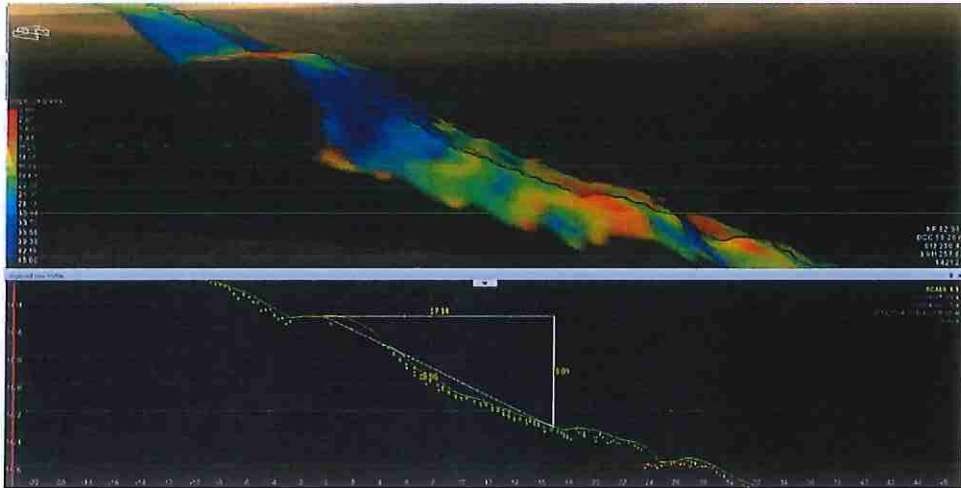
Very little in the way of debris was discovered in the area, the only items being a drinks can at KP81.727 and bucket underneath the cable at KP82.837. There was a length of hose or cable at KP82.171 and also a fishing or cargo net was also discovered at KP89.825.



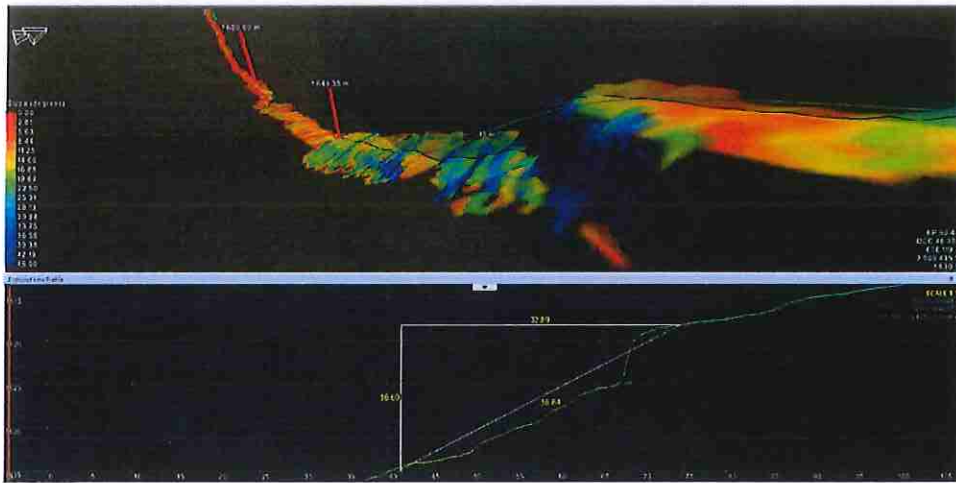
Hose / cable at KP82.171



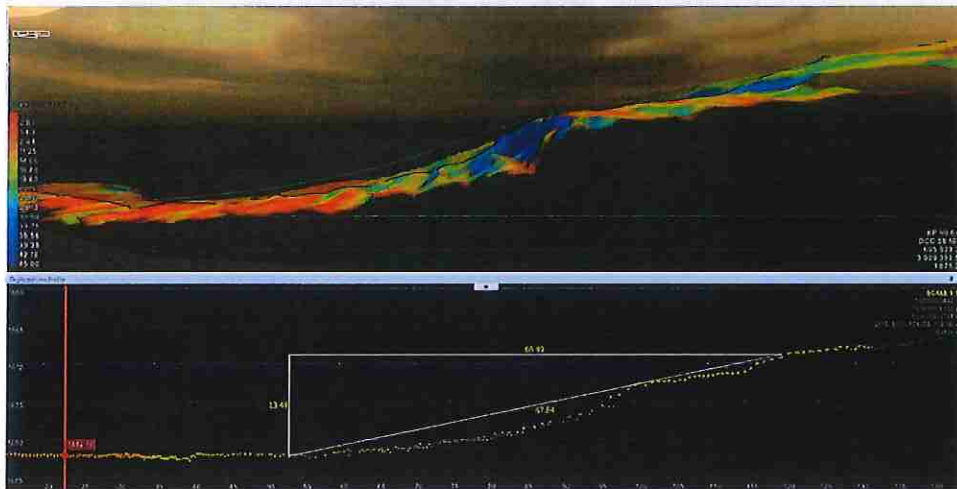
Fishing / cargo net at KP89.825



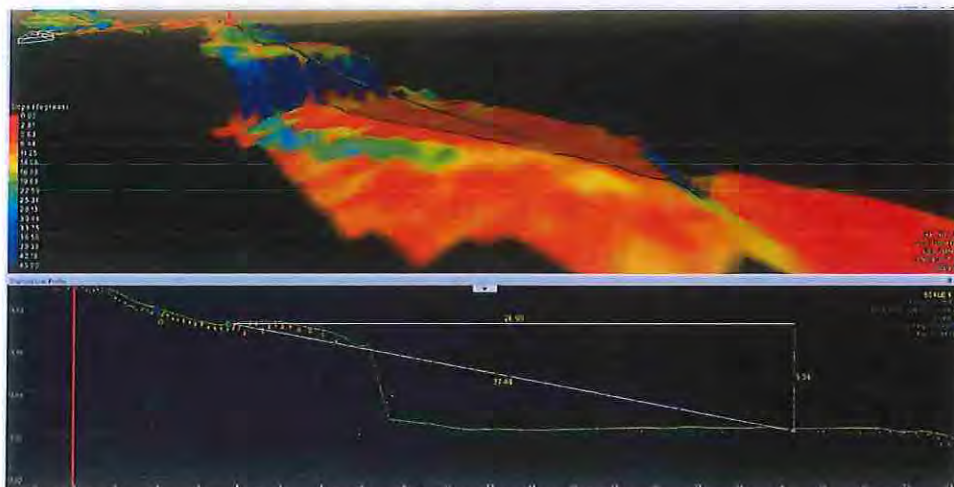
Suspension at rock ridge KP82.990



Suspension at rock ridge KP90.430



Suspension at rock ridge KP90.650



Suspension at rock ridge KP90.765

Sites 10 KP91.241 to KP95.434

Heading into the final four kilometres of the survey the cable began to describe S-bends on the seabed from KP91.562. These S-bends continue all the way to the end point of the survey. The burial depth of the cable gradually reduces from 50cm to being exposed on seabed. All observed cable exposures are listed within the 'Points of Interest' table below.

The seabed appeared to consist of a soft sandy covering over a firmer layer below. The limit of the survey, at a water depth of 1850m., was reached at KP95.324, however the ROV continued up to KP95.434 to ensure the survey limit was exceeded. This was deemed to be the offshore survey completed and the vessel recovered the ROV to transit inshore to complete a 200m section at site 1 that had been skipped due difficulty in tracking the tone on the cable.



Extent of survey as per SOW 1850m.wd KP95.323



Extent of survey (actual) KP95.432

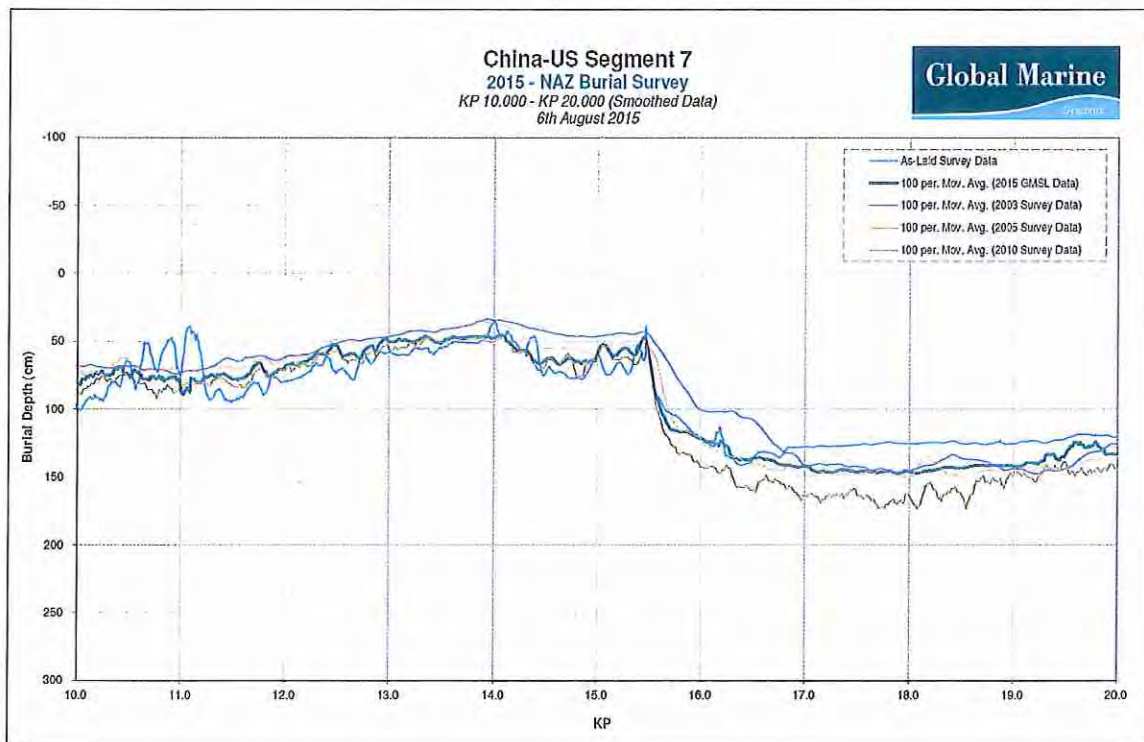
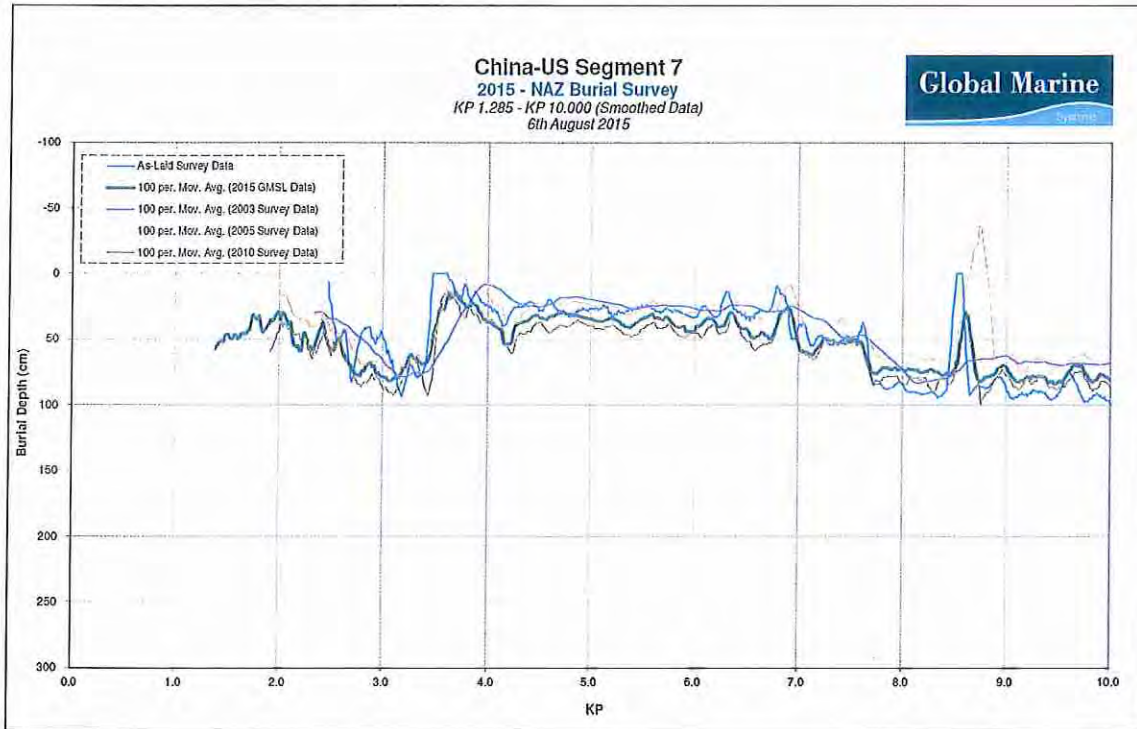
5.2 Points of Interest:

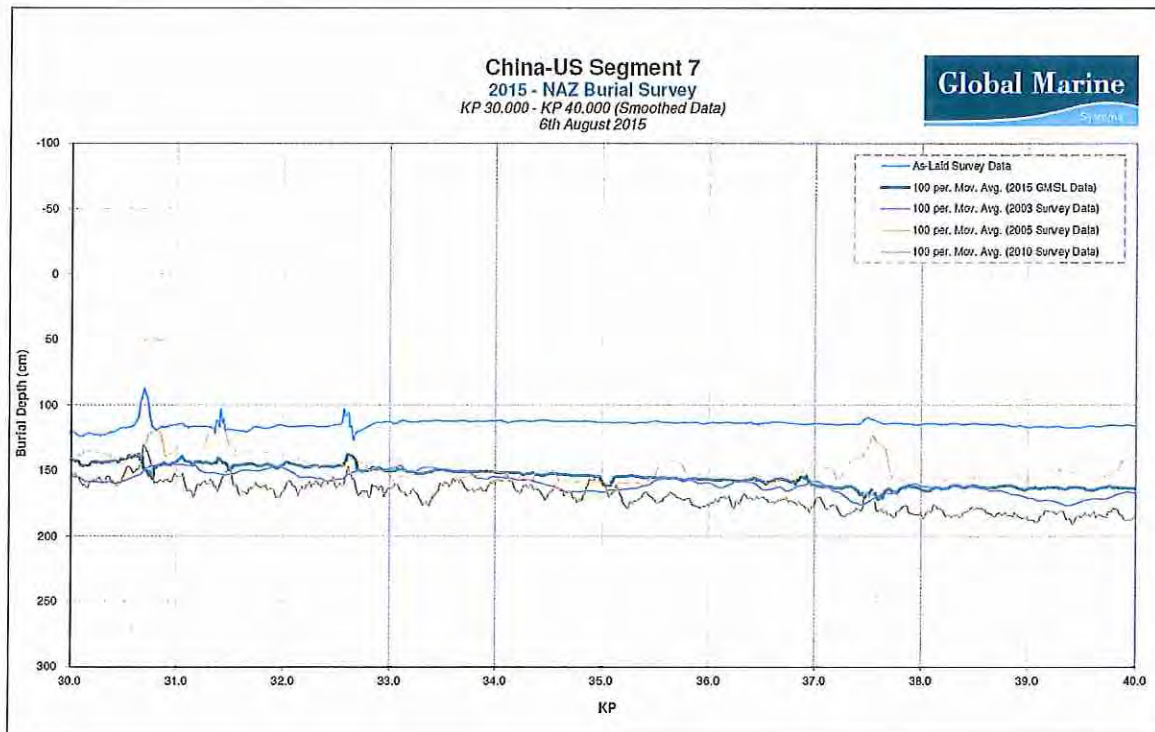
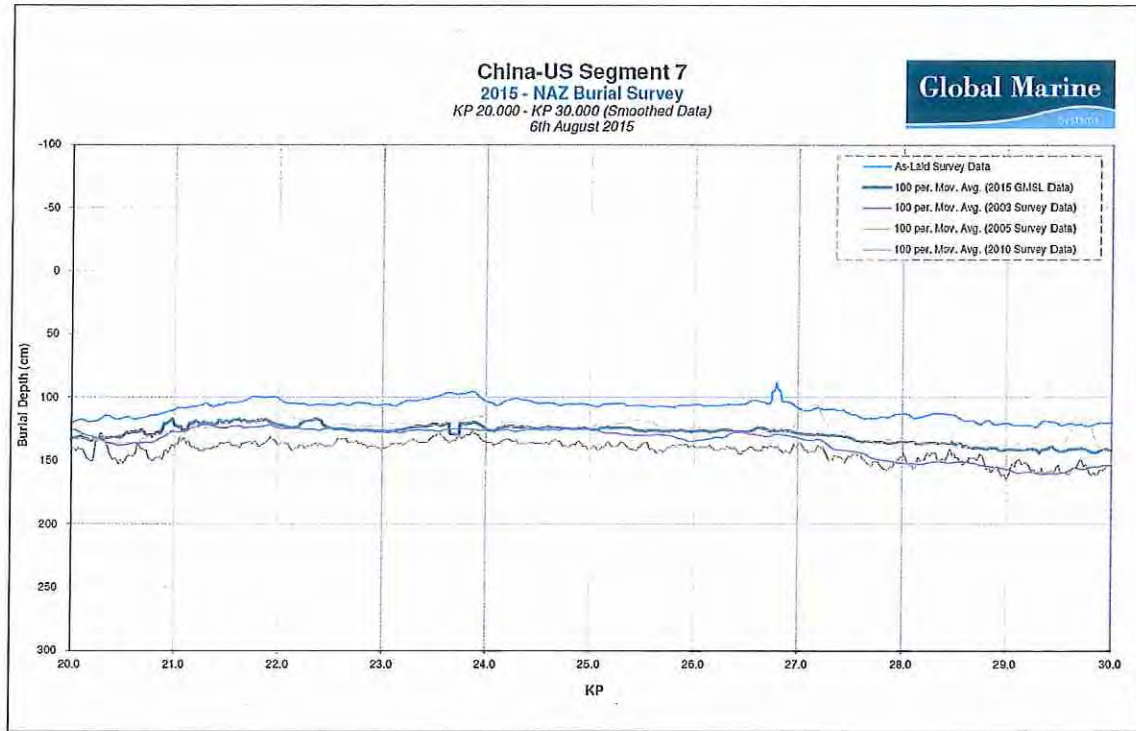
Item	From KP	To KP	Comment
For note:	1.241		Inshore extent of visual survey.
For note:	1.272		Inshore extent of survey data (ROV acquired on HPR).
Exposed Cable	1.738	1.895	Rocky seabed.
Exposed Cable	1.929	1.988	Rocky seabed.
Cable Suspended	1.952	1.965	Suspension over rocks
Exposed Cable	2.012	2.023	
Cable Crossing	2.132		AAG Seg 5. (Not seen).
Exposed Cable	2.401	2.416	
Cable Crossing	2.462		Approx. J-US Seg 1 (not seen)
Rock Outcrop	3.542	3.815	Cable exposed over very large rocks.
Suspension	3.613		Short suspension over rock.
Rope	3.629		Small length of abandoned rope.
Cable Damage	3.679		Damage to armour wires on cable. Broken wires and bird-caging noted.
S-Bends	8.492	8.701	Includes possible loops below.
Possible Loop	8.507		Cable not seen but close to seabed surface.
Possible Loop	8.553		Cable not seen but close to seabed surface.
Bucket	14.440		Plastic bucket on route.
Bucket	16.054		Plastic bucket on route.
Trawl Scar	21.220	7.525	
Seabed Depression	31.389		
Seabed Depression	32.590		
Soft Debris	71.548		Plastic sheeting.
Net / Rope	73.359		Bundle of net and rope (1m. x 2m.) 1m south of route.
Tin Can	73.481		Drinks can in trench.
Soft Debris	74.414		Plastic sheeting in trench (1m. x 2m.)
Exposed Cable	75.948	75.968	Small boulders in area.
Exposed cable	75.988	76.475	
Exposed Cable	78.280	78.297	
Exposed cable	78.447	78.450	
Exposed Cable	79.340	79.408	
Exposed Cable	79.695	79.698	
Exposed Cable	80.089	80.119	
Exposed Cable	80.137	80.497	Cable exposed over rock outcrop. Includes suspension below.
Suspension	80.249	80.307	Suspended on rock ridge.
Exposed Cable	80.598	80.756	To the South of cable route
Exposed Cable	80.766	80.839	

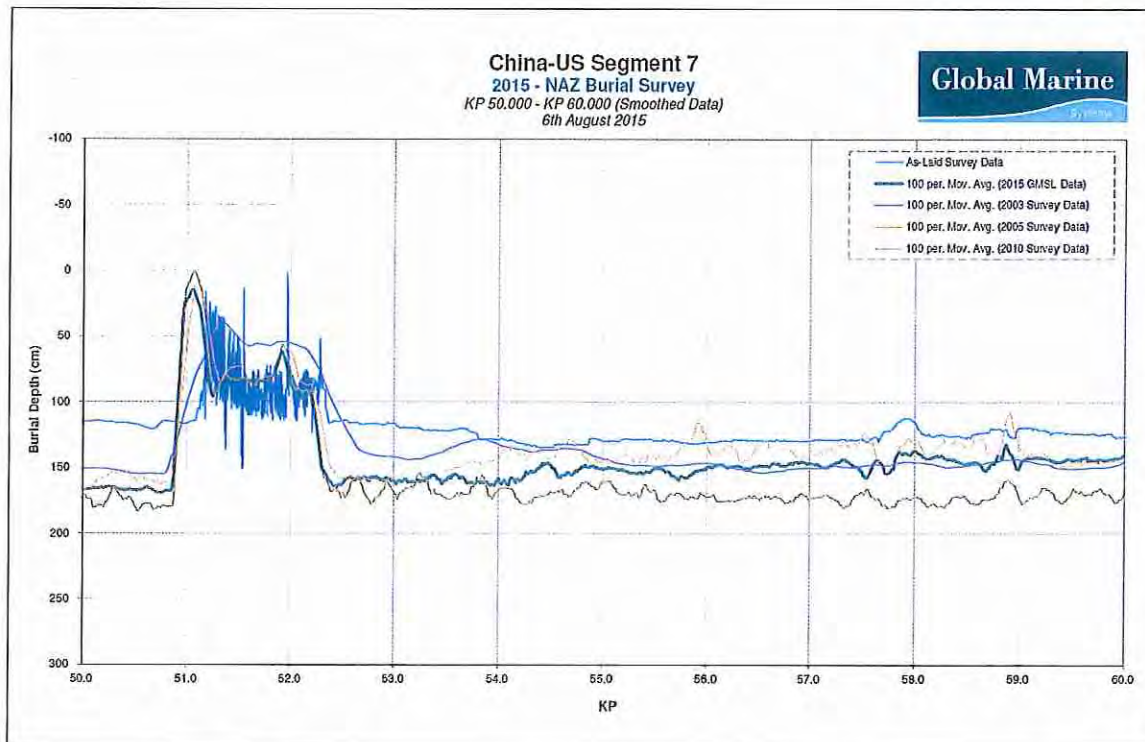
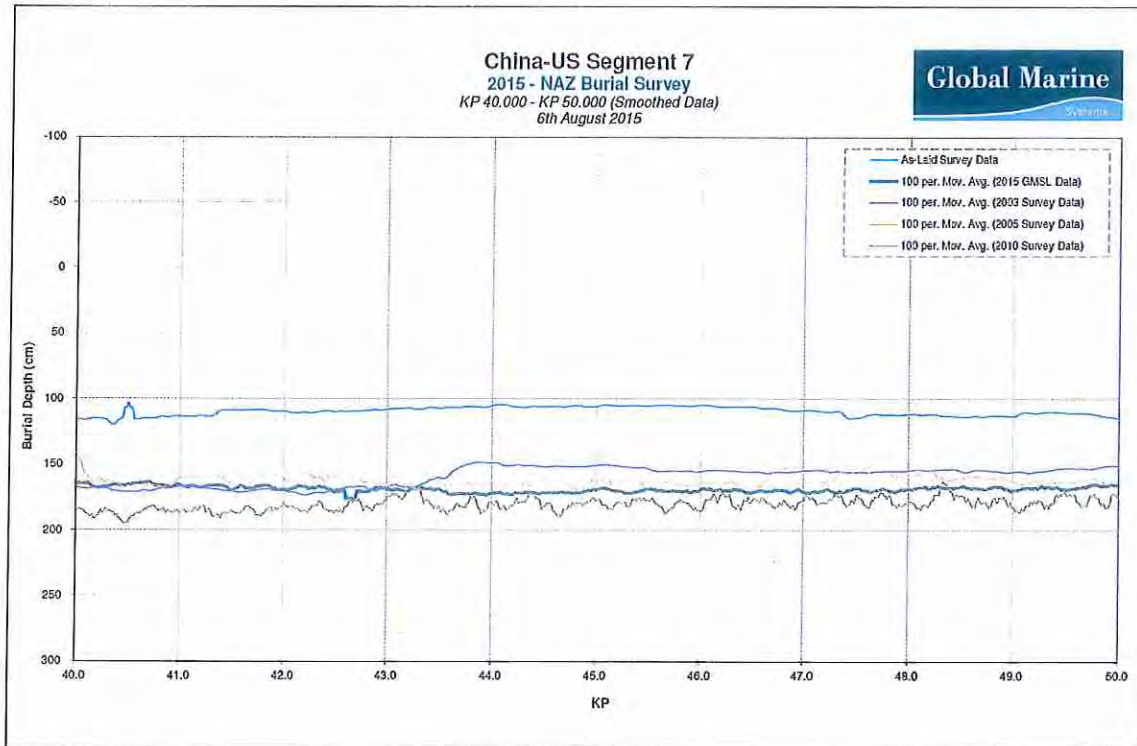


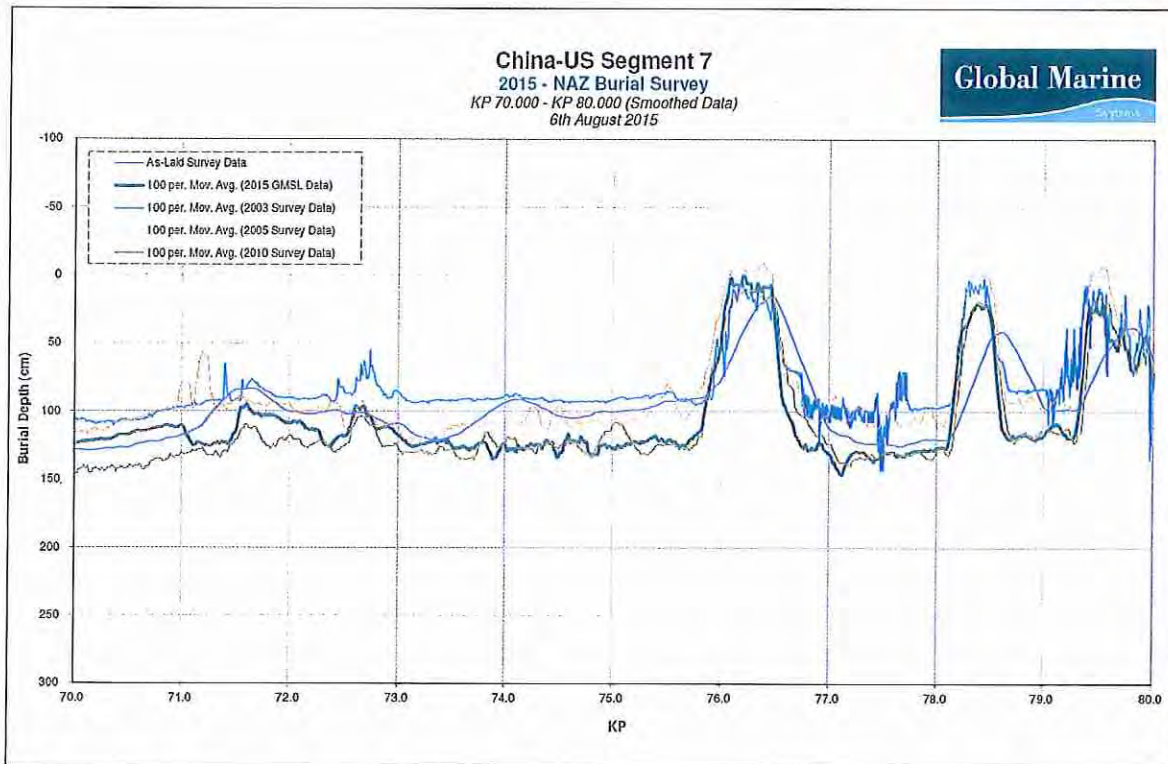
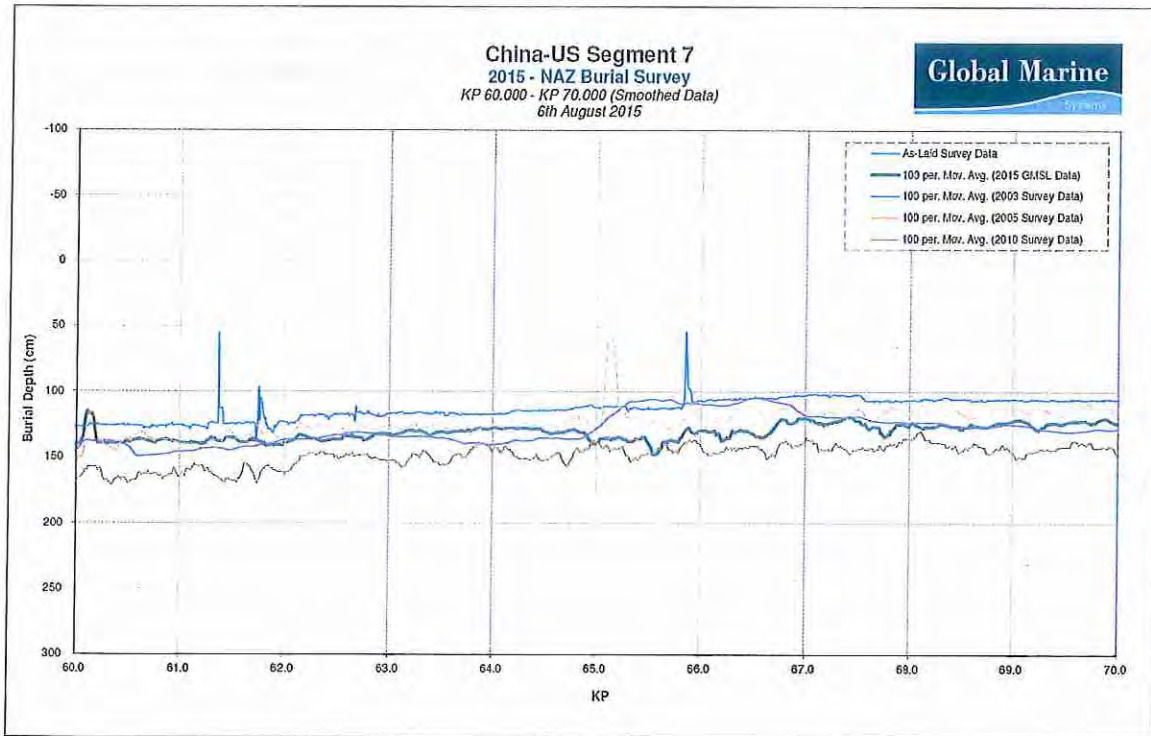
Item	From KP	To KP	Comment
Exposed Cable	80.857	80.896	
Exposed Cable	80.915	81.256	Cable exposed over rock outcrop. Includes suspension below.
Suspension	80.959	81.015	
Exposed Cable	81.269	81.513	
Exposed Cable	81.603	81.617	
Exposed Cable	81.634	81.938	
Tin Can	81.727		Tin can touching cable.
Exposed Cable	82.139	82.346	
Exposed Cable	82.351	82.360	
Exposed Cable	82.373	82.411	
Exposed Cable	82.450	82.360	Intermittent boulder fields and suspensions over rock outcrops.
Suspension	82.918	82.995	Cable suspended on rock ridge
Exposed Cable	82.373	82.411	
Exposed Cable	82.450	82.709	
Bucket	82.837		Plastic bucket under cable.
Exposed Cable	82.881	82.993	Includes suspension below.
Suspension	82.918	82.993	
Exposed Cable	83.419	83.572	
Exposed Cable	84.208	84.487	
Exposed Cable	84.753	84.989	
Net	87.188		Fishing net on cable route.
Net	89.825		Fishing / cargo net in trench.
Exposed Cable	90.334	90.337	
Suspension	90.430	91.067	Intermittent suspensions over rocky ridges.
S-Bends	91.562	To end of survey	
Possible Loop	91.669		
Exposed Cable	92.468	92.479	
Plastic Sheet	93.288		Plastic sheet laid on cable route.
Exposed Cable	94.507	To end of survey	
1850m Contour	95.323		Contracted end of survey.
End Survey	95.434		Actual end of survey.

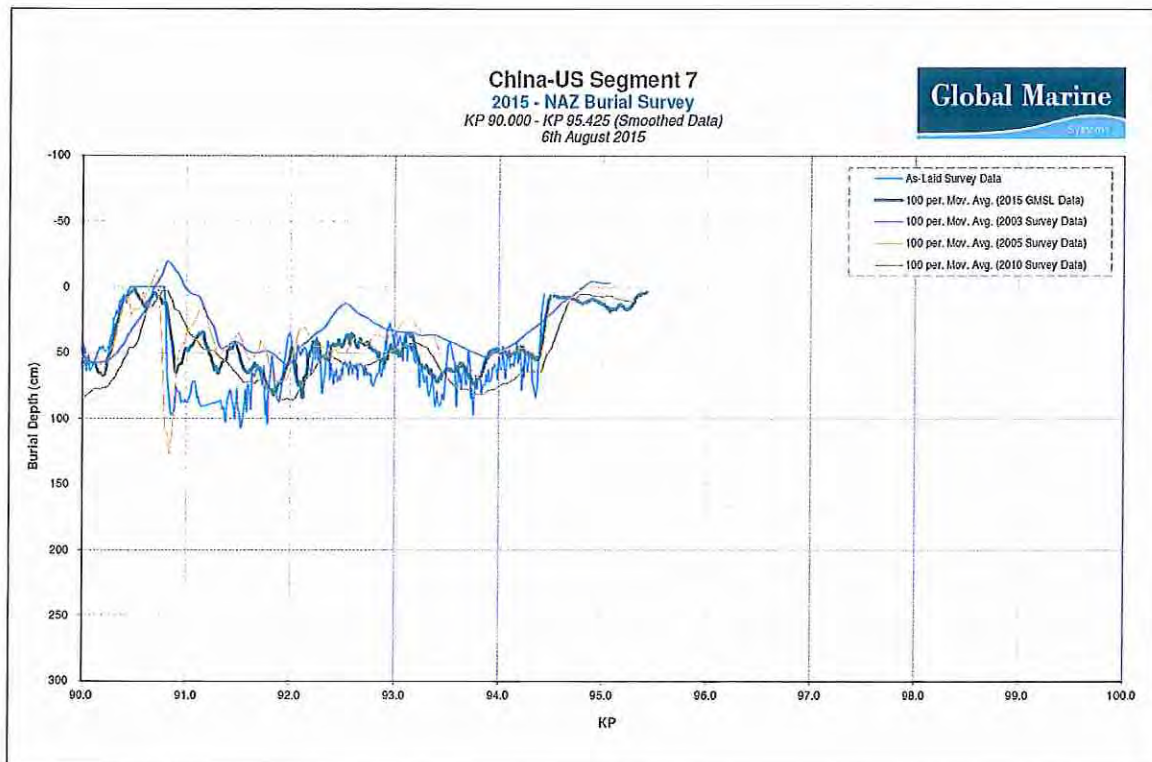
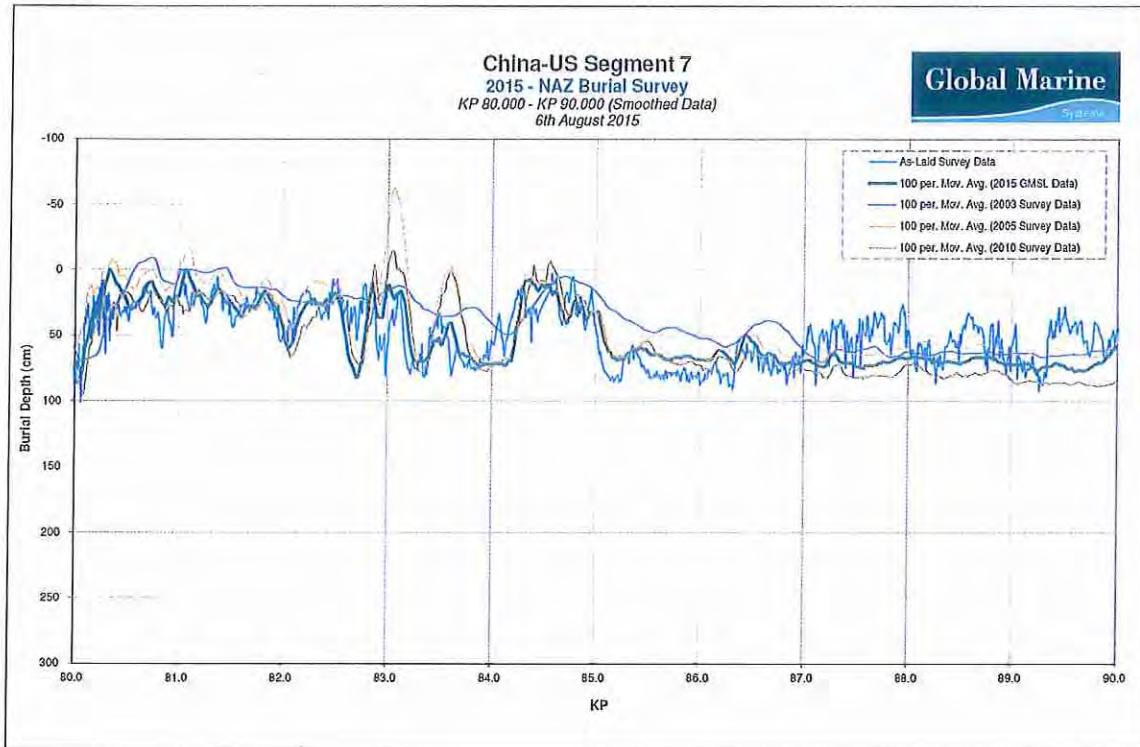
6.0 Cable Burial Comparison Graphs













7.0 Vessel & ROV Diary of Events

SHIP & ROV OPERATIONAL DIARY

Tuesday 7th July

Standby Port 06:00 – 08:06

06:00 Vessel engine and deck team carried out pre-departure checklist.
Fuel: 663.8MT Lubes: 6255L

07:42 Pilot embarked.

07:44 Gangway lifted and secured.

08:00 All lines released ashore.

Pilotage 08:06 – 09:00

08:06 All lines retrieved Forward and Aft, commenced pilotage.

08:52 Pilot boat alongside.

08:54 Pilot disembarked.

Passage 09:00 – 23:59

09:00 Vessel full away on passage.
Fuel: 663.4MT Lubes: 6255L

16:20 Fire & Boat muster carried out.

23:59 Continued passage towards San Francisco.
Fuel: 648.3MT Lubes: 6135L
Lat: 46° 57.4 N Long: 125° 20.8 W

Wednesday 8th July

Passage 00:00 – 07:48

00:00 Continued passage towards San Francisco.
Fuel: 648.3MT Lubes: 6135L
Lat: 46° 57.4 N Long: 125° 20.8 W

ROV Trials 07:48 – 12:48

07:48 Vessel passage suspended for ROV trials, commenced ROV trials
Lat: 45° 31.54N Long: 125° 22.54W

07:49 Vessel controls passed to aft bridge.

07:59 Vessel headed East to find shallower water.
DOW : 2300m

09:17 ROV off deck – commenced ROV test dive.
DOW : 1760m

10:07 ROV on seabed.

11:51 All parties satisfied with data and expectance tests, commenced recovery of ROV to deck.

11:52 ROV off seabed.

12:35 ROV at surface.

12:40 ROV on deck - end of ROV test dive.

Passage 12:48 – 23:59



- 12:48 Vessel resumed transit to San Francisco.
- 23:59 Continued passage towards San Francisco.
Fuel: 630.1MT Lubes: 6135L
Lat: 43° 15.7 N Long: 125° 06.3 W

Thursday 9th July

Passage 00:00 – 23:59

- 00:00 Continued passage to San Francisco.
Fuel: 630.1MT Lubes: 6135L
Lat: 43° 15.7 N Long: 125° 06.3 W
- 16:00 PSM VENT/SLO/001 sent. CS Wave Venture requesting contact details for San Luis Obispo terminal staff who will perform the TPSO duties throughout AAG Seg 5 operations.
- 21:00 Vessel's emergency steering gear tested, all tests satisfactory.
- 23:59 Continued passage to San Francisco.
Fuel: 610.0MT Lubes: 6135L
Lat: 38° 44.9 N Long: 124° 01.8 W

Friday 10th July

Passage 00:00 – 09:12

- 00:00 Continued passage to San Francisco.
Fuel: 610.0MT Lubes: 6135L
Lat: 38° 44.9 N Long: 124° 01.8 W

Pilotage 09:12 – 11:30

- 09:12 End of passage to San Francisco.
Fuel: 601.9MT Lubes: 6095L
Lat: 37° 46.1 N Long: 122° 42.8 W
- 09:24 Pilot onboard.
- 10:20 Passing the Golden Gate Bridge.
- 10:54 Passing Oakland Bay Bridge.
- 11:30 Vessel anchored in position.
Telephoned San Luis Obispo terminal station to verify PSM VENT/SLO/001 was received. This was confirmed but they requested a resend.

Vessel Standby (US Clearance) 11:30 – 21:00

- 11:30 Pilot away.
- 11:36 Two US Coastguard persons onboard.
- 11:40 PSM VENT/SLO/001 re-sent. CS Wave Venture requesting contact details for San Luis Obispo terminal staff that will perform the TPSO duties throughout AAG Seg 5 operations resent by request of SLO.
- 13:18 Email received confirming San Luis Obispo terminal staff received PSM VENT/SLO/001 and are ready.
- 15:00 Fire and Boat Drill carried out for Coastguard.
- 16:00 Coastguard inspections completed.
- 16:20 Two US Coastguard persons depart.
- 19:31 Pilot onboard.



19:48 Commenced heaving anchor.

20:08 Anchor home. Vessel awaiting US Coastguard clearance to depart.

Pilotage 21:00 – 22:48

21:00 Clear to depart granted.

21:15 Passing Oakland Bay Bridge.

21:44 Passing Golden Gate Bridge.

22:34 Pilot away.

Passage 22:48 – 23:59

22:48 Full away on passage to Morro Bay.
Fuel: 596.6MT Lubes: 6135L
Lat: 37° 44.3 N Long: 122° 41.1 W

23:59 Continued passage to Morro Bay.
Fuel: 595.6MT Lubes: 6135L
Lat: 37° 29.4 N Long: 122° 43.9 W

Saturday 11th July

Passage 00:00 – 17:00

00:00 Continued passage to Morro Bay.
Fuel: 595.6MT Lubes: 6135L
Lat: 37° 29.4 N Long: 122° 43.9 W

11:29 Vessel heading for western end of run line to inspect for fishing gear.

13:10 Vessel on transit along AAG Seg 5 cable route inspecting for fishing gear

16:12 Transit of AAG Seg 5 cable route completed, Vessel heading to HPR calibration position.

Non - Survey Operations 17:00 – 23:59

17:00 End of passage, vessel commenced survey equipment calibrations
Fuel: 580.6MT Lubes: 6055L
Lat: 35° 16.4 N Long: 120° 59.3 W

17:25 Vessel transferred to DP.

17:42 Vessel in location for Temperature and Salinity Dip.

18:18 Vessel moving 600m to HPR calibration position.

18:54 HPR pole down.

18:59 ROV off deck. Start of Dive 1.

19:03 ROV in water.

19:11 ROV in position.

21:00 PSM VENT/SLO/002 sent. CS Wave Venture requesting tone to be applied to AAG Seg 5 at 06:00L 12th July. Temperature and Salinity dip completed, commenced HPR calibration

23:59 Vessel continued HPR calibrations
Fuel: 576.3MT Lubes: 6055L
Lat: 35° 16.26 N Long: 120° 59.53 W



Sunday 12th July

Non - Survey Operations 00:00 – 23:48

00:00 Vessel continued HPR calibrations
Fuel: 576.3MT Lubes: 6055L
Lat: 35° 16.26 N Long: 120° 59.53 W

3:19 Calibration results entered into NaviPac.

4:09 ROV off deck - Start of Dive 3.

4:23 ROV in position.

4:53 ROV on deck with Beacon - End of Dive 3.

5:04 Vessel commences transit to AAG Segment 5 cable.

7:17 Vessel arrives on location. Commenced Profiler patch test

7:41 ROV off deck - Start of Dive 4.

8:58 ROV commenced survey of first calibration line.

9:09 ROV completed survey of first line.

9:37 ROV to recover to check Doppler settings.

9:39 Commence ROV recovery.

9:49 ROV on deck - End of Dive 4.

9:56 DVL mounting checked - mounting OK.

10:09 ROV off deck - Start of Dive 5.

10:19 ROV in position, re-commenced profiler patch test

12:40 Completed profiler patch test, Commence ROV recovery.

12:43 ROV at surface.

12:47 ROV on deck – End of Dive 5.

13:03 Reposition tritech bathy unit on ROV.

14:12 ROV off deck – Start of Dive 6 – AAG Seg 5 Survey Operations

**China – US Seg 7 Reporting Suspended for AAG Seg 5 & Japan US Seg 1 Survey Operations
14:12 12th July – 16:06 28th July 2015**

Commenced China – US Seg 7 Survey Operations 16:06 28th July 2015

Tuesday 28th July

China – US Seg 7 transit 16:06 – 16:54

16:06 ROV on Deck. End of Dive 06. KP 96.047, Vessel commenced transit to China – US Seg 7.

China – US Seg 7 Survey Operations 16:54 – 21:24

16:54 Vessel at China - US Seg 7 cable route. Vessel commenced transit survey checking for fishing gear.
KP95.849

Japan – US Seg 1 transit 21:24 – 22:06

21:24 Vessel arrived at KP 10.071, vessel suspended China – US Seg 7 transit survey, vessel altered course for Japan – US Seg 1, additional 200m survey section



Japan – US Seg 1 Survey Operations 22:06 – 23:06

- 22:06 Vessel completed transit to 200m Survey section on Japan – US Seg 1. ROV off Deck - Start of Dive 07. KP9.6973
- 22:16 ROV in position. KP 9.6977
- 22:25 ROV moving off - start survey. KP 9.6969
- 22:58 Survey Stopped- end of infill survey. KP 9.4106
- 23:02 Commence ROV recovery. KP 9.4104

China – US Seg 7 transit 23:06 – 23:36

- 23:06 ROV on Deck - End of Dive 07, commenced transit back to China – US Seg 7 break off point. KP 9.454

Wednesday 29th July

China – US Seg 7 Survey operations 00:00 – 07:00

- 00:00 Continue China – US Seg 7 transit survey
Fuel: 412.3MT Lubes: 5354L
Lat: 35° 20.04 N Long: 120° 56.90 W
Water Depth:83mtrs Vessel speed:4.7Km/h
KP 9.346
- 01:35 Vessel in position at 30 m contour. KP 3.844
- 01:54 ROV off deck - Start of dive 01. KP 3.836
- 02:01 ROV in position. KP 3.836
- 02:19 ROV commenced survey heading east. KP 3.827
- 02:23 Cable on surface. KP 3.816
- 02:26 ROV having to fly over rocky area. KP 3.806
- 02:23 Rock next to cable. KP 3.810
- 02:35 Cable buried. KP 3.770
- 02:36 Cable on surface. KP 3.760
- 02:41 Cable buried. KP 3.720
- 02:42 Cable on surface. KP 3.713
- 02:47 Armour Damage, Bird Caging sighted. KP 3.680
- 02:54 Rock next to cable. KP 3.662
- 03:04 Rope sighted laying over cable. KP 3.629
- 03:36 Rock next to cable. KP 3.484
- 03:42 End of boulder field. KP 3.450
- 05:33 Cable on surface. KP 2.516
- 05:36 Cable buried. KP 2.490
- 05:39 ROV at Japan-US Segment 1 crossing. KP 2.459
- 05:44 Cable on surface. KP 2.416



05:44 Cable buried. KP 2.409
06:11 ROV at AAG Segment 5 crossing. KP 2.136
06:22 Cable on surface. KP 2.023
06:23 Cable back into burial. KP 2.012
06:26 Cable on the surface. KP 1.989
06:28 Start of suspension. KP 1.965
06:29 End of suspension. KP 1.953
06:31 Cable buried. KP 1.931
06:31 Cable on surface. KP 1.929
06:31 Rock next to Cable. KP 1.928
06:35 Cable buried. KP 1.892
06:48 Cable on surface. KP 1.738
06:48 Boulder field. KP 1.738
06:57 All stopped, ROV reported hydraulic failure. KP 1.694

ROV downtime 07:00 – 07:48

07:00 Commenced ROV recovery, Commence ROV recovery. KP 1.694
07:04 ROV on deck - End of dive 01. KP 1.701
07:36 ROV off deck - Start of dive 02. KP 1.701
07:39 ROV in position. KP 1.702

Survey Operations 07:48 – 15:30

07:48 Re-Start Survey. KP 1.701
08:30 HPR lost due to shallow water depth, ROV continued visual survey. KP 1.341
08:48 Survey stopped. KP 1.242
08:49 Commence ROV recovery. KP 1.243
08:51 ROV on deck - End of dive 02. KP 1.258
08:51 Vessel commenced transit to KP 7.000. KP 1.258
10:52 Vessel in position at KP 7.000.
11:00 ROV off deck - Start of dive 03. KP 6.998
11:08 ROV in position. KP 6.997
11:28 Recommended survey heading east. KP 6.970
11:36 Cable on surface. KP 6.896
11:39 Cable buried. KP 6.874
11:42 Cable on surface. KP 6.846
11:43 Cable buried. KP 6.841



12:33 Boulder field. KP 6.327

12:35 Cable on surface. KP 6.314

12:39 Cable buried. KP 6.300

ROV downtime 15:30 – 16:30

15:30 Stop survey - lost profiler input to NaviScan. KP 4.398

15:35 Commence ROV recovery. KP 4.397

15:36 ROV on deck - End of dive 03. Vessel moving back 450m to restart survey. KP 4.394

16:14 Vessel at restart position. ROV off deck start of dive 04. KP 4.847

16:18 ROV in position. KP 4.842

Survey Operations 16:30 – 23:59

16:30 Re-start survey. KP 4.843

16:32 Boulder field. KP 4.808

17:46 ROV at AAG Seg 5 crossing. KP 3.959

17:55 Cable on surface. KP 3.854

17:56 ROV at boulder field. KP 3.849

17:57 Frequent suspensions through boulder field. KP 3.837

18:06 Cable buried. KP 3.772

18:07 Cable on surface. KP 3.761

18:09 Rocky ridge. KP 3.745

18:15 Armour damage to cable as previously logged at 02:47. KP 3.680

18:17 Large boulders on route. KP 3.656

18:21 Several suspensions over large sand waves. KP 3.599

18:26 All stopped, end of survey east. KP 3.563

18:27 Commence ROV recovery. KP 3.574

18:29 ROV on deck - End of dive 04. KP 3.571

18:29 Vessel commenced transit to KP 7.000. KP 3.571

19:18 Vessel in position. KP 6.974

19:20 ROV off deck - Start of dive 05. KP 6.973

19:25 ROV in position. KP 6.960

19:30 Start survey heading west. KP 6.968

22:35 Start of S bends. KP 8.492

22:41 Cable on surface. KP 8.511

22:44 Stopped survey - lost tone, possible cable bight offline. KP 8.511

22:45 Re-start survey. KP 8.512



- 22:56 Survey Stopped - unusable data due to possible cable bight, ROV unable to detect reliable tone. KP 8.545
- 22:58 ROV moving 100m to the west to locate cable tone.
- 23:59 Continue China – US Seg 7 survey – ROV continued to locate cable
Fuel: 400.3MT Lubes: 5354L
Lat: 35° 20.18 N Long: 120° 56.32 W
Water Depth:76mtrs Vessel speed:0.2Km/h
KP 8.546

Thursday 30th July

China – US Seg 7 Survey operations 00:00 – 06:12

- 00:00 Continued China – US Seg 7 survey, ROV continued to locate tone
Fuel: 400.3MT Lubes: 5354L
Lat: 35° 20.18 N Long: 120° 56.32 W
Water Depth:76mtrs Vessel speed:0.2Km/h
KP 8.546
- 01:22 ROV not able to locate cable due to cable bight (possible loop) caused erratic tone detection KP 8.543
- 01:23 ROV relocating past cable bight. KP 8.543
- 01:40 ROV on cable, start survey. KP 8.668

ROV maintenance 06:12 – 07:18

- 06:12 All stopped for beacon change out, Commence ROV recovery. KP 11.067
- 06:18 ROV on deck - End of Dive 05. KP 11.031
- 07:05 ROV off Deck - Start of Dive 06. KP 11.043
- 07:12 ROV in position. KP 11.046

Survey Operations 07:18 – 23:59

- 07:18 Re-Start Survey. KP 11.033
- 12:02 Small plastic container on cable route. KP 14.441
- 14:05 Bucket on cable route. KP 16.055
- 22:08 Shallow trench across route - 20cms deep. KP 21.221
- 23:59 Continued China – US Seg 7 survey
Fuel: 390.8MT Lubes: 5354L
Lat: 35° 20.60 N Long: 120° 05.20 W
Water Depth:264mtrs Vessel speed:0.5Km/h
KP 21.249

Friday 31st July

China – US Seg 7 Survey operations 00:00 – 23:59

- 00:00 Continued China – US Seg 7 survey
Fuel: 390.8MT Lubes: 5354L
Lat: 35° 20.60 N Long: 120° 05.20 W
Water Depth:264mtrs Vessel speed:0.5Km/h
KP 21.249
- 02:37 ROV at area of Marine Growth. KP 23.640
- 05:20 Survey Stopped - HPR dropped Out. KP 25.399



05:23 HPR Re-booted. KP 25.423
05:25 ROV moving back 30 m to Re-start survey position. KP 25.422
05:42 Re-Start Survey. KP 25.375
13:26 Very large boulder 1m south of cable line, 1m diameter. KP 30.671
15:35 ROV lifted over obstacle, unknown obstacle due to poor visibility. KP 31.388
23:59 Continued China – US Seg 7 survey
Fuel: 383MT Lubes: 5314L
Lat: 35° 20.85 N Long: 121° 14.81 W
Water Depth:486mtrs Vessel speed:0.7Km/h
KP 36.814

Saturday 1st August

China – US Seg 7 Survey operations 00:00 – 23:59

00:00 Continued China – US Seg 7 survey
Fuel: 383MT Lubes: 5314L
Lat: 35° 20.85 N Long: 121° 14.81 W
Water Depth:486mtrs Vessel speed:0.7Km/h
KP 36.814
06:00 Continued China – US Seg 7 survey KP 40.133
12:00 Continued China – US Seg 7 survey KP 44.348
18:00 Continued China – US Seg 7 survey KP 48.057
22:58 Cable on surface. KP 51.042
22:59 Cable back into burial. KP 51.047
23:59 Continued China – US Seg 7 survey
Fuel: 375.3MT Lubes: 5274L
Lat: 35° 21.10 N Long: 121° 24.66 W
Water Depth:781mtrs Vessel speed:0.5Km/h
KP 51.724

Sunday 2nd August

China – US Seg 7 Survey operations 00:00 – 01:30

00:00 Continued China – US Seg 7 survey
Fuel: 375.3MT Lubes: 5274L
Lat: 35° 21.10 N Long: 121° 24.66 W
Water Depth:781mtrs Vessel speed:0.5Km/h
KP 51.724

ROV Maintenance 01:30 – 03:24

01:30 Survey stopped – Recover ROV to change beacons. KP 52.656
01:40 Commence ROV recovery. KP 52.597
02:04 ROV on Deck - End of Dive 06. KP 52.600
03:00 ROV off Deck - Start of Dive 07. KP 52.600
03:23 ROV in position. KP 52.604

Survey Operations 03:24 – 23:59

03:24 Re-start survey. KP 52.602



04:19 Survey stopped - Beacon dropout, ROV moving back 30m. KP 53.112
04:28 Re-start survey. KP 53.095
05:35 Survey stopped - Bad HPR spiking. KP 53.803
05:44 Re-start survey. KP 53.730
06:05 ROV struggling with seabed conditions. KP 53.881
06:35 ROV off cable. ROV moving 20m back along cable route. KP 54.193
06:44 Re-start survey. KP 54.135
06:51 Survey stopped - ROV sorting out umbilical. KP 54.149
07:09 Re-start survey. KP 54.156
20:43 Survey stopped, lost beacons. KP 62.601
20:48 Re-start survey. KP 62.574
23:59 Continued China – US Seg 7 survey
Fuel: 367.6MT Lubes: 5234L
Lat: 35° 21.30 N Long: 121° 33.14 W
Water Depth:960mtrs Vessel speed:0.6Km/h
KP 64.603

Monday 3rd August

China – US Seg 7 Survey operations 00:00 – 23:59

00:00 Continued China – US Seg 7 survey
Fuel: 367.6MT Lubes: 5234L
Lat: 35° 21.30 N Long: 121° 33.14 W
Water Depth:960mtrs Vessel speed:0.6Km/h
KP 64.603
05:01 Survey stopped - Lost beacons - ROV moving back 20 m. KP 67.257
05:09 Re-start survey. KP 67.234
05:20 Bad HPR, spiking. KP 67.377
07:18 Survey stopped - Lost Beacons, ROV backing up 20 m. KP 68.595
07:25 Re-start survey. KP 68.569
12:07 Soft debris - plastic sheet. KP 71.548
15:03 Net and rope 1m South of cable route. KP 73.359
16:59 Soft plastic sheet approximately 1m x 2m, in trench. KP 74.418
19:38 Cable on surface. KP 75.949
19:40 Cable buried. KP 75.968
19:42 Cable on surface.
19:56 Boulder field. KP 76.144
20:29 Cable buried. KP 76.476
23:58 Start of cable on surface. KP 78.280
23:59 Continued China – US Seg 7 survey
Fuel: 359.8MT Lubes: 5234L



Lat: 35° 20.86 N Long: 121° 42.13 W
Water Depth:1260mtrs Vessel speed:0.6Km/h
KP 78.285

Tuesday 4th August

China – US Seg 7 Survey operations 00:00 – 04:00

- 00:00 Continued China – US Seg 7 survey
Fuel: 359.8MT Lubes: 5234L
Lat: 35° 20.86 N Long: 121° 42.13 W
Water Depth:1260mtrs Vessel speed:0.6Km/h
KP 78.285
- 00:01 Cable into burial. KP 78.297
- 01:54 Start of cable on surface. KP 79.341
- 01:58 Start of suspension. KP 79.367
- 01:59 Cable on Rock. KP 79.379
- 02:02 End of suspension. KP 79.393
- 02:03 Cable into burial. KP 79.406
- 02:11 Start of cable on surface. KP 79.440
- 02:11 Cable on Rock. KP 79.454
- 02:15 Rock next to cable. KP 79.492
- 02:22 Cable into burial. KP 79.547
- 03:08 Start of cable on surface. KP 80.088
- 03:09 Cable on Rock. KP 80.093
- 03:11 Cable into burial. KP 80.119
- 03:18 Start of suspension. KP 80.201
- 03:19 Cable on Rock. KP 80.205
- 03:20 End of suspension. KP 80.221
- 03:22 Start of suspension. KP 80.231
- 03:24 Survey stopped - ROV backing up 20m. KP 80.249
- 03:36 Re-start survey. KP 80.230
- 03:45 Cable suspended 1 metre above seabed. KP 80.286
- 03:49 Survey stopped. KP 80.282

ROV downtime 04:00 – 04:12

- 04:00 ROV lost telemetry. Commence ROV recovery. KP 80.240

Survey Operations 04:12 – 19:48

- 04:12 ROV regained telemetry during recovery, cancel recovery. Re-start survey. KP 80.229
- 04:25 End of suspension. KP 80.306
- 04:31 Start of cable on surface. KP 80.350



04:50 Cable into burial. KP 80.585
04:51 Start of cable on surface. KP 80.596
04:56 Start of suspension. KP 80.657
04:57 End of suspension. KP 80.662
05:03 Cable into burial. KP 80.740
05:05 Start of cable on surface. KP 80.762
05:11 Cable into burial. KP 80.839
05:13 Start of cable on surface. KP 80.853
05:14 Start of suspension. KP 80.869
05:15 End of suspension. KP 80.872
05:16 Rock next to cable. KP 80.876
05:18 Cable into burial. KP 80.896
05:19 Start of cable on surface. KP 80.909
05:20 Start of suspension. KP 80.919
05:21 End of suspension. KP 80.924
05:24 Start of suspension. KP 80.966
05:27 Cable crossing ridge - End of suspension. KP 81.017
05:48 Cable into burial. KP 81.255
05:49 Start of cable on surface. KP 81.266
05:50 Cable on rock. KP 81.279
05:57 Cable on rock. KP 81.365
06:09 Cable into burial. KP 81.513
06:16 Cable on surface. KP 81.604
06:17 Cable into burial. KP 81.618
06:19 Cable on surface. KP 81.634
06:42 Cable into burial. KP 81.896
06:42 Start of cable on surface. KP 81.897
06:45 Cable into burial. KP 81.936
07:02 Start of cable on surface. KP 82.137
07:03 Rock next to cable. KP 82.148
07:05 Rope / Cable on cable line. KP 82.171
07:16 Start of cable on surface. KP 82.285
07:20 Cable into burial. KP 82.339
07:21 Start of cable on surface. KP 82.350



07:22 Cable into burial. KP 82.360
07:23 Start of cable on surface. KP 82.372
07:26 Cable into burial. KP 82.411
07:29 Start of cable on surface. KP 82.449
07:36 Cable into burial. KP 82.538
07:51 Start of cable on surface. KP 82.702
07:52 Start of suspension. KP 82.718
07:56 Cable on Rock. KP 82.754
07:57 End of suspension. KP 82.760
07:57 ROV encountering steep slope. KP 82.764
08:02 Start of suspension. KP 82.802
08:04 ROV reports 30° slope to Port. KP 82.823
08:06 Bucket under cable. KP 82.834
08:10 Cable into burial. KP 82.878
08:10 End of suspension. KP 82.878
08:12 Start of cable on surface. KP 82.887
08:17 Start of suspension. KP 82.915
08:22 End of suspension. KP 82.961
08:27 Start of suspension. KP 82.986
08:27 Cable going over ridge. KP 82.988
08:27 End of suspension. KP 82.988
08:35 Rock on cable. KP 83.037
08:46 Survey stopped. ROV moving back 20m KP 83.112
08:47 Re-start survey. KP 83.096
08:50 Cable into burial. KP 83.119
09:11 ROV reports 10 Deg slope to Port. KP 83.351
09:18 Start of cable on surface. KP 83.408
09:22 Survey stopped. ROV moving back 20m. KP 83.410
09:27 Re-start survey. KP 83.385
09:31 Start of cable on surface. KP 83.414
09:43 Cable into burial. KP 83.542
10:42 Start of cable on surface. KP 84.205
10:46 Cable on rock. KP 84.251
10:46 Start of suspension. KP 84.252



10:47 End of suspension. KP 84.263
10:50 Cable on rock. KP 84.293
10:50 Start of suspension. KP 84.301
10:51 Cable on rock. KP 84.306
10:51 End of suspension. KP 84.313
11:03 Cable on rock. KP 84.449
11:12 Cable on Rock. KP 84.539
11:16 Start of suspension. KP 84.580
11:17 Cable on Rock. KP 84.582
11:17 End of suspension. KP 84.593
11:18 Start of suspension. KP 84.600
11:18 Cable on Rock. KP 84.603
11:30 Cable into burial. KP 84.728
11:32 Start of cable on surface. KP 84.746
11:35 Start of suspension. KP 84.779
11:36 End of suspension. KP 84.792
11:56 Cable into burial. KP 84.989
15:13 Small fishing net. KP 87.188
15:46 Assorted small soft debris. KP 87.596
18:41 Survey Stopped-poor tone. KP 89.807
18:42 ROV commenced moving back 50m. KP 89.806
18:55 ROV moving east to acquire tone. KP 89.760
19:02 ROV unable detect tone, commenced relocating 100m east to known area of good tone. KP 89.697
19:39 Terminal station contacted to check on tone application, terminal staff report – all ok. KP 89.606
ROV downtime 19:48 – 21:06
19:48 Commence ROV recovery. Decision made to recover ROV to check TSS 350 system KP 89.608
20:24 ROV on Deck - End of Dive 07. KP 89.598
ROV maintenance 21:06 – 23:12
21:06 TSS 350 Repaired, replaced TSS 350 harness replace, commenced Beacon change out
22:12 ROV off Deck - Start of Dive 08. KP 89.598
22:52 ROV in position. KP 89.698
Survey Operations 23:12 – 23:59
23:12 Re-start survey. KP 89.726
23:59 Continued China – US Seg 7 survey
Fuel: 352MT Lubes: 5174L



Lat: 35° 19.40 N Long: 121° 49.64 W
Water Depth:1581mtrs Vessel speed:0.6Km/h
KP 90.042

Wednesday 5th August

China – US Seg 7 Survey operations 00:00 – 10:48

00:00 Continued China – US Seg 7 survey
Fuel: 352MT Lubes: 5174L
Lat: 35° 19.40 N Long: 121° 49.64 W
Water Depth:1581mtrs Vessel speed:0.6Km/h
KP 90.042

00:26 Short section of cable on surface (3 to 4 metres). KP 90.327

00:27 Start of cable on surface. KP 90.342

00:27 Cable into burial. KP 90.348

00:27 Start of cable on surface. KP 90.354

00:28 Cable into burial. KP 90.366

00:30 Start of cable on surface. KP 90.382

00:34 Start of suspension. KP 90.427

00:49 End of suspension. KP 90.451

01:06 Start of suspension. KP 90.604

01:29 End of suspension. KP 90.794

01:31 Cable into burial. KP 90.807

01:56 Start of cable on surface. KP 91.062

01:56 Cable into burial. KP 91.064

02:40 Start of S Bends. KP 91.562

04:37 Start of cable on surface. KP 92.468

04:39 Cable into burial. KP 92.480

06:14 Plastic sheet in trench. KP 93.288

08:20 Start of cable on surface. KP 94.507

09:36 ROV at 1850m contour line. KP 95.324

09:46 End of Survey - 100 m past 1850m water depth mark. KP 95.429

09:52 Commence ROV recovery. KP 95.434

Southern Cross Survey Operations

Southern Cross Seq D transit 10:48 – 11:06

10:48 ROV on Deck - End of Dive 08. KP 95.430

10:48 Vessel commencing Transit to Southern Cross. KP 95.430

Survey Transit 11:06 – 14:54

11:06 Vessel at Southern Cross - Commencing Fishing Survey. KP 95.400



China – US Seg 7 Survey Operations 14:54 – 17:12

14:54 Vessel leaves Southern Cross line for In-fill Survey on CH-US Seg 7. KP 8.720
14:58 Vessel in DP. KP 8.720
15:02 ROV off deck - Start of Dive 09. KP 8.720
15:30 PSM VENT/SOX/002 sent requesting 17Hz tone at max current to be applied to SX cable.
15:34 ROV in position. KP 8.720
15:45 Telephoned Morro Bay Cable Station to check PSM was received.
16:05 ROV moving 90m west to start infill survey of C-US Seg 7. KP 8.745
16:09 SOX/VENT/002 received, 17Hz 120mA applied.
16:11 Start survey. KP 8.785
16:48 Lost tone. KP 8.508
16:56 Tone received. KP 8.494
17:03 In-fill Survey of China-US Segment 7 completed. KP 8.448
17:06 Commence ROV recovery. KP 8.446
17:12 ROV on deck - End of Dive 09, commenced transit to Southern Cross cable route KP 8.456

End of China – US Seg 7 Reporting

Monday 31st August

Continue Japan US seg 9 survey

00:01 Continue survey
- Japan-US seg-9 KP 581.771; WD: 572m
Lat: 38° 53.96 N Long: 123° 59.81W

00:03 Rock on cable line. KP 581.716
00:18 Rock on cable line. KP 581.440
00:59 Vessel Heading Change - 5 Deg to Stbd. KP 580.766
01:09 Start of cable on surface. KP 580.588
01:09 End of cable on surface. KP 580.585
01:11 Start of cable on surface. KP 580.563
01:11 Cable on Rock. KP 580.564
01:12 End of cable on surface. KP 580.552
01:28 Start of cable on surface. KP 580.292
01:29 End of cable on surface. KP 580.277
01:39 Start of cable on surface. KP 580.091
01:39 End of cable on surface. KP 580.088
01:41 Start of cable on surface. KP 580.059
01:41 End of cable on surface. KP 580.057



01:41	Start of cable on surface.	KP 580.048
01:45	End of cable on surface.	KP 579.991
01:47	Start of cable on surface.	KP 579.966
01:47	End of cable on surface.	KP 579.962
01:53	Start of cable on surface.	KP 579.836
01:54	Cable on Rock.	KP 579.829
01:57	End of cable on surface.	KP 579.778
01:58	Start of cable on surface.	KP 579.754
02:00	POL: WD: 860 m Burial: 0.00 m.	KP 579.737
02:02	End of cable on surface.	KP 579.682
02:44	Vessel Heading Change - 5 Deg to Stbd.	KP 579.005
02:47	Large Fishing Net on cable line. ROV going round it - missing 20 m of survey.	KP 578.935
03:53	Survey Stopped - loss of beacons. Small piece netting on cable line	KP 577.815
04:12	Re-Start Survey.	KP 577.792
05:02	Start of cable exposed in trench.	KP 577.018
05:02	End of cable exposed in trench.	KP 577.019
05:16	Start of cable exposed in trench.	KP 576.790
05:17	Start of unsupported cable.	KP 576.785
05:18	End of unsupported cable.	KP 576.760
05:18	End of cable on surface.	KP 576.760
06:00	POL: WD: 1415 m Burial: 0.55 m.	KP 576.118
06:31	Start of cable exposed in trench.	KP 575.604
07:32	End of cable exposed in trench.	KP 575.590
06:32	Start of cable on surface.	KP 575.583
06:33	Start of unsupported cable.	KP 575.573
06:35	End of unsupported cable.	KP 575.533
06:36	Cable back into burial.	KP 575.524
07:59	Pressure: 1003 mb WD: 1747 m Burial: 0.55 m.	KP 574.135
08:57	ROV at 1850 metre Water Depth.	KP 573.282
09:03	Start of cable on surface - to the end of the survey.	KP 573.192
09:09	ROV at 1850 metre Water Depth + 100 m.	KP 573.120
09:09	Survey Stopped - End of survey of Japan-US Segment 9 cable.	KP 573.115
09:28	Commence ROV recovery.	KP 573.086
09:30	Representative gives Vessel release	



Reporting on Japan US seg 9 ceased, vessel continues with passage reports

10:16 ROV on Deck - End of Dive 02. KP 573.089
10:25 Vessel commencing Passage to San Francisco. KP 573.089
10:40 PSM VENT/JUS8&9/002 sent requesting tone off both segments
11:00 FAOP
FO: 433.7 MT LO: 4290 Ltrs
11:27 E mail received from Manchester TS, tone removed both segments
1830 End of passage. 85.87NM at speed of 11.4Knts
Lat: 37° 46.79 N Long: 122° 47.45 W
18:38 Pilot onboard
21:05 Arrive at anchorage #9
21:14 Anchor away, Pilot departs.
Lat: 37° 45.55 N Long: 122° 20.00 W
FO: 425.4 MT LO: 4290 Ltrs
23:59 Vessel at Anchorage #9 San Francisco awaiting provisions, bunkering and crew changes
Lat: 37° 45.55 N Long: 122° 20.00 W

Survey progress last 24 hrs: 8.656km, average speed 0.98kph

Tuesday 1st September

At Anchorage #9 San Francisco

00:01 Vessel at Anchorage #9 San Francisco awaiting provisions, bunkering and crew changes
Lat: 37° 45.55 N Long: 122° 20.00 W
05:16 Water Barge 'Baycat' alongside stbd.
05:45 Commence loading FW.
10:10 Ships agent onboard.
10:35 Agent away, handcarrying MMWG rental equipment.
11:47 Disembark Surveyor N Ashcroft on 'Ms Katie'.
13:00 306MT FW loaded to date.
14:37 Lube oil barge 'Rivercat' alongside port.
15:12 FW loading completed, Provision boat 'Ms Katie' alongside port forward, commence loading provisions.
15:28 Commence loading Lube oil.
15:42 Water Barge 'Baycat' away.
15:55 Completed loading Lube oil.
15:58 Provisions loaded, 'Ms Katie' away.
16:15 Lube oil barge 'Rivercat' away.
23:59 Vessel at Anchorage #9 San Francisco loading provisions completed, bunkering and crew changes upcoming. Lat: 37° 45.55 N Long: 122° 20.00 W

Wednesday 2nd September



At Anchorage #9 San Francisco

00:01 Vessel at Anchorage #9 San Francisco loading provisions completed, bunkering and crew changes upcoming. Lat: 37° 45.55 N Long: 122° 20.00 W

10:35 Water Taxi 'Ms Katie' alongside port forward 6 Onsigners embark.

10:45 Water Taxi 'Ms Katie' away.

11:50 Water Taxi 'Ms Katie' alongside port forward.

11:53 Representative and 2 surveyors disembark.

11:55 Water Taxi 'Ms Katie' away.

13:30 Fire alarm activated: manual call point zone 9 C4, all fire parties mustered, alarm activated by glass unseating,
All stood down 13:36 no signs of fire.

15:25 'Ms Katie' alongside port forward crane to offload 3 pallets of provisions.

15:45 'Ms Katie' alongside port gangway for offsigners disembarkation.

15:50 Bunker barge alongside stbd.

16:00 Offsigners away.

16:55 Commence loading Fuel oil.

19:00 Bunkering completed.

19:40 Bunker barge away.

20:34 POB.

20:40 Commence heaving Anchor.

20:47 Anchor on deck, commence pilotage.

22:30 FAOP.
Lat: 37° 45.50 N Long: 122° 40.4 W
FO: 618.3 MT LO: 7379 Ltrs

23:59 Vessel on passage to Victoria. Lat: 37° 53.37 N Long: 122° 57.14 W

Thursday 3rd September

On Passage to Victoria Canada

00:01 Vessel on passage to Victoria. Lat: 37° 53.37 N Long: 122° 57.14 W

11:00 Fire and lifeboat drill carried out followed by all hands team brief, stood down at 11:20.

23:59 Vessel continues passage to Victoria. Lat: 41° 11.34 N Long: 125° 25.55 W

Friday 4th September

On Passage to Victoria Canada

00:01 Vessel continues passage to Victoria. Lat: 41° 11.34 N Long: 125° 25.55 W

23:59 Vessel continues passage to Victoria. Lat: 45° 20.70 N Long: 125° 35.90 W



Saturday 5th September

On Passage to Victoria Canada

00:01 Vessel continues passage to Victoria. Lat: 45° 20.70 N Long: 125° 35.90 W
13:45 **Acting on PM instructions**, vessel deviates to attend Endeavour Ridge CWG
Lat: 47° 53.00 N Long: 125° 19.80 W
FO: 559.3 MT LO: 7218 Ltrs

Reporting suspended and will resume again once back on passage plan.

Tuesday 8th September

On Passage to Victoria Canada

22:00 Vessel continues passage to Victoria. **Reporting resumes; deviation for Endeavour Ridge completed.**
Lat: 48° 27.42 N Long: 126° 28.44 W
FO: 508.5 MT LO: 7153 Ltrs

23:59 Vessel continues passage to Victoria Lat: 48° 28.79 N Long: 124° 52.20 W

Wednesday 9th September

On Passage to Victoria Canada

23:59 Vessel continues passage to Victoria Lat: 48° 28.79 N Long: 124° 52.20 W

05:00 EOP Lat: 48° 13.75 N Long: 123° 29.75 W
FO: 501.8 MT LO: 7153 Ltrs

05:55 Pilot onboard

06:48 All secure, FWE Lat: 48° 25.02 N Long: 123° 23.34 W
FO: 500.1 MT LO: 7153 Ltrs

Reporting of the NAZ 2015 surveys is now completed and ceases henceforth.



8.0 Notices & Permits

Permit:

CALIFORNIA STATE LANDS COMMISSION STATE OF CALIFORNIA SURVEY PERMIT

Notices issued by Allen Matkins LLP as part of the permit process and also by GMSL prior to the Wave Venture's arrival on site. The notice issued by GMSL can be found below.

From: Wrottesley, John (GMSL) Sent: Tue 30/06/2015 14:05
To: 'D111NM@uscg.mil'; 'shawnstam@gmail.com'; 'eendersby@morro-bay.ca.us'; 'PA-citymgr@mon.org'; Catherine Creese (catherine.creese@navy.mil); steven@portsanluis.com
Cc: Stalley, Paul (GMSL); Read, Martyn (GMSL); Perratt, Brian (GMSL); CS Wave Venture, Master; rw1791@att.com
Subject: Notification: Subsea Cable Surveys California

Message Overview Chart North.pdf (1 MB) Overview Chart South.pdf (2 MB)
Vessel Specification - CS Wave Venture.pdf (291 KB)

Ladies and Gentlemen,

Global Marine Systems Limited has been contracted to conduct surveys for several submarine telecommunications cable systems off the coast of California. The CS Wave Venture is scheduled to arrive on site and commence survey on or soon after 4th July. Works are expected to be complete on 28th August 2015 – dependent upon weather or other operational conditions on site.

The Wave Venture will be conducting the surveys off Manchester and Morro Bay using a Remotely Operated Vehicle (ROV) to determine the depth of burial of eight subsea cables. The surveys will follow the cable routes from approximately 10-12m water depth out to 1850m or vice versa.

Further information and details of the cable vessel can be found in the attachments:


- Overview Chart North
- Overview Chart South
- Vessel Specification – Wave Venture

Please distribute this information accordingly so that other sea users are aware - the cable ship will be restricted in its manoeuvrability and other vessels should keep clear for safety. Please do not hesitate to contact myself or Paul Stalley (Project Manager in copy) if you have any queries regarding this notification or if you have any information on any underwater activity in this area that is relevant to the proposed operation.

Best Regards,
John Wrottesley

John Wrottesley
Permitting Manager
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9.0 Incident Reports

Global Marine Systems Ltd
Project: California Burial Surveys
Incident Report Ref: WVEN-IR08-15



CUSTOMER INCIDENT REPORT

SHIP	Wave Venture	PM	Paul Stalley
COMMANDER	Capt. M. Nash	DATE	10/08/2015
PROJECT	California Burial Surveys	PAGES	1
SUBJECT	Loss of power to ROV	REF	WVEN-IR08-2015
TIME OF INCIDENT	07:30	POSITION	Lat: 33° 04.86N Long: 121° 21.22W

INCIDENT

Vessel was preparing to launch the ROV when a loss of power occurred.

INVESTIGATIONS

During the NAZ 2015 Survey ops the ROV ST204 was recovered to deck on dive 2 of the Southern Cross Seg D survey to replace transponder beacons. After changing out the beacons and carrying out ROV deck checks the ROV was ready for launch. At 07:37 the Launch and Recovery System (LARS) HPU power packs were turned on and a loud bang was heard and smoke observed coming from behind the ROV workshop on the port side.

On investigation it was found that a short circuit had occurred in the High Voltage junction box due to the break down of insulation on one of the cables. This resulted in a total loss of power to the ROV and caused the connecting lug to the bus bar to melt.

REMEDIAL ACTION

A new lug was fabricated on board, a new gland fitted to the junction box and the cable reconnected.

CORRECTIVE ACTION

The cable has been re-routed inside the junction box and a new larger gland fitted to reduce stress on the cable.

Paul Stalley
Assistant Maintenance Agreement Manager
Global Marine Systems Limited
Date: 13/08/15



10.0 Waivers and Concessions

Passage speed waiver requested.



11.0 Performance DMOQ

2015 California Burial Surveys			
Description	Performance Requirements	Performance	Comments
Time to mobilize Cable ship and sail for a Repair operation	24 Hours from receipt of call	DMOQ N/A	
Average economic transit speed of Cable ship passage to Repair location	Average economic transit speed sailed of no less than 12 knots	DMOQ Waived	Waiver requested due to outbound passage speeds reduced for timed arrival at San Francisco pilots and transit to site slowed on direction of MWOs.
Time to complete a cable Repair operation	112 hours for an operation in water depth greater than 15 meters but less than 1000 meters 160 hours for an operation in water depth greater than 1000 meters but less than 3000m 200 hours for an operation in water depth greater than 3000 meters	DMOQ N/A	
Time to commence a cable load operation	Commence loading the necessary spare submersible plant , required for the Repair, onto the Cable ship within 12hrs from receipt of notification for the Cable ship from the relevant Maintenance Authority	DMOQ N/A	
Cable Loading Operation	Load LW or LWP type cable at minimum average speed of 5 km per hour and load armour cable at minimum average speed of 3 km per hour	DMOQ N/A	
Vessel Predicted Fuel Use	Vessel fuel consumption shall be within 10% of Service Provider's estimate for: *Economic Transit speed @ 12 kts or greater *During cable working operations operations	DMOQ Achieved Consumption Figures: On passage = 18.1 MT/day. On CWG = 9.7 MT/day. In port = 4.81 MT/day.	Predicted Consumption Figures: On passage = 27 MT/day. On CWG = 15 MT/day. In port = 5 MT/day
ROV Availability	23 hours per 24 hours of operation to be accumulated	DMOQ Achieved 23.53hrs per 24hrs	Survey operation time: 1221.25hrs ROV available 1197.2hrs



Vessel Availability	The vessel's downtime shall not exceed 2% of the total operational time that prevents the vessel from performing cable Repair operations.	DMOQ Achieved Vessel downtime: 0.68%	Total operation time: 1456.55hrs Vessel downtime: 9.97hrs
Time to issue Repair Synopsis Report after the Repair	1 week from the completion of the Repair	DMOQ N/A	
Time to issue Completion Report after the Repair	1 month from the completion of the Repair	DMOQ N/A	
Time to issue charts after a survey operation	60 days from completion of the survey operation (or as otherwise agreed)	DMOQ Achieved	Agreed timescale of 35 days from completion of the survey operation. Survey Completed: 17:25UTC 31/08/2015 Charts due by: 17:25UTC 05/10/2015



12.0 Survey Documentation

12.1 Survey Units

Linear units are expressed in International Metres (m)

Angular units are expressed in degrees (°) Grid

12.2 Geodetic Parameters:

Geodetic Parameters	WGS 84
Spheroid	WGS 84
Datum	WGS 84
Semi-Major Axis	6 378 137.000 metres
Semi-Minor Axis	6 356 911.946 metres
Inverse Flattening (1/f)	298.257223563
Eccentricity Squared (e ²)	0.006694379990

12.3 Projection

All coordinates are presented in Universal Transverse Mercator Projection Zone 10, with central meridian 123°W.

Projection	Universal Transverse Mercator
Central Meridian	123°W
Latitude of Origin	0°
False Easting on CM	500 000.00 metres
False Northing	0 metres
Scale Factor on CM	0.9996

12.4 Vessel Offset Measurements

CS Wave Venture is a fully operational cable lay and maintenance vessel on constant standby for cable repairs within the NAZ cable maintenance agreement. As such there exist a range of points of interest with measured and recorded offsets from the vessels CRP. The offsets listed below reflect those entered in the vessels resident Makai cable laying and repair software and were used on this project within the NaviSuite software.

Position	X (m)	Y (m)	Z (m)
CRP	0.0	0.0	0.0
CNAV-1 Antenna	-1.4	-2.6	23.5
CNAV-2 Antenna	1.4	-2.6	23.5
Starboard Sheave	2.2	-72.1	8.2
Port Sheave	-2.2	-72.1	8.2
ROV Dock Head	14.6	-31.5	7.9
HPR Pole	-0.87	1.35	0.0
Echo Sounder	0.0	60.0	0.0

X, Y, Z values are measured from the CRP to the offset in accordance with the following convention:

X = positive to starboard



Y = positive to bow
 Z = positive up

Additionally:

Roll = positive starboard down
 Pitch = negative bow down
 Heading = positive clockwise

12.5 ROV ST204

ROV ST204 is installed on CS Wave Venture, with the launch and recovery position on the starboard side of the vessel. For the purposes of the survey the vehicle was fitted with seabed profilers for determining the mean seabed level. Additionally a RDI workhorse Doppler was fitted to aid in positioning of the ROV.

12.6 ROV Offsets

All utilised offsets were measured during the vessel mobilisation and referenced to the ROV CRP.

Offset sign convention:

X = positive to starboard, Y = positive to bow, Z = positive upwards

ROV ST204 - Offsets				
Instrument	X	Y	Z	Comments
Beacon 11 (Stbd)	0.77	0.34	2.26	Transponder
Beacon 22 (Port)	-0.77	0.34	2.26	Transponder
Beacon 33 (Stbd)	1.06	-2.90	2.20	Aft Transponder
Beacon 44 (Port)	-1.06	-2.90	2.16	Aft Transponder
TSS 340	0.00	1.42	0.40	
TSS 350	0.00	0.14	0.71	
Tritech Bathy	1.20	0.20	1.77	
Tritech (Alt)	1.24	-0.15	0.35	
Altimeter (Old)	-1.08	-3.04	0.76	Not used for this job
Profilor (Port)	-1.25	1.15	1.78	
Profilor (Stbd)	1.25	1.15	1.78	
DVL	0.00	-1.80	0.18	
GYRO	-0.12	-1.40	0.50	
Laser Cross	-0.04	1.18	0.00	



12.7 Navigation Software

The EIVA NaviSuite group of programs was provided on the vessel to record and process the collected data. All vessel and ROV sensor data was interfaced into NaviPac and NaviScan online programs with eventing carried out in NaviSuite Eventing. Post processing was carried out utilising NaviEdit and NaviModel. Software versions used were as follows:

NaviPac	3.9.4
NaviScan	8.6.0
NaviSuite Eventing	1.2.5
NaviEdit	7.12.0.3704
NaviModel	3.5

12.8 Primary Navigation

CS Wave Venture is permanently outfitted with two CNAV 3050 DGPS receivers.

DGPS verification of the C-NAV DGPS system was undertaken on the 10th July 2015, whilst the vessel was at anchor in San Francisco Bay, California.

Scatter plots were produced to demonstrate the repeatability of the DGPS System. When each receiver is calculated to the vessel CRP using vessel offsets the resulting DGPS plots depict a variation of 0.02m difference between the two calculated CRP positions. C-NAV specification for Precise Point Positioning (PPP) states: <0.1m horizontally and 0.2m vertically.

12.9 Heading Sensor

A Subsea Ixsea Octans Survey Gyro was installed in the aft bridge of the vessel parallel to the longitudinal axis. In order to correct for any misalignment with this axis a gyro calibration was undertaken. The gyro was calibrated utilising the services of Simple Geospatial Solutions utilising Leica GX1230+ GNSS base receiver with a Leica GS14 Smart Antenna and CS15 field controller.

12.10 Acoustic Tracking

A calibration of the HPR system was carried out overnight 11th / 12th July 2015. The calibration was carried out utilising the USBLfix program within the NaviSuite survey software.

On completion the resulting heading, pitch and roll corrections were entered into the NaviPac survey software.

Calibration Results	Correction
Heading	-1.085
Pitch	0.274
Roll	-0.621

12.11 Mobilisation and Calibration

For further information on the mobilisation and calibration of the survey system please refer to the document in Appendix G: [NAZ California Surveys 2015 Survey Mobilisation and Calibration](#).

13.0 Appendix A – Equipment Specifications

Equipment specifications are included with the electronic copy of this report.



14.0 Appendix B – Alignment Charts

Alignment charts are included with the electronic copy of this report.



15.0 Appendix C – Navigation Data

Navigation data is included with the electronic copy of this report.



16.0 Appendix D – Burial Data

Burial data is included with the electronic copy of this report.



17.0 Appendix E – Video Logs

Video logs are included with the electronic copy of this report and can be used in conjunction with the full video footage to view specific events.



18.0 Appendix F – ROV Video and Photos

Full ROV videos and photos of points of interest are included with the electronic copy of this report.



19.0 Appendix G – Mobilisation and Calibration Report

GMSL's Mobilisation and Calibration Report is included with the electronic copy of this report.



20.0 Appendix H – Marine Wildlife Mitigation Monitoring Report

The Marine Wildlife Mitigation Monitoring Report prepared by the Marine Mammal Consulting Group is included with the electronic copy of this report.



21.0 Appendix I – Scope of Work

The scope of work is included with the electronic copy of this report.

