Southwest–Midwest deep crustal seismic survey program 2023–24

Line 23GSWA-SW1 final data release note

Release date: 30 May 2024

Release products

On-line download from: *https://magix.dmirs.wa.gov.au/surveys/view-survey/3806*

- Pre-stack Time Migration TWT sections to 8 s and 20 s and Depth conversions to a maximum depth of 26km and 50km respectively.
- Pre-stack Depth Migration to 50 km
- Navigation and velocity data files

Off-line: Field data gathers and full processed data products
Request form: https://magix.dmirs.wa.gov.au/about/order-datasets-on-external-hard-drive

See lists at end of this document.

Geological context

The 630 km long line 23GSWA-SW1 is one of three lines surveyed in GSWA's 2023–24 Southwest–Midwest deep crustal seismic survey program which was designed to test fundamental interpretations of recent GSWA geological mapping of the southwest Yilgarn Craton, and its juxtaposition with the Perth Basin.

The line extends from the southeastern edge of the Yilgarn Craton between Ravensthorpe and Esperance in the east where it overlaps the earlier Albany–Fraser 12GA-AF2 seismic line, continuing westward across the southwestern portion of the Yilgarn Craton and into the southern Perth Basin and the Leeuwin Inlier, terminating on the coast at Hamelin Bay (Figure 1).

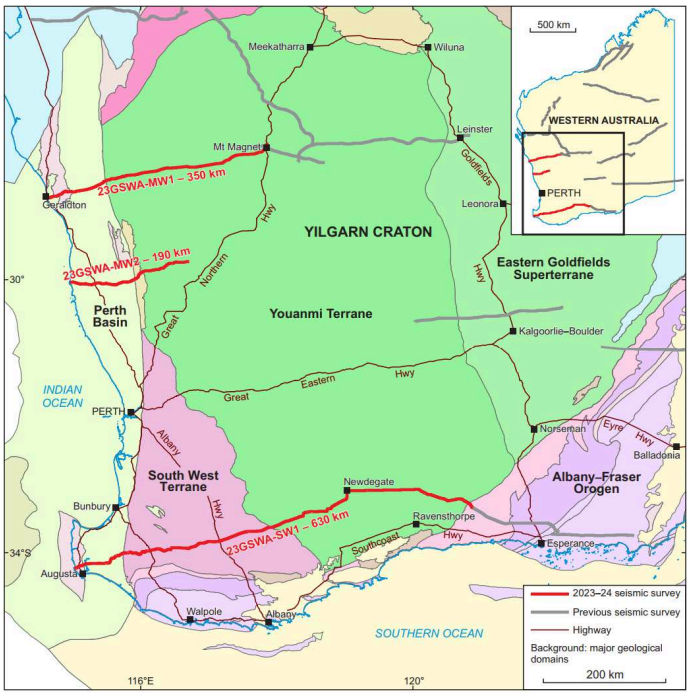

Figure 1. Location of seismic survey lines

Data acquisition specifications

Coordinate system: GDA2020–MGA50

HiSeis ***Job: SW1 2D – 278 – GSWA***

Acquisition: September—October 2023

Survey configuration:	
Line length	632.72 km
Total number of source points	15951 – Skips
Number of receiver stations	63088 – Skips
Sample Interval	2 ms
Record Length	20 s
Nominal Fold	200 — Radial offset patch of 8 km.
Format	SEG Y (REV 0) to USB hard drive in field.
Source	INOVA AHV-IV (60000 lb)
Source Array	3 x AHV IV in a single fleet
Source Number	1
Recording filters:	
Low-cut	3 Hz
High-cut	0.8 Nyquist set to 219 Hz
Notch	Out
Diversity Stack	Yes
Source parameters:	
Source Spacing	40 m and 20 m for makeup shots.
Sweep Frequency	3 – 96 Hz
Sweep Number	1
Sweep Length	24 s + 20 s listen time
Sweep Type -	Weibull
Source Array	3 Vibroseis
Start Taper	500 ms
End Taper	600 ms
Maximum Source Gaps	As required for safety/access
Receiver configuration:	
Geophone Type	Quantum 5 Hz (PS-5GR)
Case	Land
Frequency	5 Hz
Group Spacing	10 m
Geophones per Group	1

POST-PLOT survey statistics:

Line #	*Rec Stations*	*Shot Stations*	*BOL*	*EOL*	*Distance*
23GSWA-SW1	61725	15951 + 1055 reshoot	10001	72086	632 km

Source and Receiver Numbering: 1 digit line and up to 5 digit station numbers, e.g. 1 10001

Processing workflow

1. **PRE-PROCESSING**
   Reformat from field records to internal format
   Geometry assignment
   Data QC and first break picking
   Refraction tomography
   Low-cut debias filter
   Receiver domain TFDN to suppress vehicle noise
   Refraction statics (final datum: 410 m, replacement velocity 5800 m/s)
   Zero-phase spike deconvolution
   Air blast attenuation
   Surface wave noise attenuation
   Shot domain denoise (TFDN)
   Initial velocity model
   Residual statics
   Velocity analysis 5 km intervals
   2nd pass residual statics
   PreSTM velocity analysis 2 km intervals
   PreSTM velocity analysis 1 km intervals
   Amplitude recovery
   Shift to final datum

2. **PRE-STACK TIME MIGRATION**
   Kirchhoff Pre-stack time migration (30 km aperture, 75 degree dip limit)
   Linear noise attenuation
   High density velocity analysis at 500 m intervals
   Amplitude balancing (tailored to 8 second and 20 second sections)
   Trace mute (Angle mutes for 8 second sections and hand-picked mute from 20 second sections)
   Stack

3. **POST-STACK PROCESSING - PRESTM**
   Random noise attenuation
   Time-varying bandpass filter
   Coherence filter (tailored for 8 second and 20second records)
   Time-varying gain (8 seconds sections only)
   AGC (record length)
   Topographic mute
   Time-depth conversion
   SEGY output

4. PRE-STACK DEPTH MIGRATION

Model building migration (initial model)
RMO picking and reflection tomography update 1
Model building migration (tomo 1 model)
RMO picking and reflection tomography update 2
Model building migration (tomo 2 model)
RMO picking and reflection tomography update 3
Kirchhoff Pre-stack depth migration (10 km aperture, 75 degree dip limit, from topography)
Amplitude balancing
Linear noise attenuation
Stack

5. POST-STACK PROCESSING – PRESDM

Depth-varying bandpass filter
Coherence filter
Random noise attenuation
AGC (record length)
SEGY output

Online products

23GSWA_SW1_2D_Processing_Report_REV1.pdf :: 5.65MB
23GSWA_SW1_Acquisition_Report_REV1.pdf :: 2.58MB
23GSWA_SW1_PreSDM-Stk_Final_20240422_Depth@410m.sgy :: 6.97GB
23GSWA_SW1_PreSTM-Stk_20sec_Full_Final_20240410_Depth@410m.sgy :: 5.81GB
23GSWA_SW1_PreSTM-Stk_20sec_Full_Final_20240410_Time@410m.sgy :: 4.65GB
23GSWA_SW1_PreSTM-Stk_8sec_Full_Final_20240313_Depth@410m.sgy :: 3.03GB
23GSWA_SW1_PreSTM-Stk_8sec_Full_Final_20240422_Time@410m.sgy :: 1.88GB

==========
..\23GSWA_SW1_SPS_files\
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_2023_11_01_000000000_2D_00_field_SPS.R01 :: 4.89MB
_2023_11_01_000000000_2D_00_field_SPS.S01 :: 2.52MB
_2023_11_01_000000000_2D_00_field_SPS.X01 :: 11.81MB
GSWA_SW1_2D_Final_SPS.R01 :: 4.77MB
GSWA_SW1_2D_Final_SPS.S01 :: 1.23MB
GSWA_SW1_2D_Final_SPS.X01 :: 19.85MB

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..\23GSWA_SW1_Velocity_files\
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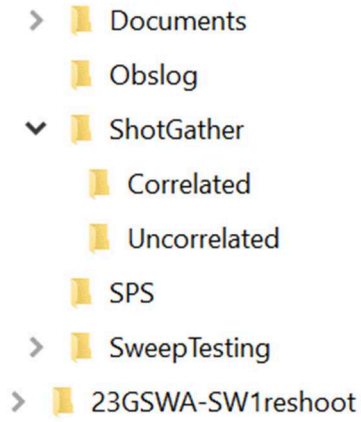
23GSWA_SW1_Final_PreSDM_Vel_VINTZ_20240422@410m.sgy :: 1.42GB
23GSWA_SW1_Final_PreSTM_Vel_RMST_20240312@410m.sgy :: 423.46MB
23GSWA_SW1_Final_PreSTM_Vel_VINTZ_20240312@410m.sgy :: 1.42GB
23GSWA_SW1_PreSTM_Time-Depth_Vel_RMST_20240312@410m.sgy :: 423.46MB
Final_PreSTM_Vel_INTZ.ascii :: 674.32MB
Final_PreSTM_Vel_RMST.ascii :: 164.14MB
PreSTM_T-D_conversion_Vel_RMST.ascii :: 202.25MB

Offline products *(2 x 6 TB)*

Field data package



Processed data package

Continuous node recordings also available (15 TB).