Technical Report for Raw 2D MCS Reflection Data,

R/V Sonne Cruise 294, Vancouver (Canada) – Port Hueneme (USA), 13/09/22 – 27/10/23

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Keywords: 2 D multichannel seismic (MCS) reflection data – raw data – GI Gun – GGun array – earthquake – tsunami – Cascadia subduction zone – deformation front – gas hydrates –BSR– carbon-capture & storage (CCS)

Coordinates: *Median Latitude:* 49.36135 * *Median Longitude:* -128.05476 * *South-bound Latitude:* 47.55729 * *West-bound Longitude:* -129.20661 * *North-bound Latitude:* 50.29167 * *East-bound Longitude:* -126.30441

Abstract

The raw 2D multichannel seismic reflection data in this project were acquired during expedition SO294 offshore Vancouver Island, Canada, using two different sources, i.e., a single GI Gun and a GGun array. The data were recorded with an 184-channel streamer. The objectives of expedition SO294 were twofold: provision of geophysical images to constrain the hazard potential of the Cascadia subduction zone, and to constrain the geophysical properties of the oceanic crust to assess its storage potential for carbon capture and storage (CCS). The data comprise 1660 line kilometers and are provided in raw format (SEG-D) and associated standardized metadata. Detailed information on the acquisition can be found in the SO294 cruise report (https://doi.org/10.48433/cr_so294). In addition, this technical report is provided with the 2D multichannel seismic reflection data set.

1 Introduction

Expedition SO294 served two scientific projects. The main part of the cruise was concerned with the project CLOCKS: “Northern Cascadia: Extent of locked zone, prism deformation, slip-to-toe, and the edge of subduction”. The Cascadia subduction zone extending from northern California to the northern tip of Vancouver Island, remains unbroken by a megathrust earthquake since January 26, 1700, which is known from tsunami records in Japan. Based on previous studies, the megathrust fault on the subducting Juan de Fuca (JdF) Plate is believed to be fully locked. Along a 2D profile from the deformation front to the shelf off Vancouver

Island, marine MT data were recorded for one month. A landward extension of the profile across Vancouver Island was recorded by the University of Alberta. We acquired seismic data across the deformation front at the central northern Cascadia margin to image faulting and identify potential slip-to-toe events where the megathrust may have ruptured out to the deformation front. Seismic data were also collected in the Winona Basin (Explorer Plate) to address the extent of subduction off northern Vancouver Island. All seismic shots were co-recorded on Ocean-Bottom-Seismographs (OBS) to allow P-wave and S-wave velocity analysis.

The second project is a collaborative study between GEOMAR and Ocean Networks Canada (ONC) on potential CO_2 storage in marine basalt complexes called CASCADIA CO2 (CCO2). The project aims to study the lateral variability of the basalt formations and their physical properties by acquiring seismic data on OBS optimized for the measurement of S-waves - a dataset yet missing in the assessments of the CO_2 storage potential of basalt.

2 Seismic Acquisition

During SO294, several types of long-term monitoring instruments were deployed on the central accretionary prism: nine short-period long-term OBS (JAMSTEC), six OBP (Kobe Univ., Tokyo Univ., JAMSTEC), and six broad-band long-term OBS (GEOMAR). An additional eleven short-period long-term OBS (JAMSTEC) were deployed north of the Nootka Fault in the Winona Basin region. These instruments will be recovered during expeditions led by the GSC in 2023 (OBS, Douglas et al., 2024) and 2024 (OBP).

A total of 54 short-term OBS used for active-source seismic refraction analyses were used in three sub-regions of the study area: 22 OBS were deployed along two perpendicular profiles in the Cascadia Basin with the CCO2 project, 20 OBS were used along two parallel profiles in the Winona Basin, and 12 OBS were used in one profile across the central accretionary prism off Vancouver Island.

The seismic refraction experiments were carried out with a six GGun array with a combined volume of 2840 in^3 (84 L) and a total of 370 km of profile length was acquired across the OBS. An additional 180 km were acquired on cross-lines not directly above the 2D OBS profiles. High-resolution seismic reflection imaging was achieved using a single GI airgun (355 in^3, 6 L) and a MCS streamer consisting of 184 channels at 1.56 m spacing over a 290 m total active length. Reflection data were acquired in the Winona Basin (685 km) and across the deformation front of the central accretionary prism off Vancouver Island (425 km).

During SO294, a total of 1660 km of 2D multichannel seismic (MCS) reflection data were acquired, forming an extensive grid of lines in each of the three research areas (Figure 3). The goal was to image the subsurface with a focus on the oceanic crust. In total, we shot seven surveys with two different acquisition geometries. P1000 (Figure 4) was part of the secondary user project CCO2. Surveys P2000, P3000, and P7000 were part of OBS refraction

measurements, while P4000, P5000, and P6000 were dedicated to high-resolution streamer seismic acquisition. A list of lines acquired for each setup can be found in *6 Acknowledgments*.

2.1 Streamer Set-up

We used 23 active streamer sections each consisting of eight channels at a spacing of 1.5625 m (Geometrics GeoEel streamer segments, 12.5 m). This resulted in 287.5 m of active streamer length. In Figures 1 and 2, the streamer set-up, deck geometries, and gun settings for the 2D surveys are visualized. The receiver system consisted of a 40 m-long tow cable (from the stern of the vessel), a 20 m-long stretch section, followed by 23 active streamer sections (7 oil-filled, 16 solid-state) and another stretch section, to reduce the drag noise of the tail-buoy at the end of the streamer. The active sections were connected with analog-to-digital (AD) converter modules, which communicated with the recording system in the lab via a TCP/IP protocol. A repeater connected the deck cable and the tow cable (lead-in). In the lab, the streamer power supply unit constituted the connection between the recording system and the AD modules. It also handled the management of the streamer power supply.

For maintaining a constant streamer depth of 2 m (4 m for P7000), four bird Remote Units (RUs) were attached to the streamer during the survey. The birds communicated with the controller via coils embedded in the streamer and the information was transmitted via a twisted pair of wires within the deck cable. Two RUs were directly attached to the stretch and the 5th active section. The other two were attached to 1.56 m long bird sections added to the streamer between the active sections 13/14 and 19/20. The bird sections did not contain hydrophones. As a consequence, the total length of the streamer is 290.6 m.

The seismic data were A/D converted within digitizing bottles within each streamer segment and transferred to the ship using an ethernet network. The data were recorded with an SPSU and Geometrics software in SEG-D format.

For navigation, we mounted a GPS antenna on the ship's superstructure close to the stern of the vessel. The position of this GPS antenna was measured with a tape measure and related to the towing points of the airgun source and the streamer. The navigation data were logged in parallel to the seismic data.

2.2 Seismic Sources

2.2.1 GI Gun

For the high-resolution MCS surveys P4000, P5000, and P6000 (Figure 1), a single GI Gun was used as the seismic source. It was attached to a stringer by two steel chains of about 1 m in length. The set-up was stabilized in a water depth of ~2 m by a large float, attached to the stringer. The gun was operated in Harmonic 355 mode (250 in^3 generator and 105 in^3 injector chamber) with a pressure of 140 bar. The injector pulse was triggered with a delay of 63 milliseconds after the generator. The shot interval was 10 seconds, equivalent to ~25 m shot point distance at a survey speed of ~4 kn.

2.2.2 GGun Array

The GGun array used during SO294 (Figure 2) consisted of six (6) GGuns operated at a pressure of 140 bar. Two GGuns each formed a cluster, and three clusters were towed together at a distance of 2.5 m from each other. The total length of the array is 8 m. Cluster 1 and 3 consisted of two 520 in^3 guns, and the middle cluster comprised two 380 in^3 guns. The total volume was 2840 in^3 (~ 46 L). The port-side deployment rail was used to deploy the array from the stern of the vessel. During data acquisition, the array was towed 49 m behind the ship's stern at 8 m depth. To achieve sufficient ray coverage while avoiding previous shot noise and allow receivers on land stations to record the signals, the GGun array was used with a shot interval of 60 s, translating to a shot point distance of 150 m at 4 kn speed.

A detailed description of the streamer and source setup can be found in *8 Appendix*.

Table 1: Data acquisition parameters for SO294
* Includes bird sections; + measured relative to GPS antenna

	P1000	**P2000**	**P3000**	**P4000**	**P5000**	**P6000**	**P7000**
Shot rate (s)	60	60	30	10	10	10	30
Record length (s)	12	12	12	8	8	8	12
Sample rate (ms)	1	1	1	0.5	0.5	0.5	1
Shot mode	GGun Array	GGun Array	GGun Array	GI Gun Harmonic 355	GI Gun Harmonic 355	GI Gun Harmonic 355	GGun Array
Streamer depth (m)	2	2	2	2	2	2	4
Total Streamer Length (m)*	290.6	290.6	290.6	290.6	290.6	290.6	290.6
Delay (ms)	55	55	55	150	150	150	55
Gun-offset to port (m)$^+$	0	0	0	0	0	0	0
Gun-offset aft (m)$^+$	68.1	68.1	68.1	45.1	45.1	45.1	68.1
Streamer offset to port (m)$^+$	9.4	9.4	9.4	9.4	9.4	9.4	9.4
Streamer offset aft (m)$^+$	83.1	83.1	83.1	83.1	83.1	83.1	83.1

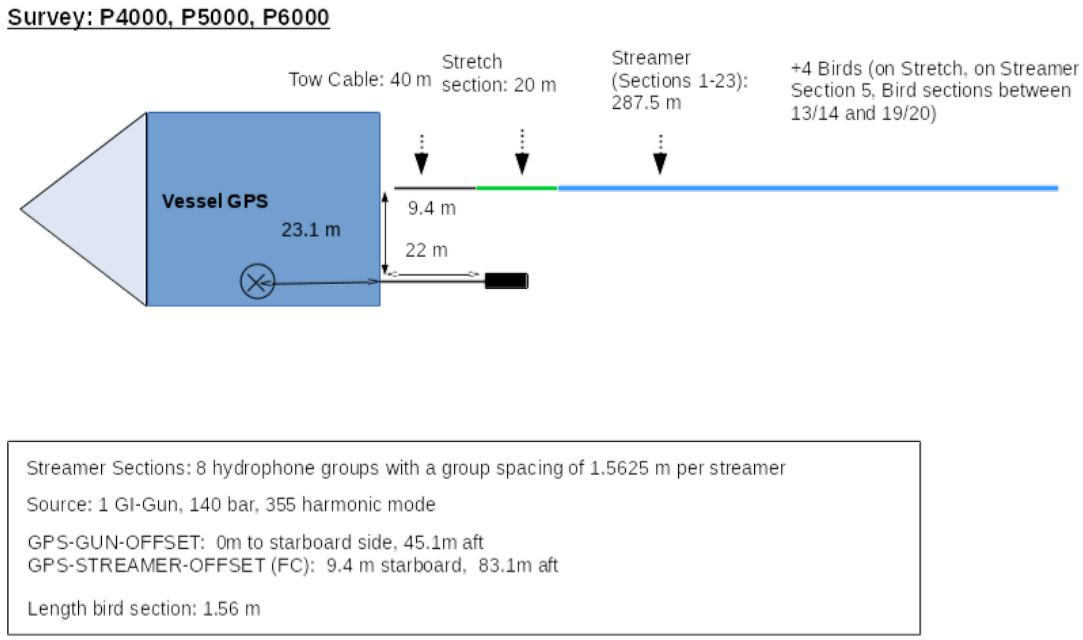

Figure 1: Survey geometry for 2D seismic acquisition using a single GI airgun during SO294

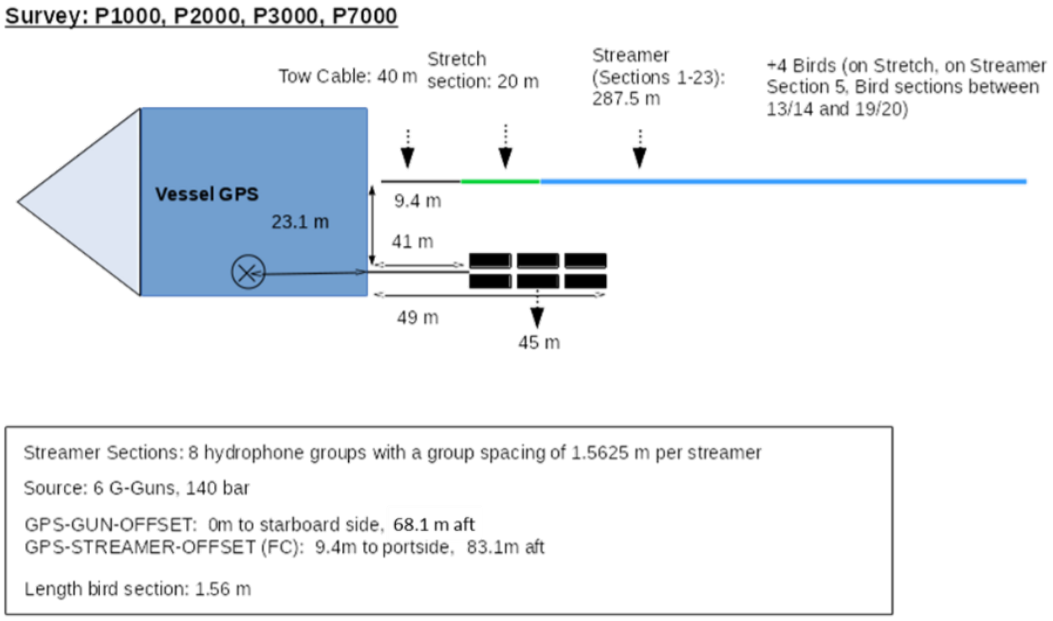

Figure 2: Survey geometry for 2D seismic acquisition using a GGun array during SO294

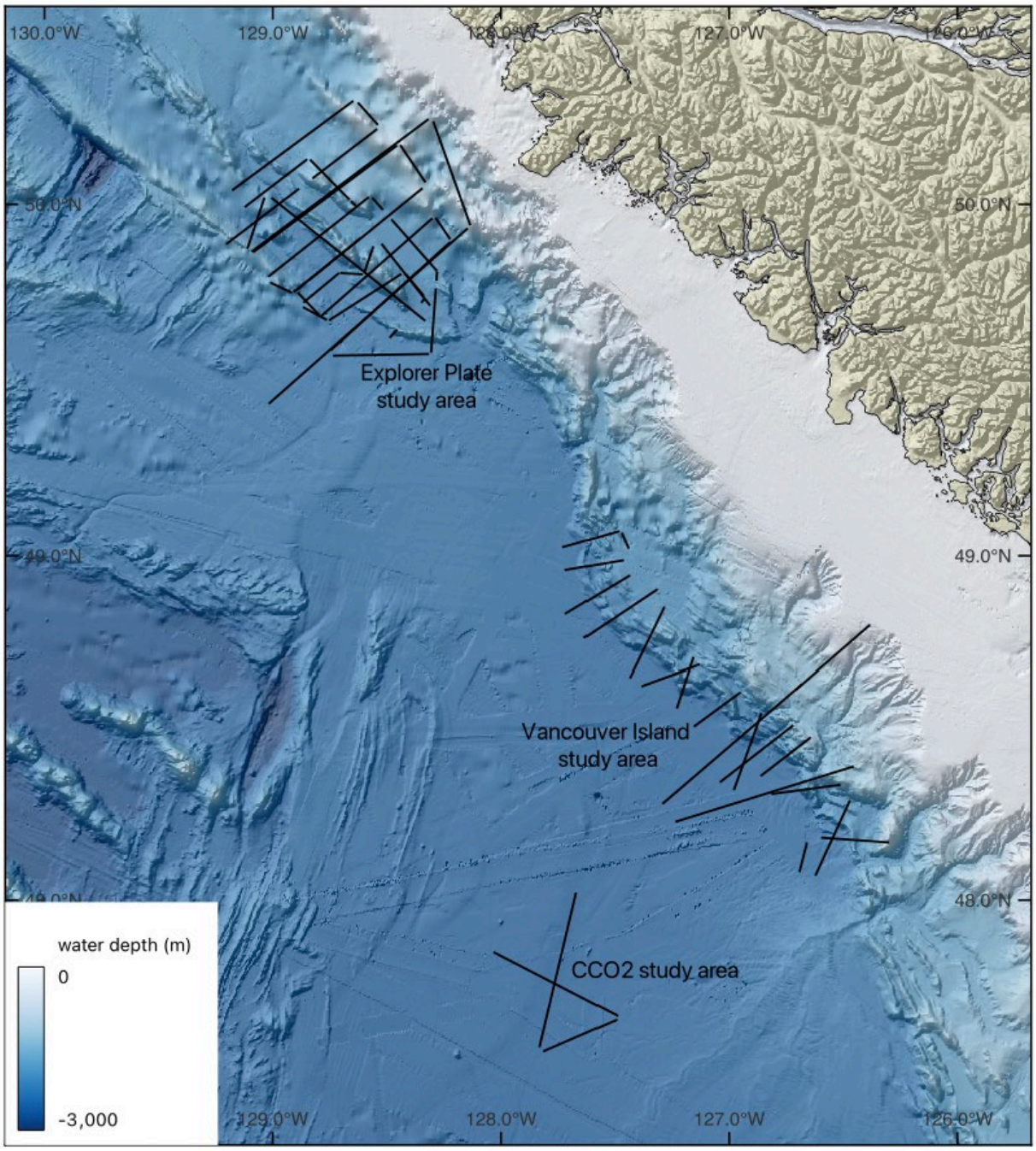

Figure 3: Overview of reflection seismic acquisition during SO294

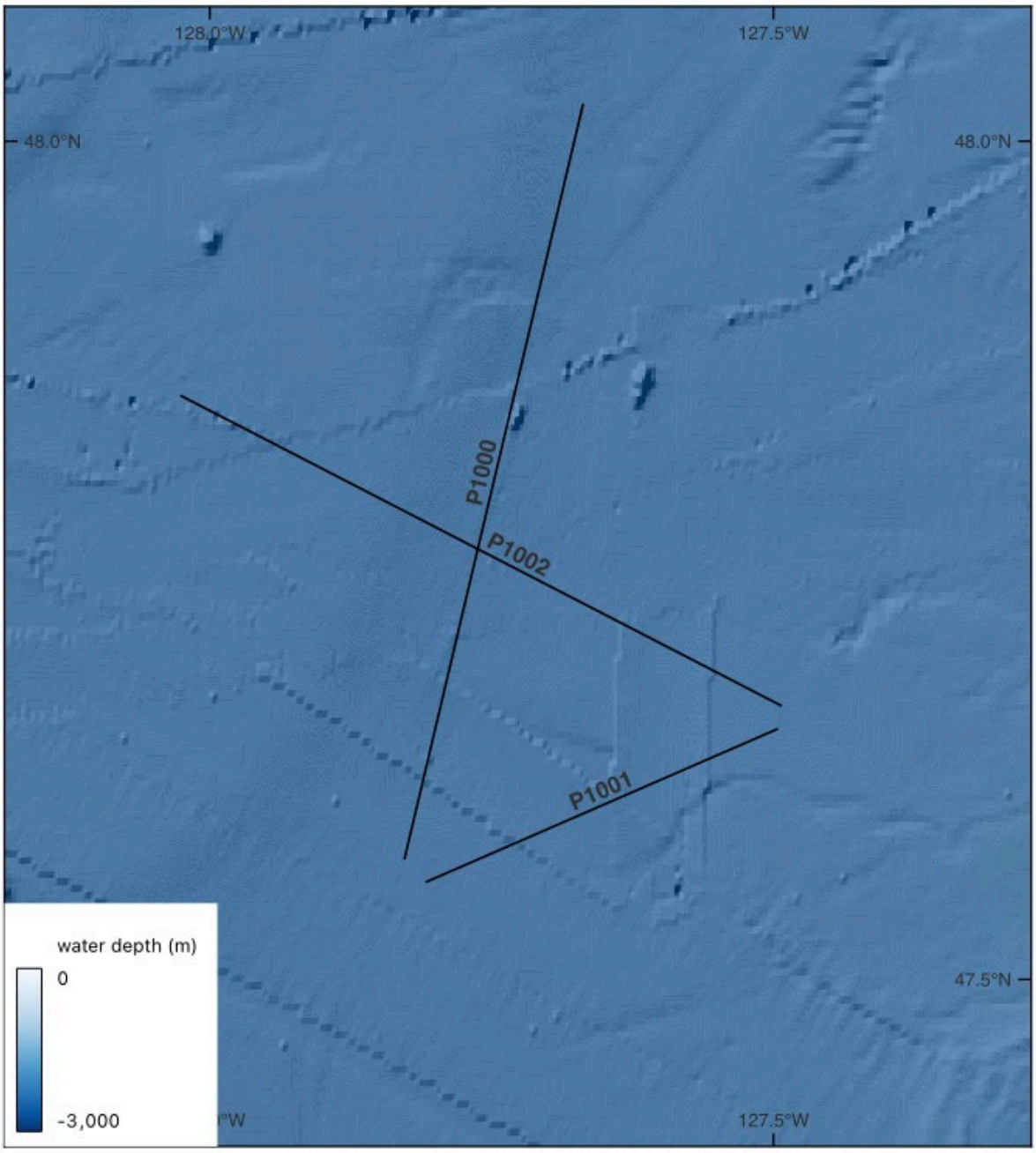

Figure 4: SO294 seismic survey **P1000** in the CCO2 study area

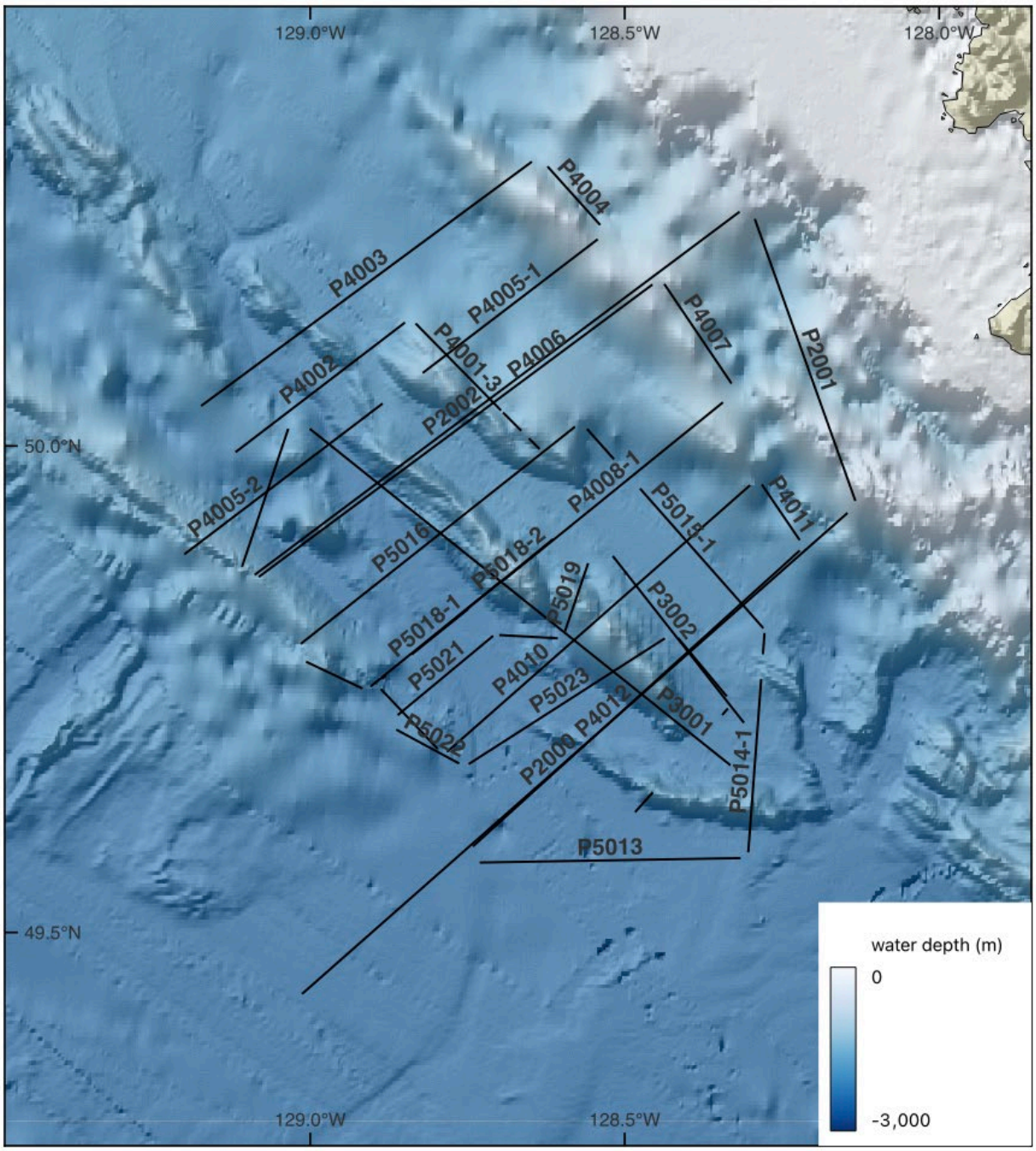

Figure 5: SO294 seismic surveys **P2000**, **P3000**, **P4000**, and **P5000** on Explorer Plate

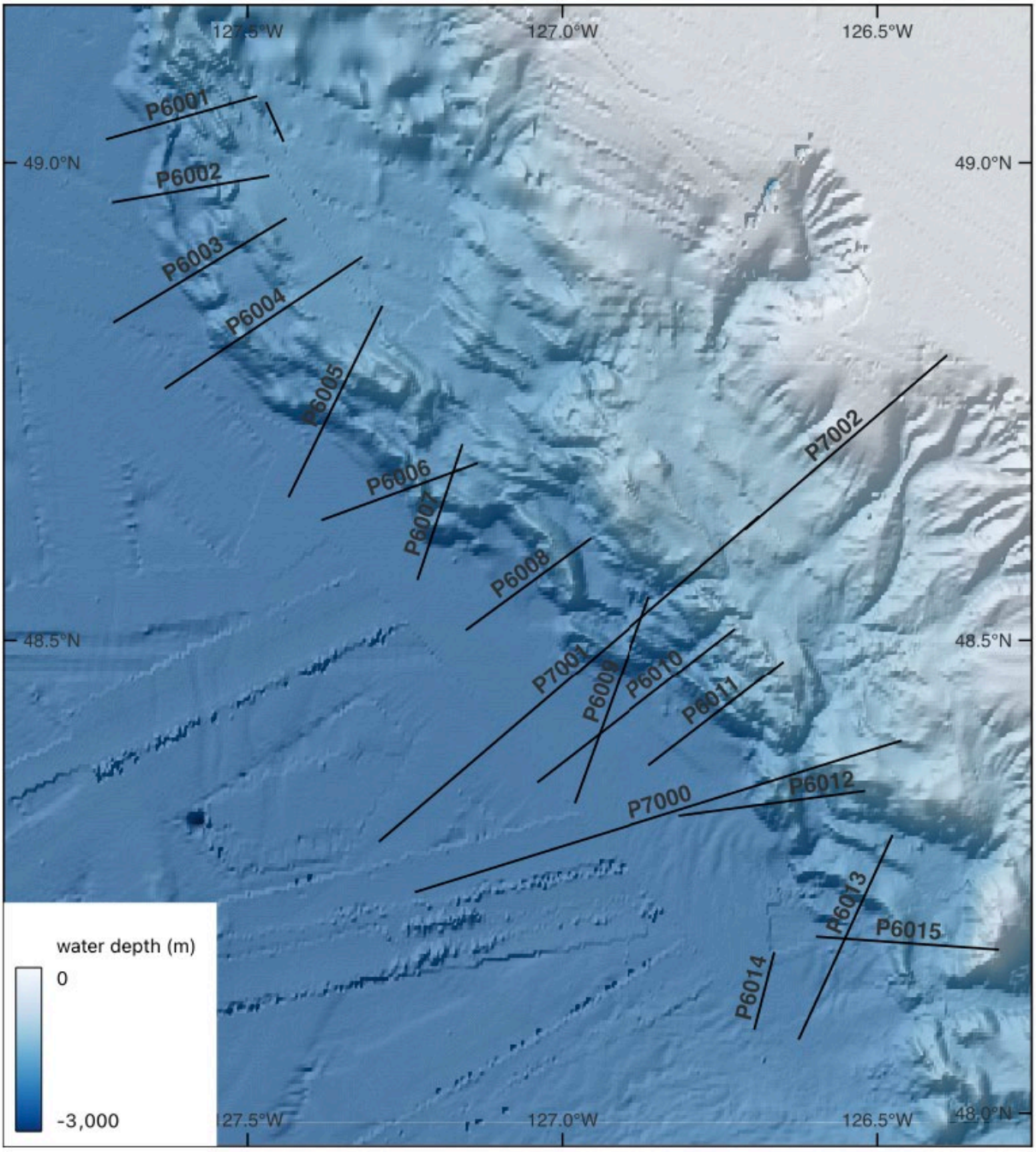

Figure 6: SO294 seismic surveys **P6000** and **P7000** off Vancouver Island

3 Data Description

The complete raw 2D multichannel reflection seismic data set has been archived at the German repository PANGAEA. The data have been quality controlled before archiving. However, for completeness, all recorded shots, whether qualified or not, have been included in the archiving process.

In addition, the seismic watchkeeping log called *SO294_2D_Seismic_watchkeeping_log.xls* documents any changes or problems during the acquisition and logging of the data. The navigation files listed in Table 2 have been attached and linked to the data set.

Please note that the line numbering in this technical report has been revised after the first quality control and might differ from the original final line numbering referred to in the original logs and final report linked to this data set.

Table 2: Supplement

Item	**Description**
SO294_Schiff.txt	Navigation text file – Start 20.09.2022 at 21:29:43 End 22.09.2022 at 21:13:21
SO294_P1000_Schiff.txt	Navigation text file Start 20.09.2022 at 21:28:07 End 20.09.2022 at 21:29:15
SO294_P2000_Schiff.txt	Navigation text file Start 28.09.2022 at 22:31:12 End 30.09.2022 at 05:49:09
SO294_P3000_Schiff.txt	Navigation text file Start 30.09.2022 at 05:49:24 End 30.09.2022 at 20:57:29
SO294_P4000_Schiff.txt	Navigation text file Start 30.09.2022 at 20:57:48 End 03.10.2022 at 04:13:26
SO294_P5000_Schiff.txt	Navigation text file Start 03.10.2022 at 04:13:46 End 04.10.2022 at 17:28:54
SO294_P6000_Schiff.txt	Navigation text file Start 12.10.2022 at 16:28:40 End 14.10.2022 at 22:18:31
SO294_P7000_Schiff.txt	Navigation text file Start 14.10.2022 at 22:19:42 End 15.10.2022 at 23:43:39
SO294_P1000.0000.Nav.txt	Navigation text file for **SP 1000-2063**
SO294_P2000.0000.Nav.txt	Navigation text file for **SP 3000-4748**
SO294_P3000.0000.Nav.txt	Navigation text file for **SP 5000-6710**
SO294_P4000.0000.Nav.txt	Navigation text file for **SP 7000-41662** Covering P4000 and P5000
SO294_P6000.0000.Nav.txt	Navigation text file for **SP 43000-62033**
SO294_P7000.0000.Nav.txt	Navigation text file for **SP 64000-64120**
SO294_P7001.0000.Nav.txt	Navigation text file for **SP 64500-66640**
SO294_P7002.0000.Nav.txt	Navigation text file for **SP 67000-67600**
SO294_2D_Seismic_watchkeeping_log.xls	Watchkeeping log for 2D MCS reflection RAW data
	Technical report for 2D MCS reflection RAW data
https://doi.org/10.48433/cr_so294	Cruise Report SO294

4 Data Quality/ Accuracy

The seismic data are of good quality and do not show significant noise apart from a bubble pulse and the seafloor multiple. Due to the relatively soft seafloor both these noise sources do not affect the imaging in a significant way. Still, it will be useful to suppress the seafloor multiple with more sophisticated processing as the data show clear evidence of primary reflections below the onset of the first seafloor multiple, especially in shallow water <1500 m water depth. The penetration of the seismic data is generally good reaching more than 1 s two-way travel time in parts of the survey area.

However, some interruptions occurred during the data acquisition for various reasons, e.g., spotting marine mammals, troubleshooting regarding the acquisition, weather downtime, etc. Any problems regarding metadata identified during quality control after the survey have been listed for each setup individually in a spreadsheet in the appendix.

Please note that these lists do not cover all shot points recorded and archived. Only shot points identified to have an issue are included.

Table 3: Abbreviation

ntbp	not to be processed (Please note: This just might be a suggestion even if there exists a SEGD file due to major acquisition problems!)
SP	Shot Point
FSP	First Shot Point
FGSP	First Good Shot Point
LSP	Last Shot Point
LGSP	Last Good Shot Point
NMEA	NMEA 0183 is a combined electrical and data specification for communication between marine electronics such as echo sounders, sonars, anemometers, gyrocompass, autopilot, GPS receivers, and many other types of instruments. It has been defined and is controlled by the National Marine Electronics Association (NMEA). This standard provides different versions depending on the setup of the recording systems. However, they all fulfill the requirements of GPS positioning and time. In case, the string has been "not recorded", necessary metadata like positioning can be obtained via DShip.
←	Information taken from
→	Consequences/ Action taken as a result of

5 Data Availability/ Access

The raw seismic files and all corresponding logs and spreadsheets or files have been archived at PANGAEA https://doi.pangaea.de/10.1594/PANGAEA.961490

The data will be freely available after the end of the moratorium period of four years ending 27th October 2027, unless the author has applied for an extension. When using the data, please cite this data publication. Recommended citation is:

Riedel, M., Bialas, J., Klein, E., Berndt, J., 2024. 2D multichannel seismic reflection raw data (GI Gun & GGun array entire dataset) of RV SONNE during cruise SO294. PANGAEA, https://doi.pangaea.de/10.1594/PANGAEA.961490

6 Acknowledgments

We acknowledge the Nuu-Chah-Nulth Tribal Council (NTC) and their member Nations as well as the Quatsino and Pacheedaht Nations on whose marine traditional territories we conducted our science.

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7 References

Douglas, K., Côté, M., Riedel, M., Podhorodeski, A., and Obana, K., 2024. 2023003PGC cruise report: Northern Cascadia Subduction Zone international research expedition, offshore British Columbia; Geological Survey of Canada, Open File 9072, 120 p. https://doi.org/10.4095/332361

8 Appendix

8.1 Details for **P1000**

(Please refer also to Figure 4: SO294 seismic survey **8.1** Details for in the CCO2 study area.)

Table 4: Seismic profiles for **P1000**
(**FGSP** stands for **F**irst **G**ood **S**hot **P**oint and **LGSP** stands for **L**ast **G**ood **S**hot **P**oint)

Event	Profile	FGSP	LGSP	LAT Start	LONG Start	LAT End	LONG End
SO294_69-1	P1000	1108	1455	48.021845°N	127.669558°W	47.572512°N	127.827843°W
SO294_69-1	P1001	1475	1651	47.558552°N	127.808177°W	47.649790°N	127.497463°W
SO294_69-1	P1002	1665	1966	47.664035°N	127.493997°W	47.848633°N	128.025807°W

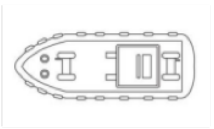
Table 5: Data acquisition parameters for **P1000**
***** Includes bird sections; $^{+}$ measured relative to GPS antenna

	P1000
Shot rate (s)	60
Record length (s)	12
Sample rate (ms)	1
Shot mode	GGun Array
Streamer depth (m)	2
Total Streamer Length (m)*	290.6
Delay (ms)	55
Gun-offset to port (m)$^{+}$	0
Gun-offset aft (m)$^{+}$	68.1
Streamer offset to port (m)$^{+}$	9.4
Streamer offset aft (m)$^{+}$	83.1

Cruise: SO294_CLOCKS Date: 20.09.2022

Line: P1000

cable length 378,21 m



sample rate 1 ms
record length 12 s
streamer depth 2 m

	Navigator Bird										Navigator Bird				
	N/A										N/A				
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.
GeoEel TowCable	GeoEel Vibro	GeoEel Digitizer	GeoEel Streamer	GeoEel Digitizer	GeoEel Streamer	GeoEel Digitizer	GeoEel Streamer	GeoEel Digitizer	GeoEel Streamer	GeoEel Digitizer	GeoEel Streamer	GeoEel Digitizer	GeoEel Streamer	GeoEel Digitizer	GeoEel Streamer
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			#1: 1 - 8		#2: 9 - 16		#3: 17 - 24		#4: 25 - 32		#5: 33 - 40		#6: 41 - 48		#7: 49 - 56
40,00 m	20,00 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m
40,00 m	60,00 m	60,33 m	72,83 m	73,16 m	85,66 m	85,99 m	98,49 m	98,82 m	111,32 m	111,65 m	124,15 m	124,48 m	136,98 m	137,31 m	149,81 m

												Navigator Bird			
												N/A			
17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.	31.	32.
GeoEel Digitizer	GeoEel Streamer	GeoEel Digitizer	GeoEel Streamer	GeoEel Digitizer	GeoEel Streamer	GeoEel Digitizer	GeoEel Streamer	GeoEel Digitizer	GeoEel Streamer	GeoEel Digitizer	GeoEel Streamer	GeoEel Bird ISO	GeoEel Digitizer	GeoEel Streamer	GeoEel Digitizer
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	#8: 57 - 64		#9: 65 - 72		#10: 73 - 80		#11: 81 - 88		#12: 89 - 96		#13: 97 - 104			#14: 105 - 112	
0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	1,56 m	0,33 m	12,50 m	0,33 m
150,14 m	162,64 m	162,97 m	175,47 m	175,80 m	188,30 m	188,63 m	201,13 m	201,46 m	213,96 m	214,29 m	226,79 m	228,35 m	228,68 m	241,18 m	241,51 m

									Navigator Bird						
									N/A						
33.	34.	35.	36.	37.	38.	39.	40.	41.	42.	43.	44.	45.	46.	47.	48.
GeoEel Streamer	GeoEel Digitizer	GeoEel Streamer	GeoEel Digitizer	GeoEel Streamer	GeoEel Digitizer	GeoEel Streamer	GeoEel Digitizer	GeoEel Streamer	GeoEel Bird ISO	GeoEel Digitizer	GeoEel Streamer	GeoEel Digitizer	GeoEel Streamer	GeoEel Digitizer	GeoEel Streamer
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
#15: 106 - 120		#16: 121 - 128		#17: 129 - 136		#18: 137 - 144		#19: 145 - 152			#20: 153 - 160		#21: 161 - 168		#22: 169 - 176
12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	1,56 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m
254,01 m	254,34 m	266,84 m	267,17 m	279,67 m	280,00 m	292,50 m	292,83 m	305,33 m	306,89 m	307,22 m	319,72 m	320,05 m	332,55 m	332,88 m	345,38 m

49.	50.	51.	52.
GeoEel Digitizer	GeoEel Streamer	GeoEel Vibro	tail-buoy
N/A	N/A	N/A	N/A
	#23: 177 - 184		
0,33 m	12,50 m	20,00 m	0,00 m
345,71 m	358,21 m	378,21 m	378,21 m

Figure 7: Streamer setup for **P1000**

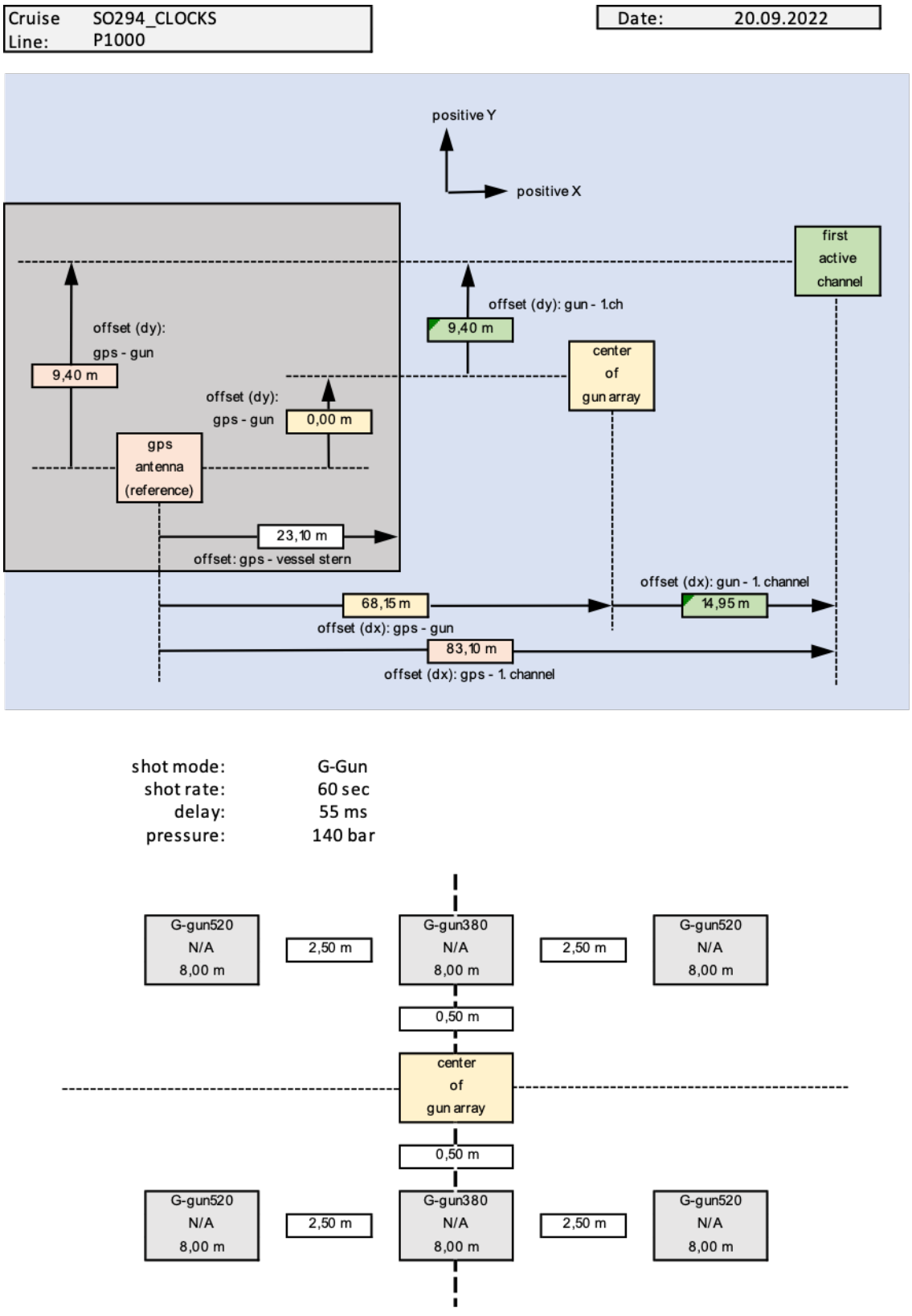


Figure 8: Source setup for **P1000**

8.2 Details for **P2000**

(Please refer also to Figure 5: SO294 seismic surveys **P2000**, **P3000**, **P4000**, and **P5000** on Explorer Plate.)

Table 6: Seismic profiles for **P2000**
(**FGSP** stands for **F**irst **G**ood **S**hot **P**oint and **LGSP** stands for **L**ast **G**ood **S**hot **P**oint)

Event	Profile	FGSP	LGSP	LAT Start	LONG Start	LAT End	LONG End
SO294_135-1	P2000	3131	3765	49.437170°N	129.011573°W	49.930683°N	128.147040°W
SO294_135-1	P2001	3780	4046	49.944942°N	128.133790°W	50.230633°N	128.292562°W
SO294_135-1	P2002	4065	4740	50.238197°N	128.318718°W	49.868710°N	129.086827°W

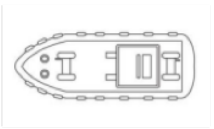
Table 7: Data acquisition parameters for **P2000**
* Includes bird sections; + measured relative to GPS antenna

	P2000
Shot rate (s)	60
Record length (s)	12
Sample rate (ms)	1
Shot mode	GGun Array
Streamer depth (m)	2
Total Streamer Length (m)*	290.6
Delay (ms)	55
Gun-offset to port (m)$^{+}$	0
Gun-offset aft (m)$^{+}$	68.1
Streamer offset to port (m)$^{+}$	9.4
Streamer offset aft (m)$^{+}$	83.1

Cruise: SO294_CLOCKS Date: 29.09.2022

Line: P2000

cable length 378,21 m



sample rate 1 ms
record length 12 s
streamer depth 2 m

	Navigator Bird										Navigator Bird				
	N/A										N/A				
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.
GeoEel TowCable	GeoEel Vibro	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			#1: 1 - 8		#2: 9 - 16		#3: 17 - 24		#4: 25 - 32		#5: 33 - 40		#6: 41 - 48		#7: 49 - 56
40,00 m	20,00 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m
40,00 m	60,00 m	60,33 m	72,83 m	73,16 m	85,66 m	85,99 m	98,49 m	98,82 m	111,32 m	111,65 m	124,15 m	124,48 m	136,98 m	137,31 m	149,81 m

												Navigator Bird			
												N/A			
17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.	31.	32.
GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	GeoEel Bird ISO	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	#8: 57 - 64		#9: 65 - 72		#10: 73 - 80		#11: 81 - 88		#12: 89 - 96		#13: 97 - 104			#14: 105 - 112	
0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	1,56 m	0,33 m	12,50 m	0,33 m
150,14 m	162,64 m	162,97 m	175,47 m	175,80 m	188,30 m	188,63 m	201,13 m	201,46 m	213,96 m	214,29 m	226,79 m	228,35 m	228,68 m	241,18 m	241,51 m

									Navigator Bird						
									N/A						
33.	34.	35.	36.	37.	38.	39.	40.	41.	42.	43.	44.	45.	46.	47.	48.
GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	GeoEel Bird ISO	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
#15: 106 - 120		#16: 121 - 128		#17: 129 - 136		#18: 137 - 144		#19: 145 - 152			#20: 153 - 160		#21: 161 - 168		#22: 169 - 176
12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	1,56 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m
254,01 m	254,34 m	266,84 m	267,17 m	279,67 m	280,00 m	292,50 m	292,83 m	305,33 m	306,89 m	307,22 m	319,72 m	320,05 m	332,55 m	332,88 m	345,38 m

49.	50.	51.	52.
GeoEelDigitizer	GeoEel Streamer	GeoEel Vibro	tail-buoy
N/A	N/A	N/A	N/A
	#23: 177 - 184		
0,33 m	12,50 m	20,00 m	0,00 m
345,71 m	358,21 m	378,21 m	378,21 m

Figure 9: Streamer setup for **P2000**

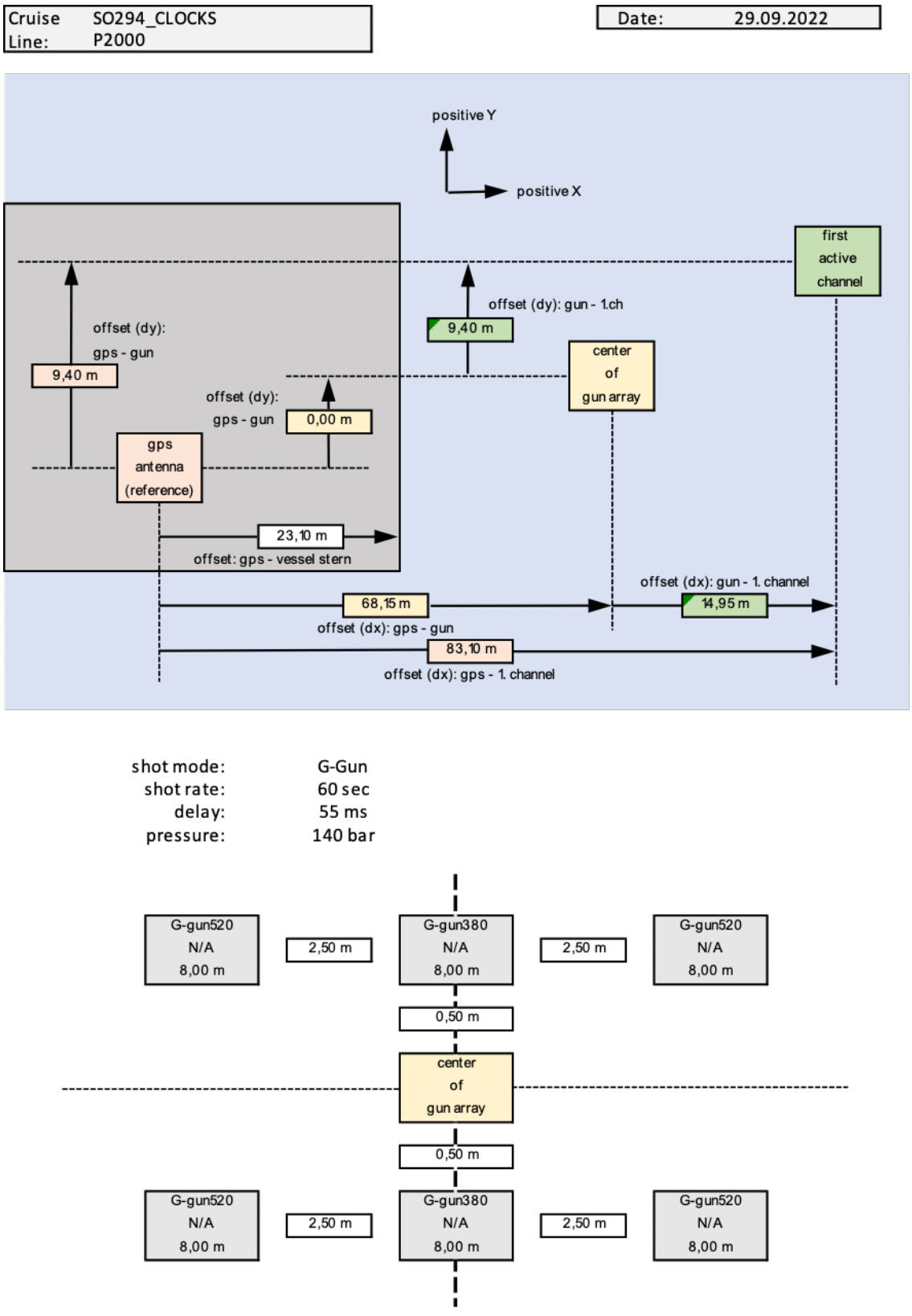


Figure 10: Source setup for **P2000**

8.3 Details for **P3000**

(Please refer also to Figure 5: SO294 seismic surveys **P2000**, **P3000**, **P4000**, and **P5000** on Explorer Plate.)

Table 8: Seismic profiles for **P3000**
(**FGSP** stands for **F**irst **G**ood **S**hot **P**oint and **LGSP** stands for **L**ast **G**ood **S**hot **P**oint)

Event	Profile	FGSP	LGSP	LAT Start	LONG Start	LAT End	LONG End
SO294_135-1	P3000	5007	5244	49.877333°N	129.107863°W	50.016430°N	129.035490°W
SO294_135-1	P3001	5304	6220	50.016918°N	128.999400°W	49.673140°N	128.333278°W
SO294_135-1	P3002	6323	6714	49.716955°N	128.311385°W	49.886465°N	128.517842°W

Table 9: Data acquisition parameters for **P3000**
* Includes bird sections; $^{+}$ measured relative to GPS antenna

	P3000
Shot rate (s)	60
Record length (s)	12
Sample rate (ms)	1
Shot mode	GGun Array
Streamer depth (m)	2
Total Streamer Length (m)*	290.6
Delay (ms)	55
Gun-offset to port (m)$^{+}$	0
Gun-offset aft (m)$^{+}$	68.1
Streamer offset to port (m)$^{+}$	9.4
Streamer offset aft (m)$^{+}$	83.1

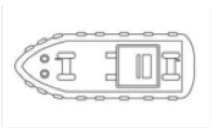
Table 10: Troubleshooting for **P3000**

Profile	Item	SP Range	Problem	Details/Action taken
P3002	SP	6711-6713	ASCII files exist but no NMEA ← not in SO294_P3000.0000.Nav.txt	NMEA created via SO294_P3000_Schiff.txt ← SO294_2D_Seismic_watchkeeping_log.xls
P3002	LGSP	6714	ASCII file exists but no NMEA ← not in SO94_P3000.0000.Nav.txt	NMEA created via SO294_P3000_Schiff.txt ← SO294_2D_Seismic_watchkeeping_log.xls
P3000	LSP	6715	ASCII file exists but no NMEA ← not in SO94_P3000.0000.Nav.txt	NMEA created via SO294_P3000_Schiff.txt ← SO294_2D_Seismic_watchkeeping_log.xls → ntbp

Cruise: SO294_CLOCKS Date: 30.09.2022

Line: P3000

cable length 378,21 m



sample rate 1 ms
record length 12 s
streamer depth 2 m

	Navigator Bird										Navigator Bird				
	N/A										N/A				
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.
GeoEel TowCable	GeoEel Vibro	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			#1: 1 - 8		#2: 9 - 16		#3: 17 - 24		#4: 25 - 32		#5: 33 - 40		#6: 41 - 48		#7: 49 - 56
40,00 m	20,00 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m
40,00 m	60,00 m	60,33 m	72,83 m	73,16 m	85,66 m	85,99 m	98,49 m	98,82 m	111,32 m	111,65 m	124,15 m	124,48 m	136,98 m	137,31 m	149,81 m

												Navigator Bird			
												N/A			
17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.	31.	32.
GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	GeoEel Bird ISO	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	#8: 57 - 64		#9: 65 - 72		#10: 73 - 80		#11: 81 - 88		#12: 89 - 96		#13: 97 - 104			#14: 105 - 112	
0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	1,56 m	0,33 m	12,50 m	0,33 m
150,14 m	162,64 m	162,97 m	175,47 m	175,80 m	188,30 m	188,63 m	201,13 m	201,46 m	213,96 m	214,29 m	226,79 m	228,35 m	228,68 m	241,18 m	241,51 m

									Navigator Bird						
									N/A						
33.	34.	35.	36.	37.	38.	39.	40.	41.	42.	43.	44.	45.	46.	47.	48.
GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	GeoEel Bird ISO	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
#15: 106 - 120		#16: 121 - 128		#17: 129 - 136		#18: 137 - 144		#19: 145 - 152			#20: 153 - 160		#21: 161 - 168		#22: 169 - 176
12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	1,56 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m
254,01 m	254,34 m	266,84 m	267,17 m	279,67 m	280,00 m	292,50 m	292,83 m	305,33 m	306,89 m	307,22 m	319,72 m	320,05 m	332,55 m	332,88 m	345,38 m

49.	50.	51.	52.
GeoEelDigitizer	GeoEel Streamer	GeoEel Vibro	tail-buoy
N/A	N/A	N/A	N/A
	#23: 177 - 184		
0,33 m	12,50 m	20,00 m	0,00 m
345,71 m	358,21 m	378,21 m	378,21 m

Figure 11: Streamer setup for **P3000**

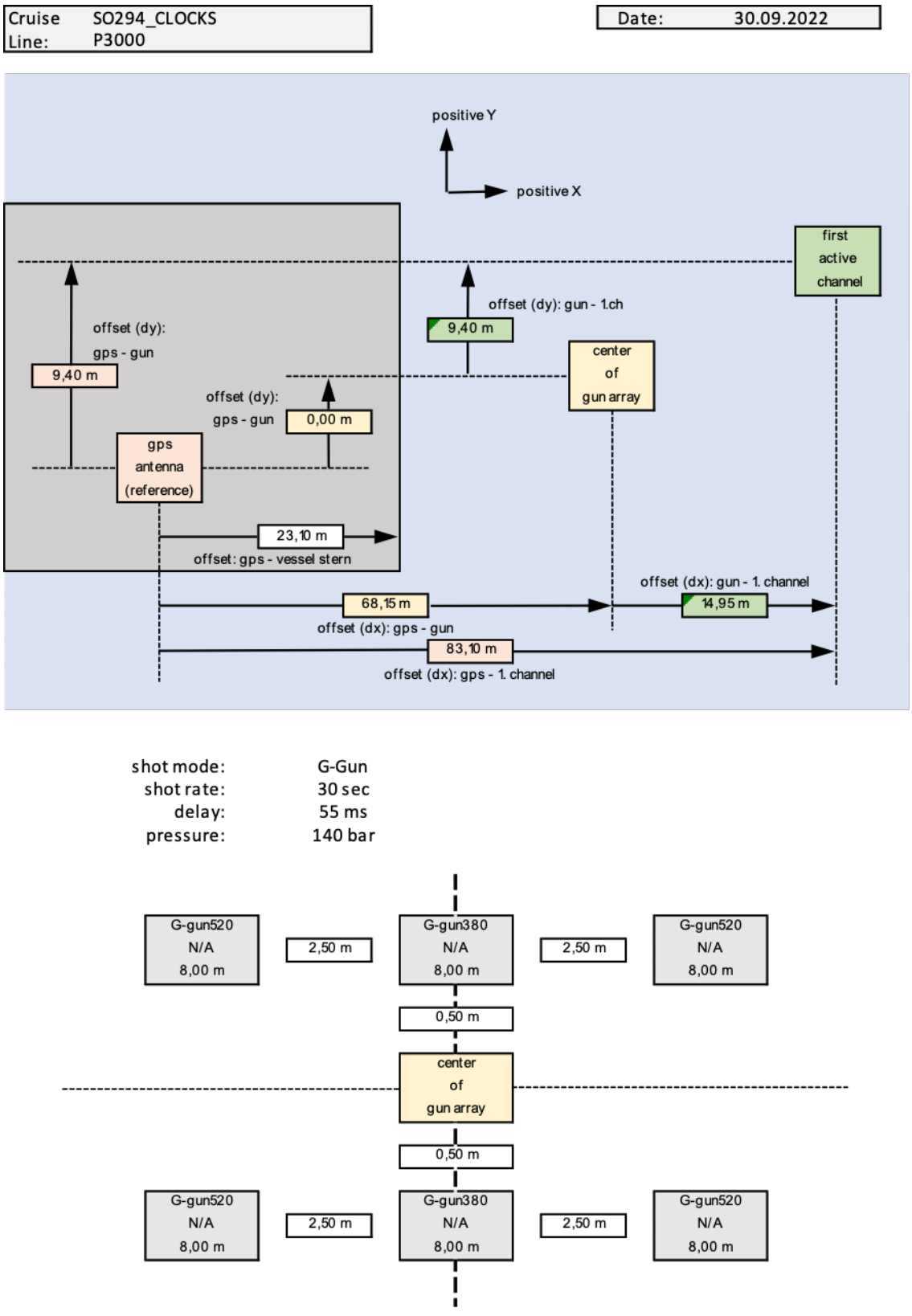


Figure 12: Source setup for **P3000**

8.4 Details for **P4000**

(Please refer also to Figure 5: SO294 seismic surveys **P2000**, **P3000**, **P4000**, and **P5000** on Explorer Plate.)

Table 11: Seismic profiles for **P4000**
(**FGSP** stands for **F**irst **G**ood **S**hot **P**oint and **LGSP** stands for **L**ast **G**ood **S**hot **P**oint)

Event	Profile	FGSP	LGSP	LAT Start	LONG Start	LAT End	LONG End
SO294_136-1	P4001-1	7375	7440	49.997588°N	128.636365°W	50.006888°N	128.650918°W
SO294_136-1	P4001-2	7700	7820	50.016375°N	128.665765°W	50.033338°N	128.692050°W
SO294_136-1	P4001-3	8000	8604	50.037157°N	128.697867°W	50.124280°N	128.831100°W
SO294_136-1	P4002	8672	9805	50.125357°N	128.850735°W	49.994383°N	129.117240°W
SO294_136-1	P4003	10175	12226	50.041590°N	129.171955°W	50.289112°N	128.648945°W
SO294_136-1	P4004	12325	12696	50.284097°N	128.621512°W	50.226298°N	128.540128°W
SO294_136-1	P4005-1	12783	13822	50.210218°N	128.544237°W	50.075242°N	128.819723°W
SO294_136-1	P4005-2	14091	15420	50.042643°N	128.886343°W	49.889827°N	129.198585°W
SO294_136-1	P4006	16124	18604	49.866642°N	129.080208°W	50.164078°N	128.457300°W
SO294_136-1	P4007	18678	19404	50.164367°N	128.435938°W	50.064750°N	128.331097°W
SO294_136-1	P4008-1	19540	20914	50.043865°N	128.345085°W	49.862680°N	128.691977°W
SO294_136-1	P4008-2	21158	21510	49.832095°N	128.750378°W	49.787117°N	128.836997°W
SO294_136-1	P4008-3	21683	21697	49.763908°N	128.880753°W	49.762048°N	128.884335°W
SO294_136-1	P4009	21757	22147	49.749947°N	128.886415°W	49.690177°N	128.798557°W
SO294_136-1	P4010	22212	24383	49.686895°N	128.781053°W	49.959083°N	128.301913°W
SO294_136-1	P4011	24455	24764	49.959613°N	128.280827°W	49.904642°N	128.222812°W
SO294_136-1	P4012	24834	27014	49.892163°N	128.222983°W	49.589587°N	128.739927°W

Table 12: Data acquisition parameters for **P4000**
* Includes bird sections; $^{+}$ measured relative to GPS antenna

	P4000
Shot rate (s)	10
Record length (s)	8
Sample rate (ms)	0.5
Shot mode	GI Gun Harmonic 355
Streamer depth (m)	2
Total Streamer Length (m)*	290.6
Delay (ms)	150
Gun-offset to port (m)$^{+}$	0
Gun-offset aft (m)$^{+}$	45.1
Streamer offset to port (m)$^{+}$	9.4
Streamer offset aft (m)$^{+}$	83.1

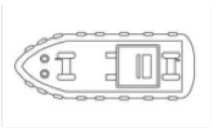
Table 13: Troubleshooting for **P4000**

Profile	**Item**	**SP Range**	**Problem**	**Details/Action taken**
P4001	SP	7441-7447	Geometrics crashed	← SO294_2D_Seismic_watchkeeping_log.xls → ntbp
P4001	SP	7448-7669	Geometrics crashed (no ASCII files and no SEGD files)	← SO294_2D_Seismic_watchkeeping_log.xls → ntbp
P4001	SP	7821-7825	Geometrics crashed	← SO294_2D_Seismic_watchkeeping_log.xls → ntbp
P4001	SP	7826-7999	Geometrics crashed (no ASCII files and no SEGD files)	← SO294_2D_Seismic_watchkeeping_log.xls → ntbp
P4005	SP	13823-14090	Shut down	← SO294 Cruise Report (Table 6.2.1) → ntbp
P4008	SP	20915-21157	No recording	← SO294 Cruise Report (Table 6.2.1) ← SO294_2D_Seismic_watchkeeping_log.xls; → ntbp
P4008	SP	21511-21682	Shut down	← SO294 Cruise Report (Table 6.2.1) → ntbp
P4000	SP	27049	ASCII file exists but no NMEA ← not in SO294_P4000.0000.Nav.txt	NMEA created via SO294_P4000_Schiff.txt

Cruise: SO294_CLOCKS Date: 30.09.2022

Line: P4000

cable length 378,21 m



sample rate 0,5 ms
record length 8 s
streamer depth 4 - 6 m

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.
GeoEel TowCable	GeoEel Vibro	GeoEelDigitizer	Navigator Bird	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	Navigator Bird	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			N/A								N/A				
			#1: 1 - 8		#2: 9 - 16		#3: 17 - 24		#4: 25 - 32		#5: 33 - 40		#6: 41 - 48		#7: 49 - 56
40,00 m	20,00 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m
40,00 m	60,00 m	60,33 m	72,83 m	73,16 m	85,66 m	85,99 m	98,49 m	98,82 m	111,32 m	111,65 m	124,15 m	124,48 m	136,98 m	137,31 m	149,81 m

17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.	31.	32.
GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	Navigator Bird	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
												N/A			
	#8: 57 - 64		#9: 65 - 72		#10: 73 - 80		#11: 81 - 88		#12: 89 - 96		#13: 97 - 104			#14: 105 - 112	
0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	1,56 m	0,33 m	12,50 m	0,33 m
150,14 m	162,64 m	162,97 m	175,47 m	175,80 m	188,30 m	188,63 m	201,13 m	201,46 m	213,96 m	214,29 m	226,79 m	228,35 m	228,68 m	241,18 m	241,51 m

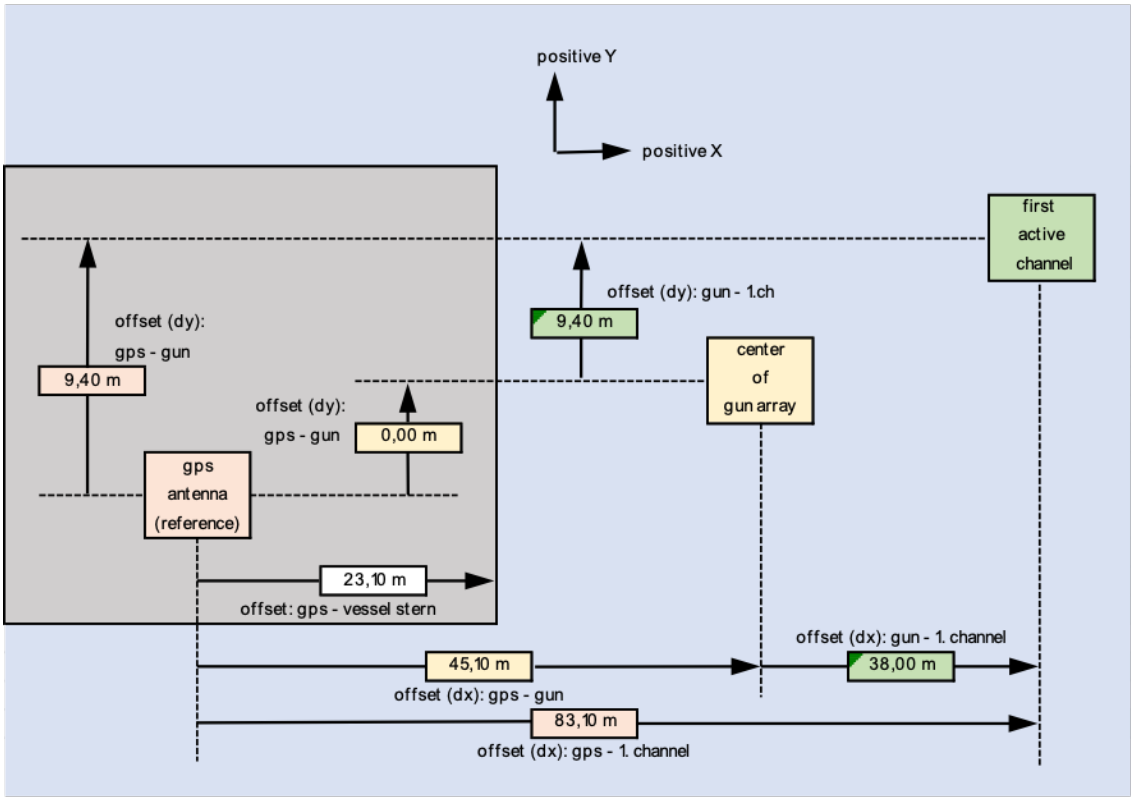
33.	34.	35.	36.	37.	38.	39.	40.	41.	42.	43.	44.	45.	46.	47.	48.
GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	Navigator Bird	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
									N/A						
#15: 106 - 120		#16: 121 - 128		#17: 129 - 136		#18: 137 - 144		#19: 145 - 152			#20: 153 - 160		#21: 161 - 168		#22: 169 - 176
12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	1,56 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m
254,01 m	254,34 m	266,84 m	267,17 m	279,67 m	280,00 m	292,50 m	292,83 m	305,33 m	306,89 m	307,22 m	319,72 m	320,05 m	332,55 m	332,88 m	345,38 m

49.	50.	51.	52.
GeoEelDigitizer	GeoEel Streamer	GeoEel Vibro	tail-buoy
N/A	N/A	N/A	N/A
	#23: 177 - 184		
0,33 m	12,50 m	20,00 m	0,00 m
345,71 m	358,21 m	378,21 m	378,21 m

Figure 13: Streamer setup for **P4000**

Cruise	SO294_CLOCKS
Line:	P4000

Date:	30.09.2022



shot mode:	GI-Gun
shot rate:	10 sec
delay:	150 ms
pressure:	140 bar

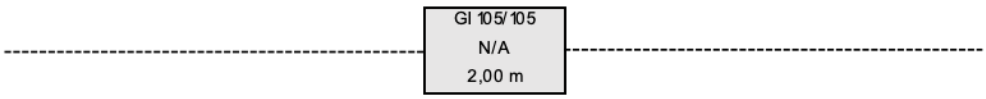


Figure 14: Source setup for **P4000**

8.5 Details for **P5000**

(Please refer also to Figure 5: SO294 seismic surveys **P2000**, **P3000**, **P4000**, and **P5000** on Explorer Plate.)

Table 14: Seismic profiles for **P5000**
(**FGSP** stands for **F**irst **G**ood **S**hot **P**oint and **LGSP** stands for **L**ast **G**ood **S**hot **P**oint)

Event	Profile	FGSP	LGSP	LAT Start	LONG Start	LAT End	LONG End
SO294_136-1	P5013	29087	30424	49.572142°N	128.728695°W	49.576702°N	128.317462°W
SO294_136-1	P5014-1	30502	31497	49.583785°N	128.303370°W	49.759883°N	128.283053°W
SO294_136-1	P5014-2	31651	31759	49.787665°N	128.279968°W	49.807128°N	128.277808°W
SO294_136-1	P5015	31803	32881	49.814253°N	128.280778°W	49.955548°N	128.474343°W
SO294_136-1	P5016	33407	35009	50.018932°N	128.580265°W	49.797867°N	129.013672°W
SO294_136-1	P5017	35142	35414	49.778405°N	129.004970°W	49.751828°N	128.918385°W
SO294_136-1	P5018-1	35458	36183	49.754053°N	128.902692°W	49.860888°N	128.698048°W
SO294_136-1	P5018-2	36971	37471	49.833620°N	128.749073°W	49.904057°N	128.614987°W
SO294_136-1	P5019	37695	38021	49.878837°N	128.558630°W	49.810990°N	128.594450°W
SO294_136-1	P5020	38080	38368	49.803003°N	128.608100°W	49.806202°N	128.697522°W
SO294_136-1	P5021	38410	38996	49.804692°N	128.710470°W	49.724778°N	128.859433°W
SO294_136-1	P5022	39085	39385	49.708530°N	128.861507°W	49.674778°N	128.764758°W
SO294_136-1	P5023	39439	40537	49.674270°N	128.746392°W	49.802248°N	128.437623°W
SO294_136-1	P5024	40618	40939	49.802200°N	128.413772°W	49.744158°N	128.338795°W
SO294_136-1	P5025-1	41006	41037	49.729915°N	128.337100°W	49.724930°N	128.343760°W
SO294_136-1	P5025-2	41546	41661	49.643670°N	128.456360°W	49.625062°N	128.482162°W

Table 15: Data acquisition parameters for **P5000**
* Includes bird sections; $^{+}$ measured relative to GPS antenna

	P5000
Shot rate (s)	10
Record length (s)	8
Sample rate (ms)	0.5
Shot mode	GI Gun Harmonic 355
Streamer depth	2 m
Total Streamer Length (m)*	290.6
Delay (ms)	150
Gun-offset to port (m)$^{+}$	0
Gun-offset aft (m)$^{+}$	45.1
Streamer offset to port (m)$^{+}$	9.4
Streamer offset aft (m)$^{+}$	83.1

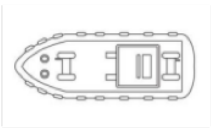
Table 16: Troubleshooting for **P5000**

Profile	**Item**	**SP Range**	**Problem**	**Details/Action taken**
P5014	SP	31498-31650	Shut down	← SO294 Cruise Report (Table 6.2.1) → ntbp
P5015	SP	32882-33119	Shut down	← SO294 Cruise Report (Table 6.2.1) → ntbp
P5015	LGSP	33333	Wrong in SO294 Cruise Report (Table 6.2.1)	Personal communication with watch keeper (after cruise)
P5018	SP	36184-36970	Shut down	← SO294 Cruise Report (Table 6.2.1) → ntbp
P5019	SP	37968	ASCII file exists but no NMEA ← not in SO-294_P4000.0000.Nav.txt Time mismatch (frozen clock) in SO294_P5000_Schiff.TXT	← SO294_P5000_Schiff.txt ← SO294_2D_Seismic_watchkeeping_log.xls → ntbp
P5025	SP	41038-41545	Shut down	← SO294 Cruise Report (Table 6.2.1) → ntbp
P5000	SP	41662	Shut down	← SO294_2D_Seismic_watchkeeping_log.xls → ntbp

Cruise: SO294_CLOCKS Date: 03.10.2022

Line: P5000

cable length 378,21 m



sample rate 0,5 ms
record length 8 s
streamer depth 4 - 6 m

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.
GeoEel TowCable	GeoEel Vibro	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			#1: 1 - 8		#2: 9 - 16		#3: 17 - 24		#4: 25 - 32		#5: 33 - 40		#6: 41 - 48		#7: 49 - 56
40,00 m	20,00 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m
40,00 m	60,00 m	60,33 m	72,83 m	73,16 m	85,66 m	85,99 m	98,49 m	98,82 m	111,32 m	111,65 m	124,15 m	124,48 m	136,98 m	137,31 m	149,81 m

17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.	31.	32.
GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	GeoEel Bird ISO	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	#8: 57 - 64		#9: 65 - 72		#10: 73 - 80		#11: 81 - 88		#12: 89 - 96		#13: 97 - 104			#14: 105 - 112	
0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	1,56 m	0,33 m	12,50 m	0,33 m
150,14 m	162,64 m	162,97 m	175,47 m	175,80 m	188,30 m	188,63 m	201,13 m	201,46 m	213,96 m	214,29 m	226,79 m	228,35 m	228,68 m	241,18 m	241,51 m

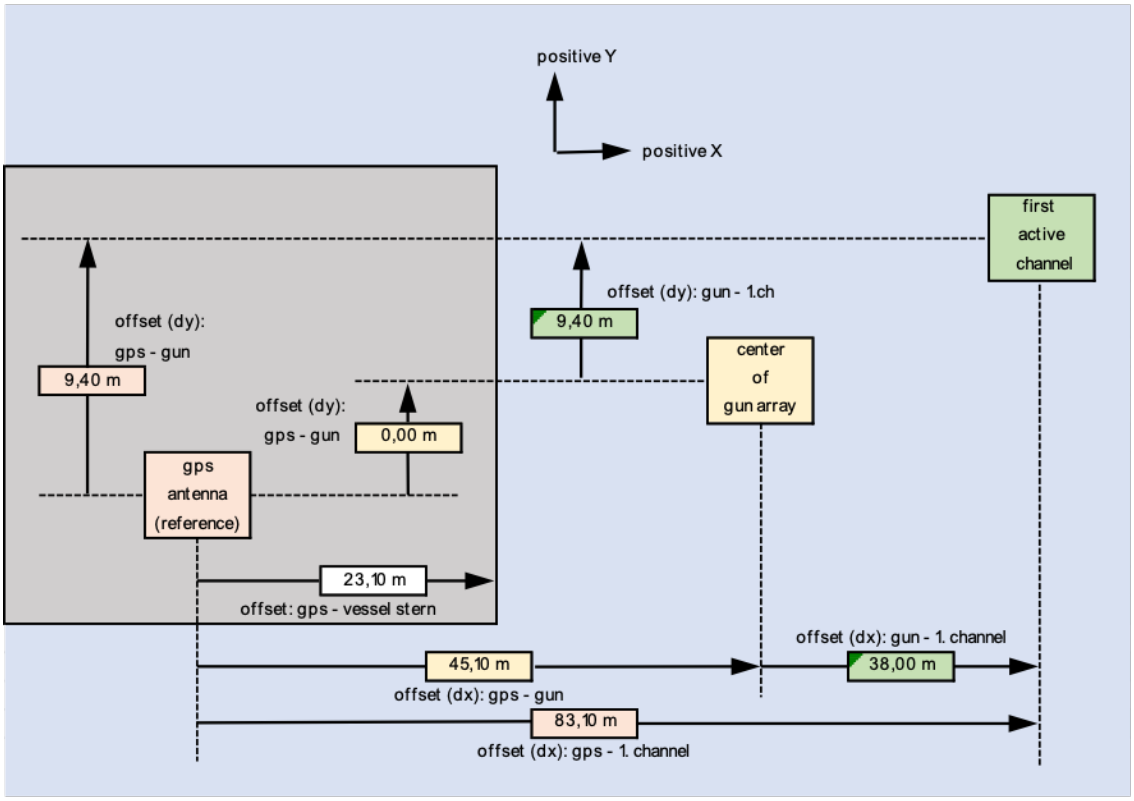
33.	34.	35.	36.	37.	38.	39.	40.	41.	42.	43.	44.	45.	46.	47.	48.
GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	GeoEel Bird ISO	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
#15: 106 - 120		#16: 121 - 128		#17: 129 - 136		#18: 137 - 144		#19: 145 - 152			#20: 153 - 160		#21: 161 - 168		#22: 169 - 176
12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	1,56 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m
254,01 m	254,34 m	266,84 m	267,17 m	279,67 m	280,00 m	292,50 m	292,83 m	305,33 m	306,89 m	307,22 m	319,72 m	320,05 m	332,55 m	332,88 m	345,38 m

49.	50.	51.	52.
GeoEelDigitizer	GeoEel Streamer	GeoEel Vibro	tail-buoy
N/A	N/A	N/A	N/A
	#23: 177 - 184		
0,33 m	12,50 m	20,00 m	0,00 m
345,71 m	358,21 m	378,21 m	378,21 m

Figure 15: Streamer setup for **P5000**

Cruise	SO294_CLOCKS
Line:	P5000

Date:	03.10.2022



shot mode:	GI-Gun
shot rate:	10 sec
delay:	150 ms
pressure:	140 bar

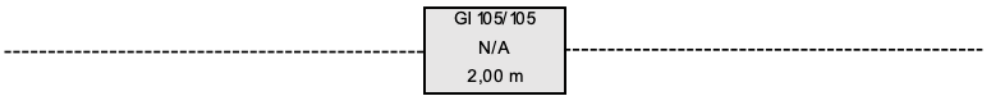


Figure 16: Source setup for **P5000**

8.6 Details for **P6000**

(Please refer also to Figure 6: SO294 seismic surveys **P6000** and **P7000** off Vancouver Island.)

Table 17: Seismic profiles for **P6000**
(**FGSP** stands for **F**irst **G**ood **S**hot **P**oint and **LGSP** stands for **L**ast **G**ood **S**hot **P**oint)

Event	Profile	FGSP	LGSP	LAT Start	LONG Start	LAT End	LONG End
SO294_208-1	P6000	43188	43382	49.023360°N	127.444830°W	49.062435°N	127.471187°W
SO294_208-1	P6001	43452	44343	49.069332°N	127.487902°W	49.025045°N	127.724378°W
SO294_208-1	P6002	44700	45506	48.959192°N	127.714015°W	48.986497°N	127.468747°W
SO294_208-1	P6003	45749	46702	48.941707°N	127.441098°W	48.834025°N	127.712963°W
SO294_208-1	P6004	47187	48354	48.765102°N	127.631380°W	48.901557°N	127.320638°W
SO294_208-1	P6005	48717	49777	48.849897°N	127.288022°W	48.651660°N	127.435325°W
SO294_208-1	P6006	50003	50808	48.626770°N	127.382198°W	48.685848°N	127.137072°W
SO294_208-1	P6007	51067	51803	48.704967°N	127.160493°W	48.564792°N	127.230838°W
SO294_208-1	P6008	52206	52984	48.511370°N	127.153325°W	48.606797°N	126.956742°W
SO294_208-1	P6009	53417	54532	48.544722°N	126.862738°W	48.328062°N	126.980438°W
SO294_208-1	P6010	54848	56186	48.349505°N	127.039445°W	48.511312°N	126.725745°W
SO294_208-1	P6011	56541	57354	48.476260°N	126.649057°W	48.367720°N	126.860988°W
SO294_208-1	P6012	57715	58734	48.313798°N	126.812542°W	48.339758°N	126.519515°W
SO294_208-1	P6013	59015	60084	48.292068°N	126.475287°W	48.077680°N	126.622898°W
SO294_208-1	P6014	60361	60786	48.088282°N	126.693577°W	48.168237°N	126.662790°W
SO294_208-1	P6015	61035	62024	48.185660°N	126.594253°W	48.172005°N	126.307007°W

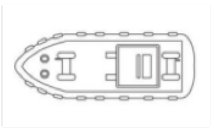
Table 18: Data acquisition parameters for **P6000**
***** Includes bird sections; $^{+}$ measured relative to GPS antenna

	P6000
Shot rate (s)	10
Record length (s)	8
Sample rate (ms)	0.5
Shot mode	GI Gun Harmonic 355
Streamer depth (m)	2
Total Streamer Length (m)*	290.6
Delay (ms)	150
Gun-offset to port (m)$^{+}$	0
Gun-offset aft (m)$^{+}$	45.1
Streamer offset to port (m)$^{+}$	9.4
Streamer offset aft (m)$^{+}$	83.1

Cruise: SO294_CLOCKS Date: 12.10.2022

Line: P6000

cable length 378,21 m



sample rate 0,5 ms
record length 8 s
streamer depth 4 - 6 m

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.
GeoEel TowCable	GeoEel Vibro	GeoEel Digitizer	Navigator Bird N/A GeoEel Streamer	GeoEel Digitizer	GeoEel Streamer	GeoEel Digitizer	GeoEel Streamer	GeoEel Digitizer	GeoEel Streamer	GeoEel Digitizer	Navigator Bird N/A GeoEel Streamer	GeoEel Digitizer	GeoEel Streamer	GeoEel Digitizer	GeoEel Streamer
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			#1: 1 - 8		#2: 9 - 16		#3: 17 - 24		#4: 25 - 32		#5: 33 - 40		#6: 41 - 48		#7: 49 - 56
40,00 m	20,00 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m
40,00 m	60,00 m	60,33 m	72,83 m	73,16 m	85,66 m	85,99 m	98,49 m	98,82 m	111,32 m	111,65 m	124,15 m	124,48 m	136,98 m	137,31 m	149,81 m

17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.	31.	32.
GeoEel Digitizer	GeoEel Streamer	GeoEel Digitizer	GeoEel Streamer	GeoEel Digitizer	GeoEel Streamer	GeoEel Digitizer	GeoEel Streamer	GeoEel Digitizer	GeoEel Streamer	GeoEel Digitizer	GeoEel Streamer	Navigator Bird N/A GeoEel Bird ISO	GeoEel Digitizer	GeoEel Streamer	GeoEel Digitizer
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	#8: 57 - 64		#9: 65 - 72		#10: 73 - 80		#11: 81 - 88		#12: 89 - 96		#13: 97 - 104			#14: 105 - 112	
0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	1,56 m	0,33 m	12,50 m	0,33 m
150,14 m	162,64 m	162,97 m	175,47 m	175,80 m	188,30 m	188,63 m	201,13 m	201,46 m	213,96 m	214,29 m	226,79 m	228,35 m	228,68 m	241,18 m	241,51 m

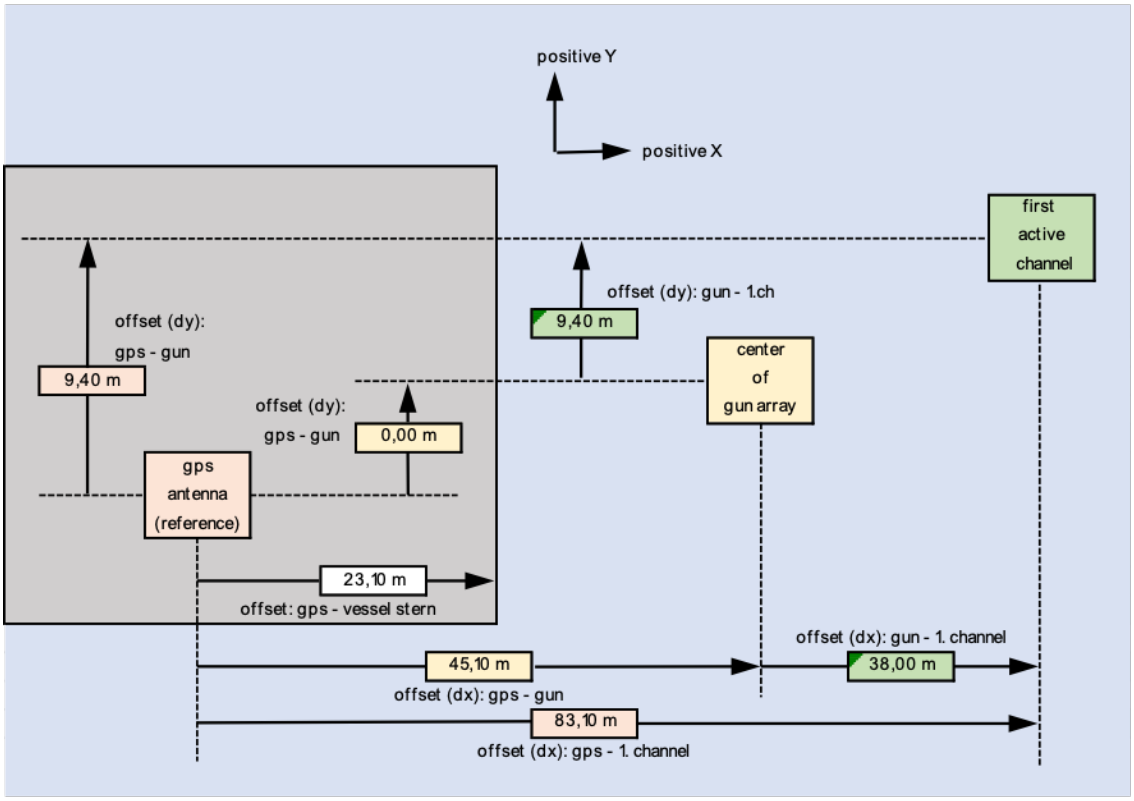
33.	34.	35.	36.	37.	38.	39.	40.	41.	42.	43.	44.	45.	46.	47.	48.
GeoEel Streamer	GeoEel Digitizer	GeoEel Streamer	GeoEel Digitizer	GeoEel Streamer	GeoEel Digitizer	GeoEel Streamer	GeoEel Digitizer	GeoEel Streamer	Navigator Bird N/A GeoEel Bird ISO	GeoEel Digitizer	GeoEel Streamer	GeoEel Digitizer	GeoEel Streamer	GeoEel Digitizer	GeoEel Streamer
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
#15: 106 - 120		#16: 121 - 128		#17: 129 - 136		#18: 137 - 144		#19: 145 - 152			#20: 153 - 160		#21: 161 - 168		#22: 169 - 176
12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	1,56 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m
254,01 m	254,34 m	266,84 m	267,17 m	279,67 m	280,00 m	292,50 m	292,83 m	305,33 m	306,89 m	307,22 m	319,72 m	320,05 m	332,55 m	332,88 m	345,38 m

49.	50.	51.	52.
GeoEel Digitizer	GeoEel Streamer	GeoEel Vibro	tail-buoy
N/A	N/A	N/A	N/A
	#23: 177 - 184		
0,33 m	12,50 m	20,00 m	0,00 m
345,71 m	358,21 m	378,21 m	378,21 m

Figure 17: Streamer setup for **P6000**

Cruise	SO294_CLOCKS
Line:	P6000

Date:	12.10.2022



shot mode:	GI-Gun
shot rate:	10 sec
delay:	150 ms
pressure:	140 bar

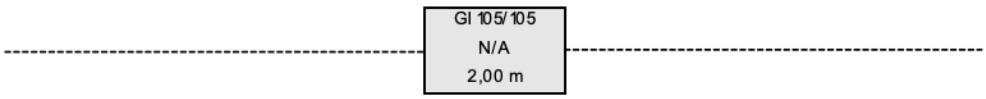


Figure 18: Source setup for **P6000**

8.7 Details for **P7000**

(Please refer also to Figure 6: SO294 seismic surveys **P6000** and **P7000** off Vancouver Island.)

Table 19: Seismic profiles for **P7000**
(**FGSP** stands for **F**irst **G**ood **S**hot **P**oint and **LGSP** stands for **L**ast **G**ood **S**hot **P**oint)

Event	Profile	FGSP	LGSP	LAT Start	LONG Start	LAT End	LONG End
SO294_209-1	P7000	64716	65585	48.392728°N	126.461568°W	48.233198°N	127.233643°W
SO294_209-1	P7001	65711	66586	48.286932°N	127.291162°W	48.629993°N	126.687290°W
SO294_209-1	P7002	67141	67600	48.617107°N	126.707712°W	48.798535°N	126.389017°W

Table 20: Data acquisition parameters for **P7000**
* Includes bird sections; $^{+}$ measured relative to GPS antenna

	P7000
Shot rate (s)	30
Record length (s)	12
Sample rate (ms)	1
Shot mode	GGun Array
Streamer depth (m)	4
Total Streamer Length (m)*	290.6
Delay (ms)	55
Gun-offset to port (m)$^{+}$	0
Gun-offset aft (m)$^{+}$	68.1
Streamer offset to port (m)$^{+}$	9.4
Streamer offset aft (m)$^{+}$	83.1

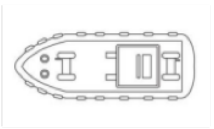
Table 21: Troubleshooting for **P7000**

Profile	Item	SP Range	Problem	Details/Action taken
P7000	SP	64061	ASCII file exists but no NMEA ← not in SO294_P7000.0000.Nav.txt	NMEA created via SO294_P7000_Schiff.txt ← SO294_2D_Seismic_watchkeeping_log.xls
P7000	SP	64121-64125	Geometrics crashed	← SO294_2D_Seismic_watchkeeping_log.xls → ntbp
P7000	SP	64917	ASCII file exists but no NMEA ← not in SO294_P7001.0000.Nav.txt	NMEA created via SO294_P7000_Schiff.txt ← SO294_2D_Seismic_watchkeeping_log.xls
P7001	SP	66411	ASCII file exists but no NMEA ← not in SO294_P7001.0000.Nav.txt Time issue	None as SP has simply been skipped by the system
P7000	SP	66641-66643	Geometrics crashed	← SO294_2D_Seismic_watchkeeping_log.xls → ntbp
P7000	SP	67601-67603	Shut down	← SO294_2D_Seismic_watchkeeping_log.xls → ntbp

Cruise: SO294_CLOCKS Date: 14.10.2022

Line: P7000

cable length 378,21 m



sample rate 1 ms
record length 12 s
streamer depth 2 m

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.
GeoEel TowCable	GeoEel Vibro	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			#1: 1 - 8		#2: 9 - 16		#3: 17 - 24		#4: 25 - 32		#5: 33 - 40		#6: 41 - 48		#7: 49 - 56
40,00 m	20,00 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m
40,00 m	60,00 m	60,33 m	72,83 m	73,16 m	85,66 m	85,99 m	98,49 m	98,82 m	111,32 m	111,65 m	124,15 m	124,48 m	136,98 m	137,31 m	149,81 m

17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.	31.	32.
GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	GeoEel Bird ISO	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	#8: 57 - 64		#9: 65 - 72		#10: 73 - 80		#11: 81 - 88		#12: 89 - 96		#13: 97 - 104			#14: 105 - 112	
0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	1,56 m	0,33 m	12,50 m	0,33 m
150,14 m	162,64 m	162,97 m	175,47 m	175,80 m	188,30 m	188,63 m	201,13 m	201,46 m	213,96 m	214,29 m	226,79 m	228,35 m	228,68 m	241,18 m	241,51 m

33.	34.	35.	36.	37.	38.	39.	40.	41.	42.	43.	44.	45.	46.	47.	48.
GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	GeoEel Bird ISO	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer	GeoEelDigitizer	GeoEel Streamer
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
#15: 106 - 120		#16: 121 - 128		#17: 129 - 136		#18: 137 - 144		#19: 145 - 152			#20: 153 - 160		#21: 161 - 168		#22: 169 - 176
12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m	1,56 m	0,33 m	12,50 m	0,33 m	12,50 m	0,33 m	12,50 m
254,01 m	254,34 m	266,84 m	267,17 m	279,67 m	280,00 m	292,50 m	292,83 m	305,33 m	306,89 m	307,22 m	319,72 m	320,05 m	332,55 m	332,88 m	345,38 m

49.	50.	51.	52.
GeoEelDigitizer	GeoEel Streamer	GeoEel Vibro	tail-buoy
N/A	N/A	N/A	N/A
	#23: 177 - 184		
0,33 m	12,50 m	20,00 m	0,00 m
345,71 m	358,21 m	378,21 m	378,21 m

Figure 19: Streamer setup for **P7000**

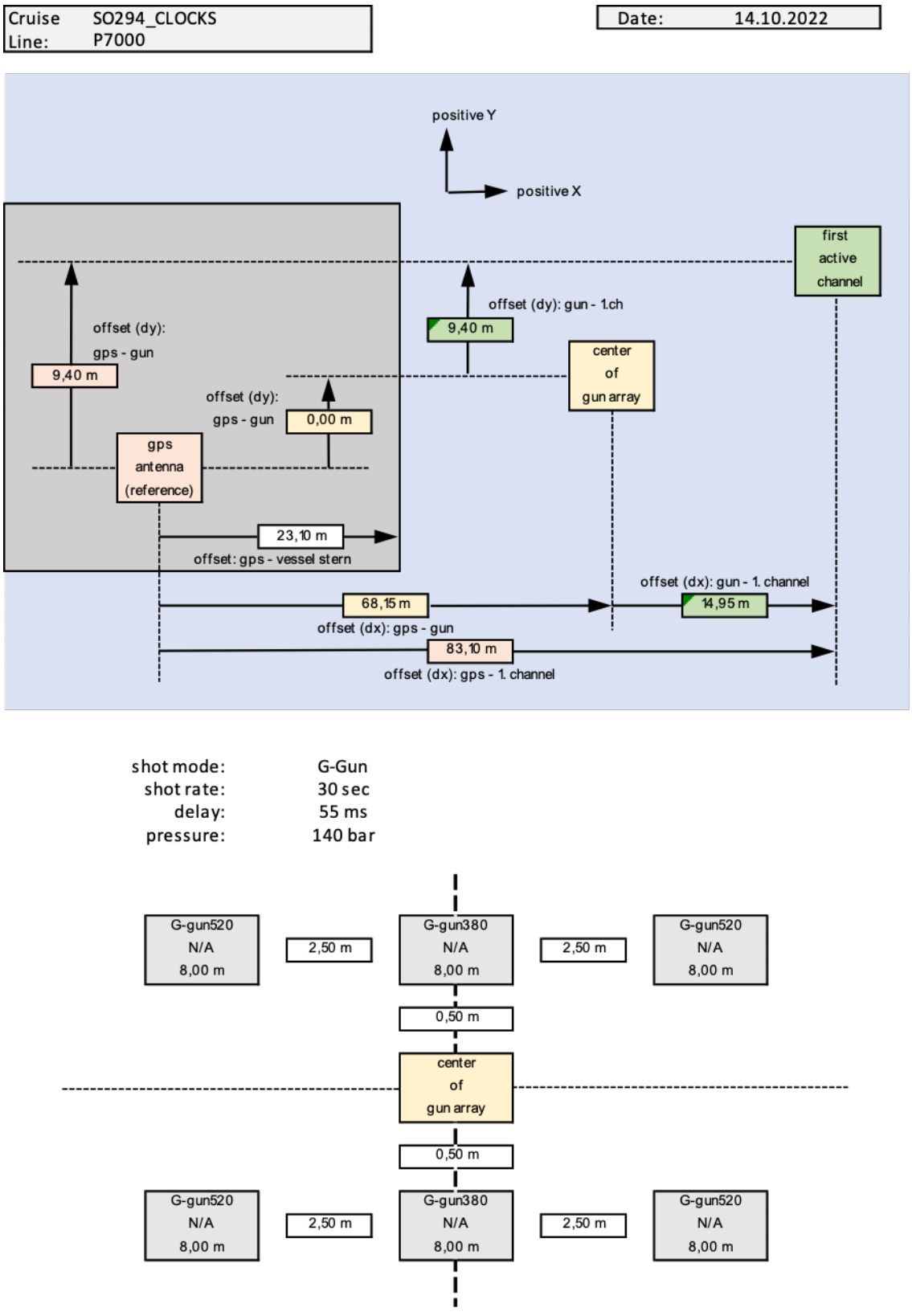


Figure 20: Source setup for **P7000**

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