



CHEVRON AUSTRALIA OPERATIONS

TITLE: Land Node 4D Monitor Seismic Survey Services – Gorgon CO₂ Project (R-40844)

DESCRIPTION: Chevron Australia is seeking expressions of interest from service providers able to provide Land Node 4D (4-dimensional) Monitor Seismic Survey services in support of the Gorgon CO₂ project.

Contractor shall provide services to record seismic Data for regular, time-lapse seismic imaging of CO₂ injection for the Gorgon project whilst minimising the impact on the environment.

Please refer to Attachment A for further detail on the Scope of Work.

CONTACT: Industry Capability Network of Western Australia –
www.icnwa.org.au/ContactUs.asp

Please Note: This is a request for specific expressions of interest. Service Providers will be considered for inclusion in the RFP if suitably qualified against this package.

PROJECT URL: <https://australia.chevron.com/>

ATTACHMENT: Attachment A: Scope of Work (includes Appendices)

CLOSING DATE: Friday 6 March 2020

ATTACHMENT A – SCOPE OF WORK

1. OBJECTIVES

- 1.1 The main objectives of this Project are to record seismic data for regular, time-lapse seismic imaging of CO₂ injection for the Gorgon project whilst minimising the impact on the environment. This data will help confirm if the behaviour of CO₂ in the injection interval, the Dupuy Formation (~2100-2500m below mean sea level), is consistent with expectations during the early phase of injection. The target image depth is from surface to the base of the injection interval. A baseline seismic survey was acquired in 2017, CO₂ injection started in 2019. To ensure good 4D signal, the new survey will replicate the acquisition parameters of the 2017 survey as closely as possible.

2. AREA OF OPERATIONS

- 2.1 The Area of Interest is Barrow Island (BWI), as shown in Appendix A to this Attachment.
- (A) BWI is the site of the Gorgon LNG gas plant and an operating oil field. Infrastructure associated with both the gas plant and oil field obstructs parts of the survey area, as shown in Appendix A and Appendix B to this Attachment.
- (B) BWI is a Class A nature reserve and is subject to strict environmental regulation. Contractor shall ensure all equipment and personnel meets quarantine standards.
- (C) Contractor shall conduct the Services in compliance with Gorgon regulatory approvals, licenses and permits relating to activities in the Area of Operations and other regulatory approvals as required for the Services. Contractor shall ensure compliance with all Company requirements.

3. COMMENCEMENT DATE

- 3.1 Company estimates for the first seismic monitor survey to be acquired in Q3 2020 at the earliest, but more likely in Q2 2021.

4. DESCRIPTION OF WORK

- 4.1 Description of Nominal Seismic Survey
- (A) Seismic Surveys shall be “Stakeless” which means source positioning shall rely solely on an appropriate navigation and GPS system in the Vibroseis vehicle.
- (B) Seismic source type shall be articulated Vibroseis vehicle(s).
- (C) Source and receiver parameters are provided in Table 1 and Table 2 respectively.

Table 1: Nominal source parameters

Vibroseis vehicle type	Inova AHV-IV PLS-364 buggy, articulated, or equivalent
Number of Vibroseis vehicles	2
Vibroseis vehicle peak force	60,000 lb (at a minimum)
Vibroseis vehicle controller electronics	Sercel VE464 or equivalent
Amplitude control	70% fundamental force (Sercel VE432 or equivalent)
Vibroseis vehicle Wheelbase width, maximum (outside of tyre to tyre)	2.5 m
Vibroseis vehicle turning radius (outside)	Maximum 10m
Number of source lines	16
Total source line length	70 km
Source line interval	500 m
Source Point interval	3.125 m
No. of Vibroseis vehicle per source point	1
Number of source point locations	22,500
Sweep frequencies	4 – 90 Hz (subject to parameter testing)
Sweep type	Linear upsweep (taper: subject to parameter testing)
Phase rotation	180 degrees between sweeps
Sweep length	4 seconds (subject to parameter testing)
No. of sweeps per source point	1 (subject to parameter testing)
Centre of source array	On receiver half station

Table 2: Nominal receiver parameters

Receiver type	Single component, autonomous nodes, high sensitivity GS-One or equivalent, frequency 10Hz, Sensitivity 75 V/m/s, critical damping 70%.
No. of receivers per station	1
Receiver group interval	50 m

Receiver line interval	200 m
Number of receiver lines	40
Total number of receiver locations	4800
Number of autonomous nodes	5000
Number of active receivers (minimum)	5000
Number of single geophones	5000
Live patch	5950 m x 4600 m

Table 3: Recording parameters

Recording instrument precision	24 bit system
Sampling interval	2 ms
Low Cut Filter	Out
High Cut Filter	High cut: 0.8 Nyquist minimum phase
Notch Filter	Out
Noise Rejection	None
Record Length	5 seconds
Pre-Amp Gains	0 dB
Polarity	SEG Standard where an increase in acoustic impedance is shown as a negative number
Tape Format	SEG-D rev2 or SEG-Y

4.2 Logistics.

- (A) Contractor shall provide all certified baskets, cages, tool racks, containers, lifting gear including slings, spreader bars, skids and associated items for transport of Contractor's equipment, tools, spares and maintenance parts required for the performance of the Services.
- (B) Contractor shall ensure that all equipment is quarantine compliant and accompanied by a correct manifest.

5. INFIELD DATA PROCESSING AND QUALITY CONTROL

5.1 Contractor shall conduct infield data processing and QC of data. This includes but is not limited to:

- (A) Process and analyse field parameter and noise tests;
- (B) Verify SPS files, Observer's reports and generate any related support documents;
- (C) Apply and verify geometry on trace data;

- (D) Perform daily review on acquisition production to identify deterioration or changes in data quality;
- (E) Process data to a brute stack on a weekly basis or as data becomes available;
- (F) Generate written reports describing unusual observations on the data, along with plots;
- (G) Generate and verify copies of the field data;
- (H) Prepare Deliverables for shipment; and
- (I) Compile and keep all daily QC reports in a single folder to be provided to the Company Field Representative at the end of Seismic Survey.

6. CONTRACTOR SUPPLIED ITEMS

6.1 Contractor shall supply the following equipment and sufficient supplies, consumables and spare parts to maintain uninterrupted operations for the duration of the Services.

(A) Vibroseis Equipment

Contractor supplied Vibroseis equipment shall include but not be limited to:

- (1) A quantity of 2 Vibroseis vehicles as per specifications in Table .
- (2) Vibroseis source control system with integrated GPS.
- (3) Vibroseis electronics.
- (4) Vibroseis spare parts, consumables, toolkit and first line spares for duration of each survey.

(B) Vehicles & Transport

- (1) Contractor shall be responsible for Contractor personnel and equipment transport once at the Area of Operations.
- (2) Contractor shall supply sufficient support vehicles to support the Services.
- (3) In addition to the specifications above, Contractor supplied vehicles shall meet the following specifications:
 - (a) Contractor shall ensure all support vehicles working within the Area of Operations are right-hand drive.
 - (b) Contractor shall ensure all vehicles are roadworthy, clean and fitted with in-vehicle monitoring.
 - (c) Contractor shall maintain all vehicles used for the duration of the Services including Vibroseis vehicles, service truck and other support vehicles.

(C) Crew Equipment

- (1) Contractor shall supply and prepare any crew equipment required for the Services.
 - (2) Contractor shall be responsible for but not limited to all supplies, lubes, oil, spare parts, support equipment, and technical support of the crew equipment necessary to maintain uninterrupted operations.
- (D) Data Acquisition System
- Contractor supplied data acquisition system shall include but not be limited to:
- (1) Cableless Recording System, which shall have the most up to date software and firmware. This system includes but is not limited to:
 - (a) Data Recorder(s).
 - (b) Autonomous Geophone Nodes (minimum quantity of 5000).
 - (c) Autonomous node systems shall be capable of accepting external geophones.
 - (d) If autonomous nodes with internal geophones are used for the Services, Contractor shall provide 5000 additional geophones.
 - (e) Battery re-charging and data download station(s).
- (E) Navigation
- (a) Navigation and positioning system for Stakeless Vibroseis operations.
 - (b) Control network.
 - (c) GPS surveying equipment for station positioning.
- (F) Maintenance
- (1) Contractor shall maintain all equipment and vehicles for the duration of the Services
- (G) Acquisition Design System
- (1) Contractor shall provide a workstation running the seismic acquisition design system.
 - (2) The Contractor shall supply sufficient software, equipment, and qualified operators that are capable of providing infield data processing and quality control (QC) of data.

END OF ATTACHMENT A

APPENDIX A – AREA OF OPERATIONS



Figure 1 Map of Area of Operations indicating survey area, elevation, road network, oil field facilities, Gorgon LNG gas plant facilities, accommodation, airport etc.

APPENDIX B – SURVEY AREA

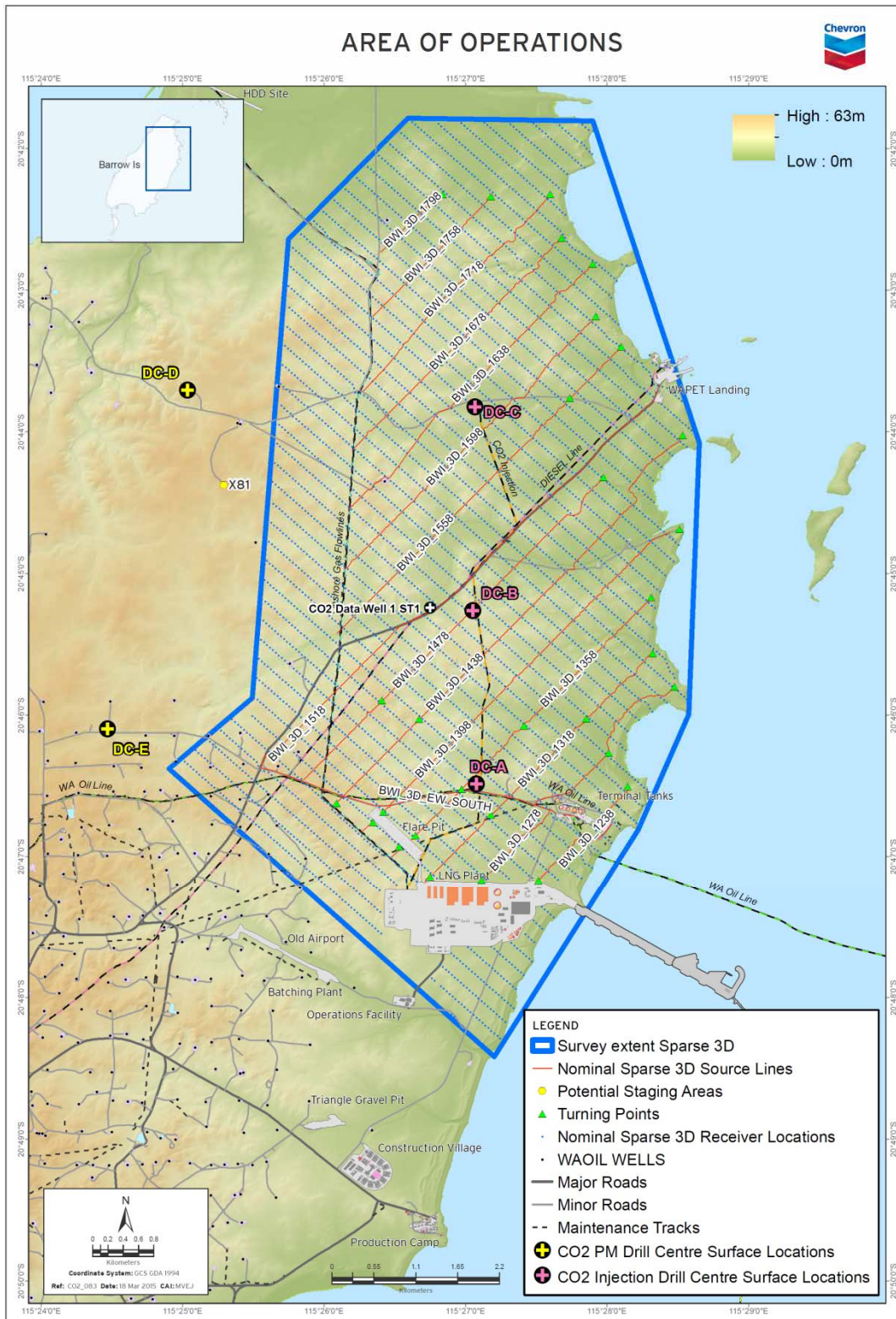


Figure 2 Map of the survey area on BWI showing the sixteen (16) source lines (red lines) and ~4800 receiver locations (blue dots). Access to the source lines is limited to road intersections. There are limited turning points (green triangles – to be confirmed by Company during infield planning) along the source lines. The potential staging area for the Services is X81J (yellow dot).