Job Book with Nav/Positioning Report

Client: Lamont Doherty Earth Observatory

Description: Cruise MGL0808

Cruise start date: April 24th 2008

Cruise end date: May 11th 2008

Revision History

Version	Description	Date	Approved
1.0	Initial Draft	04/23/2008	
1.1	Additional Notes	05/11/2008	
1.2	Parameters Added	05/11/2008	

Table of Contents

Introduction

NCS SubSea, Inc. has been contracted to provide positioning and navigation processing services for the operation of Spectra, which accurately plots the ships position in realtime, and Sprint, used to processes the data for a final product, when required.

HSE

NCS conducts its business with the utmost regard for the Health and Safety of our employees, and respect for the environment.

All employees are empowered to stop work immediately in the presence of an uncontrolled hazard. Every employee must be provided access to the appropriate Personal Protective Equipment (PPE) to ensure protection from hazards.

No NCS employee is permitted to intentionally damage the environment through the emission of any substance in any form.

All NCS employees working offshore are required to pass Medical evaluations conducted by Methodist Hospital in Houston, Texas. The evaluations are conducted every two years to the Schlumberger Medtrack standard.

Similarly all personnel are required to pass Sea Survival and Helicopter Underwater Egress Training (HUET) every three years in a US Coast-Guard approved facility.

TITLE	REVISION NO:	DATE EFFECTIVE	SECTION:
MEDICAL PROCEDURES	2	APR. 23, 2005	9.1.
	ORIGINATOR:	APPROVED BY:	PAGE
	Michael Rawson	Paul W. Ljunggren	Page 1 of 1

Emergency Response Plan

Medical Procedures

1. Scope

This section describes the procedures for treation medical problems onboard a research vessel(s) operated by Lamont-Doherty Earth Observatory Office of Marine Operations (OMO).

Any injury or seckness, no matter how minor should be reported to a supervisor or medical person in charge as soon as possible.

2. Teatment of Medical Condition

2.1. The L-DEO research vessel(s) as are all UNOLS ships, is a subscriber to the Medical Advisory Service (MAS) which is on call 24 hours per day to provide medical advice via the Inmarsat telephone:

2.1.1. Determination of extent of injury or sickness.

2.1.2. Advice on procedures for treating illness or injury.

2.1.3. Provide contact with nearest medical facility if needed.

2.2. Instructions for making contact with MAS are detailed in the MAS Medical Protocol Handbook in the ship's Hospital library (Section 9.1.1.)

2.3. Treat the injury or sickness as per medical protocols from the hospital library reference materials (Hospital Library (Section 9.1.1) with medical inventory on board (ref: Quarterly Medical Inventory sheets).

2.4. Document all treatment that is prescribed through the MAS in ship's medical log. All faxes or telexes relating to the treatment should be filed in the personal file of an injured or sick party. Treatments for minor injuries or maladies do not need to be logged.

3. Medications

3.1. All medications maintained by the vessel as medical inventory are stowed in the Ship's Hospital on the aft Port side of A-Deck.

3.2. Medications and emergency medical supplies are inventoried every three months.

3.3. No medication is prescribed unless administered by Captain or Chief Mate.

4. Serious Injury Situation

4.1. Reference should be made to the MAS Medical Protocol Procedures Manual (Section 9.1.1. Hospital Medical Books Library) to determine if an injury is serious enough to contact the medical advisory service.

4.2. If an illness or injury is serious, the MAS should be contacted by telephone or fax.

4.3. In the event of a serious injury, illness or accident, the Columbia University Accident Report should be completed per instructions in Section 12. and 12.5 in the Administrative Procedures manual.

5. Life Threatening Situation

5.1. In the event of life threatening injury or accident, in consultation with the medical advisory service, Chief Scientist and the Designated Person at the Office of Marine Operations, consider diverting to nearest port for advanced medical treatment.

5.2. Notify the appropriate national authorities, and if possible, arrange medical evacuation at sea. The following references should be consulted in the event of a medical diversion:

5.2.1. Medical Advisory Service (Manual, Hospital Library)

5.2.2. Agent's list

5.2.3. Contact numbers in List of Radio Determination and Special Stations.

6. Chemical Testing

6.1. In the event of a serious marine accident as defined in 46 CRF4.03-2, chemical testing shall be carried out as specified in 46 CRF 4.06.

Job Specifications

Geodetics

MGL0808		**MGL0808**	
Satellite Datum		Survey Datum	
WGS-84		WGS-84	
Spheroid Name:	WGS-84	Semi-Major Axis :	6378137.000
Unit:	Meter	Semi-Minor Axis:	6356752.31424518
Semi-Major Axis	6378137.000	Flattening:	0.003352810665
Inverse of Flattening	298.257223563000	Inverse of Flattening:	298.257223563000

UTM Projection – Hemisphere South – Zone 13

Deliverables

Description	Media	Frequency	Comments
P1/90 Processed Data			
P2/94 Raw Data			
Daily Log			
Job Book/Final Report		Job Completion	See contents below

Deliverable Templates

Daily Log / Line Report

na	Line Name:	na	NAVIGATION	DATE: 24-April-08	
	Line Brg:	na	DAILY/LINE LOGS	JULIAN DAY: 115	

CLIENT: National Science Foundation — SURVEY: Quebrada Discovery GoFor — MGL0808

DC SOL:	DEPTH SOL:	NAVIGATION SYSTEM USED:	C-Nav - Primary
DC EOL:	DEPTH EOL:	NAVIGATION SYSTEM USED:	POS-MV - Secondary
SMG SOL:	FEATHER SOL:	NAVIGATION SYSTEM USED:	
SMG EOL:	FEATHER EOL:	GRAVITY METER:	
WEATHER	MAX FEATHER:	MAGNETOMETER:	
WIND SOL:		MAG DEC USED : -8.75°	
WIND EOL:			
SEAS SOL			
SEAS EOL:			

operator on board: Mike Martello

SP	TIME	EVENTS	COMMENTS
	00:00	standby	Depart later for survey site
	14:00	standby	Wait on custom's paperwork and passports in order to sail
	16:45	depart	Start transit for survey site
	23:59	Transit	Underway to survey location of Line1

VESSEL POSITION

	SP	Latitude (N)	Longitude (W)
FGSP			
LGSP			

NAVIGATION OFFSET APPLIED

NRP - Stern	-4.20m
NRP - COS	-145.70m
NRP - CNG	na
COS - CNG	na
NRP - CMP	na

General remarks: Source only - no streamer

P1 p190 P2 p294

Source @ 6m

Posnet remarks: locations used:
1- stbd outside gun string #1
1- port outside gun string #4

Acoustic remarks:

Langseth.LMN
MGL0808.SCN (001)
SP spacing: 100.0m Time interval:

Sequence / Line report

Seq	L. Name	J. Day	DIR	FGSP	LGSP	m. space	Time sec. interval	comm
								Source only and OBS only - no streamer
1	Line1-B	122	12	2929	3001	150m	-----	Lines shot at one go, stop to only change name and sp interval
2	Line1-C	122	12	3107	5161	100 m	-----	Lines shot at one go, stop to only change name and sp interval
3	Line1-D	122	12	5280	5410	150 m	-----	Lines shot at one go, stop to only change name and sp interval
74	OBS19T	124	turn	8072	8148	-----	30sec.	Timed interval line during turn - Sequence was not planned
74	OBS19T	124	turn	8149	8241	-----	60sec.	Timed interval line during turn - Sequence was not planned
4	Line2-A	124	192	9988	10240	150 m	-----	Lines shot at one go, stop to only change name and sp interval
5	Line2-B	125	192	12361	12887	100 m	-----	Lines shot at one go, stop to only change name and sp interval
6	Line2-C	125	192	14593	14833	150 m	-----	Lines shot at one go, stop to only change name and sp interval

Area of Operations

This data acquistion will be done on the Pacific Rim in the vicinity of 4°17'S; 104° 08'W. The survey consists of 2 lines with azimuths of 12°/192°, and lengths of (+/-) 105 kilometers and are approximately 320 kilometers apart. These faults are known as “Quebrada, Discovery, and GoFor”.

Personnel

Client Contacts

Name	Position	Cell Phone	E-Mail
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NCS Personnel

Name	Position	Cell Phone	E-Mail
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Mike Martello	Party Manager	228 238 1368	mike.martello@ncs-subsea.com

NAVIGATION / QC

SPECTRA

Spectra is a comprehensive integrated seismic navigation system with a modular design, which allows any *innovations in navigational techniques* to be applied quickly.

Spectra is based on an expandable network of Unix or linux workstations with a dedicated real time navigation sensor acquisition system **RTNu** providing access to a tried and tested database of over 100 different navigation sensors and closure timing to a 50 micro-second resolution.

Benefits of spectra

- **Navigation acquisition and validation with real time source and streamer positioning for marine seismic surveys ranging from simple 2D and high resolution requirements to extensive 3D multi-streamer, multi-vessel configurations.**
- **Distributed Data Server provides simple connectivity to easily configure complex multi-vessel surveys. Real-time data acquisition units with integrated GPS receiver provide triggering to 50 micro-seconds, allowing remote synchronization of seismic and acoustic systems.**
- **Data logging to UKOOA P1/90, P2/91 and P2/94 standards with full redundancy, providing confidence in data integrity.**
- **Quality Control features providing alarm and audit facility meeting UKOOA guidelines. Extensive on-line graphical analysis features and end of line reporting facilities.**
- **Positioning using Kalman filtering with advanced data-probing statistical testing techniques.**
- **DGPS and RGPS real-time recomputation.**
- **Autopilot interface controlled from the instrument room, can leave the navigator in charge of steering. This facility is fully integrated with a comprehensive turn planning utility, providing optimum efficiency in line changes. (not implemented here)**

Data Acquisition

The seismic data will be acquired using OBS's, "ocean bottom seismometers" which are deployed and retrieved by the guest scientists.

Positioning

Vessel positioning will be achieved using the Spectra Totally Integrated System, provided by LDEO, which accurately plots the ships position in realtime. The system generates signals by which the "DigiSHOT" commands the Air Guns to fire at pre determined intervals, based on either distance or time as previously determined.
Real Time positioning of the source will be achieved with PosNet, a remote gps system which can gives a direct range and bearing in realtime for all events.

GPS

The C-Nav GPS Receiver combines a dual-frequency, geodetic grade, GPSReceiver with an integrated L-BAND communication RF detector and decoder all linked by an internal microprocessor. Corrections are supplied through satellite link, thus giving a GPS Quality indicator of 2 or GcGPS Corrected Fix. C-Nav used as primary navigation system.

POS/MV – Uses three sensors – the Inertial Measurement Unit (IMU) and two Global Position System (GPS) receivers. These allow the System to deliver an accurate and comprehensive data set, including:

- Geographic position (latitude, longitude and altitude)
- Heading
- Attitude (roll and pitch)
- Vertical displacement (heave)
- Velocity
- Acceleration
- Angular rate of turn
- Performance metrics
- Fault detection and reporting

Seapath 200 is a stand-alone system, which does not require input of data from any other sensors in order to provide accurate heading, roll, pitch and heave. Seapath requires input of DGPS corrections. Seapath provides a real-time heading, attitude, position and velocity solution by integrating the best signal characteristics of two technologies, Inertial Measurement Units (IMU's) and he Global Positioning System (GPS). Seapath utilizes the proven and reliable Seatex MRU 5 inertial sensor and two GPS carrier phase receivers as raw data providers. The raw sensor data are integrated in a Kalman Filter in the Seapath Processing Unit. The Kalman filter is a proven and effective filtering technique for integration of various sensors in a realtime environment, and the filter output provide heading, attitude, and position data required in survey applications.

Gyro

The Simrad GC80 gyro has been designated for any size vessel, to enhance the navigation capabilities and reliability. This is done by using basic gyroscopic action to form a stable directional platform.
When the 3 axes (spin axis, horizontal axis, and vertical axis) of the gyro reach a high stable revolution rate, the compass card reflects the True heading in relation to north. This is a factory preset, where a weight is added to the vertical ring (axis). Another, smaller weight is added to the sphere giving a damping effect to the oscillations created by the vertical ring weight. The GyroCompass north-seeking tendency depends upon the fact that north is a right angles to the west-to-east direction in which the earth's rotation carries the compass. A high degree of accuracy is maintained by the use of scheduled "calibration checks" where slight fluctuations (if any) are compensated in Spectra.

Energy Source

The energy source is a 4 string array, utilizing Bolt internal shuttle guns. Each sub-array dimensions are 16 meters in length with a sub-array cross line separation of 8 meters, and are composed of 10 guns with 1 of the 10 being a "spare" gun leaving a 1650cu in volume per string. Incorporating the "spare" guns, a total volume of 6600 cu in. is reached.
Source synchronization is achieved with a DigiSHOT Seismic Source Controller System. The DigiSHOT control's all airguns within the same array. The timing for each gun is individually controlled.
The system collects and displays graphically the sensor data for all guns in the array. It also collects and displays the gun depth and air pressure supplied to each string.
The sensor data is used to detect when the airgun was triggered and to make the necessary adjustments to airgun timing. The DigiSHOT system provides timing resolution of 0.1ms.
Source positioning will be derived by nominal value and actual RGPS range and bearings, and acoustic positioning pods.

Multibeam Echosounder

The EM 120 multibeam is designed to perform seabed mapping to full ocean depth. The system is cost effective, reliable, and easily operated on workstations with familiar operating systems.
Key facts
The Kongsberg Maritime product is designed to perform seabed mapping to full ocean depth with an unsurpassed resolution, coverage and accuracy. The design is based on more than 50 years of hydrographical experience with echo sounders, sonars and underwater positioning for civilian and military use.
The EM 120 is a complete system. All necessary sensor interfaces, data displays for quality control and sensor calibration, seabed visualization, and data logging are a standard part of the system, as is integrated seabed acoustical imaging capability (sidescan).
The nominal sonar frequency is 12kHz with an angular coverage sector of up to 150 degrees wand 191 beams per ping as narrow as 1 degree. Achievable swath width of a flat bottom will normally be approximately six times the water depth. The angular coverage sector and beam pointing angles may be set to vary automatically with depth according to achievable coverage. This maximizes the number of usable beams.
The EM 120 transducers are linear arrays in a Mills cross configuration with separate units for transmit and receive. The arrays are divided into modules (and hence the beamwidth) may be adjusted according to particular installation requirements.
A combination of phase and amplitude detection is used, resulting in an instrument measurement accuracy practically independent of beam pointing angle.

Water Column Velocity of Propagation

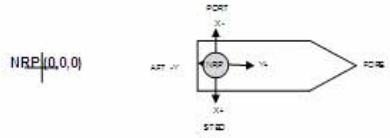
Water velocity for the survey will be assumed at a static 1500 m/sec except for seismic processing.

Navigation Data Processing

Not a prerequisite for this survey. Sprint is available.

Navigation Antenna Offsets

r/v Marcus G. Langseth - Navigation Mast



Both C-Nav and Posnet antenna's are located on the "observation deck", starboard side above the "winch operator booth", forward of the NRP.

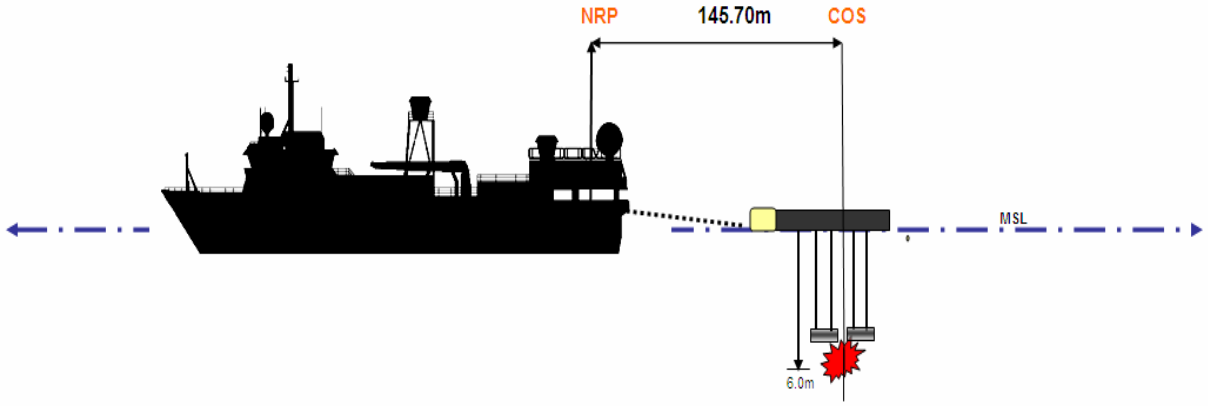
			FORE / AFT (Y)	STBD / PORT (X)	UP / DOWN (Z)
NRP	NAVIGATION REFERENCE POINT		0.000	0.000	0.000
V1G1	C-Nav		4.870	8.055	14.500
V1G2	Pos V	(on top of MMO tower)	-1.500	25.300	16.900
V1G3	SeaPath	(on top of MMO tower)	1.500	25.300	16.900
V1R1	Posnet /GPS		4.870	10.453	14.500

All measurements in meters

FRONT-END OFFSETS

R/V Marcus G. Langseth - Towing Offsets

*** Offsets used for sequence 001 to end of survey ***

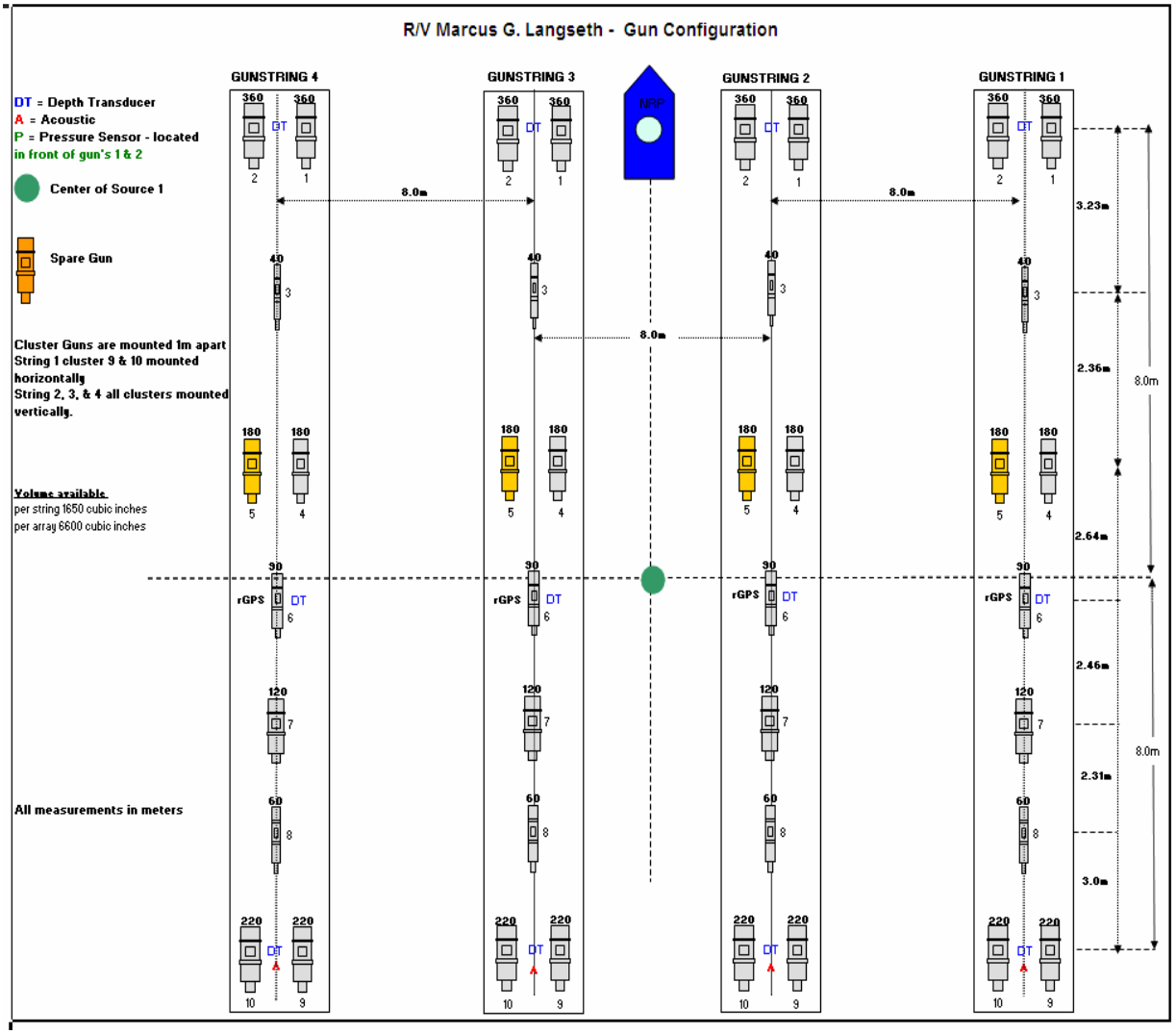


*** Offsets used for sequences001 to XXX ***

NRP-Stern	4.20	m	
NRP-COS	145.70	m	
NRP-CNG	na		
COS-CNG	na		
NRP-CMP	na		

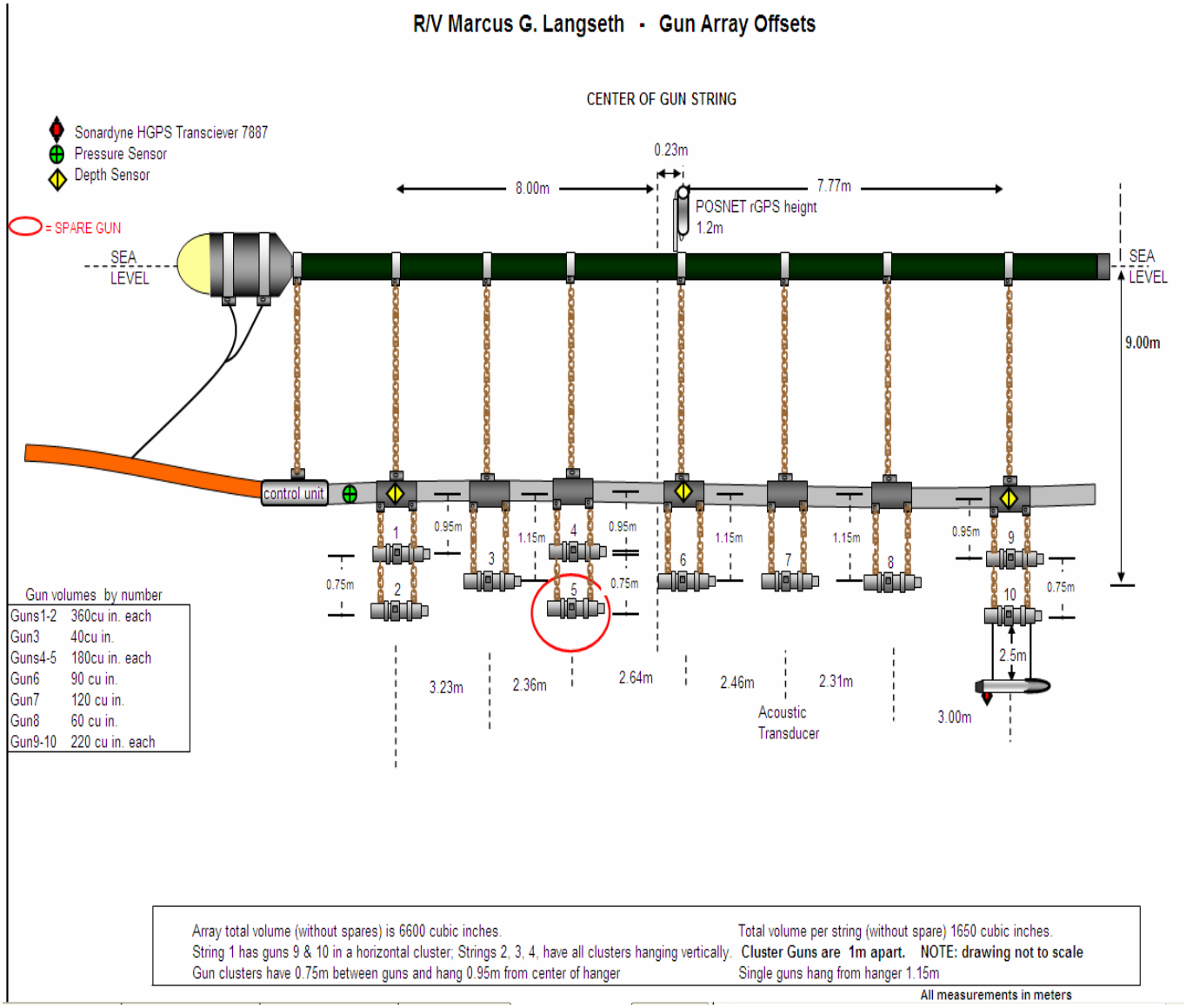
NRP	Nav Reference Point
COS	Centre of Source
CNG	na
CMP	na
MSL	Mean Sea Level

GUN ARRAY LAYOUT



Note: Gun #5, on all strings, is spare gun.
Note: Gun strings 2 & 3 do not have rgps on this survey.

SUB-ARRAY LAYOUT



Note: MGL0808 do not have rgps on strings 2 & 3

Positioning Summary

Each line shot with 150m interval at start of line, 100m interval for the middle and 150m interval at end. "Great Circle" line parameter was used at client request. Vessel speed was controlled for a record length of +/- 60 seconds for the OBS's. There were no "positioning problems with "GPS" on this study.

Processing Summary

No processing was done during this trip.

ADDITIONAL NOTES:

An additional line was shot, OBS19T, while turning for Line2. It was started with a 30 second interval while ramping up the guns; this was changed to 60 second for OBS recording, while shooting during turn and run-in to Line2.

SCN revision history:

SCN Configuration Revision History

File Name	rev. #		date	comment with numerical changes listed:
MGL0808.SCN (001)	1	1	23-Apr-08	SCN ready for the OBS operation, guns only - no streamer
			4-May-08	Study complete without changing SCN configuration