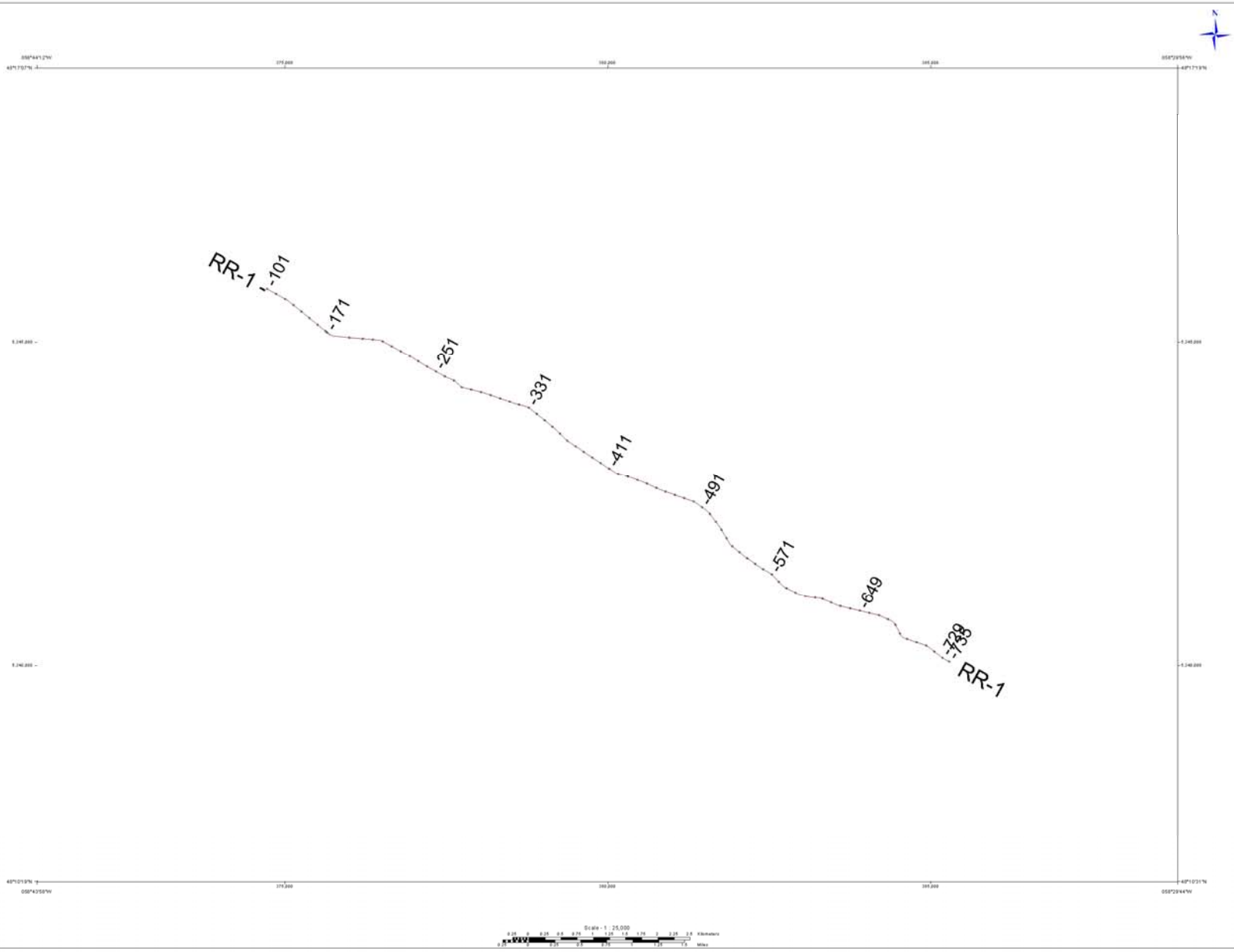
SEISMIC PROCESSING QC REPORT

Area: **ROBINSON RIVER**
Location: **NTS GRID: 12-B**

Line: **RR-1**

Date: November 15th 2011
Prepared by: Trevor LeDrew



Software by Accu-Audit Ltd.

TRIUMPH

ROBINSON RIVER

Datum: NAD27	Ellipsoid: Clarke 1866
Projection: UTM Zone 21	Grid: ATS 2.6
Made By: C & C Systems	November 15, 2009

Acquisition Parameters

```
REM LOGO
REM LOGO
REM LOGO
REM LOGO   SHOT BY:               CAPILANO GEOPHYSICAL LTD.   PTY: 600
REM LOGO                          OCT,  1989
REM LOGO
REM LOGO   SHOT FOR:              M.U.N
REM LOGO
REM LOGO   SPREAD:                2620 - 260  *  260 - 2620 METERS
REM LOGO   SOURCE INTERVAL:       40     METERS
REM LOGO   RECEIVER INTERVAL:     20     METERS
REM LOGO
REM LOGO                          NUMBER OF VIBRATORS     : 4 OVER 30 METERS
REM LOGO                          NUMBER OF SWEEPS / VP   : 4
REM LOGO                          VIB SEPARATION          : 10     METERS
REM LOGO                          VIB ARRAY LENGTH        : 30     METERS
REM LOGO                          MOVE UP                 : 8      METERS
REM LOGO                          TOTAL ARRAY LENGTH      : 0      METERS
REM LOGO                          SWEEP LENGTH            : 8.0    SEC
REM LOGO                          UNCORRELATED REC LENGTH : 12.0   SEC
REM LOGO                          SWEEP FREQUENCY         : 20-90  HZ
REM LOGO
REM LOGO   RECEIVERS:             TYPE  MARK L-28 14 HZ
REM LOGO                          12 GEOPHONES INLINE OVER 17 METERS
REM LOGO
REM LOGO   INSTRUMENTS:           DFS-V                 TRACES: 240
REM LOGO   TAPE FORMAT:           SEGB
REM LOGO   GAIN MODE:             IFP
REM LOGO   FIELD FILTER:          OUT - 128(72) HZ      NOTCH:  OUT
REM LOGO   SAMPLE RATE:           0.002  SEC
REM LOGO   RECORD LENGTH:         4.000  SEC
REM LOGO
REM LOGO
REM LOGO
```

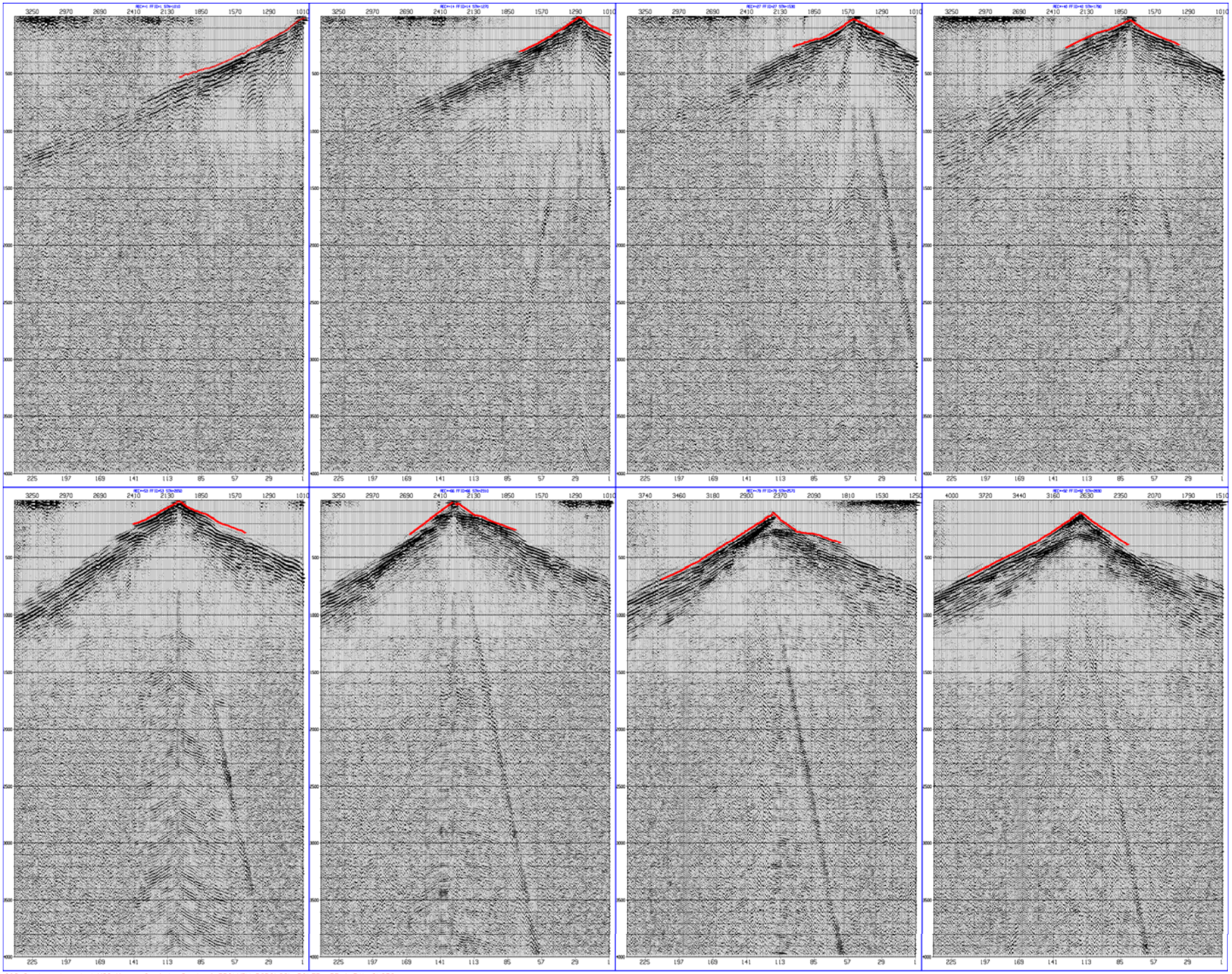
RAW FIELD RECORDS

Example of raw field records (with exponential gain recovery applied and AGC scaling) taken along the seismic line.

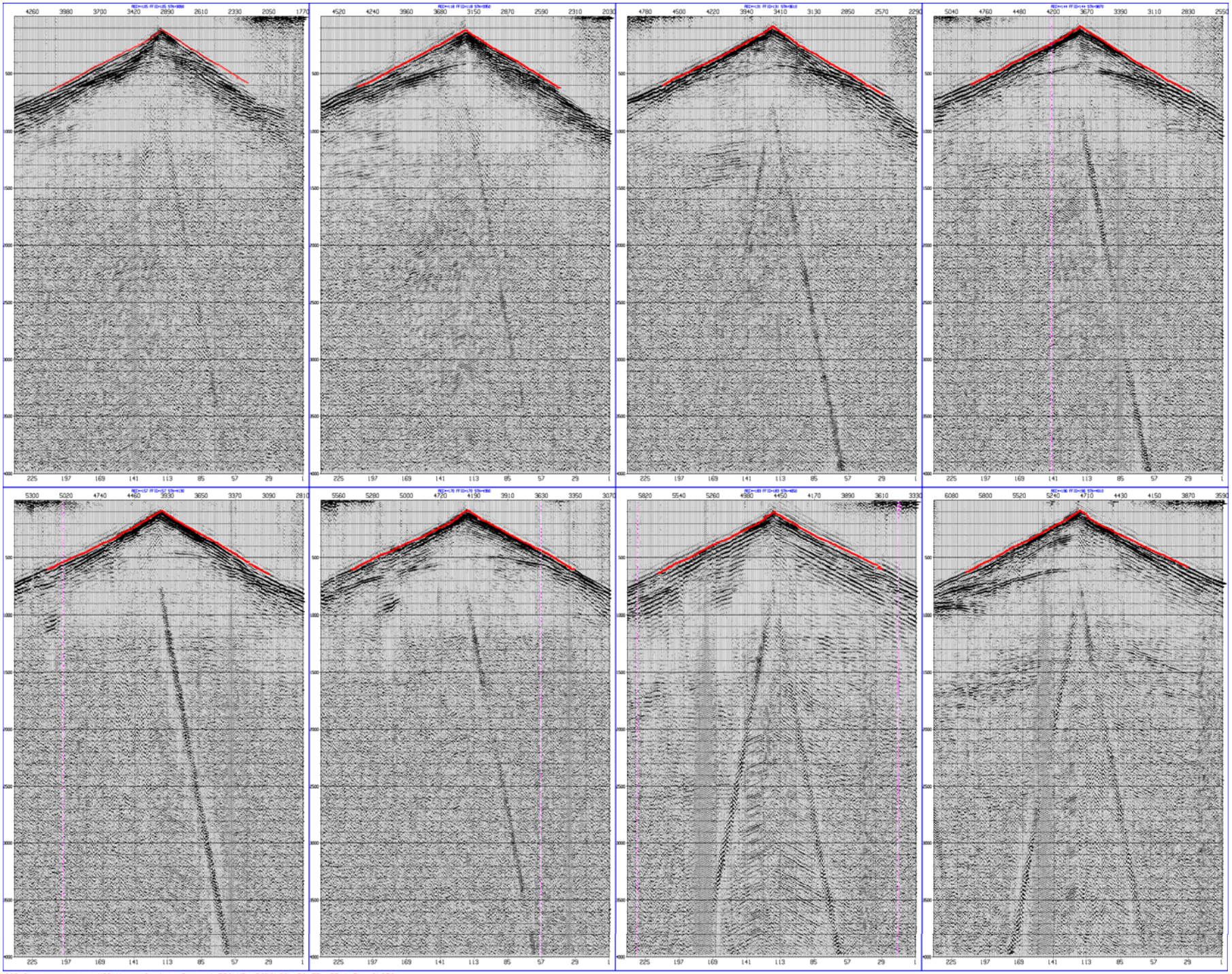
Display layout description

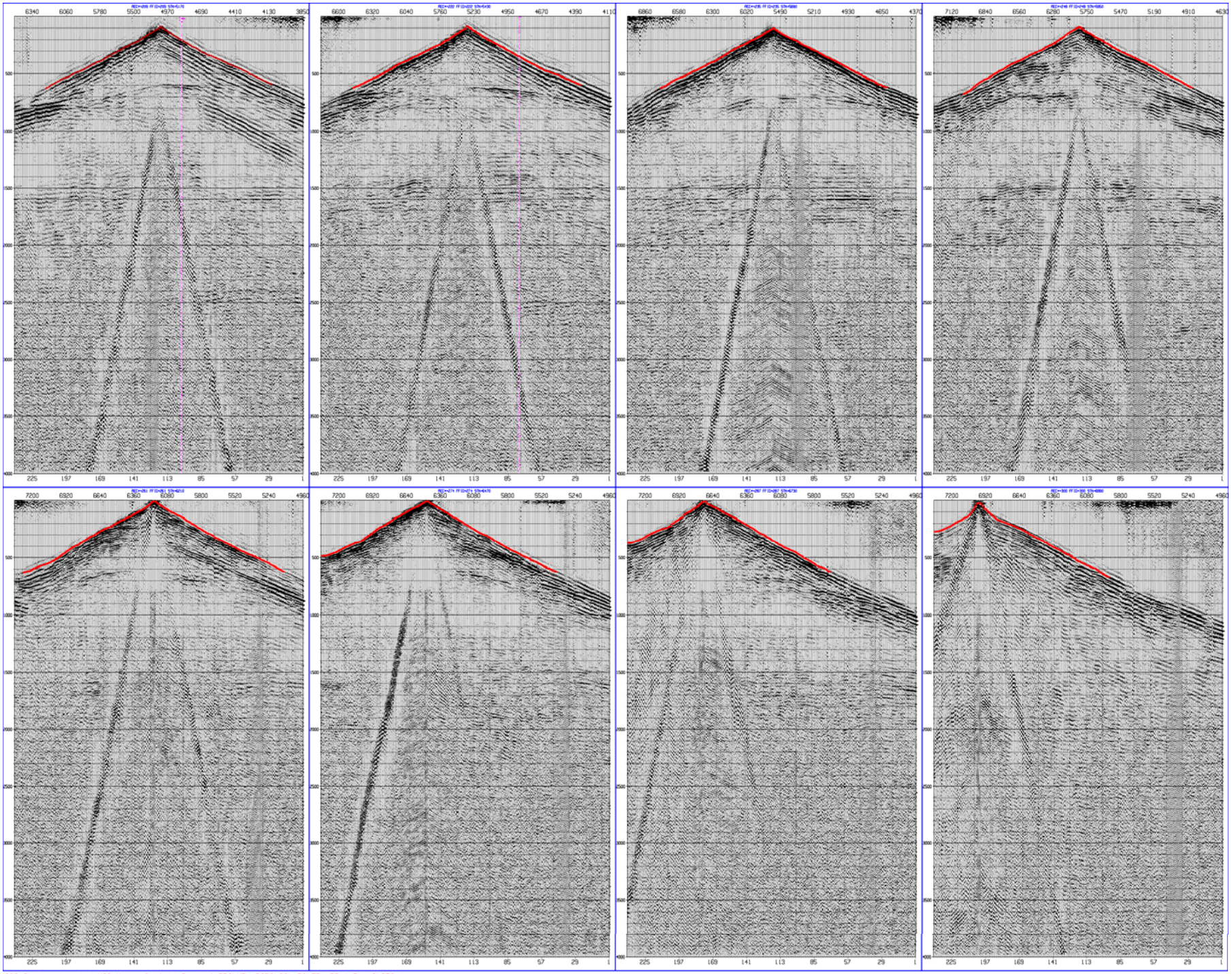
EXAMPLE OF RAW FIELD RECORDS

Vertical PINK line – indicative of trace edit (kill)
Vertical RED line – indicative of trace reversal
Diagonal RED line – indicate position of first break picked used in GLI refraction analysis



C&C Systems Limited MOC-Micro Quality Control TRIUMPH ROBINSON RIVER RR-1 RAW SHOTS





AMPLITUDE AND F-K SPECTRUM – RAW SHOT RECORDS

Example of raw field records before deconvolution

Display layout description

EXAMPLES OF UN-FILTERED RAW FIELD SHOT RECORDS

Vertical PINK line – indicative of trace edit (kill)
Vertical RED line – indicative of trace reversal
Diagonal RED line – indicate position of first break picked used in GLI refraction analysis

FK TRANSFORM:

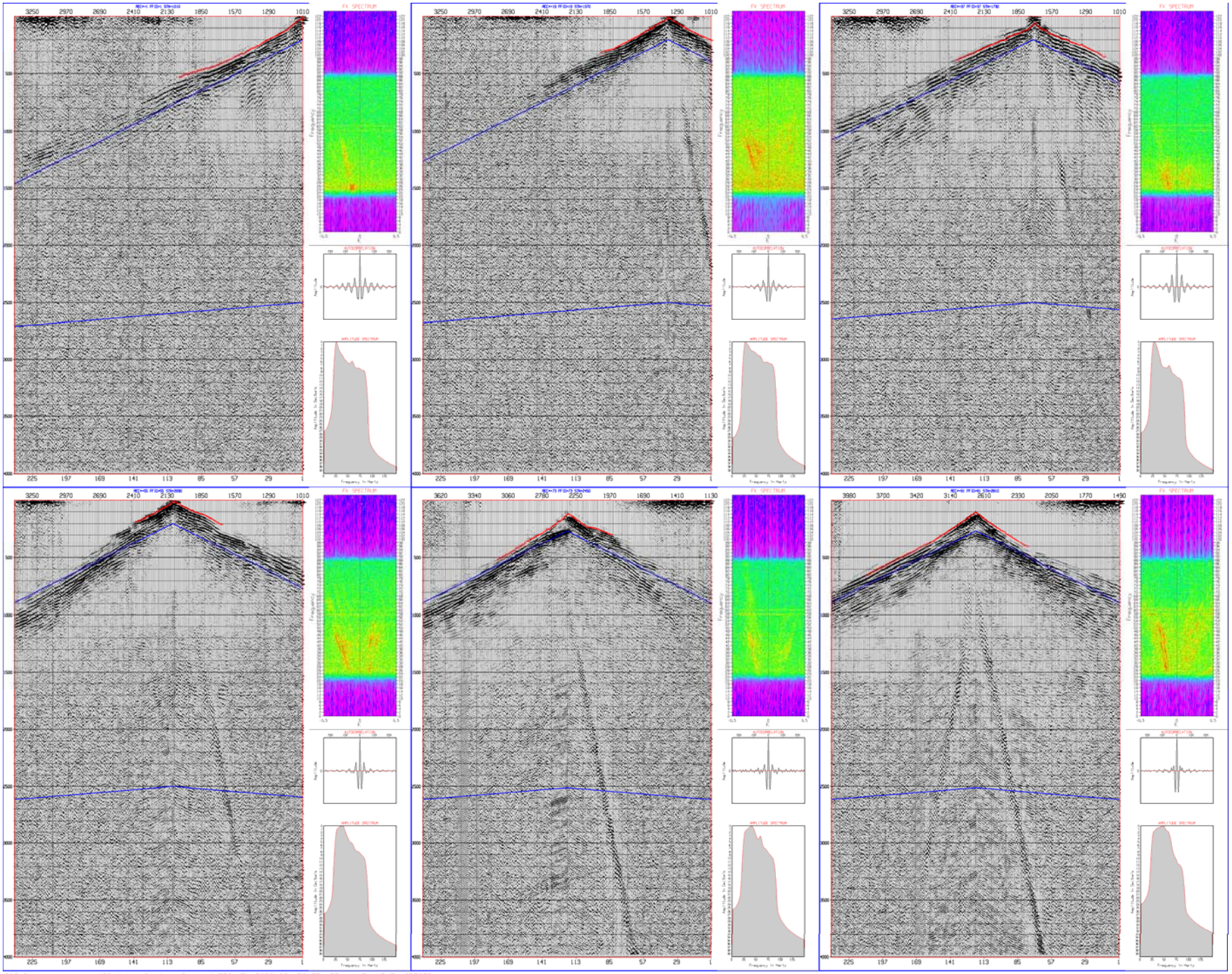
Wave number (K) vs. Frequency (hz.) - derived over the deconvolution design window (shown in blue).

AUTOCORRELATION:

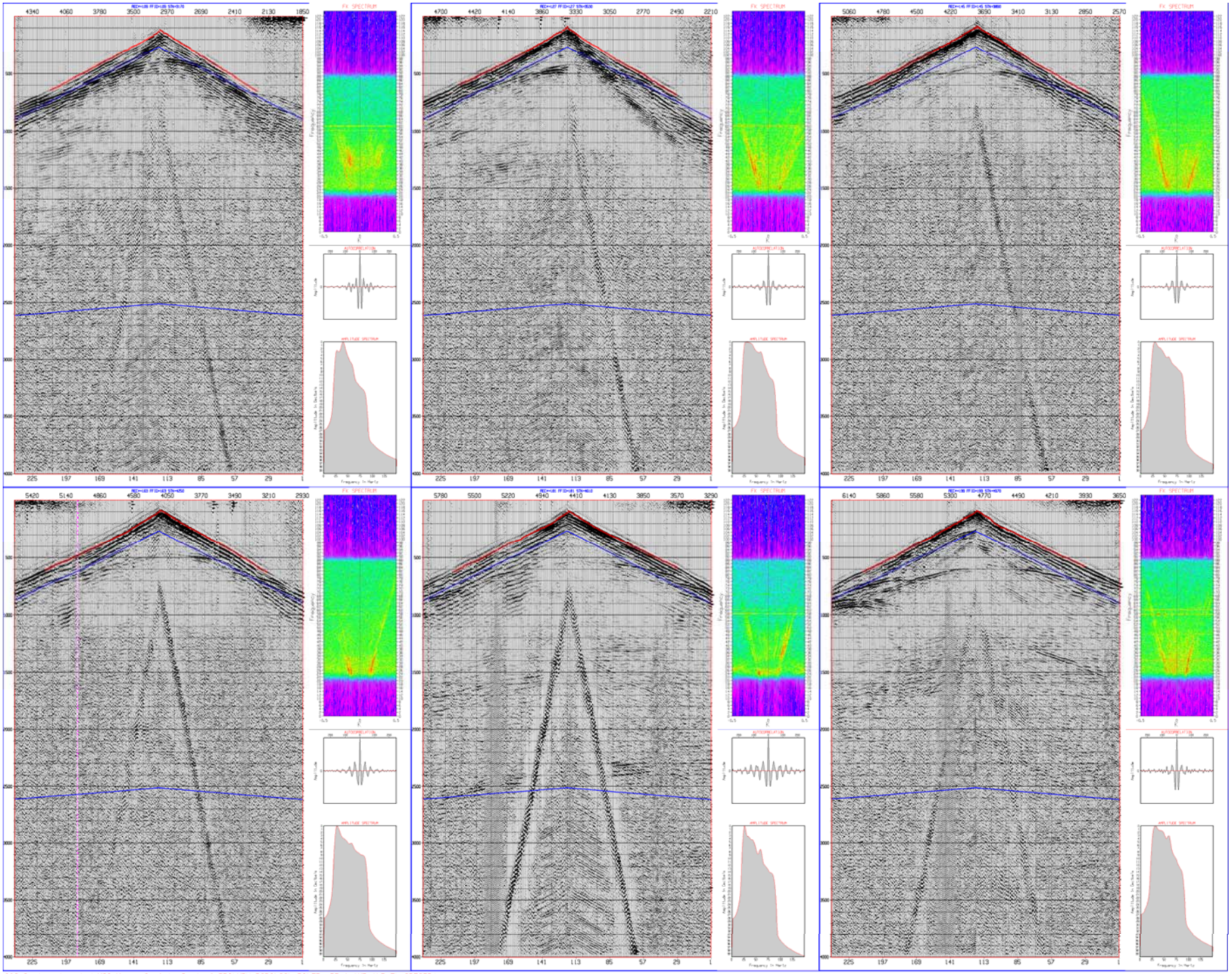
derived over the deconvolution design window (shown in blue).

AMPLITUDE SPECTRUM:

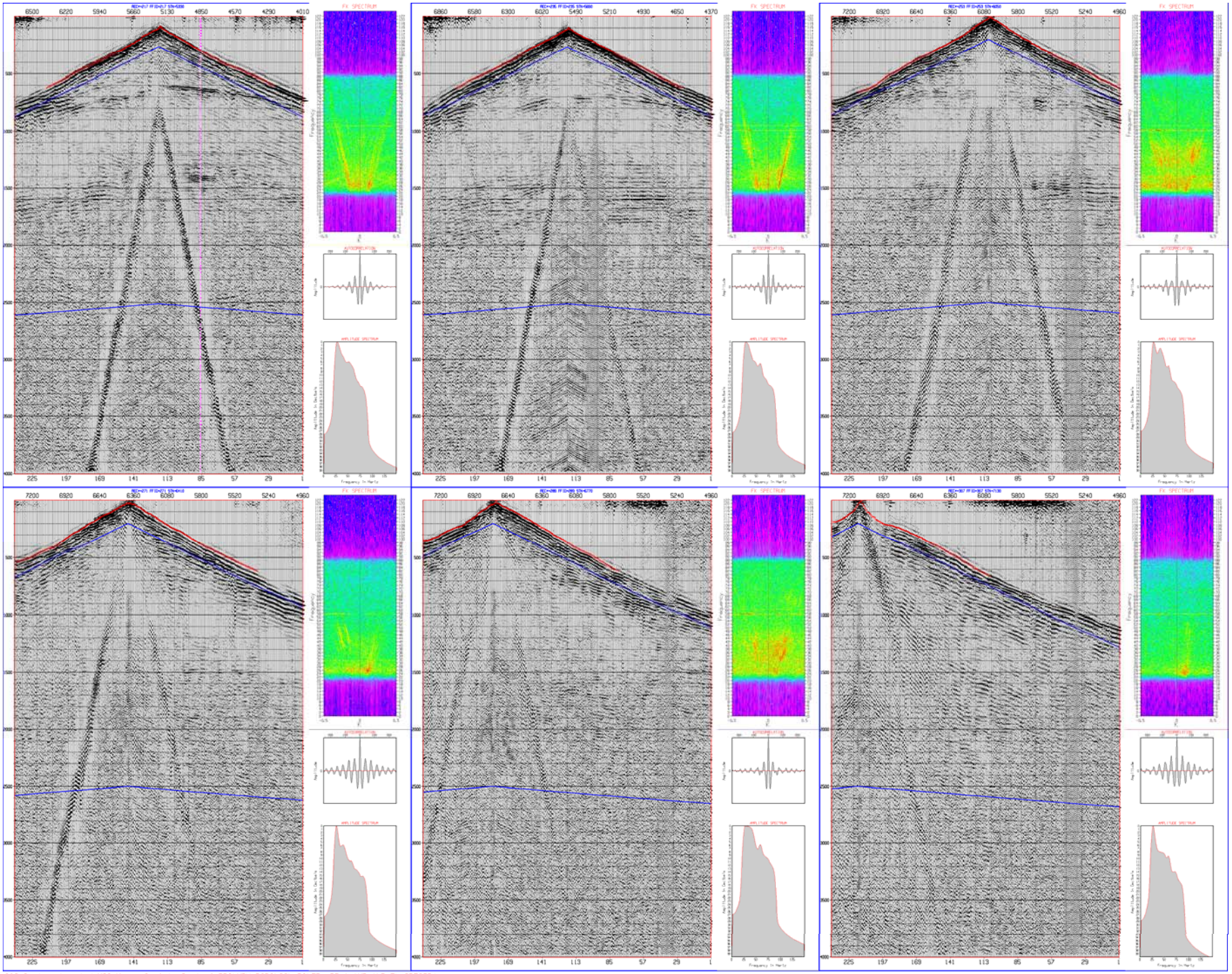
Amplitude (db) vs. Frequency (hz.) - derived over the deconvolution design window (shown in blue).



C&C Systems Limited MOC-Micro Quality Control TRIUMPH ROBINSON RIVER RR-1 AMP AND FK SPECTRA



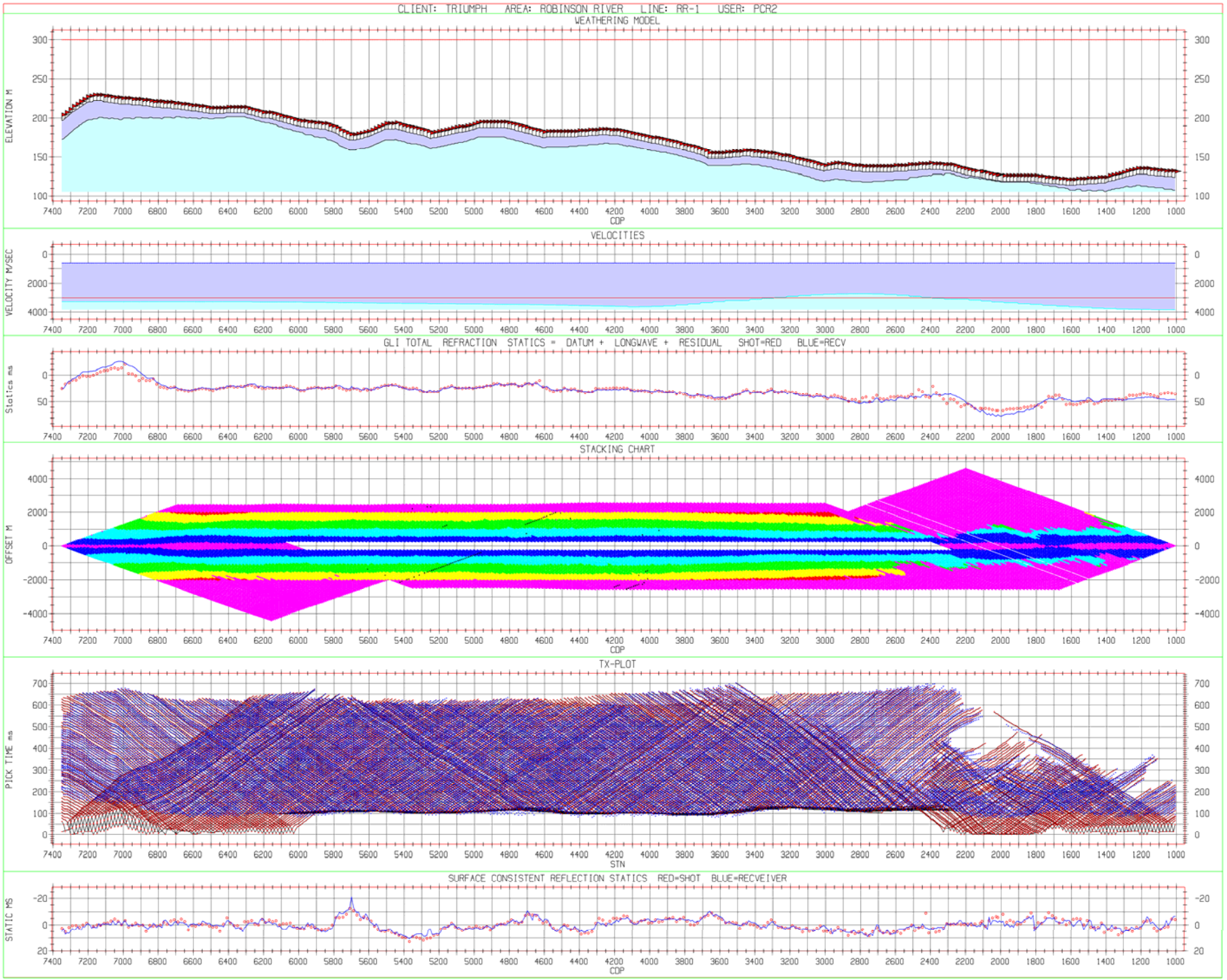
C&C Systems Limited MOC-Micro Quality Control TRIUMPH ROBINSON RIVER RR-1 AMP AND FK SPECTRA



C&C Systems Limited MOC-Micro Quality Control TRIUMPH ROBINSON RIVER RR-1 AMP AND FK SPECTRA

WEATHERING MODEL

Profile 1	**Refraction depth model** Display elevation profile Shows shot point locations along the line Thickness of the ‘weathering’ and ‘drift’ layers Datum Elevation (red horizontal line)
Profile 2	**Refraction velocity model** Dark blue – ‘weathering’ velocity (usually 610 m/s) Light blue – ‘drift’ velocity Green – base of ‘drift’ velocity
Profile 3	**Total GLI refraction statics profile** Blue – receivers Red – shots
Profile 4	**Stacking chart** Displaying color coded pick times and trace edits (if present) The offset range of first break times are assigned one of five (5) unique color bars
Profile 5	**First Break T-X plot** Red – actual first break picks Blue – model first break picks
Profile 6	**Static profile** First pass surface consistent reflection statics Blue – receivers Red – shots


CLIENT: TRIUMPH AREA: ROBINSON RIVER LINE: RR-1 USER: PCR2
WEATHERING MODEL
ELEVATION M
CDP
VELOCITIES
VELOCITY M/SEC
GLI TOTAL REFRACTION STATICS = DATUM + LONGWAVE + RESIDUAL SHOT=RED BLUE=RECV
Statics ms
STACKING CHART
OFFSET M
CDP
TX-PLOT
PICK TIME ms
STN
SURFACE CONSISTENT REFLECTION STATICS RED=SHOT BLUE=RECVEIVER
STATIC MS
CDP

SEMBLANCE / COMMON OFFSET STACK DISPLAY
STACKING VELOCITY and DERIVED INTERVAL VELOCITY DISPLAY

Example of semblance and filtered common offset stacks with velocities applied.

Group Interval:		20 m
Offset Range:		0 - 1000 m
Number of Offsets:		120
Number of CDP's/coff:		20
Velocity	Range:	1000 - 6000 m/s
	Incr.:	50 m/s

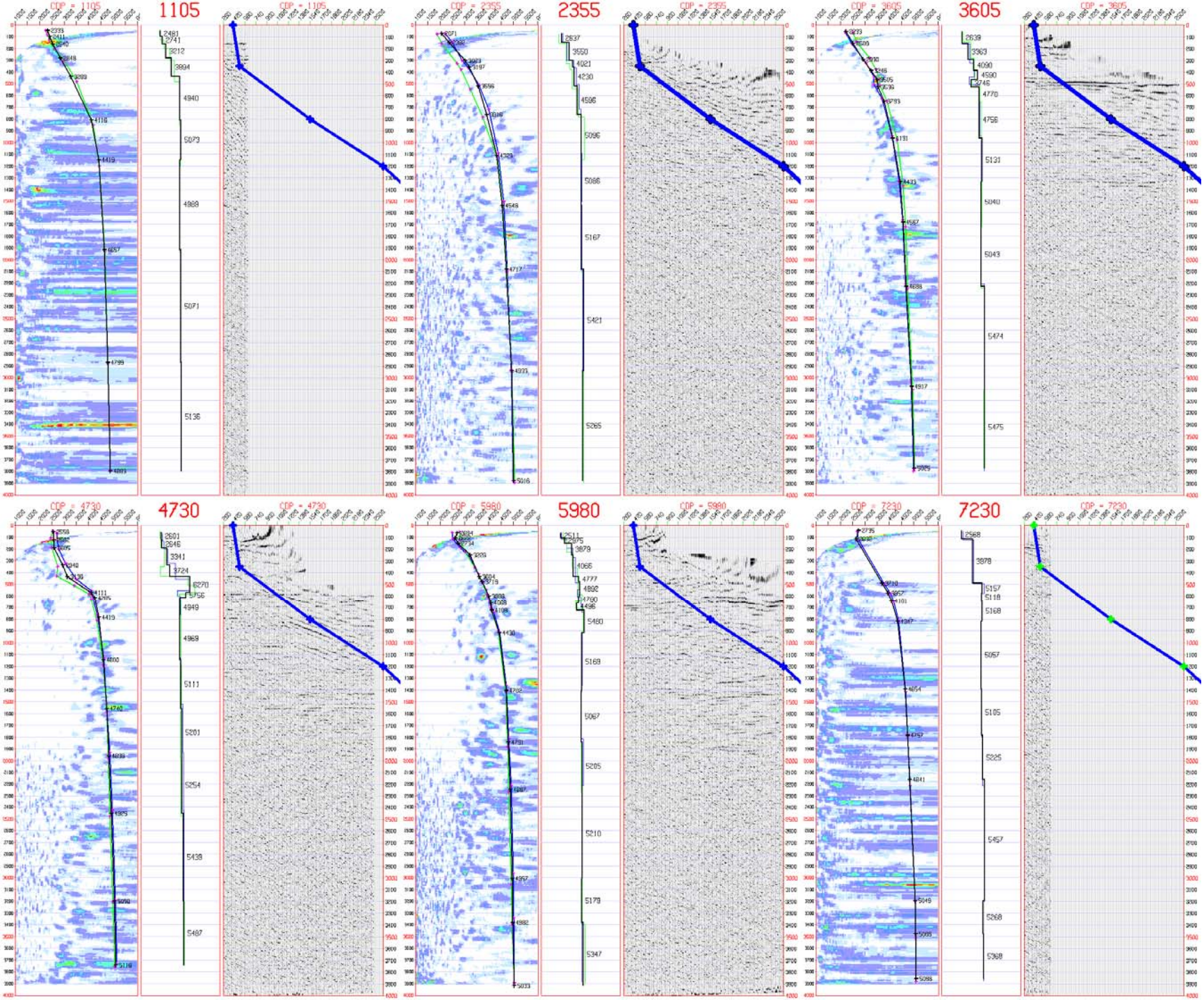
Display layout description

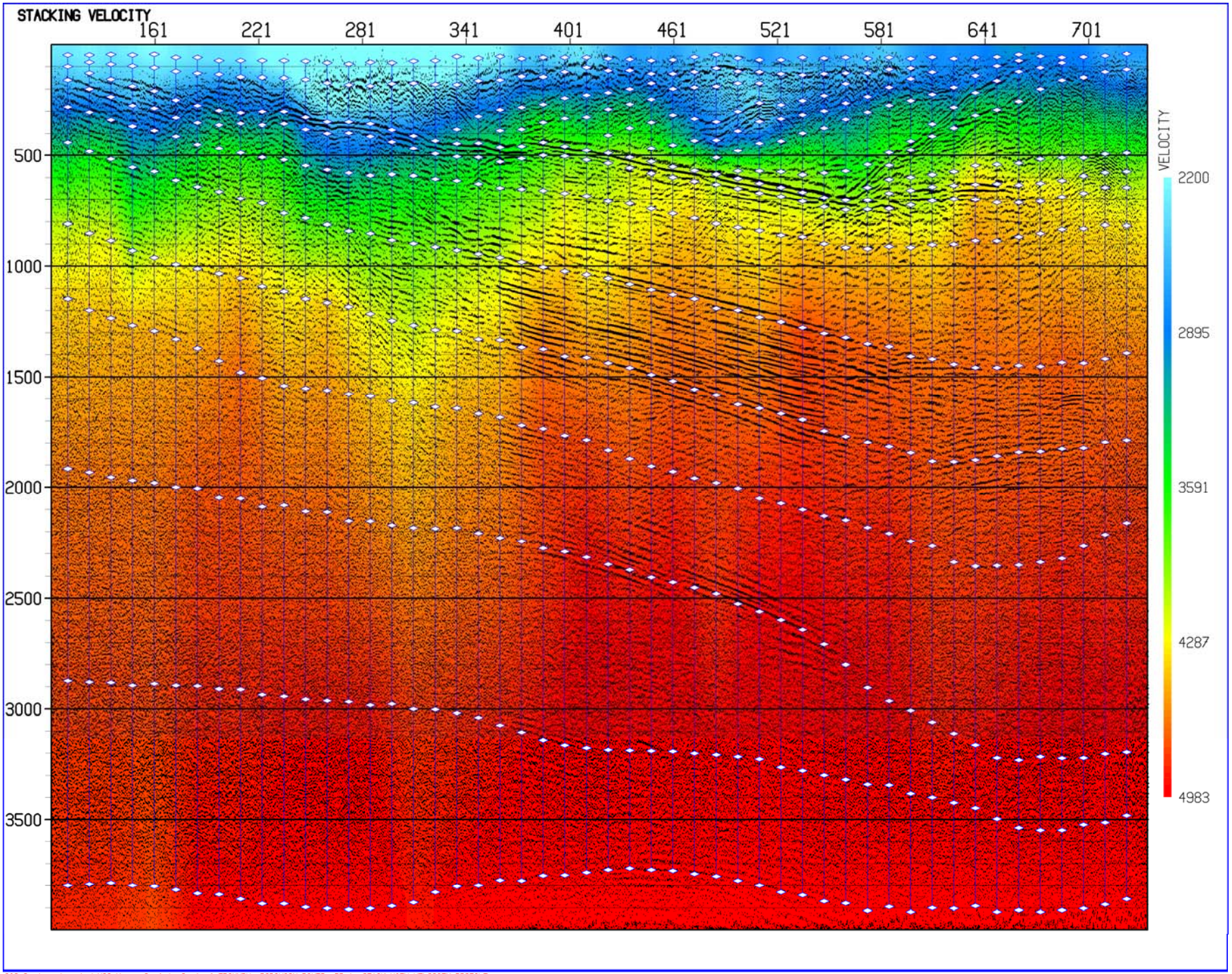
SEMBLANCE DISPLAY	**COMMON OFFSET STACK**
Range of velocities sampled over RMS velocities selected Derived interval velocity profile from RMS velocities	Displays NMO corrected common offset stack

The color plots following the semblance displays indicate the stacking velocity used in the processing of the data as well as the derived interval velocities (using Dix equation) from the stacking velocities.

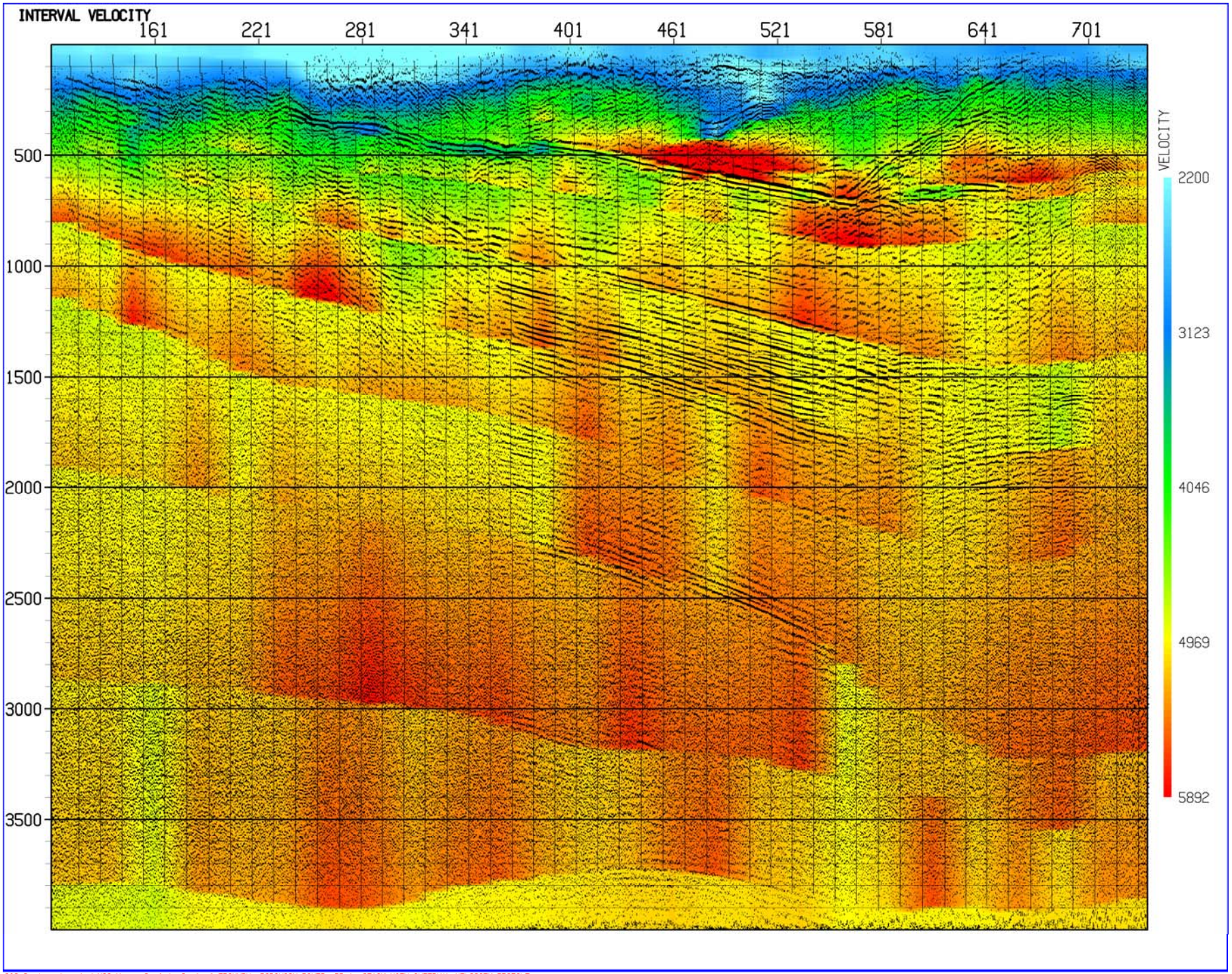
Control points along the line are indicated on the plots.

A small color bar is to the right of the display indicating velocity ranges for the colors used.


CDP = 1105
1105
CDP = 1105
CDP = 2355
2355
CDP = 2355
CDP = 3605
3605
CDP = 3605
CDP = 4730
4730
CDP = 4730
CDP = 5980
5980
CDP = 5980
CDP = 7230
7230
CDP = 7230



C&C Systems Limited MQC-Micro Quality Control TRIUMPH ROBINSON RIVER RR-1 STACK WITH VELOCITY PROFILE



C&C Systems Limited MQC-Micro Quality Control TRIUMPH ROBINSON RIVER RR-1 STACK WITH INTERVAL VELOCITY PROFILE

STACK EVOLUTION DISPLAY

Comparison of processing steps from Elevation Corrections only to Final Migrated stack

Display layout description

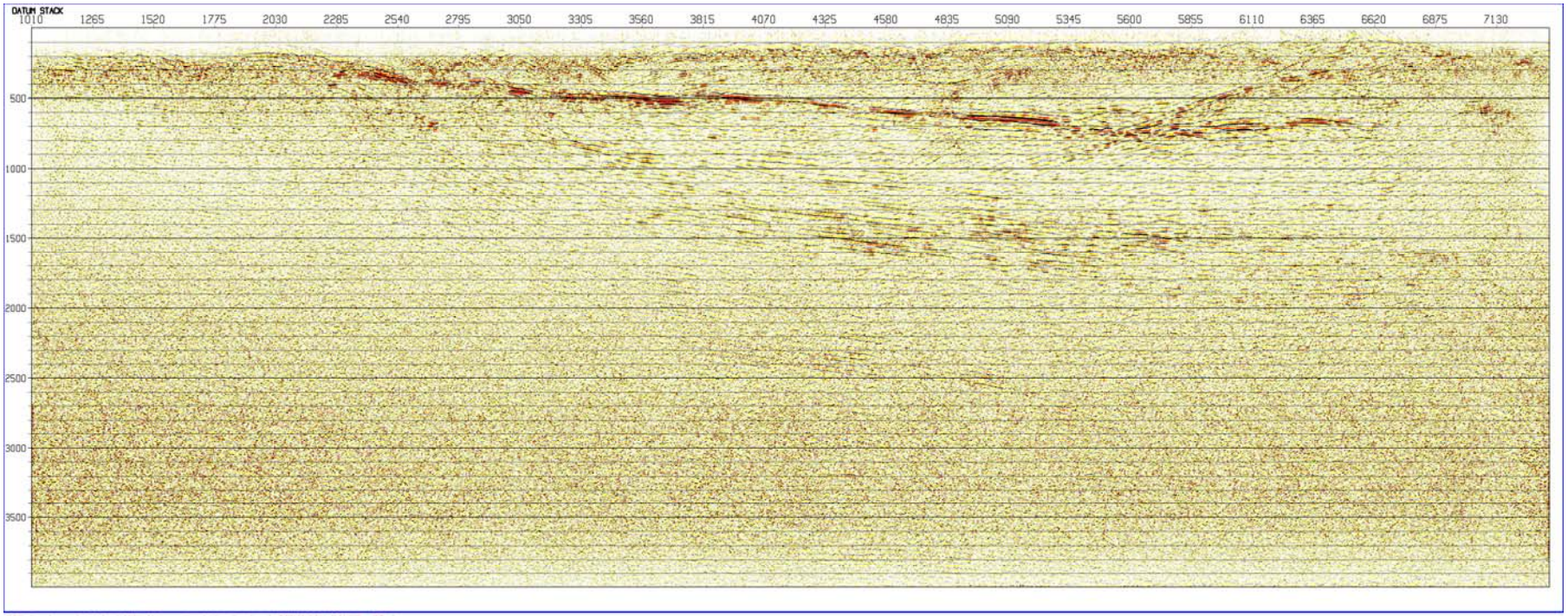
DATUM STACK Elevation statics only with preliminary velocity function.
BRUTE STACK Elevation & Refraction statics with preliminary velocity function

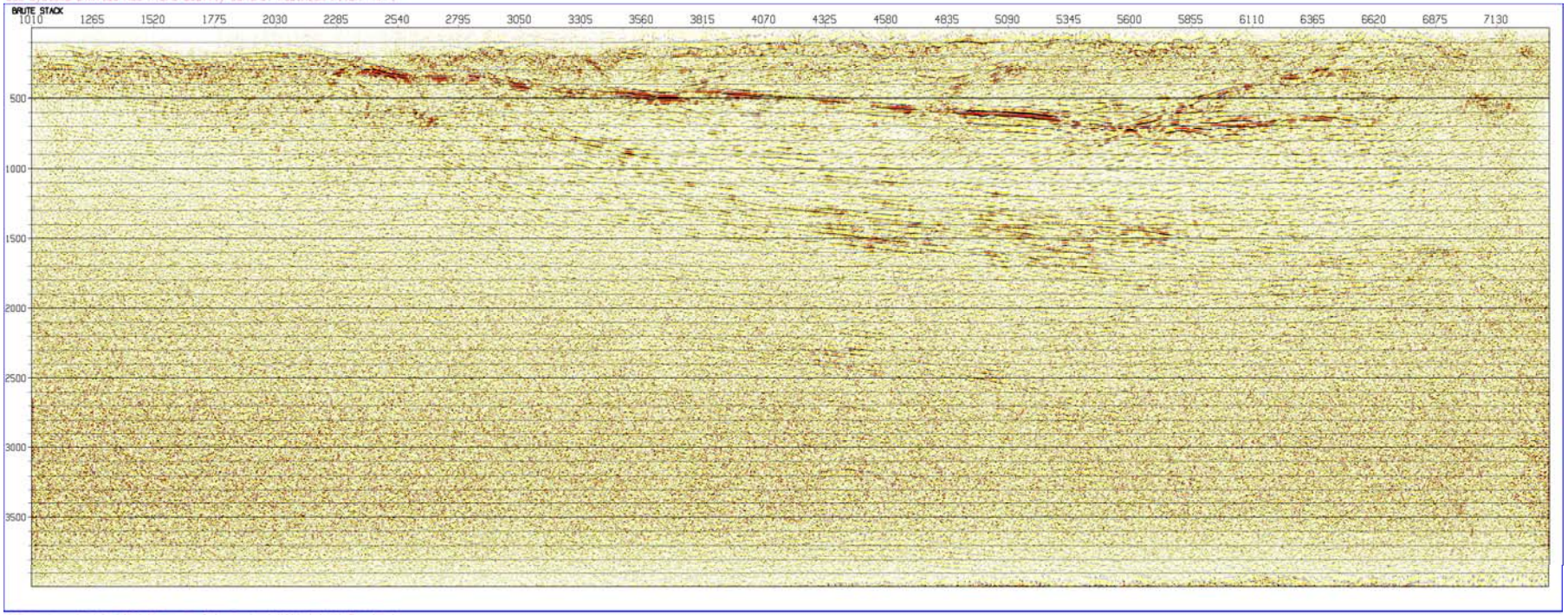
STATIC/VELOCITY CORRECTED STACK Elevation, Refraction & reflection statics with final velocity functions.
FINAL STRUCTURE STACK Elevation, Refraction, Reflection & CDP trim statics

NOISE REDUCED STRUCTURE STACK Post stack F-X Noise Attenuation
MIGRATED STACK Phase Shift Migration of post-stack F-X Noise attenuated structure stack

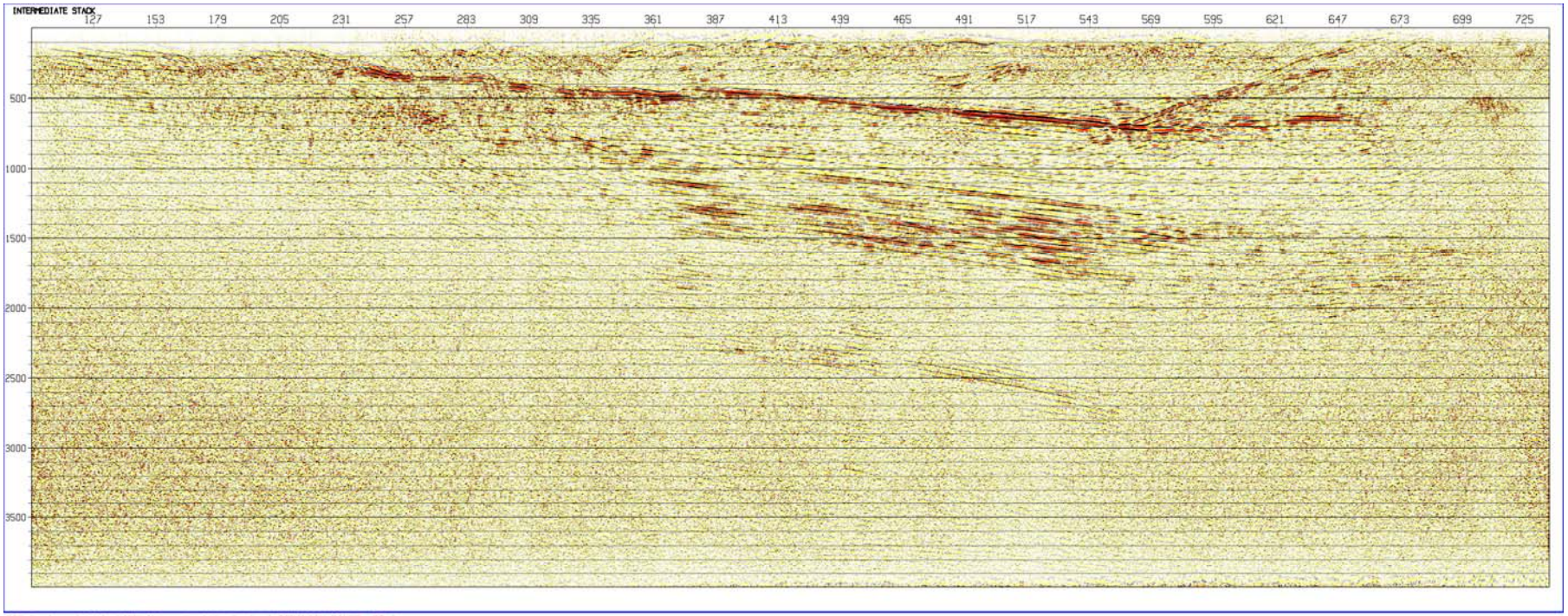
E-FOCUS STRUCTURE STACK Pre-stack E-FOCUS
MIGRATED E-FOCUS STACK KIRCHOFF Migration of E-FOCUS structure stack

A display of the structure stack with corresponding static and velocity corrected sourcepoints is displayed. The correlation static windows as well as data muting windows are presented on the displays.

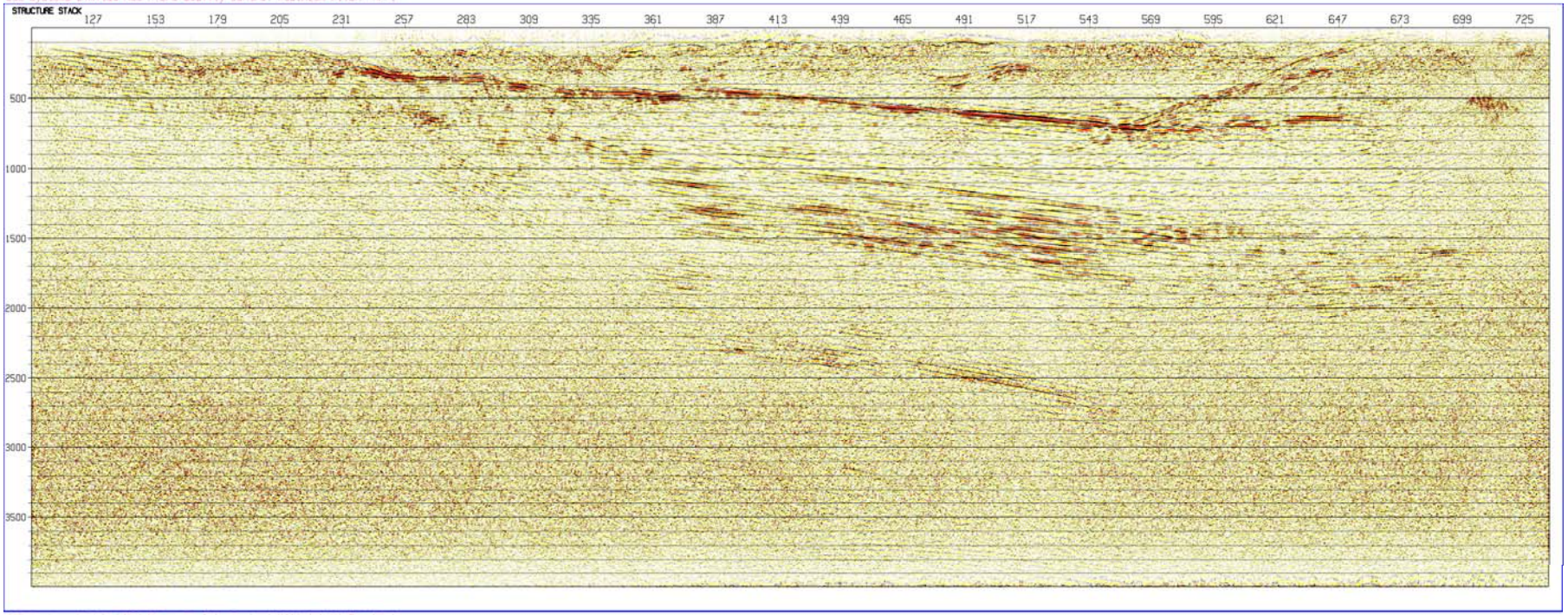




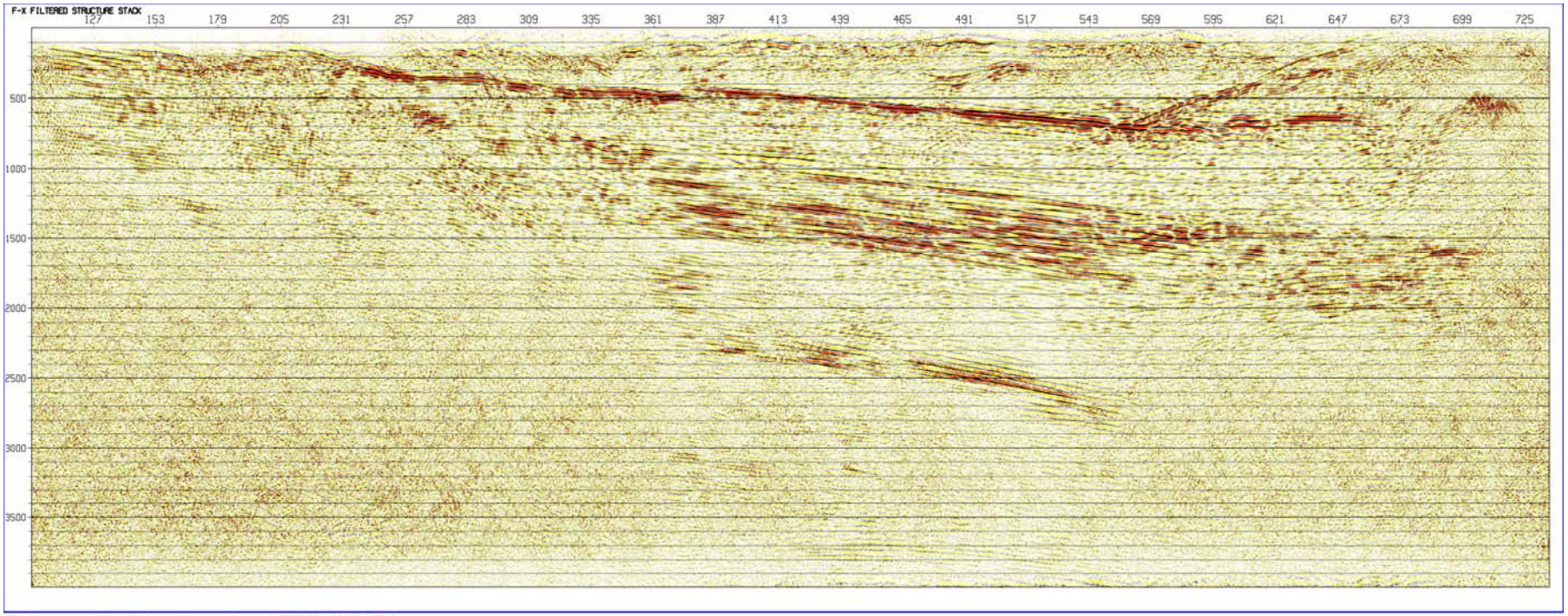
C&C Systems Limited MDC-Micro Quality Control ROBINSON RIVER RR-1



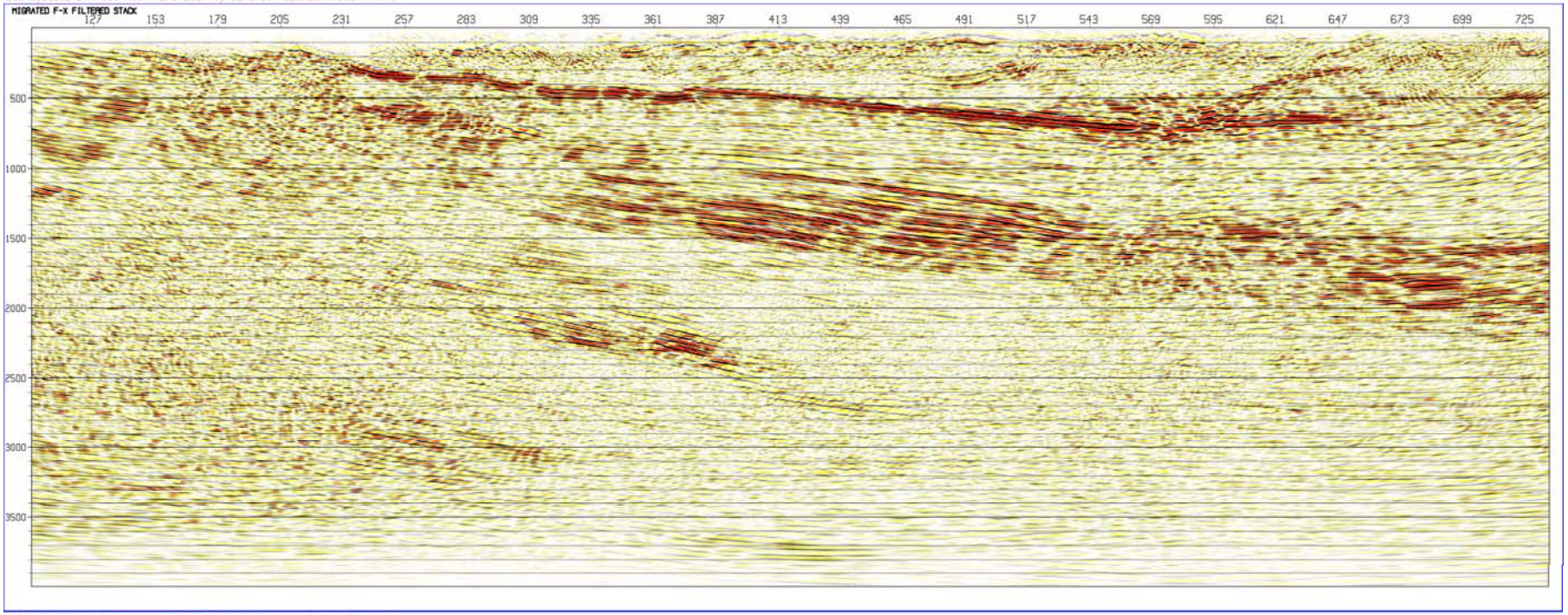
C&C Systems Limited MDC-Micro Quality Control ROBINSON RIVER RR-1



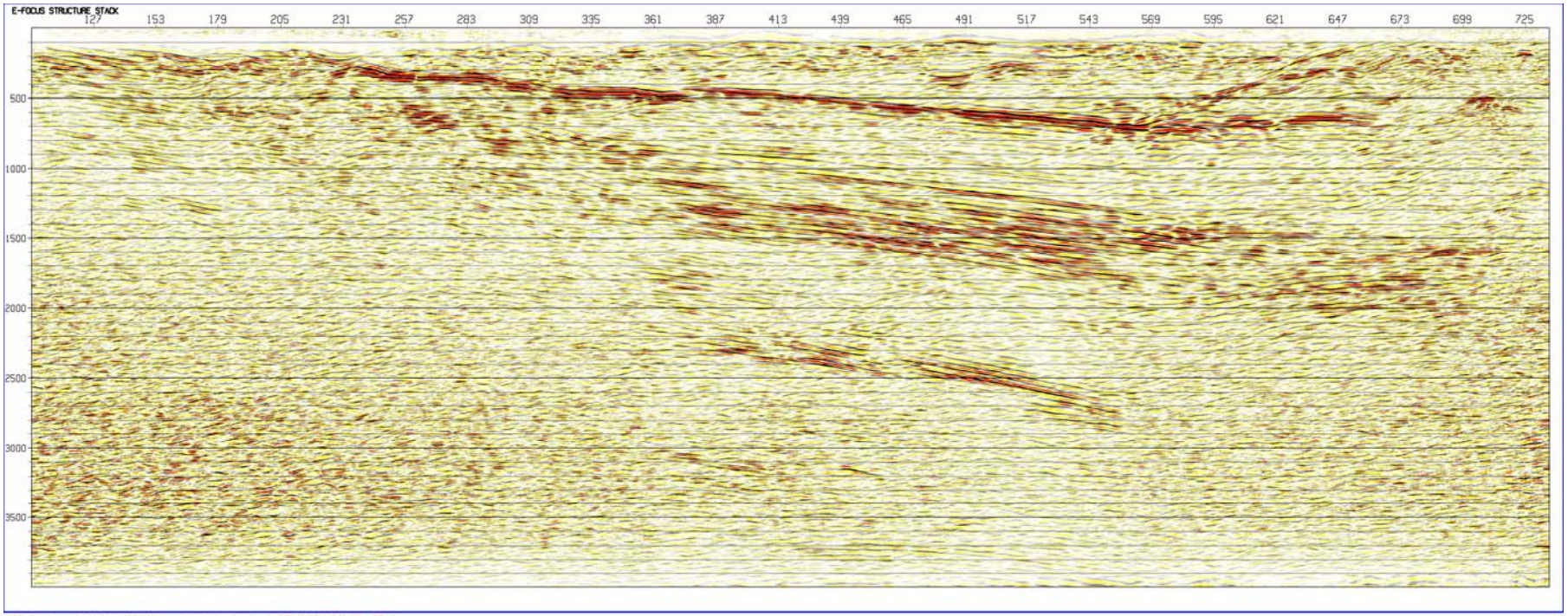
C&C Systems Limited MDC-Micro Quality Control ROBINSON RIVER RR-1

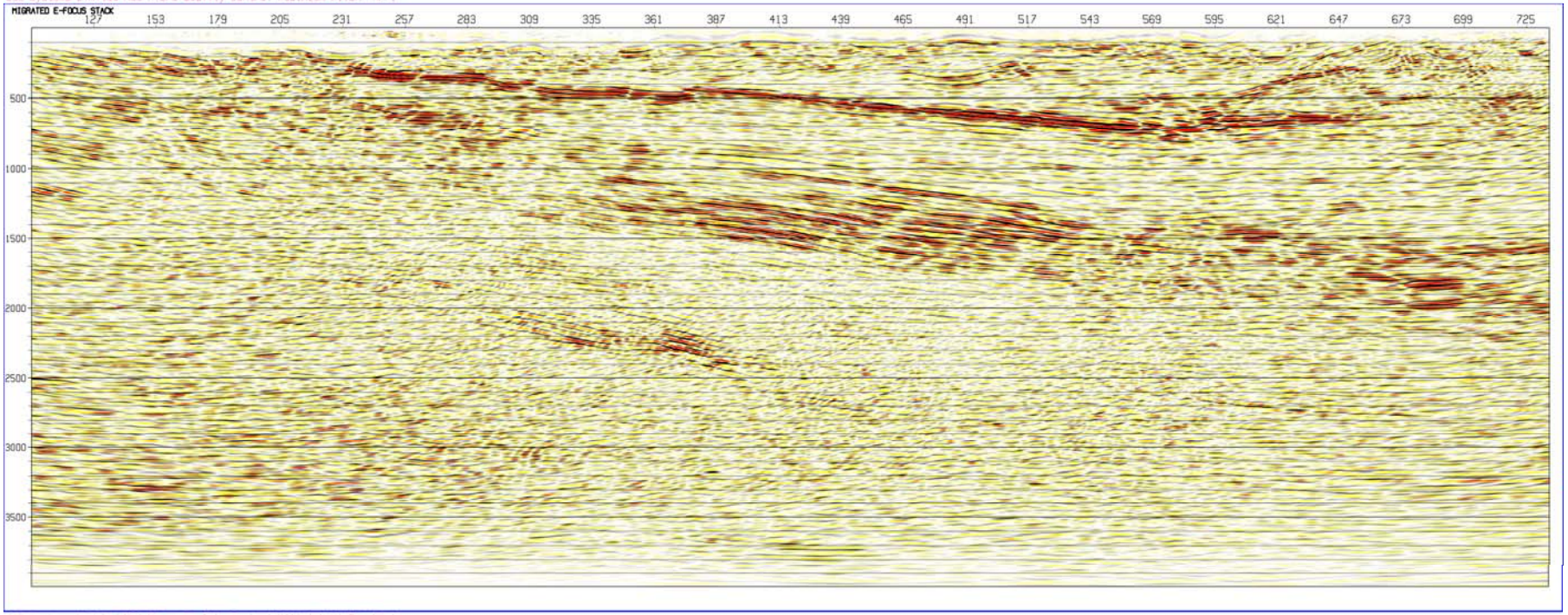


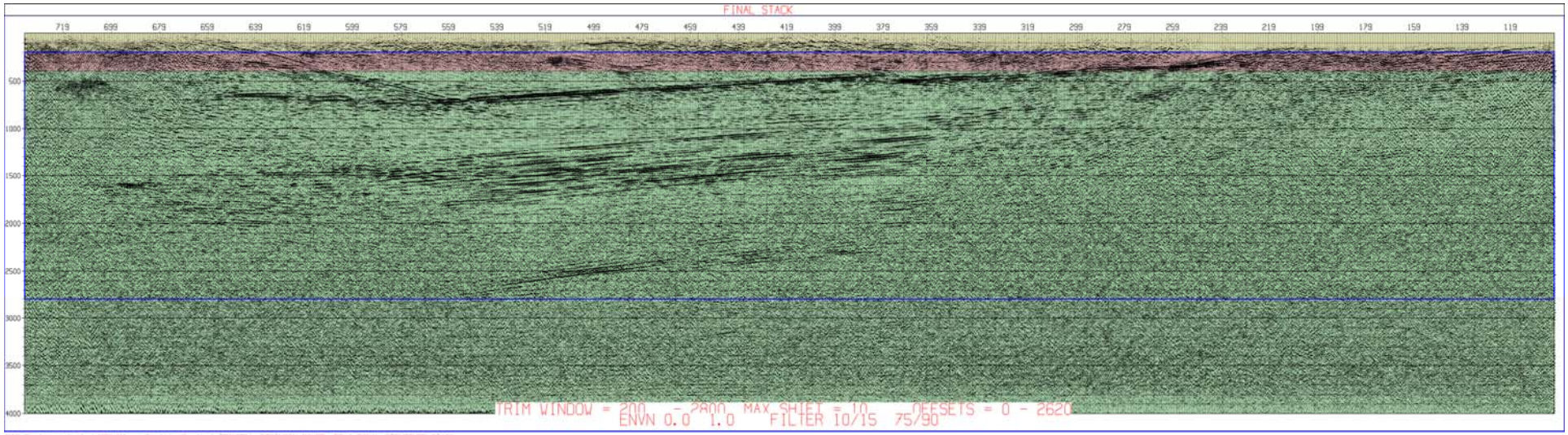
C&C Systems Limited MDC-Micro Quality Control ROBINSON RIVER RR-1

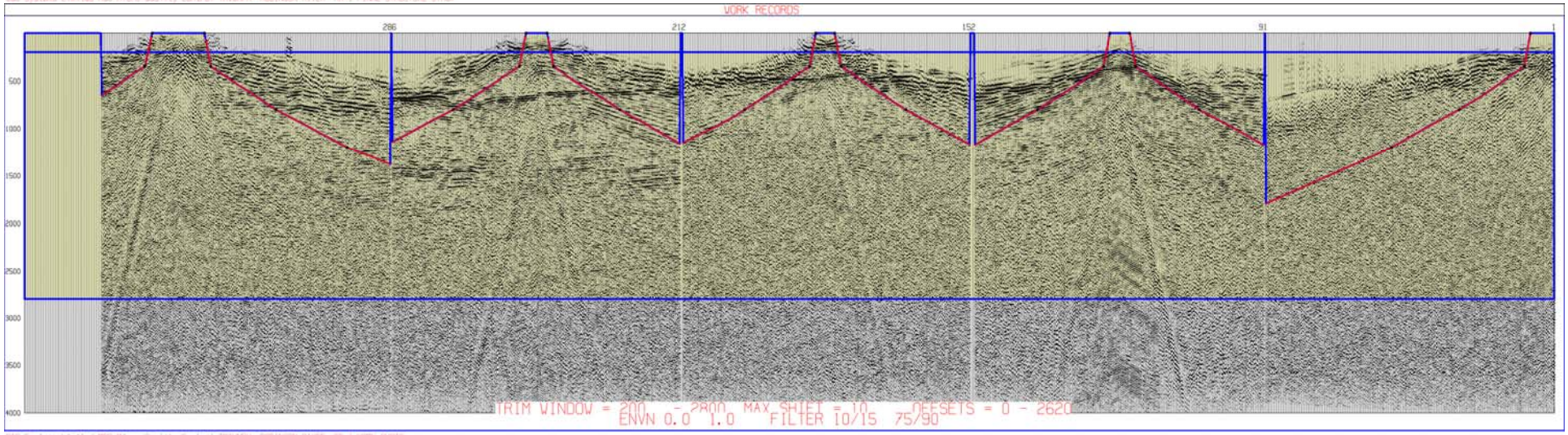


C&C Systems Limited MDC-Micro Quality Control ROBINSON RIVER RR-1






FINAL STACK
719 699 679 659 639 619 599 579 559 539 519 499 479 459 439 419 399 379 359 339 319 299 279 259 238 219 199 179 159 139 119
500
1000
1500
2000
2500
3000
3500
4000
TRIM WINDOW = 200 - 2800 MAX SHIFT = 10 OFFSETS = 0 - 2620
ENVN 0.0 1.0 FILTER 10/15 75/90
GSC Systems Limited MDC-Micro Quality Control TRIUMPH ROBINSON RIVER RR-1 FINAL STRUCTURE STACK


WORK RECORDS
286 212 152 91 1
500
1000
1500
2000
2500
3000
3500
4000
TRIM WINDOW = 200 - 2800 MAX SHIFT = 10 OFFSETS = 0 - 2620
ENVN 0.0 1.0 FILTER 10/15 75/90
GSC Systems Limited MDC-Micro Quality Control TRIUMPH ROBINSON RIVER RR-1 WORK SHOTS

STACKS

Side label information for the final filtered migrated F-X noise reduced.

Triumph Atlantic GEOPCM

LINE: RR-1
GEOKEY:
REFNO:
NTS: 12-B
AREA: ROBINSON RIVER
PROVINCE: NEWFOUNDLAND
LOCATION: TWF RGE
SHOT POINTS: 101 735
DIRECTION: NW <-------> SE

MIGRATED F-X FILT. STACK

NORMAL POLARITY

ACQUISITION PARAMETERS

SHOT BY: CAPILANO GEOPHYSICAL LTD. PTY: 630
OCT. 1988

SHOT FOR: M.U.N

SPREAD: 2620 - 280 • 280 - 2820 METERS
SOURCE INTERVAL: 40 METERS
RECEIVER INTERVAL: 20 METERS

NUMBER OF ZIBRATORS : 4 OVER 30 METERS
VIB SEPARATION : 10 METERS
VIB ARRAY LENGTH : 30 METERS
NUMBER OF SWEEPS / VP : 3
TOTAL ARRAY LENGTH : 9.0 SEC
SWEEP PERIOD : 12.0 SEC
SWEEP FREQUENCY : 20-90 HZ

RECEIVERS: TYPE - MARK L 28 14 HZ
12 GEOPHONES INLINE OVER 17 METERS

INSTRUMENTS: DFS-V
FILTERS: SERIES TRACES: 240
GAIN MODE: IFP
FIELD FILTER: OUT - 128(72) HZ NOTCH OUT
SAMPLE RATE: 4.000 SEC
RECORD LENGTH:

PROCESSING PARAMETERS

DEMULTIPLEX/REFORMAT

GAIN RECOVERY ATTBT B -0.8 SR. 2 MS

DECONVOLUTION MINIMUM PHASE (SHOT+RECV ONLY)
SURFACE CONSISTENT 80MS PRE-WHITENING -.13% M OFFSET
OPERATOR LENGTH 1400 - 2200 MS AT 9400 M OFFSET
DESIGN WINDOW

ENVELOPE EQUALIZATION ELEVATION WEATHERING AND DRIFT

STRUCTURE STATICS 300 M/SEC
DATUM 3000 M/SEC
REPLACEMENT VELOCITY

VELOCITY ANALYSIS SEMBLANCE EVERY 25 CDPS

STATICS SURFACE CONSISTENT STATICS
CORRELATION WINDOW +/- 24 MS
MAXIMUM SHIFT

VELOCITY ANALYSIS SEMBLANCE EVERY 25 CDPS

MUTE	DIST. (M)	400	500	1540	2820	4650
	TIME (MS)	0	350	800	1200	1800

STATICS CDP TRIM STATICS
CORRELATION WINDOW 200-3800 MS
MAXIMUM SHIFT +/- 10 MS

GRID BALANCE STATIC SHIFT: 0.00 MS

STACK FOLD - 6000 %

F-X NOISE REDUCTION PREDICTION/OPERATOR LEN: 5 TRACES
DESIGN WINDOW: 30 TRACES
WINDOW LENGTH: 230 MS

MIGRATION 100 % STACKING VELOCITY

FILTER 10/15- 75/90 HZ 0.000-4.000 S
EQUALIZATION WINDOW 400-3800 MS

Display Parameters - H:\ROB11\RR1\FHTGFX-100.TVM -

Traces/Inch === 60.00
Inches/Second === 3.75
Polarity === Normal

Processed By: --- PGR2

C&C/VW Limited 2D Systems
395-39 Wenonah Cr. N.E.
Calgary, Alberta
Canada, T2J 5S4
403-253-9609

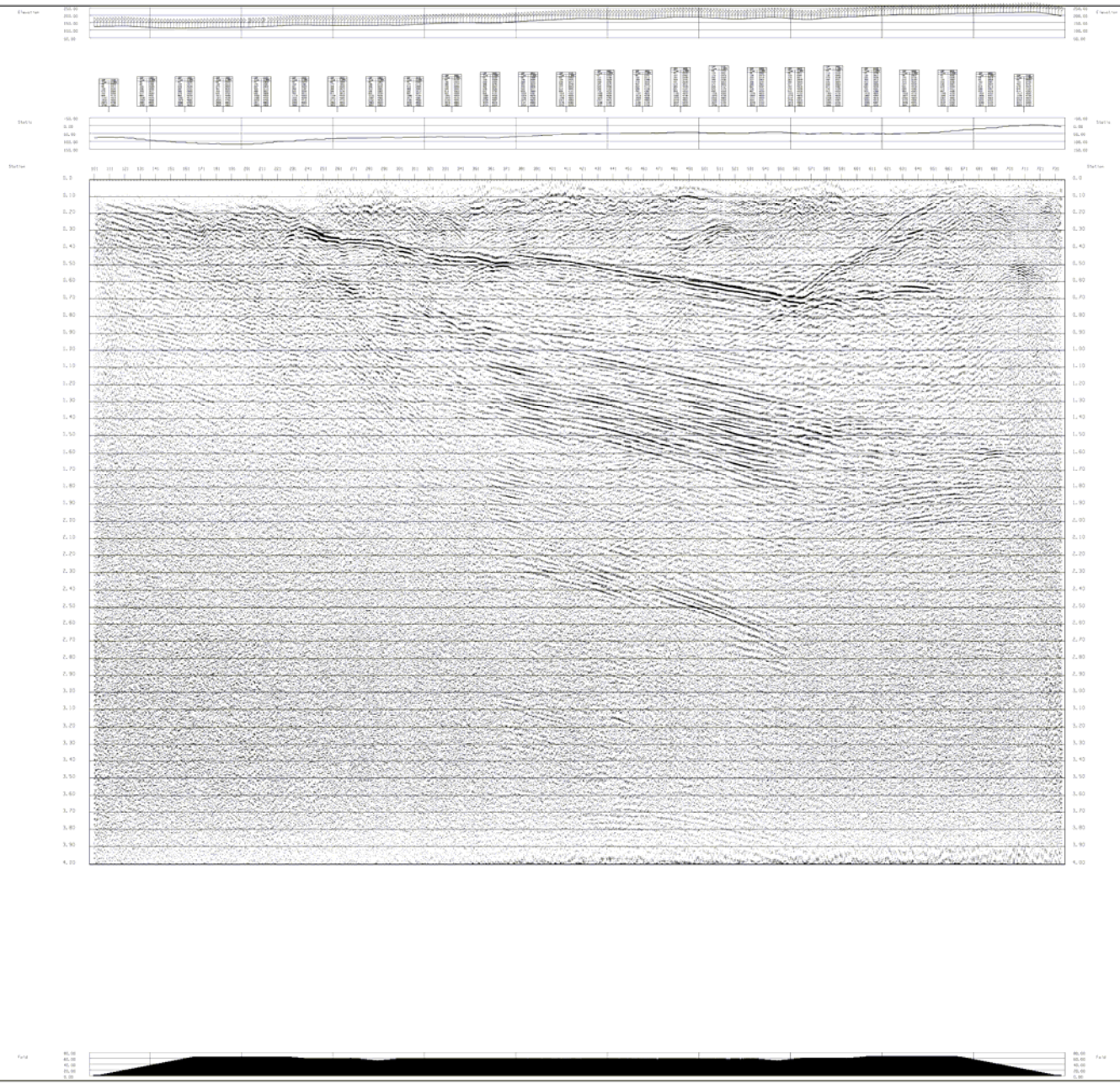
Tue Nov 15 09:34:24 2011

The following displays are stacks with side label information, and show approximately how the final output product appears.

Display layout description

Filtered structure stack
Filtered Migrated stack with noise attenuation
Filtered Migrated E-FOCUS structure stack

Horizontal and vertical scale adjusted to fit on paper



Triumph GEPCM Atlantic

LINE: RR-1
GEOKEY:
REFNO:
NTS: 12-B
AREA: ROBINSON RIVER
PROVINCE: NEWFOUNDLAND
LOCATION: TWP RGE
SHOT POINTS: 101 735
DIRECTION: NW <-------> SE

STRUCTURE STACK

NORMAL POLARITY

ACQUISITION PARAMETERS

SHOT BY: CAPILANO GEOPHYSICAL LTD. PTY: 600
OCT 1989

SHOT FOR: M.U.N

SPREAD: 2620 - 260 + 260 - 2620 METERS
SOURCE INTERVAL: 40 METERS
RECEIVER INTERVAL: 20 METERS

NUMBER OF VIBRATORS : 4 OVER 30 METERS
NUMBER OF SWEEPS / VP : 4
VIB SEPARATION : 10 METERS
VIB ARRAY LENGTH : 30 METERS
MOVE UP : 8 METERS
TOTAL ARRAY LENGTH : 0 METERS
SWEEP LENGTH : 6.0 SEC
UNCORRELATED REC LENGTH : 12.0 SEC
SWEEP FREQUENCY : 20-90 HZ

RECEIVERS: TYPE: MARK L-28 14 HZ
12 GEOPHONES INLINE OVER 17 METERS

INSTRUMENTS: DFS-V TRACES: 240
TAPE FORMAT: SEGB
GAIN MODE: IFP
FIELD FILTER: OUT - 128\125 HZ NOTCH OUT
SAMPLE RATE: 0.002 SEC
RECORD LENGTH: 4.000 SEC

PROCESSING PARAMETERS

DEMULTIPLEX/REFORMAT

GAIN RECOVERY: ATEBT B +0.8 SR .2 MS

DECONVOLUTION
SURFACE CONSISTENT: MINIMUM PHASE (SHOT+REC ONLY)
OPERATOR LENGTH: 80MS PRE-WHITENING 1.0%
DESIGN WINDOW: 200 - 2300 MS AT 0 M OFFSET
1900 - 2700 MS AT 4400 M OFFSET

ENVELOPE EQUALIZATION

STRUCTURE STATICS: ELEVATION WEATHERING AND DRIFT
DATUM: 300 M
WEATHERING VELOCITY: 610 M/SEC
REPLACEMENT VELOCITY: 3000 M/SEC

VELOCITY ANALYSIS: SEMBLANCE EVERY 25 CDPS

STATICS: SURFACE CONSISTENT STATICS
CORRELATION WINDOW: 200-2800 MS
MAXIMUM SHIFT: +/- 24 MS

VELOCITY ANALYSIS: SEMBLANCE EVERY 25 CDPS

MUTE DIST. (M.) 400 500 1540 2620 4650
TIME (MS) 0 350 800 1200 1800

STATICS: CDP TRIM STATICS
CORRELATION WINDOW: 200-3800 MS
MAXIMUM SHIFT: +/- 10 MS

GRID BALANCE: STATIC SHIFTS 0.00 MS

STACK: FOLD = 6000 %

FILTER: 10/15- 75/90 HZ 0.000-4.000 S

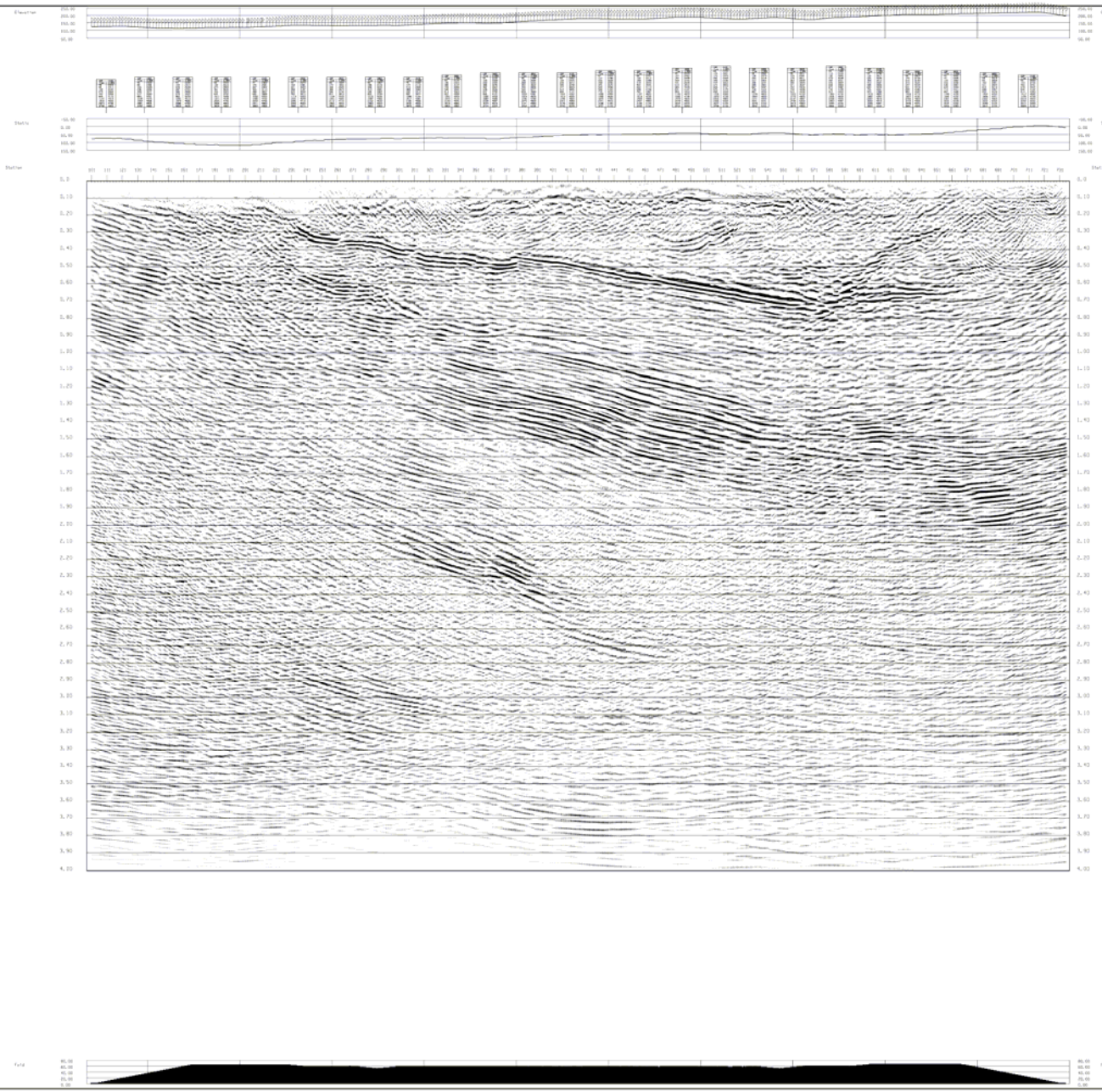
EQUALIZATION WINDOW: 400-3800 MS

Display Parameters - M:\ROB11\RR1\FSTK.TVM :

Traces/Inch --- 65.00
Inches/Second --- 5.75
Polarity --- Normal

Processed By --- PCR2

C&C Systems Limited
2D



Triumph GEPCM Atlantic

LINE: RR-1
GEOKEY:
REFNO:
NTS: 12-B
AREA: ROBINSON RIVER
PROVINCE: NEWFOUNDLAND
LOCATION: TWP RGE
SHOT POINTS: 101 735
DIRECTION: NW <--------> SE

MIGRATED F-K FILT. STACK

NORMAL POLARITY

ACQUISITION PARAMETERS

SHOT BY: CAPILANO GEOPHYSICAL LTD. PTY: 600
OCT 1989

SHOT FOR: M.U.N

SPREAD: 2620 - 260 + 260 - 2620 METERS
SOURCE INTERVAL: 40 METERS
RECEIVER INTERVAL: 20 METERS

NUMBER OF VIBRATORS : 4 OVER 30 METERS
NUMBER OF SWEEPS / VP : 4
VIB SEPARATION : 10 METERS
VIB ARRAY LENGTH : 30 METERS
MOVE UP : 8 METERS
TOTAL ARRAY LENGTH : 0 METERS
SWEEP LENGTH : 6.0 SEC
UNCORRELATED REC LENGTH : 12.0 SEC
SWEEP FREQUENCY : 20-90 HZ

RECEIVERS: TYPE - MARK L-28 14 HZ
12 GEOPHONES INLINE OVER 17 METERS

INSTRUMENTS: DFS-V TRACES: 240
TAPE FORMAT: SEGB
GAIN MODE: IFP
FIELD FILTER: OUT - 128/ 72) HZ NOTCH OUT
SAMPLE RATE: 0.002 SEC
RECORD LENGTH: 4.000 SEC

PROCESSING PARAMETERS

DEMULTIPLEX/REFORMAT

GAIN RECOVERY: ATEBT B =0.8 SR. 2 MS

DECONVOLUTION
SURFACE CONSISTENT: MINIMUM PHASE (SHOT+RECV ONLY)
OPERATOR LENGTH: 80MS PRE-WHITENING 1.0%
DESIGN WINDOW: 200 - 2300 MS AT 0 M OFFSET
1900 - 2700 MS AT 4400 M OFFSET

ENVELOPE EQUALIZATION

STRUCTURE STATICS: ELEVATION WEATHERING AND DRIFT
DATUM: 300 M
WEATHERING VELOCITY: 610 M/SEC
REPLACEMENT VELOCITY: 3000 M/SEC

VELOCITY ANALYSIS: SEMBLANCE EVERY 25 CDPS

STATICS: SURFACE CONSISTENT STATICS
CORRELATION WINDOW: 200-2800 MS
MAXIMUM SHIFT: +/- 24 MS

VELOCITY ANALYSIS: SEMBLANCE EVERY 25 CDPS

MUTE DIST. (M.)
TIME (MS)
400 920 1540 2620 4650
0 350 800 1200 1800

STATICS: CDP TRIM STATICS
CORRELATION WINDOW: 200-3800 MS
MAXIMUM SHIFT: +/- 10 MS

GRID BALANCE: STATIC SHIFT= 0.00 MS

STACK: FOLD = 6000 %

F-K NOISE REDUCTION: PREDICTION OPERATOR LENG 5 TRACES
DESIGN WINDOW: 20 TRACES
WINDOW LENGTH: 200 MS

MIGRATION: 100 % STACKING VELOCITY

FILTER: 10/15- 75/90 HZ 0.000-4.000 S

EQUALIZATION WINDOW: 400-3800 MS

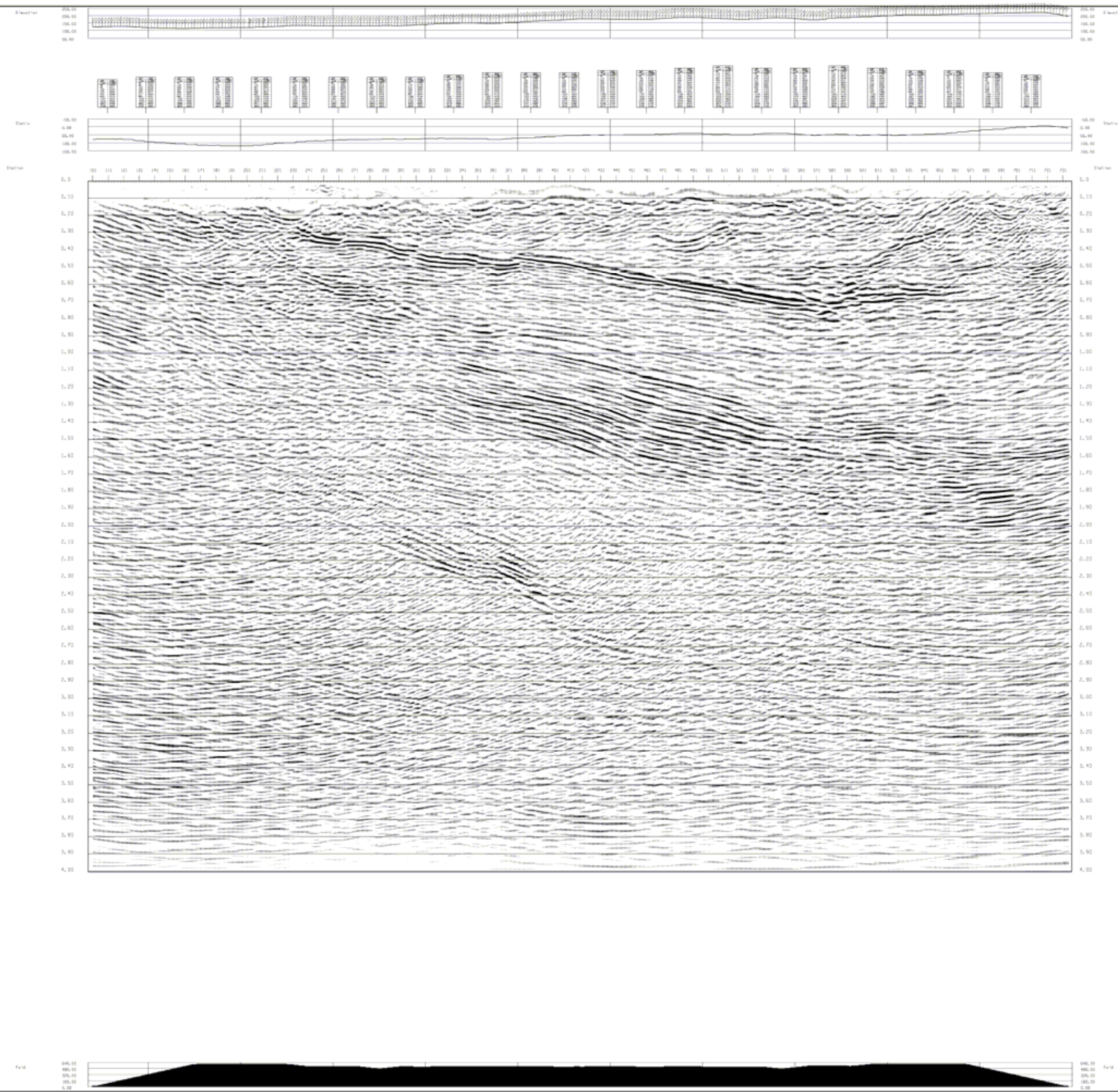
Display Parameters - m:\ROB11\RR1\PM1\DFX-100_TVM -

Traces/Inch --- 65.00
Inches/Second --- 5.75
Polarity --- Normal

Processed By --- PCR2

C&C Systems Limited
2D
Calgary, Alberta
Canada, T3J 3L8

Tue Nov 15 09:34:24 2011



Triumph GEPCM Atlantic

LINE:	RR-1
GEOKEY:	
REFNO:	
NTS:	12-B
AREA:	ROBINSON RIVER
PROVINCE:	NEWFOUNDLAND
LOCATION:	TWP RGE
SHOT POINTS:	101 735
DIRECTION:	NW <-------> SE

MIGRATED E-FOCUS STACK

NORMAL POLARITY

ACQUISITION PARAMETERS

SHOT BY: CAPILANO GEOPHYSICAL LTD. PTY: 600
OCT 1989

SHOT FOR: M.U.N

SPREAD: 2620 - 260 * 260 - 2620 METERS
SOURCE INTERVAL: 40 METERS
RECEIVER INTERVAL: 20 METERS

NUMBER OF VIBRATORS : 4 OVER 30 METERS
NUMBER OF SWEEPS / VP : 4
VIB SEPARATION : 10 METERS
VIB ARRAY LENGTH : 30 METERS
MOVE UP : 8 METERS
TOTAL ARRAY LENGTH : 0 METERS
SWEEP LENGTH : 8.0 SEC
UNCORRELATED REC LENGTH : 12.0 SEC
SWEEP FREQUENCY : 20-90 HZ

RECEIVERS: TYPE MARK L-28 14 HZ
12 GEOPHONES INLINE OVER 17 METERS

INSTRUMENTS: DFS-V TRACES: 240
TAPE FORMAT: SEGB
GAIN MODE: IFP
FIELD FILTER: OUT - 128(72) HZ NOTCH: OUT
SAMPLE RATE: 0.002 SEC
RECORD LENGTH: 4.000 SEC

PROCESSING PARAMETERS

DEMULTIPLEX/REFORMAT

GAIN RECOVERY ATEBT B -0.8 SR. 2 MS

DECONVOLUTION
SURFACE CONSISTENT MINIMUM PHASE (SHOT+RECV ONLY)
OPERATOR LENGTH 80MS PRE-WHITENING .10%
DESIGN WINDOW 200 - 2500 MS AT 0 M OFFSET
1400 - 2700 MS AT 4400 M OFFSET

ENVELOPE EQUALIZATION

STRUCTURE STATICS ELEVATION WEATHERING AND DRIFT
DATUM 300 M
WEATHERING VELOCITY 610 M/SEC
REPLACEMENT VELOCITY 3000 M/SEC

VELOCITY ANALYSIS SEMBLANCE EVERY 25 CDPS

STATICS SURFACE CONSISTENT STATICS
CORRELATION WINDOW 200-2800 MS
MAXIMUM SHIFT +/- 24 MS

VELOCITY ANALYSIS SEMBLANCE EVERY 25 CDPS

MUTE					
DIST. (M)	400	500	1540	2620	4650
TIME (MS)	0	350	800	1200	1800

STATICS CDP TRIM STATICS
CORRELATION WINDOW 200-3800 MS
MAXIMUM SHIFT +/- 10 MS

SUPER GATHER 9 : 1

E-FOCUS STEP SIZE: 4 MS
DCRE: 0 NCRE: 20
DCEE: 20 NCEE: 20
DSIN: 0.01 NSIN: 7

STACK E-FOCUS GATHERS

MIGRATION 100 % STACKING VELOCITY

FILTER 10/15- 75/90 HZ 0.000-4.000 S

EQUALIZATION WINDOW 400-3800 MS

Display Parameters - H:\ROBI1\RR1\FMIGEFx-100.TVM -

Traces/Inch --- 60.00
Inches/Second --- 3.75
Polarity --- Normal

Processed By --- PCR2

C&C Systems Limited
2D 3D

Tue Nov 15 09:35:38 2011