# 3. UNDERWAY GEOPHYSICS, LEG 105[1]

Shipboard Scientific Party[2]

Underway geophysical measurements were made during Ocean Drilling Program (ODP) Leg 105, which began in St. John's (Newfoundland, Canada) on 29 August 1985 and returned to St. John's after 59 days of operations in Baffin Bay and the Labrador Sea. During Leg 105, *JOIDES Resolution* was under way for 13.6 days (23% of the time).

The quality of the underway seismic data deteriorated at transit speeds greater than 5–6 kt. For this reason, we did not attempt to collect data during the long transits between sites when the *Resolution* cruised at an average speed of 10 kt. We collected underway geophysical data, presented in this chapter, only during our approaches to the sites at reduced speeds of 4.5–5 kt as a means of locating the sites. The approaches to the sites tracked along previously obtained multichannel or single-channel seismic lines that were used to select potential drill-site locations.

Instrumentation on board included two precision echo-sounders (3.5 and 12 kHz), a proton precision magnetometer, a digital seismic-reflection-profiling system, and a satellite-navigation system. The instruments were maintained and operated by the ODP marine technicians in cooperation with the scientific party and the officers and crew of the *Resolution*.

## NAVIGATION

Navigation data were collected on the bridge using a Magnavox MX702A satellite-navigation system (SATNAV). Positions were obtained with this system through the entire 59 days spent at sea (Table 1). The general ship-track chart for Leg 105 is shown in Figure 1.

## BATHYMETRIC DATA RECORDING

Bathymetric data were obtained with both 3.5- and 12-kHz echo-sounder systems; the signals were recorded on a Raytheon recorder for the 3.5-kHz system and on an EDO 248C recorder for the 12-kHz system.

## MAGNETICS DATA RECORDING

Total intensity measurements of the Earth's magnetic field were obtained with a Geometrics 801 proton precession magnetometer. The sensor was towed approximately 300 m astern. This data were recorded in analog form on a graphic recorder, in the header of seismic tapes (once per seismic shot), and manually every 5 min in the geophysical log.

## SEISMIC-REFLECTION PROFILES

The seismic lines collected during ODP Leg 105 (Figs. 2 through 4) were recorded using the following equipment:

*Sources*. The seismic sources used on board the *Resolution* during Leg 105 normally were two 80-in.$^3$ water guns. However, a 300-in.$^3$ air gun was also used occasionally; for example, on the approach to Site 645 we towed one 80-in.$^3$ water gun and then switched to the 300-in.$^3$ water gun in an attempt to obtain a sonobuoy profile. During the approaches to Sites 646 and 647, we towed two 80-in.$^3$ water guns.

*Streamer hydrophones*. A 100-m-long Teledyne streamer containing 60 active sections was deployed from the fantail and towed 500 m behind the vessel. Towing depth was set by external depth depressors (birds). The hydrophone elements were combined to procure a single signal.

*Data recording*. The recording system, consisting of a SuperMicro 561 Masscomp computer to record and process the seismic data, allowed data to be processed and displayed in real time on a 15-in.-wide high-resolution graphic printer (160 dots per in.). The processing treatments applied are described in Table 2. Raw data were recorded on a magnetic tape in SEG-Y format at a density of 1600 bits per in.

Seismic lines 2, 3, and 4 were displayed on the Printronix printer with the following parameters:

| | | |
|---|---|---|
| Traces per inch | = | 10.0 |
| Clip high | = | 0.10 in. |
| Clip low | = | −0.10 in. |
| Deflection | = | 0.10 in. |
| Positive peaks to the right | | |

Seismic data were also displayed in real time in analog form on two EDO 550 dry-paper recorders, at different sweep rates and filter settings (Table 3).

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[1] Srivastava, S. P., Arthur, M., Clement, B., et al., 1987. *Proc., Init. Repts. (Pt. A), ODP*, 105.

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**Table 1. Satellite-navigation fixes obtained during Leg 105.**

| Day (Julian) | Time (UTC) | North latitude (deg) | West longitude (deg) |
|---|---|---|---|
| 241 | 0705 | 47.56 | 52.71 |
| 241 | 1007 | 47.56 | 52.66 |
| 241 | 1111 | 47.66 | 52.45 |
| 241 | 1248 | 47.89 | 52.20 |
| 241 | 1324 | 47.98 | 52.10 |
| 241 | 1344 | 48.03 | 52.03 |
| 241 | 1434 | 48.16 | 51.89 |
| 241 | 1508 | 48.24 | 51.80 |
| 241 | 1650 | 48.49 | 51.54 |
| 241 | 1847 | 48.75 | 51.23 |
| 241 | 2029 | 49.02 | 50.92 |
| 241 | 2222 | 49.37 | 50.86 |
| 241 | 2314 | 49.54 | 50.88 |
| 242 | 0000 | 49.67 | 50.90 |
| 242 | 0140 | 50.02 | 50.95 |
| 242 | 0205 | 50.10 | 50.97 |
| 242 | 0326 | 50.37 | 51.01 |
| 242 | 0350 | 50.44 | 51.02 |
| 242 | 0512 | 50.70 | 51.06 |
| 242 | 0701 | 51.06 | 51.12 |
| 242 | 0727 | 51.15 | 51.15 |
| 242 | 0848 | 51.42 | 51.21 |
| 242 | 0946 | 51.61 | 51.23 |
| 242 | 1036 | 51.79 | 51.23 |
| 242 | 1133 | 51.97 | 51.29 |
| 242 | 1200 | 52.06 | 51.30 |
| 242 | 1322 | 52.34 | 51.32 |
| 242 | 1401 | 52.47 | 51.34 |
| 242 | 1534 | 52.77 | 51.39 |
| 242 | 1601 | 52.85 | 51.41 |
| 242 | 1628 | 52.94 | 51.41 |
| 242 | 1748 | 53.20 | 51.45 |
| 242 | 1936 | 53.56 | 51.53 |
| 242 | 1958 | 53.63 | 51.54 |
| 242 | 2146 | 53.99 | 51.61 |
| 242 | 2249 | 54.20 | 51.62 |
| 242 | 2332 | 54.34 | 51.64 |
| 243 | 0038 | 54.56 | 51.66 |
| 243 | 0054 | 54.61 | 51.66 |
| 243 | 0225 | 54.92 | 51.70 |
| 243 | 0814 | 56.11 | 51.86 |
| 243 | 0829 | 56.16 | 51.85 |
| 243 | 0924 | 56.35 | 51.89 |
| 243 | 1002 | 56.48 | 51.89 |
| 243 | 1112 | 56.72 | 51.94 |
| 243 | 1513 | 57.55 | 52.04 |
| 243 | 1603 | 57.73 | 52.04 |
| 243 | 1625 | 57.81 | 52.06 |
| 243 | 1659 | 57.92 | 52.06 |
| 243 | 1753 | 58.12 | 52.07 |
| 243 | 1846 | 58.30 | 52.18 |
| 243 | 1921 | 58.41 | 52.26 |
| 243 | 1942 | 58.47 | 52.32 |
| 243 | 2033 | 58.64 | 52.43 |
| 243 | 2128 | 58.81 | 52.59 |
| 243 | 2224 | 58.99 | 52.72 |
| 243 | 2256 | 59.10 | 52.80 |
| 243 | 2342 | 59.25 | 52.88 |
| 243 | 2358 | 59.30 | 52.91 |
| 244 | 0130 | 59.60 | 53.10 |
| 244 | 0202 | 59.71 | 53.19 |
| 244 | 0315 | 59.95 | 53.35 |
| 244 | 0332 | 60.01 | 53.39 |
| 244 | 0358 | 60.10 | 53.43 |
| 244 | 0517 | 60.36 | 53.61 |
| 244 | 0807 | 60.92 | 54.02 |
| 244 | 0959 | 61.30 | 54.32 |

**Table 1 (continued).**

| Day (Julian) | Time (UTC) | North latitude (deg) | West longitude (deg) |
|---|---|---|---|
| 244 | 1050 | 61.47 | 54.50 |
| 244 | 1117 | 61.56 | 54.55 |
| 244 | 1211 | 61.74 | 54.71 |
| 244 | 1239 | 61.84 | 54.76 |
| 244 | 1332 | 62.01 | 54.92 |
| 244 | 1429 | 62.20 | 55.07 |
| 244 | 1517 | 62.35 | 55.20 |
| 244 | 1538 | 62.42 | 55.25 |
| 244 | 1611 | 62.53 | 55.34 |
| 244 | 1729 | 62.79 | 55.51 |
| 244 | 1843 | 63.05 | 55.70 |
| 244 | 1918 | 63.16 | 55.81 |
| 244 | 1945 | 63.26 | 55.87 |
| 244 | 2032 | 63.41 | 56.00 |
| 244 | 2105 | 63.52 | 56.10 |
| 244 | 2159 | 63.71 | 56.25 |
| 244 | 2220 | 63.78 | 56.32 |
| 244 | 2306 | 63.94 | 56.44 |
| 245 | 0018 | 64.19 | 56.63 |
| 245 | 0138 | 64.46 | 56.83 |
| 245 | 0205 | 64.55 | 56.90 |
| 245 | 0242 | 64.67 | 56.99 |
| 245 | 0306 | 64.76 | 57.06 |
| 245 | 0325 | 64.82 | 57.12 |
| 245 | 0350 | 64.91 | 57.19 |
| 245 | 0408 | 64.97 | 57.24 |
| 245 | 0428 | 65.04 | 57.30 |
| 245 | 0454 | 65.14 | 57.36 |
| 245 | 0534 | 65.27 | 57.44 |
| 245 | 0556 | 65.35 | 57.50 |
| 245 | 0641 | 65.49 | 57.64 |
| 245 | 0707 | 65.58 | 57.72 |
| 245 | 0745 | 65.71 | 57.84 |
| 245 | 0826 | 65.85 | 57.96 |
| 245 | 0854 | 65.94 | 58.03 |
| 245 | 0936 | 66.07 | 58.15 |
| 245 | 1010 | 66.18 | 58.24 |
| 245 | 1029 | 66.24 | 58.30 |
| 245 | 1225 | 66.63 | 58.66 |
| 245 | 1310 | 66.78 | 58.78 |
| 245 | 1407 | 66.97 | 58.94 |
| 245 | 1457 | 67.12 | 59.19 |
| 245 | 1523 | 67.20 | 59.35 |
| 245 | 1555 | 67.30 | 59.52 |
| 245 | 1645 | 67.45 | 59.78 |
| 245 | 1708 | 67.53 | 59.90 |
| 245 | 1742 | 67.63 | 60.06 |
| 245 | 1805 | 67.70 | 60.18 |
| 245 | 1856 | 67.85 | 60.44 |
| 245 | 1955 | 68.03 | 60.73 |
| 245 | 2041 | 68.17 | 60.96 |
| 245 | 2118 | 68.27 | 61.13 |
| 245 | 2134 | 68.33 | 61.21 |
| 245 | 2228 | 68.49 | 60.52 |
| 245 | 2306 | 68.60 | 61.73 |
| 245 | 2325 | 68.66 | 61.85 |
| 246 | 0004 | 68.77 | 62.08 |
| 246 | 0024 | 68.83 | 62.20 |
| 246 | 0054 | 68.92 | 62.38 |
| 246 | 0114 | 68.98 | 62.50 |
| 246 | 0151 | 69.06 | 62.63 |
| 246 | 0214 | 69.08 | 62.69 |
| 246 | 0240 | 69.12 | 62.74 |
| 246 | 0302 | 69.15 | 62.78 |
| 246 | 0338 | 69.20 | 62.86 |
| 246 | 0402 | 69.23 | 62.93 |
| 246 | 0425 | 69.25 | 62.98 |
| 246 | 0524 | 69.32 | 63.12 |
| 246 | 0610 | 69.38 | 63.23 |
| 246 | 0633 | 69.41 | 63.28 |
| 246 | 0708 | 69.45 | 63.37 |
| 246 | 0736 | 69.48 | 63.43 |
| 246 | 0820 | 69.55 | 63.61 |
| 246 | 0853 | 69.63 | 63.81 |
| 246 | 0913 | 69.69 | 63.89 |
| 246 | 1222 | 70.02 | 64.20 |
| 246 | 1306 | 70.08 | 64.28 |
| 246 | 1552 | 70.36 | 64.53 |
| 246 | 1630 | 70.42 | 64.57 |
| 246 | 1726 | 70.51 | 64.68 |
| 246 | 1740 | 70.54 | 64.71 |
| 246 | 1818 | 70.57 | 64.84 |

**Table 1 (continued).**

| Day (Julian) | Time (UTC) | North latitude (deg) | West longitude (deg) |
|---|---|---|---|
| 246 | 2008 | 70.49 | 65.22 |
| 246 | 2122 | 70.38 | 65.24 |
| 246 | 2300 | 70.38 | 64.99 |
| 246 | 2352 | 70.41 | 64.83 |
| 247 | 0042 | 70.45 | 64.68 |
| 247 | 0058 | 70.46 | 64.61 |
| 247 | 0226 | 70.45 | 64.77 |
| 247 | 0312 | 70.44 | 64.73 |
| 247 | 0322 | 70.46 | 64.75 |
| 271 | 1245 | 70.45 | 64.65 |
| 271 | 1517 | 70.45 | 64.65 |
| 271 | 1708 | 70.45 | 64.65 |
| 271 | 2045 | 70.49 | 64.76 |
| 271 | 2135 | 70.43 | 64.57 |
| 271 | 2310 | 70.30 | 64.32 |
| 272 | 0007 | 70.23 | 64.17 |
| 272 | 0021 | 70.21 | 64.14 |
| 272 | 0057 | 70.18 | 64.06 |
| 272 | 0154 | 70.11 | 63.94 |
| 272 | 0242 | 70.06 | 63.84 |
| 272 | 0340 | 70.00 | 63.70 |
| 272 | 0355 | 69.99 | 63.66 |
| 272 | 0426 | 69.95 | 63.58 |
| 272 | 0535 | 69.88 | 63.40 |
| 272 | 0610 | 69.83 | 63.31 |
| 272 | 0722 | 69.75 | 63.13 |
| 272 | 0752 | 69.71 | 63.06 |
| 272 | 0853 | 69.64 | 62.91 |
| 272 | 0910 | 69.62 | 62.87 |
| 272 | 0935 | 69.59 | 62.81 |
| 272 | 1038 | 69.50 | 62.56 |
| 272 | 1119 | 69.44 | 62.39 |
| 272 | 1253 | 69.27 | 62.01 |
| 272 | 1411 | 69.13 | 61.71 |
| 272 | 1444 | 69.07 | 61.58 |
| 272 | 1632 | 68.82 | 61.20 |
| 272 | 1822 | 68.46 | 60.77 |
| 272 | 2130 | 67.92 | 60.04 |
| 272 | 2359 | 67.71 | 59.82 |
| 273 | 0231 | 67.54 | 59.67 |
| 273 | 0608 | 67.29 | 59.35 |
| 273 | 0834 | 67.10 | 59.09 |
| 273 | 1134 | 66.60 | 58.72 |
| 273 | 1335 | 66.23 | 58.47 |
| 273 | 1557 | 65.87 | 58.05 |
| 273 | 1903 | 65.36 | 57.49 |
| 273 | 2148 | 64.98 | 57.10 |
| 273 | 2337 | 64.78 | 56.88 |
| 274 | 0423 | 64.26 | 56.39 |
| 274 | 0610 | 64.06 | 56.21 |
| 274 | 0757 | 63.87 | 56.03 |
| 274 | 1205 | 63.26 | 55.38 |
| 274 | 1415 | 62.92 | 55.00 |
| 274 | 1712 | 62.47 | 54.48 |
| 274 | 1936 | 62.12 | 54.06 |
| 274 | 2126 | 61.89 | 53.67 |
| 274 | 2315 | 61.71 | 53.42 |
| 275 | 0116 | 61.50 | 53.12 |
| 275 | 0331 | 61.27 | 52.79 |
| 275 | 0520 | 61.09 | 52.52 |
| 275 | 0804 | 60.80 | 52.10 |
| 275 | 0955 | 60.56 | 51.77 |
| 275 | 1305 | 60.09 | 51.08 |
| 275 | 1700 | 59.66 | 50.09 |
| 275 | 1914 | 59.43 | 49.54 |
| 275 | 2104 | 59.24 | 49.10 |
| 276 | 0140 | 58.77 | 48.20 |
| 276 | 0307 | 58.58 | 48.23 |
| 276 | 0359 | 58.48 | 48.29 |
| 276 | 0456 | 58.38 | 48.33 |
| 287 | 0000 | 58.20 | 48.36 |
| 287 | 0005 | 58.13 | 48.35 |
| 287 | 0232 | 57.94 | 48.24 |
| 287 | 0342 | 57.74 | 48.12 |
| 287 | 0421 | 57.62 | 48.07 |
| 287 | 0612 | 57.30 | 47.88 |
| 287 | 0705 | 57.16 | 47.78 |
| 287 | 0951 | 56.70 | 47.48 |
| 287 | 1219 | 56.27 | 47.28 |
| 287 | 1552 | 55.63 | 47.20 |
| 287 | 1835 | 55.10 | 47.16 |
| 287 | 2156 | 54.48 | 46.85 |

**Table 1 (continued).**

| Day (Julian) | Time (UTC) | North latitude (deg) | West longitude (deg) |
|---|---|---|---|
| 287 | 2229 | 54.38 | 46.79 |
| 288 | 0107 | 53.90 | 46.41 |
| 288 | 0254 | 53.67 | 45.93 |
| 288 | 0356 | 53.53 | 45.67 |
| 288 | 0502 | 53.43 | 45.49 |
| 288 | 0642 | 53.34 | 45.32 |
| 298 | 1215 | 53.33 | 45.26 |
| 298 | 1648 | 52.47 | 46.20 |
| 298 | 1934 | 52.00 | 46.84 |
| 298 | 2122 | 51.70 | 47.20 |
| 298 | 2326 | 51.37 | 47.65 |
| 299 | 0051 | 51.14 | 47.97 |
| 299 | 0238 | 50.86 | 48.30 |
| 299 | 0543 | 50.40 | 48.92 |
| 299 | 0754 | 50.19 | 49.22 |
| 299 | 0943 | 50.06 | 49.40 |
| 299 | 1132 | 49.80 | 49.73 |
| 299 | 1627 | 49.03 | 50.64 |
| 299 | 1843 | 48.66 | 51.07 |
| 299 | 2051 | 48.33 | 51.51 |
| 299 | 2238 | 48.15 | 51.73 |
| 300 | 0002 | 48.06 | 51.83 |
| 300 | 0715 | 47.56 | 52.71 |

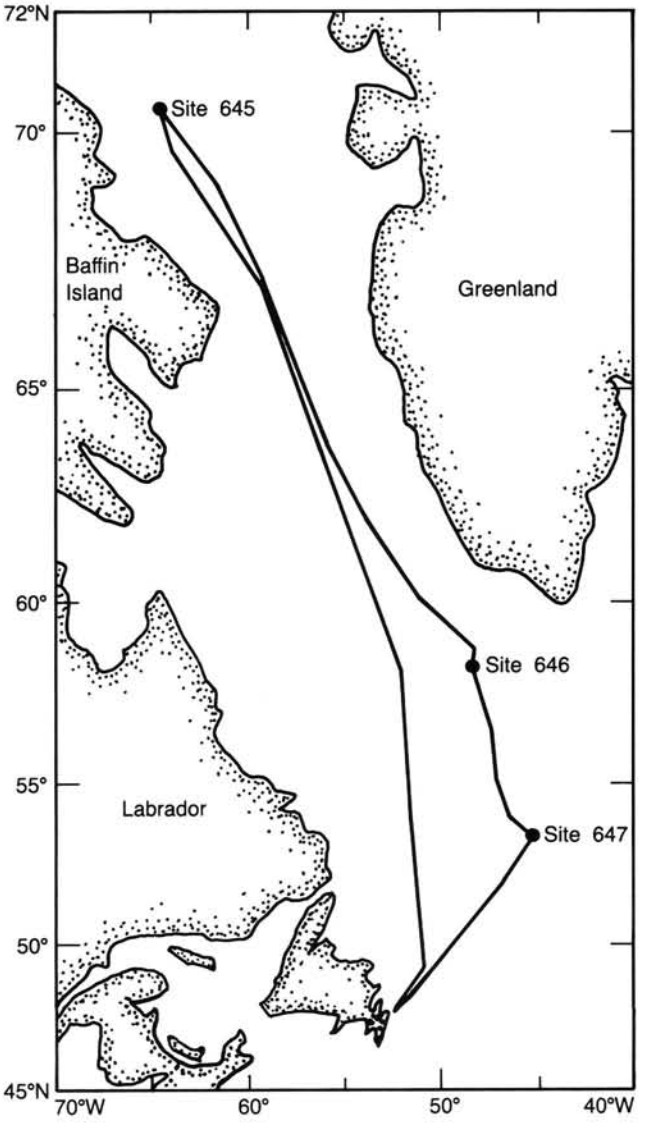


Figure 1. Track chart, ODP Leg 105.

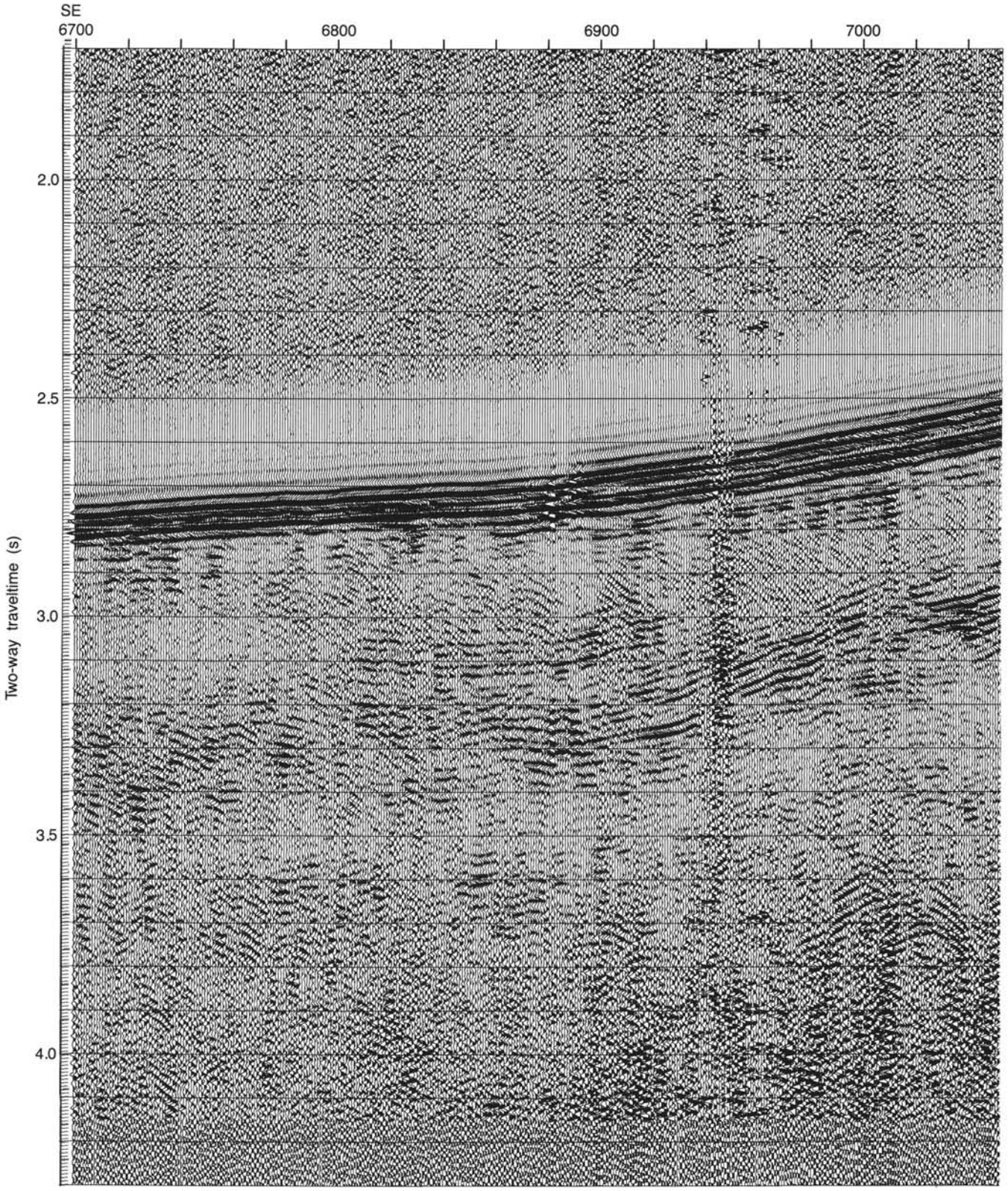


Figure 2. Single-channel seismic line (seismic line 2) shot on approach to Site 645.

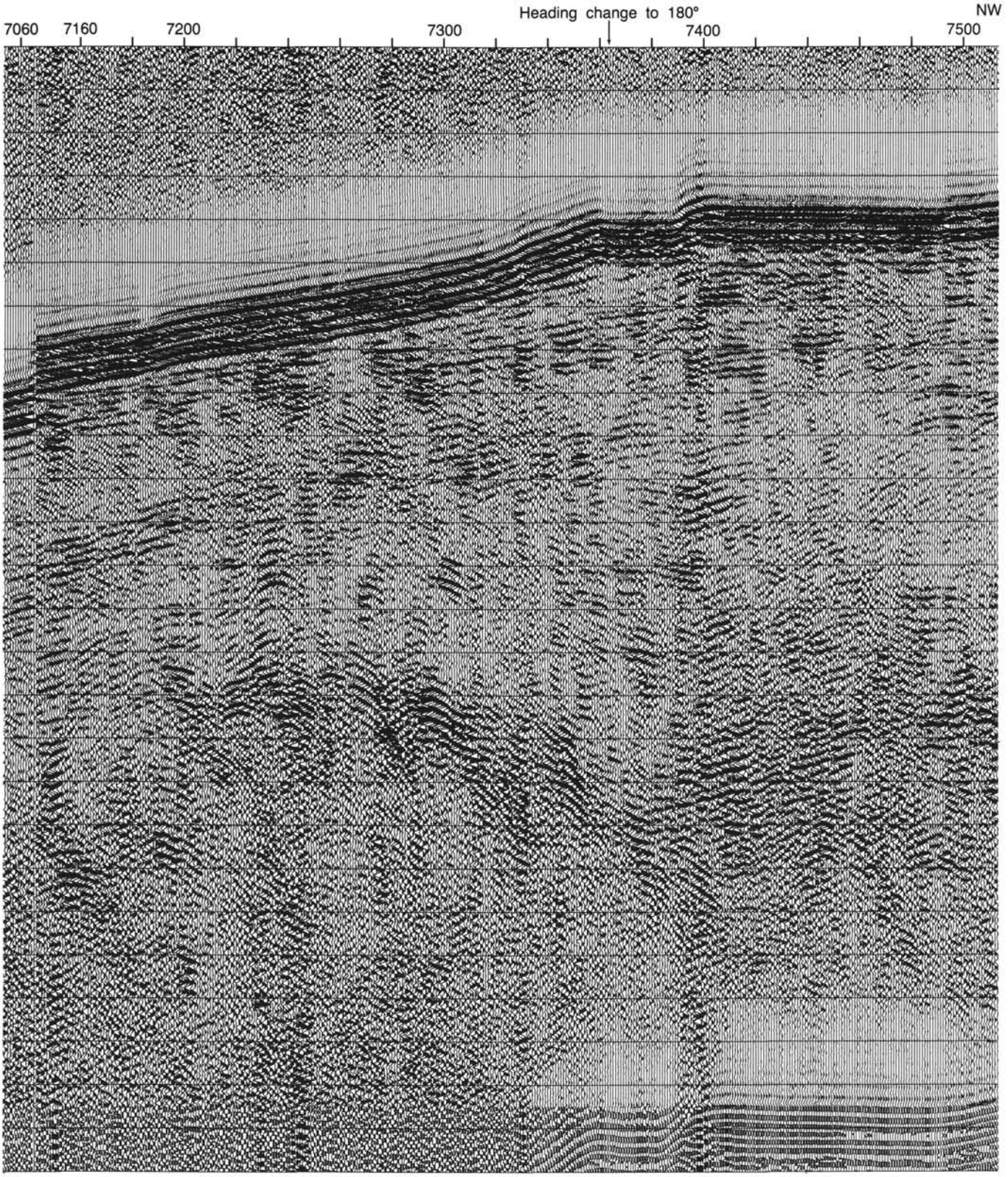


Figure 2 (continued).

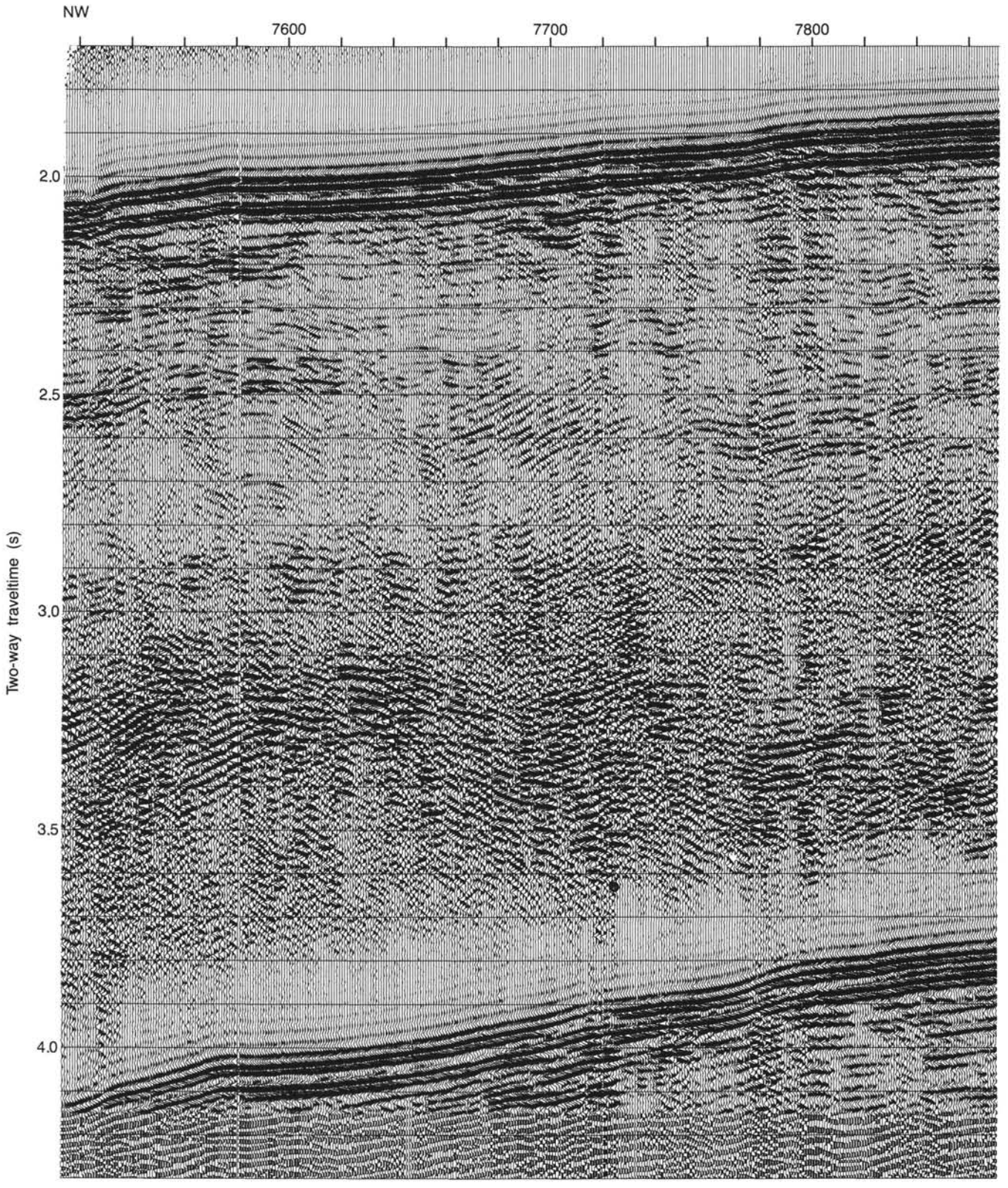


Figure 2 (continued).

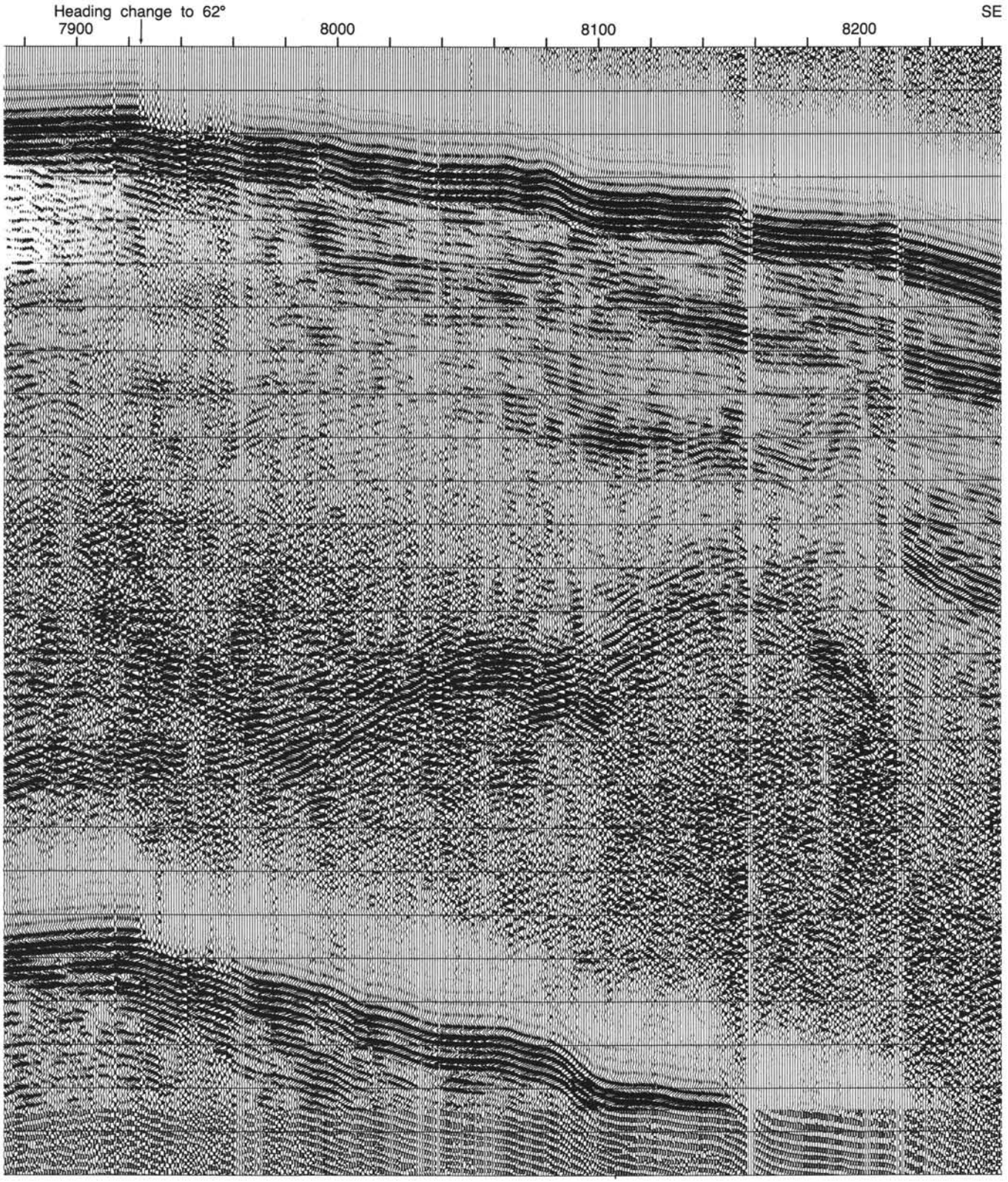


Figure 2 (continued).

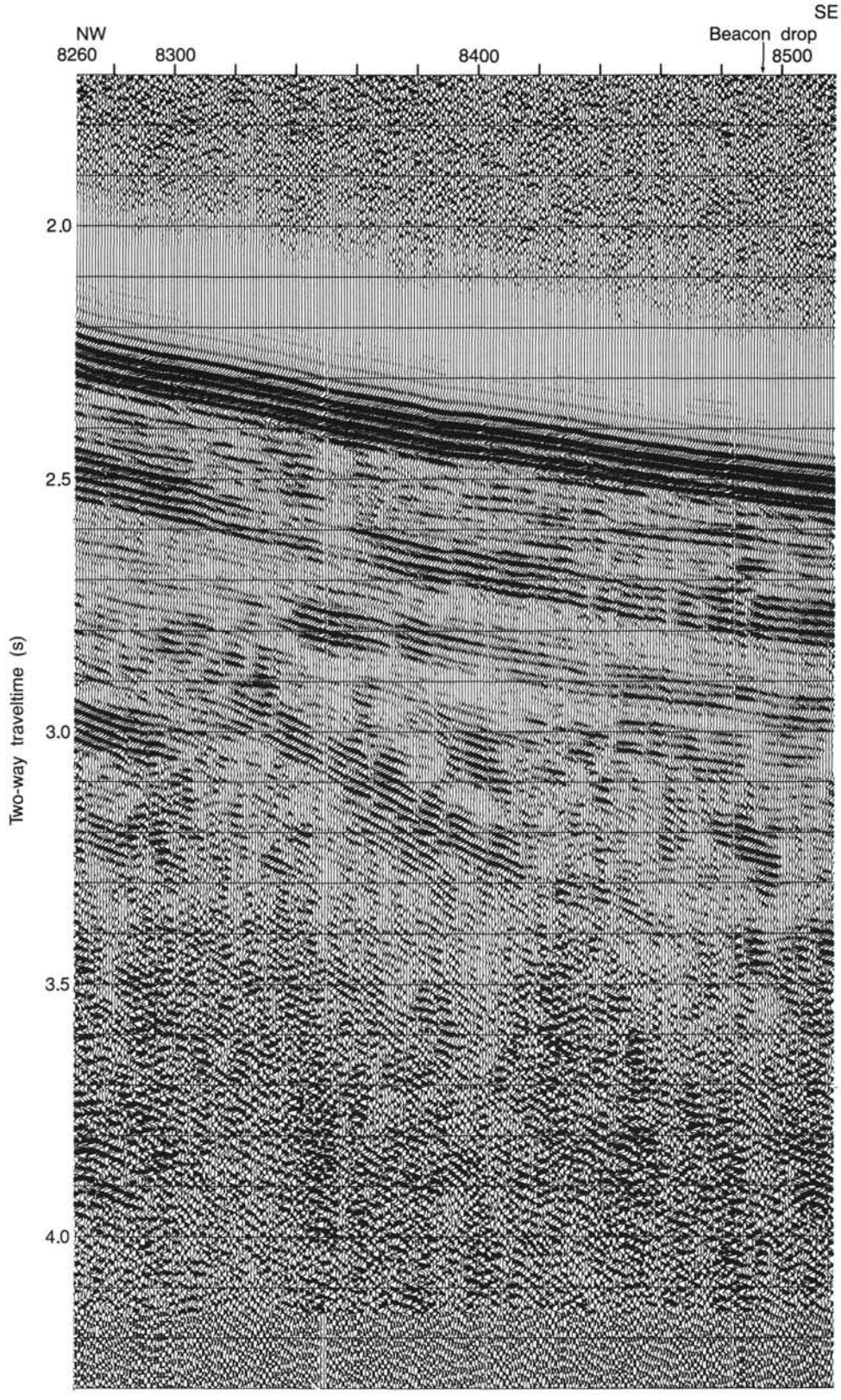


Figure 2 (continued).

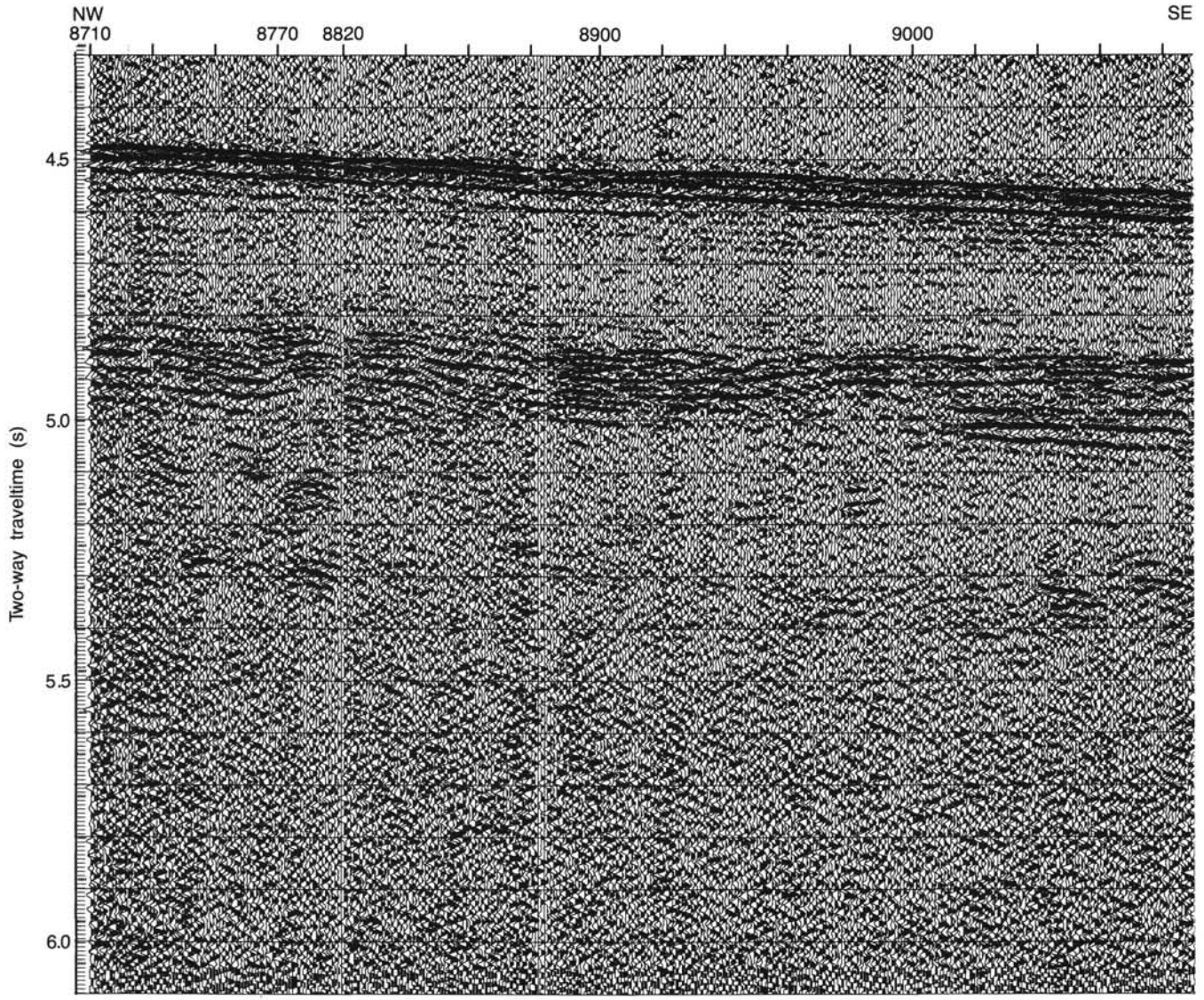


Figure 3. Single-channel seismic line (seismic line 3) shot on approach to Site 646.

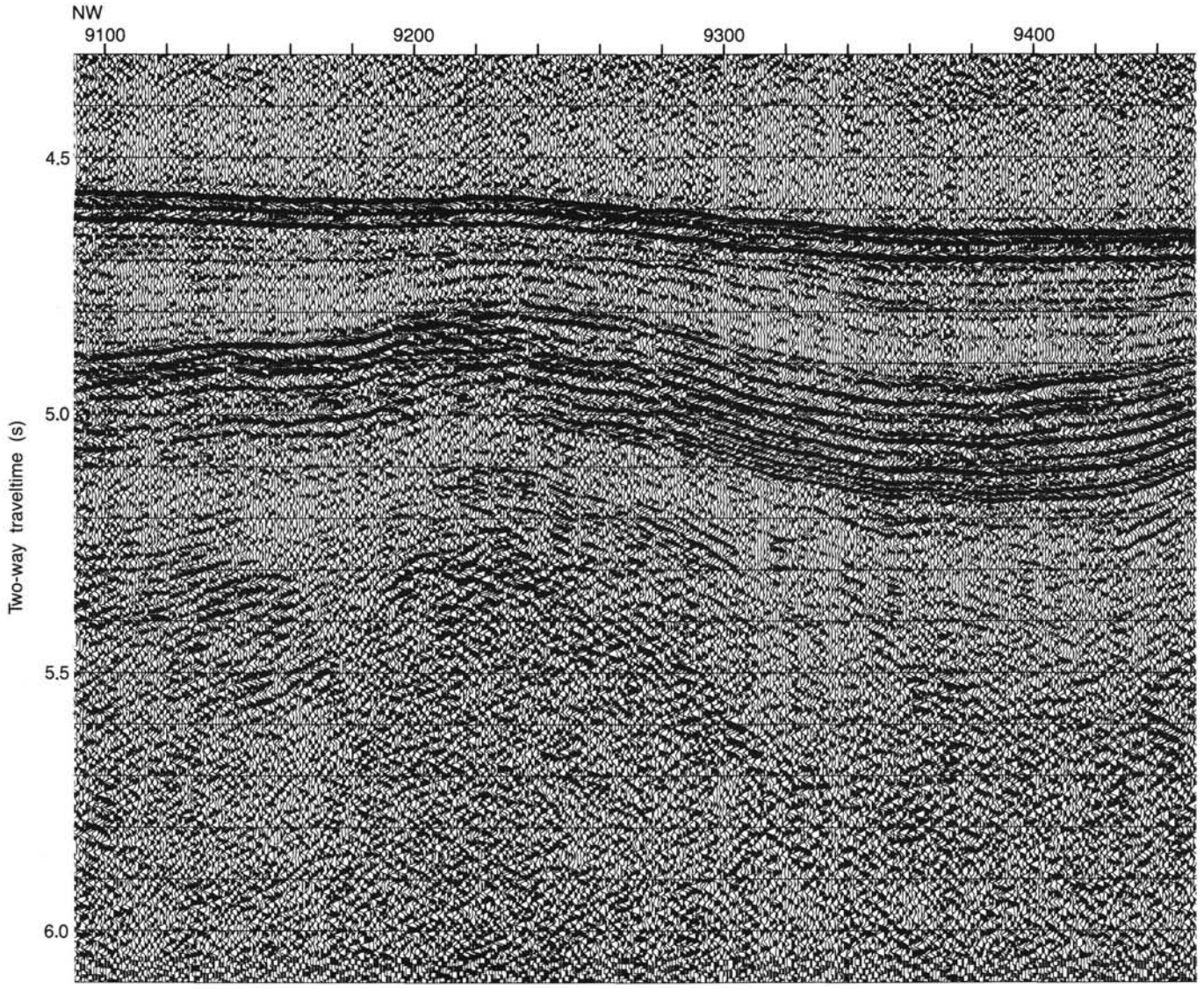


Figure 3 (continued).

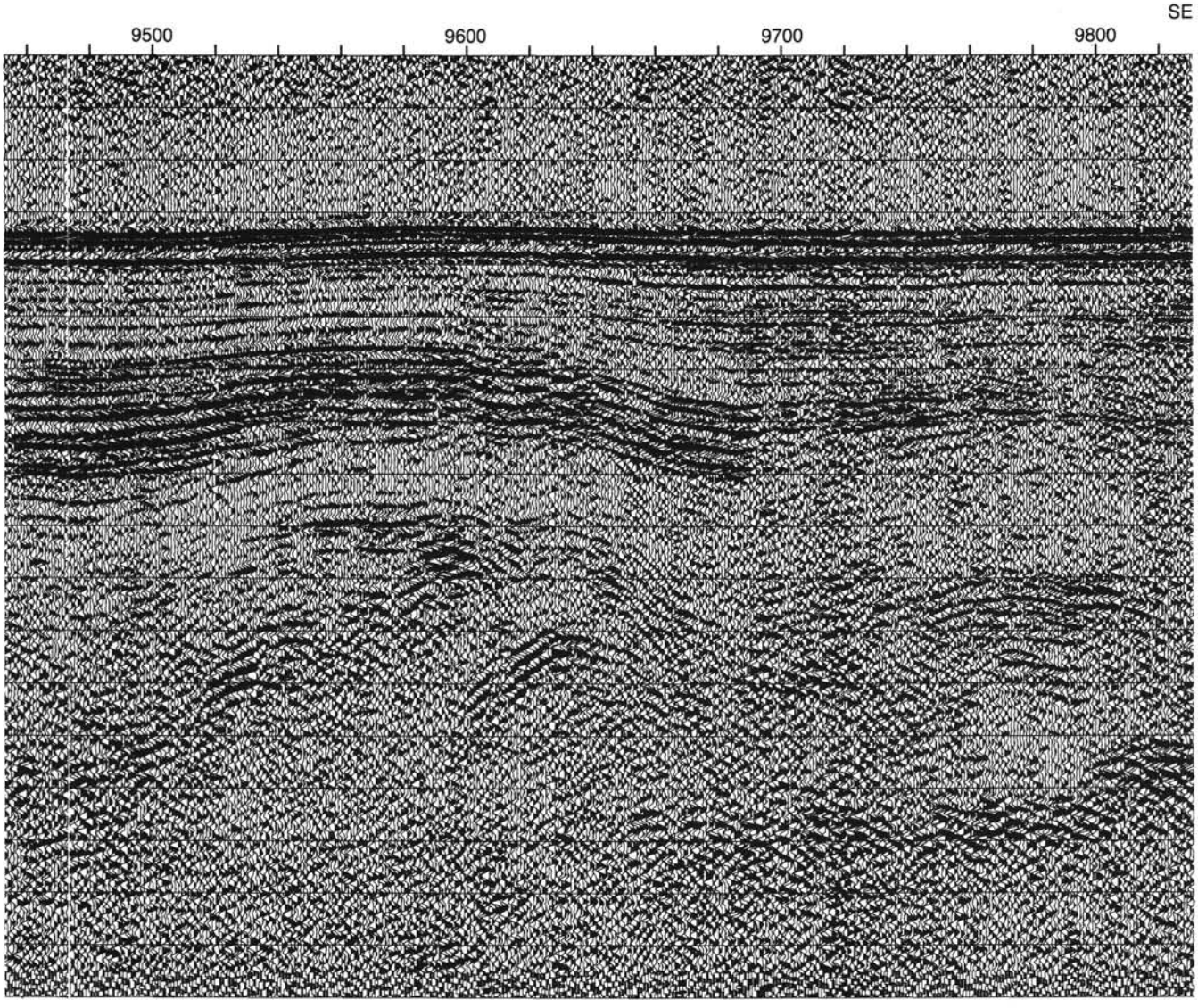


Figure 3 (continued).

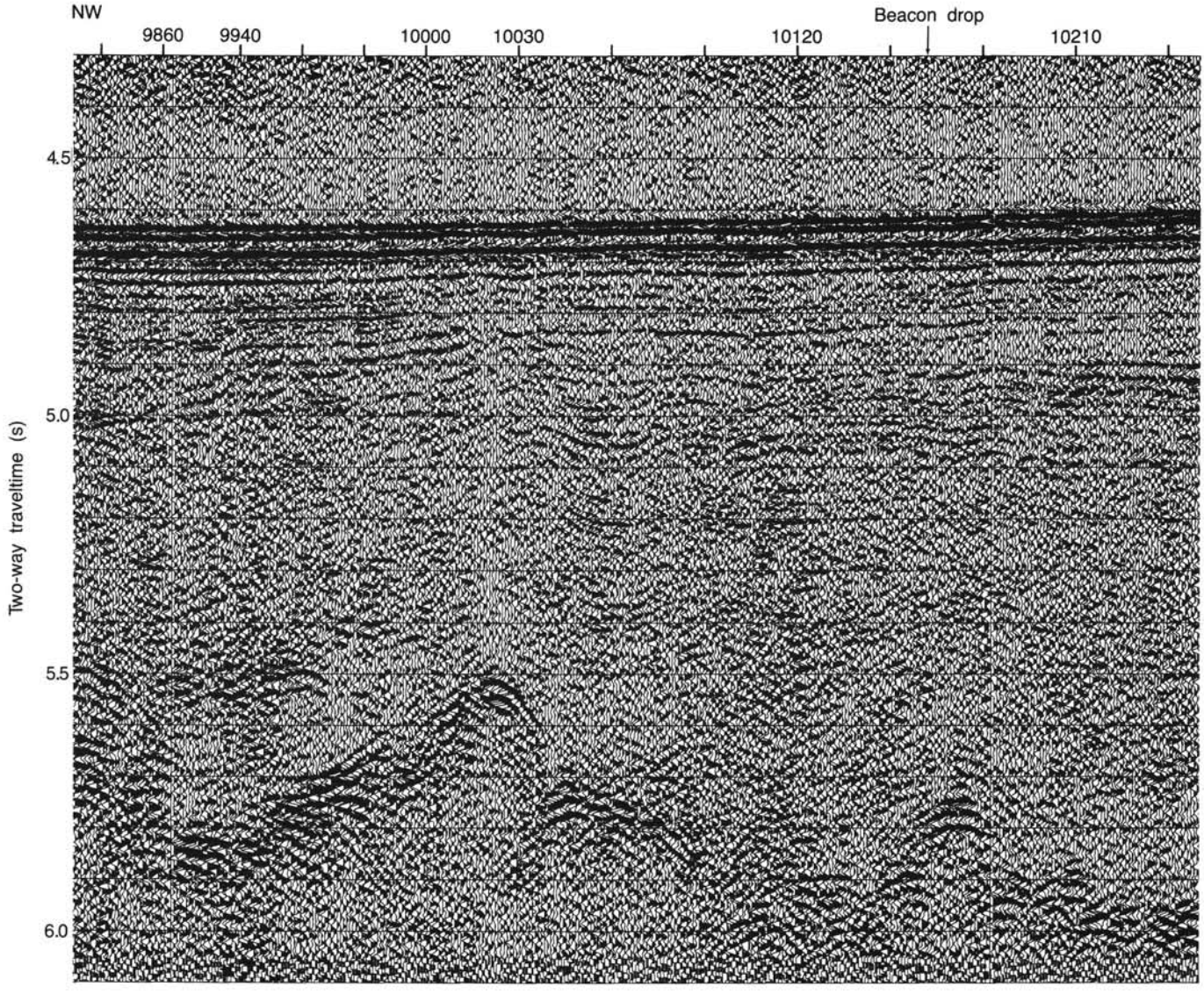


Figure 3 (continued).

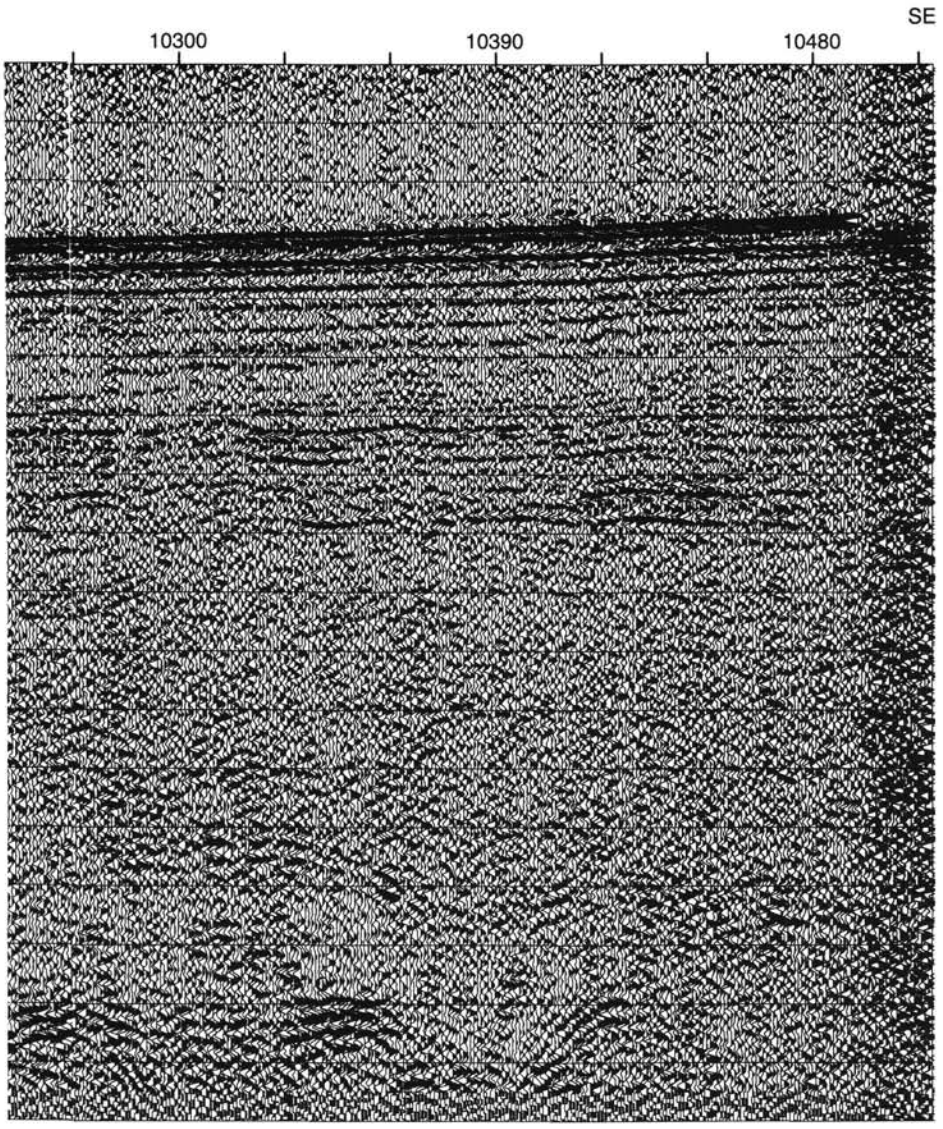


Figure 3 (continued).

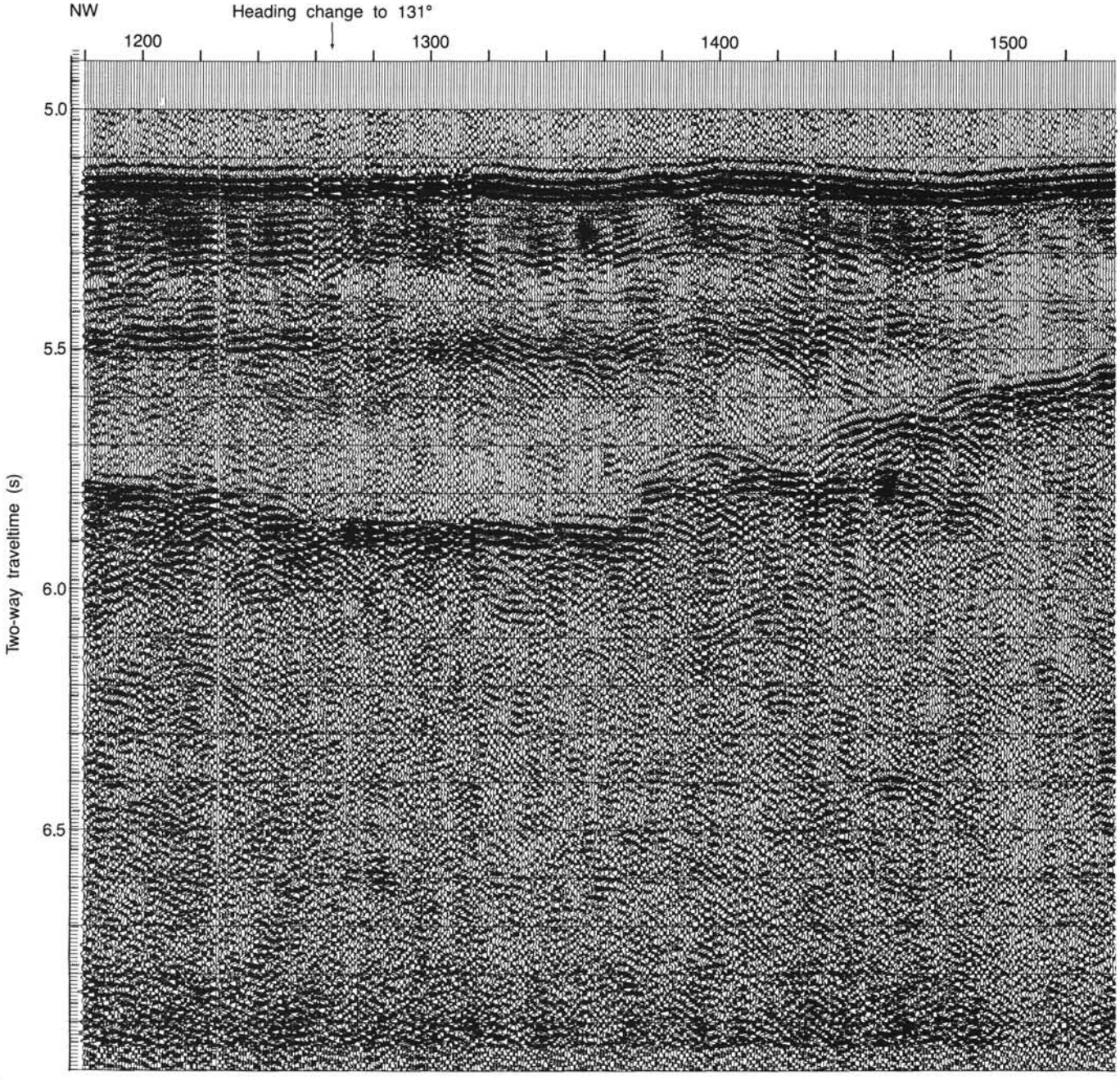


Figure 4. Single-channel seismic line (seismic line 4) shot on approach to Site 647.

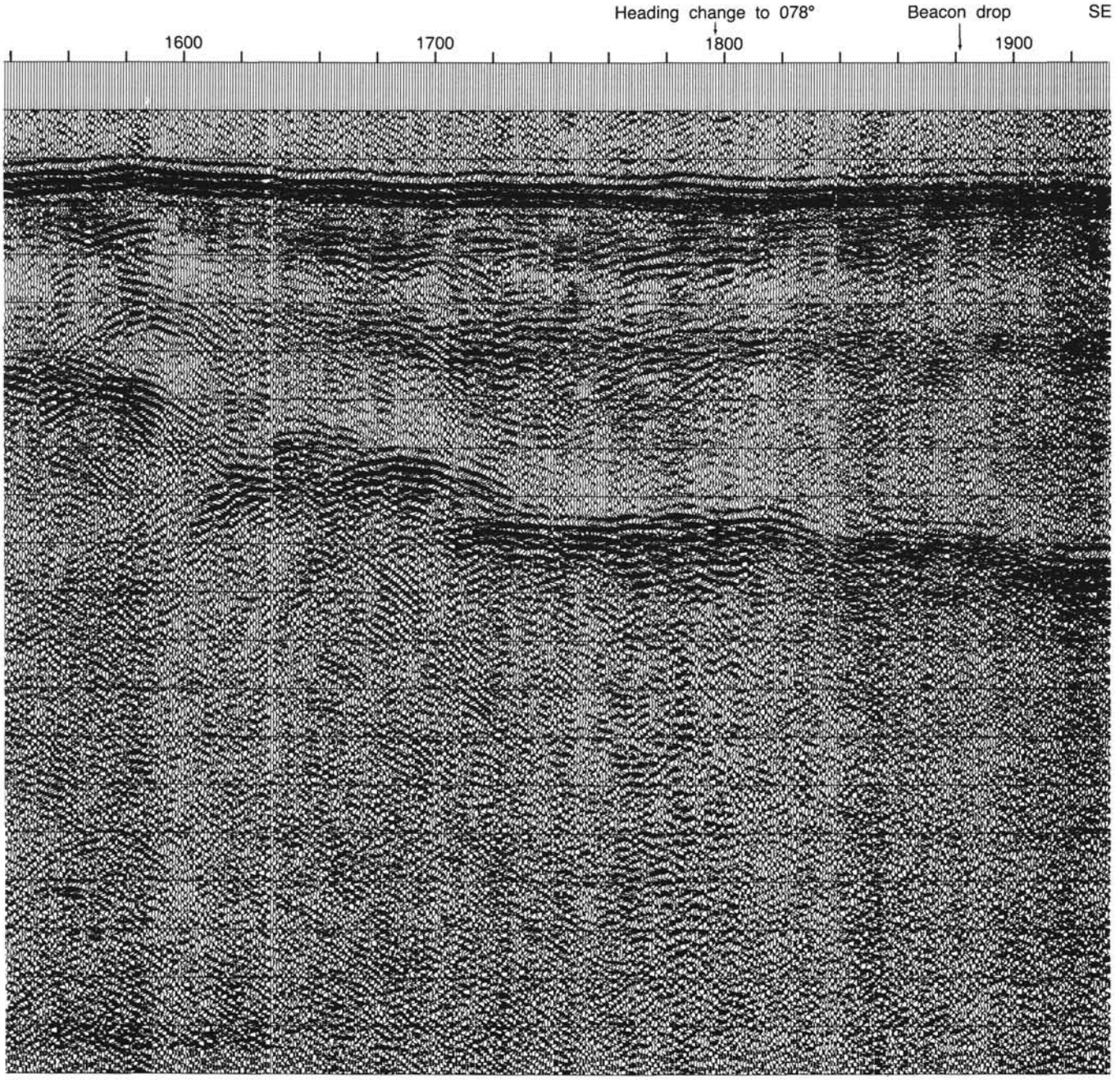


Figure 4 (continued).

**Table 2. Processing parameters.**

| | Line 2 | Line 3 | Line 4 |
|---|---|---|---|
| Data window | 1500–4400 ms | 3800–6300 ms | 4600–7200 ms |
| Plot start time | 1700 ms | 4300 ms | 4900 ms |
| Plot stop time | 4300 ms | 6100 ms | 7000 ms |
| Plot time scale | 5.00 in./s | 5.00 in./s | 5.00 in./s |
| Zero-phase band-pass filter | | | |
| High cut: | 40 Hz | 30 Hz | 40 Hz |
| Low cut: | 95 Hz | 80 Hz | 200 Hz |

**Table 3. Real-time recording parameters.**

| | Line 2 | Line 3 | Line 4 |
|---|---|---|---|
| Start at | Approach and survey Site 645 | Approach Site 646 | Approach Site 647 |
| End at | Site 645 | Site 646 | Site 647 |
| Source | 80-in.$^3$ water gun<br>300-in.$^3$ air gun<br>80-in.$^3$ water gun | 80-in.$^3$ water gun<br>80-in.$^3$ water gun | 80-in.$^3$ water gun<br>80-in.$^3$ water gun |
| Streamer | Starboard | Port | Port |
| EDO 1 | | | |
| High cut | 600 Hz | 400 Hz | 400 Hz |
| Low cut | 40 Hz | 40 Hz | 40 Hz |
| Gain | | | |
| Amplitude | Variable | 90 dB | 85 dB |
| Recorder | Variable | Full | Full |
| EDO 2 | | | |
| High cut | 200 Hz | 400 Hz | 400 Hz |
| Low cut | 60 Hz | 40 Hz | 40 Hz |
| Gain | | | |
| Amplitude | Variable | 90 dB | 85 dB |
| Recorders | Variable | Full | Full |