Final Seismic QC Report

M/V Sanco Spirit & M/V Vikland

4D 4C OBC Seismic Survey

North Sea, Norway, Block 15/9

For

Project Number: ST10010 Volve

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1 GENERAL INFORMATION

1.1 Vessel and Processing System Specifications

Seismic data QC within RXT is handled in two phases, online QC and offline QC. Online QC is defined as that QC which happens during the recording phase or immediately after. This was handled by the Instrument department onboard the M/V Vikland. Offline QC begins upon retrieval of the data bucket and continues through final tape delivery to the client. The Seismic QC department onboard M/V Vikland handled the offline QC.

Seismic acquisition commenced on the Volve 4D-4C survey on the 28th September 2010 after a transit from the previous survey for Statoil at the Njord field.

The Seismic QC Department was equipped with some of the best hardware and software technology available for this type of Ocean Bottom Cable acquisition. High capacity media devices were employed in order to meet the large volume of data acquired (Appendix 11.1). Bulk data handling was achieved using the Data Bucket Unloader or DBU (from Ion), while processing and geometry QC were accomplished using the Vista package from GEDCO.

1.2 Department Personnel

The Seismic QC Department consisted of one Chief and two to three QC Geophysicists per rotation. Seismic QC activities were ongoing 24 hours per day.

M/V Vikland

Rotation A		Rotation B	
Chief Seismic QC	David Woollatt	Chief Seismic QC	Kelly Redden
Chief Seismic QC	Chamam Zulkarnen	Chief Seismic QC	Alastair Fergusson
Senior Seismic QC	Atanas Vasilev	Senior Seismic QC	Ken Chapman
Seismic QC	Taylor Patterson		

Table 1. Seismic QC Personnel offshore

Onshore RXT QC and Marketing Geophysicist, Anthony Mathieson, liaised with the client in order to meet the survey's Geophysical objectives.

2 SURVEY DETAILS

2.1 Start-up Recording Parameter Test

The VSO hydrophone has an adjustable pre-Amp recording gain parameter that should be tested prior to the commencement of any survey. The dB gain settings available for this parameter vary every 6dB between 0db and 36dB. The pre-Amp gain setting controls the level of gain applied to the hydrophone prior to being recorded to disk. A pre-Amp gain setting too high will lead to the direct arrivals being overdriven which will severely impact the quality of the hydrophone – geophone summation testing. A pre-Amp gain setting too low will reduce the amplitude resolution attainable for the survey thereby impacting the overall seismic quality.

The hydrophone gain parameter was set at 6dB for the Volve survey after discussion with Statoil and after initial testing done on the previous Statoil survey in Njord.

2.2 Survey Location and Layout

The Volve survey was located in the Norwegian sector of the North Sea, in Block 15/9.

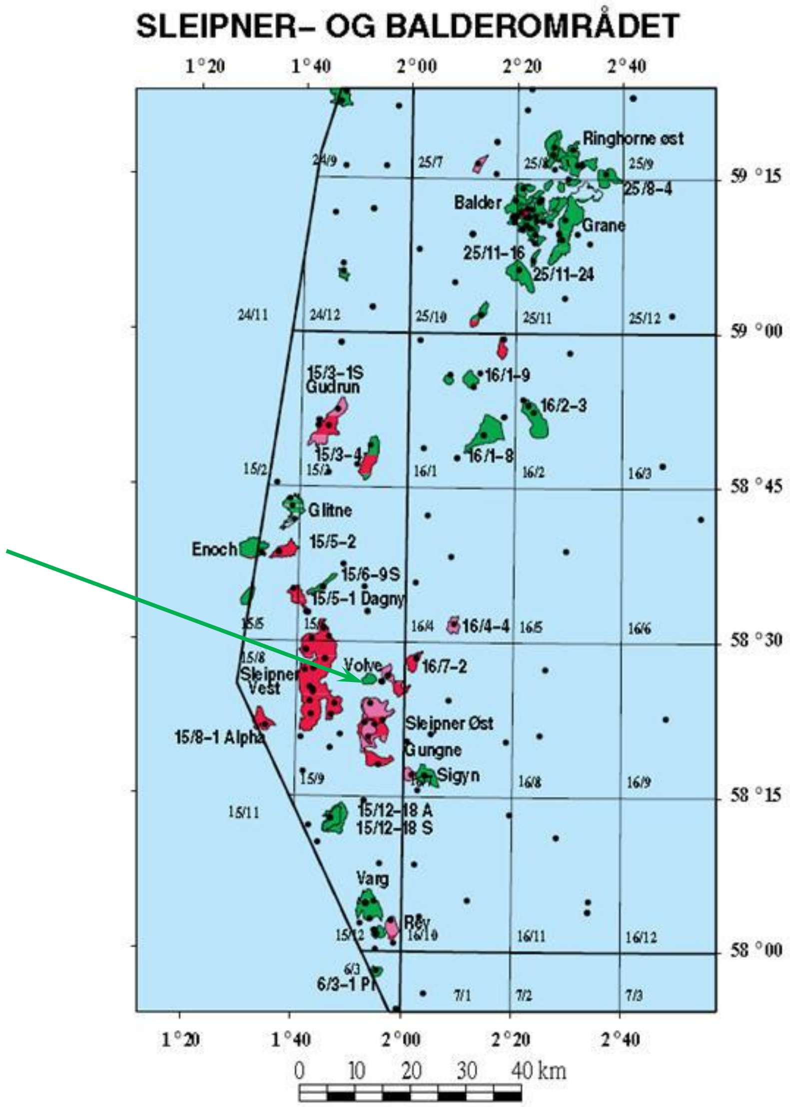


Figure 1. Survey Area

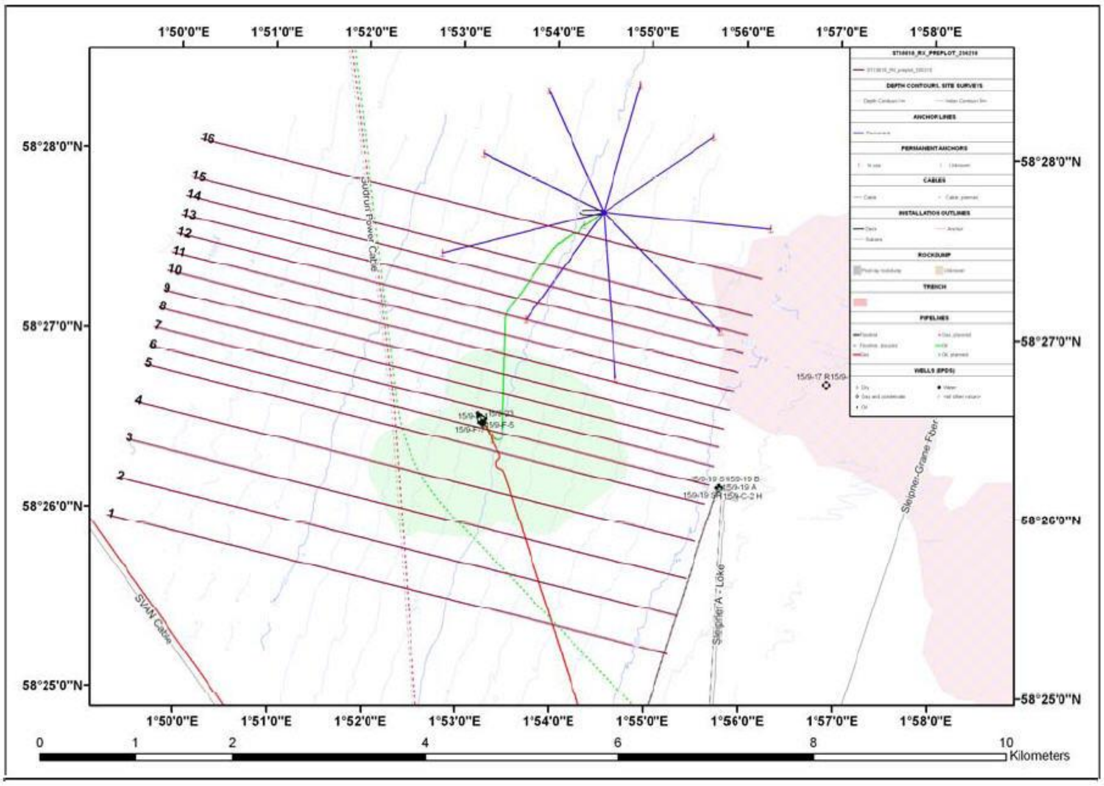


Figure 2. Project layout.

The survey comprised two static spread swaths of 8 x 6km receiver lines each. Swath 11 was desiginated as the southern 8 receiver lines (nominally numbered 1-8) and Swath 12 was desiginated as the norther 8 receiver lines (nominally numbered 9-16).
Sail-lines were acquired in each swath such that the required offsets of 3000m inline and 975m crossline were achieved into all receivers. A special case was made for receiver lines nominally numbered as RLs 10 and 11 in swath 12. These receiver lines were kept active for all sail-lines up to the northern boundary of the survey thus achieving a maximum crossline offset of 2375m.

Both receiver lines and sail-lines were oriented in the 104°/284° line direction.

2.3 Source and Ground Station Numbering

The line naming convention for this survey consisted of 8 digit shotline numbering, and 7 digit receiver line numbering. A shotline number was made from a 2 digit swath number, 1 digit Statoil direction code, 4 digit preplot line that incremented by 8 each line, and an attempt number which starts at “0” for the first prime shoot or first receiver line lay. Each receiver line then consisted of a 2 digit swath nubmer, 4 digit preplot line, incrementing by either 16 or 32, and a 1 digit relay code. The relay code started at “0” and incremented by 1 for each subsequent cable deployment on the same location.

X = preplot line (4 digits)
D = direction code (1 digit) Sail line only, “1” this survey indicating inline swath shooting
P = swath (2 digits)
I = attempt number (1 digit) “0” indicates prime, “1” indicates first reshoot or relay

<u>Shot Line</u>

PPDXXXXI

Receiver Line
PPXXXXI

The final SEGY tapes were delivered with the above line naming conventions. The shot line numbering as recorded in the field was different in order to aid acquisition organizational convenience.

X = preplot line (4 digits)
I = attempt number (1 digit) "0" indicates prime, "1" indicates first reshoot
S = sequence number (4 digits) starting with "0001"

Shot Line
XXXXISSSS

All final deliverable products were manipulated such that the Statoil naming conventions were observed.

2.4 FFID, Channel and Sensor Numbering

The VSO system is integrated with the Gator database that contains the survey info. The native data headers in the recording buoy are survey related headers: source line, receiver line, shot point and station number. Also a time stamp is recorded for each file.

The channel number is assigned later on in the data flow by the DBU. Each 4C node comprises 4 consecutive channels that are ordered by 1) hydrophone, 2) Z component, 3) X component, 4) Y component. A 240-node cable will record 960 channels. Channel 1 is located at node 1 which **IS** at the buoy end of the cable, and channel 960 is at the tail end.

Node 1: channels 1 - 4 -----------------> Node 240: channels 957 -960

Because each buoy records data only for the cable that it is attached to, and accumulates shots over a number of sail lines, it is unlikely that assigning FFID by sequential numbering will result in consistency between receiver lines. FFID and channel are the primary headers in more dated recording systems, requiring relational info (via obs logs and/or SPS files) to assign the shot point and station headers required for processing. It is acknowledged here that VSO data does not have the same requirements. FFID is therefore assigned arbitrarily as the same as the shot point number to maintain consistency across receiver lines.

The DBU assigns the FFID and Channel headers in the data transcription stage. At this point the system creates an online SPS relational 'X' file that maps channel to station and FFID to shot point. The 'X' file also provides information on what data has passed through the transcription process and cross checks this with what data is expected according to the Gator system. Discrepancies are highlighted.

Sensor Numbering
HY (Hydrophone) component : 1
Z (Vertical) component : 6
X (In Line) component : 7
Y (Cross Line) component : 8

2.5 Field Parameters

Recording System:
Recording system : ION 24-bit Vectorseis
System manufacturer : Input/Output

Record length	: 10 seconds
Sample rate	: 2 msec
Low cut filter Hydrophone	: Out
Low cut filter MEMS	: Out
High cut filter @ 2 msec	: Cut off freq: 176Hz (not selectable) Slope: 261dB/Oct (not selectable)
Type of filter, (operator selectable)	: Minimum Phase
Hydrophone pre-amplifier gain (operator selectable)	: 6 dB
Hydrophone recording mode (operator selectable)	: Differential
Recording format	: Proprietary
Deliverable format	: SEG Y
Tape type	: 3592 E05 500GB tapes

<u>Cable System:</u>

Cable	: Vectorseis OBC
Cable Manufacturer	: Input/Output
Number of Cables	: 8 cables in use / 8 per deployment
Cable Length	: 5975 m each cable
Hydrophone, p component	: Type: HTI-97-DA Sensitivity: 24 Volt/Bar
Accelerometer, z component	: VectorSeis
Accelerometer, x component	: VectorSeis
Accelerometer, y component	: VectorSeis
Receiver group length	: 0 meters
Receiver group interval	: 25 meters
Number of receivers	: 240 each cable
Lead-in cable(s)	: 1000 meters

<u>Source Parameters</u>

Shot Interval	: 25 meters
Number of sources	: 2 (Flip-Flop)
Source Separation	: 50 meters
Source Depth	: 6 meters
Source Volume	: 3990 cu. in.
Source Pressure	: 2000 psi
Sub-Arrays/Strings	: 6
Sail Line Spacing	: 100 meters

2.6 Source Details

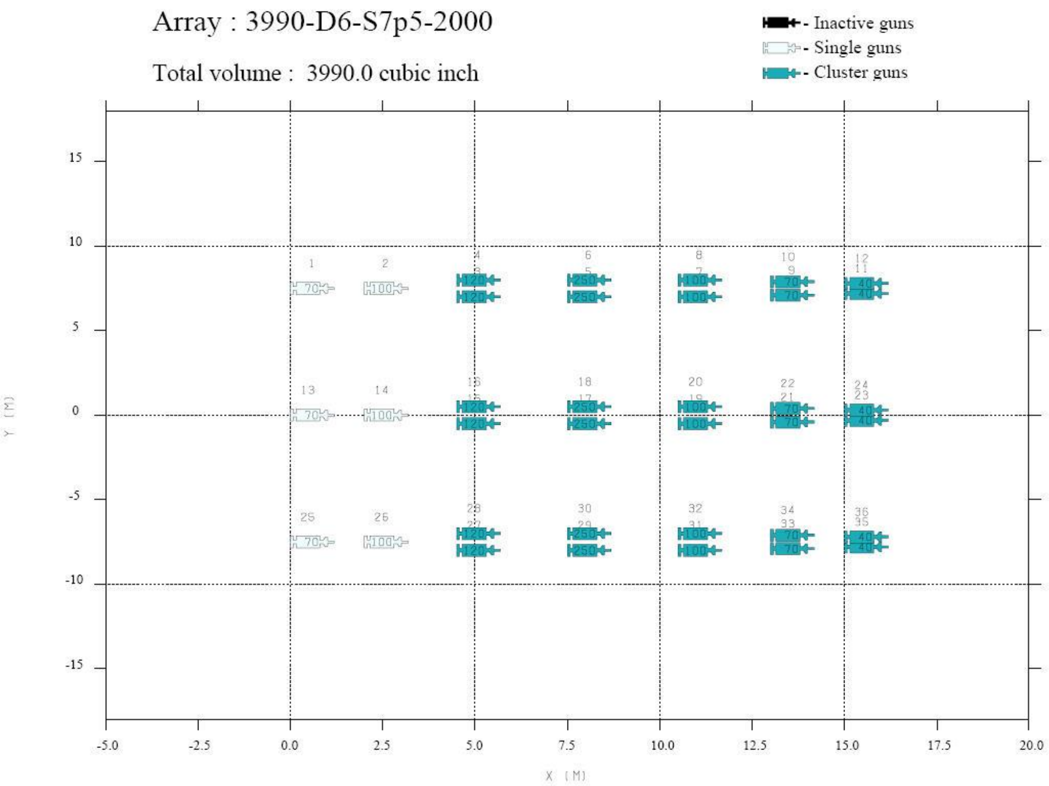


Figure 3. Gun Array Diagram

```
SOURCE ARRAY LISTING

Source array name     : 3990-D6-S7p5-2000

Array created by Nucleus version 6.5.4
Array created by Marine source modelling version 5.2.4

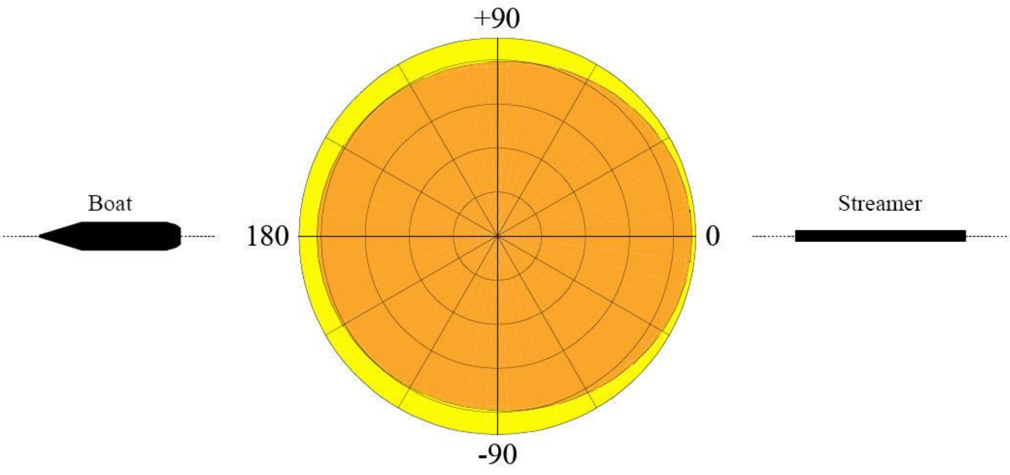
Number of active guns :       36
Total active volume   :     3990 CU.IN.
Number of spare guns  :        0
```

GUN #	GUN TYPE	X (m)	Y (m)	Z (m)	VOLUME (cu.in)	PRESSURE (psi)	DELAY (ms)	CLUSTER NUMBER
1	14	0.00	7.50	6.00	70	2000	0.00	0
2	14	2.00	7.50	6.00	100	2000	0.00	0
3	14	4.50	7.00	6.00	120	2000	0.00	1
4	14	4.50	8.00	6.00	120	2000	0.00	1
5	14	7.50	7.00	6.00	250	2000	0.00	2
6	14	7.50	8.00	6.00	250	2000	0.00	2
7	14	10.50	7.00	6.00	100	2000	0.00	3
8	14	10.50	8.00	6.00	100	2000	0.00	3
9	14	13.00	7.10	6.00	70	2000	0.00	4
10	14	13.00	7.90	6.00	70	2000	0.00	4
11	14	15.00	7.20	6.00	40	2000	0.00	5
12	14	15.00	7.80	6.00	40	2000	0.00	5
13	14	0.00	0.00	6.00	70	2000	0.00	0
14	14	2.00	0.00	6.00	100	2000	0.00	0
15	14	4.50	-0.50	6.00	120	2000	0.00	6
16	14	4.50	0.50	6.00	120	2000	0.00	6
17	14	7.50	-0.50	6.00	250	2000	0.00	7
18	14	7.50	0.50	6.00	250	2000	0.00	7
19	14	10.50	-0.50	6.00	100	2000	0.00	8
20	14	10.50	0.50	6.00	100	2000	0.00	8
21	14	13.00	-0.40	6.00	70	2000	0.00	9
22	14	13.00	0.40	6.00	70	2000	0.00	9
23	14	15.00	-0.30	6.00	40	2000	0.00	10
24	14	15.00	0.30	6.00	40	2000	0.00	10
25	14	0.00	-7.50	6.00	70	2000	0.00	0
26	14	2.00	-7.50	6.00	100	2000	0.00	0
27	14	4.50	-8.00	6.00	120	2000	0.00	11
28	14	4.50	-7.00	6.00	120	2000	0.00	11
29	14	7.50	-8.00	6.00	250	2000	0.00	12
30	14	7.50	-7.00	6.00	250	2000	0.00	12
31	14	10.50	-8.00	6.00	100	2000	0.00	13
32	14	10.50	-7.00	6.00	100	2000	0.00	13
33	14	13.00	-7.90	6.00	70	2000	0.00	14
34	14	13.00	-7.10	6.00	70	2000	0.00	14
35	14	15.00	-7.80	6.00	40	2000	0.00	15
36	14	15.00	-7.20	6.00	40	2000	0.00	15

```
THE GUN TYPES ARE:
   14: G-GUN
```

Figure 4. Gun Array Listing

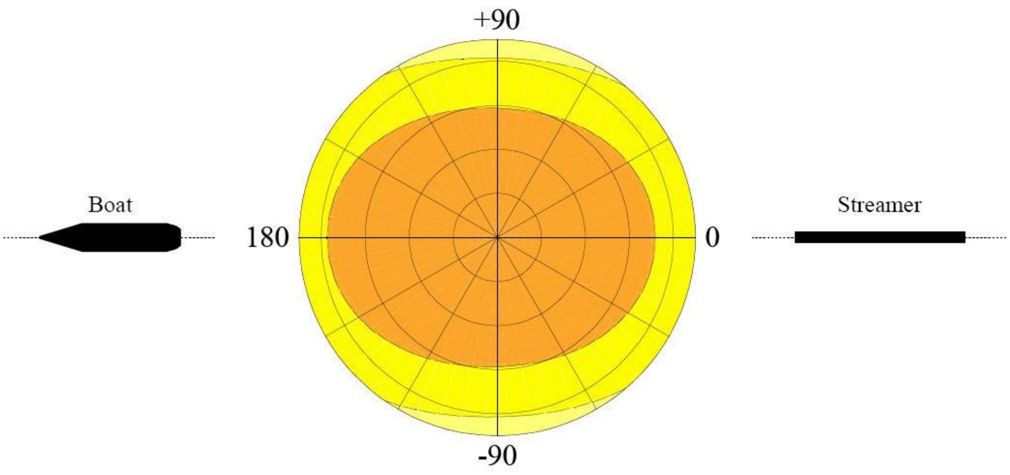
Source Directivity Plot - frequency : 30.0 Hz. - array 3990-D6-S7p5-2000



Azimuth angle marked in degrees.
Angle of vertical (0 - 45.0 degrees) plotted along radii.

out - 187Hz VSO filter

Source Directivity Plot - frequency : 60.0 Hz. - array 3990-D6-S7p5-2000



Azimuth angle marked in degrees.
Angle of vertical (0 - 45.0 degrees) plotted along radii.

out - 187Hz VSO filter

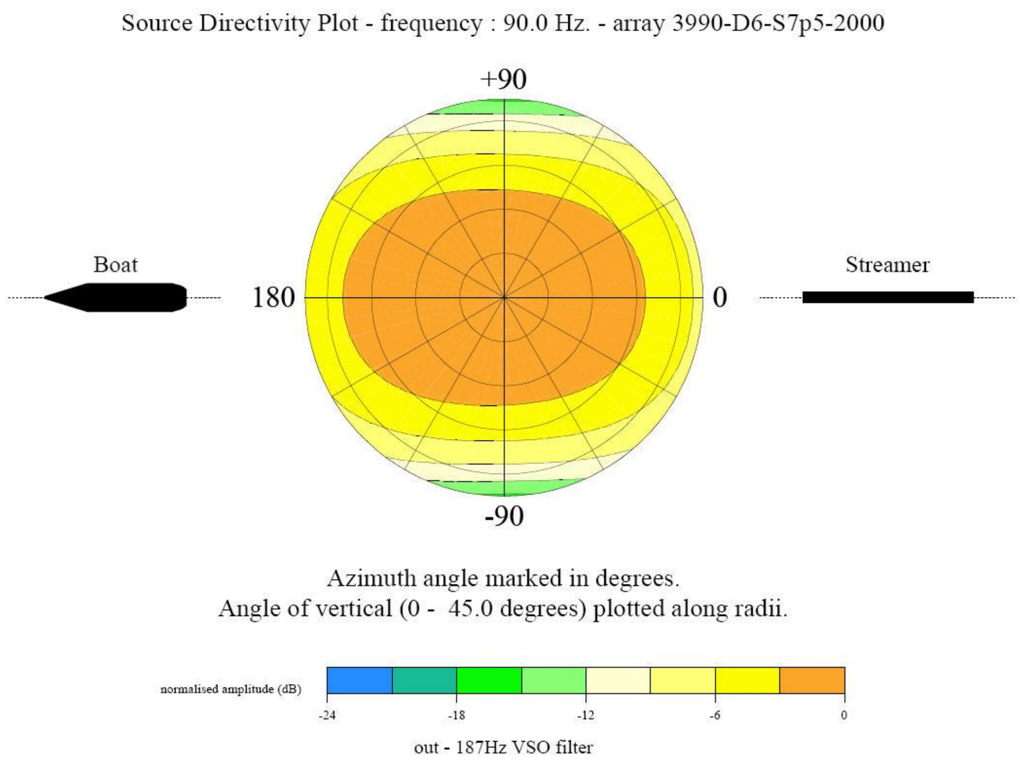


Figure 5. Source Directivity Plots

2.7 Far Field Signature

Far field signatures for the source described in the previous section are shown on the following page.

- Differential

This filter both differentiates and applies recording filter to the unfiltered source signature. If the Client chooses to deconvolve in the acceleration (differential) domain, this filter should be used for Deconvolution of the accelerometer data and hydrophone data in differentiated mode.

The far-field signature listing is provided in Appendix 11.2.

Farfield signature : 3990-D6-S7p5-2000

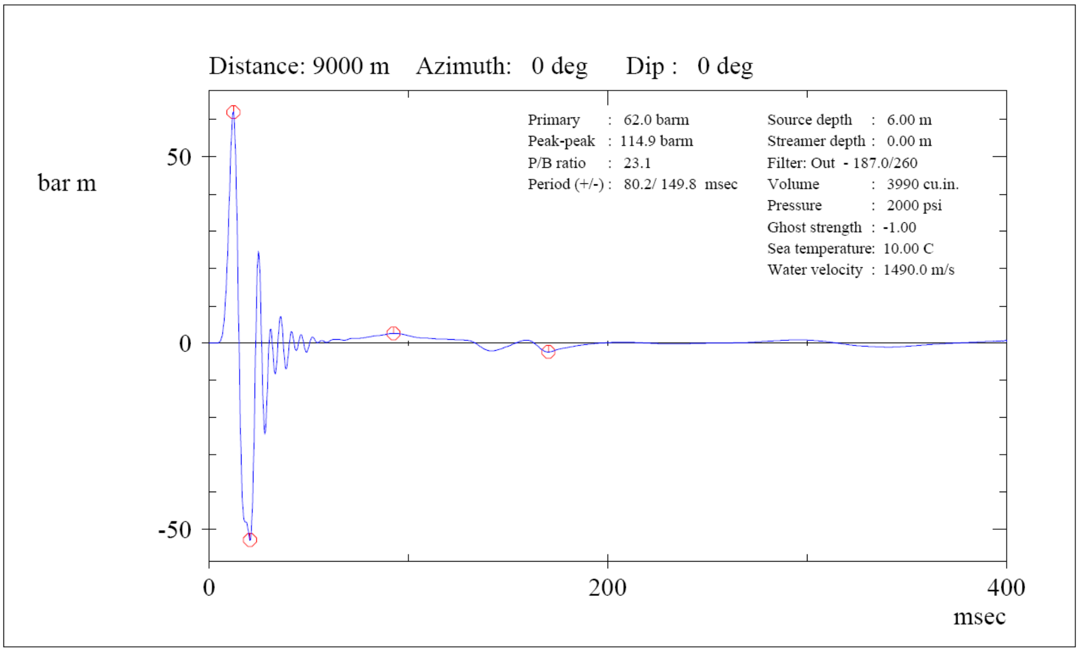
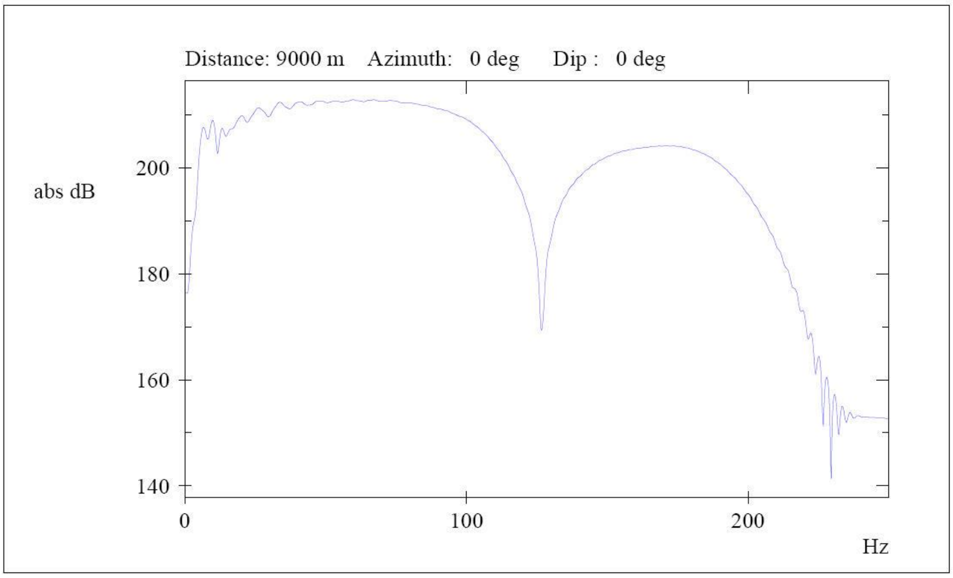


Figure 6 Field Signature

Amplitude spectrum of farfield signature : 3990-D6-S7p5-2000



out - 187Hz VSO filter

Figure 7. Far Field Signature Amplitude Spectrum

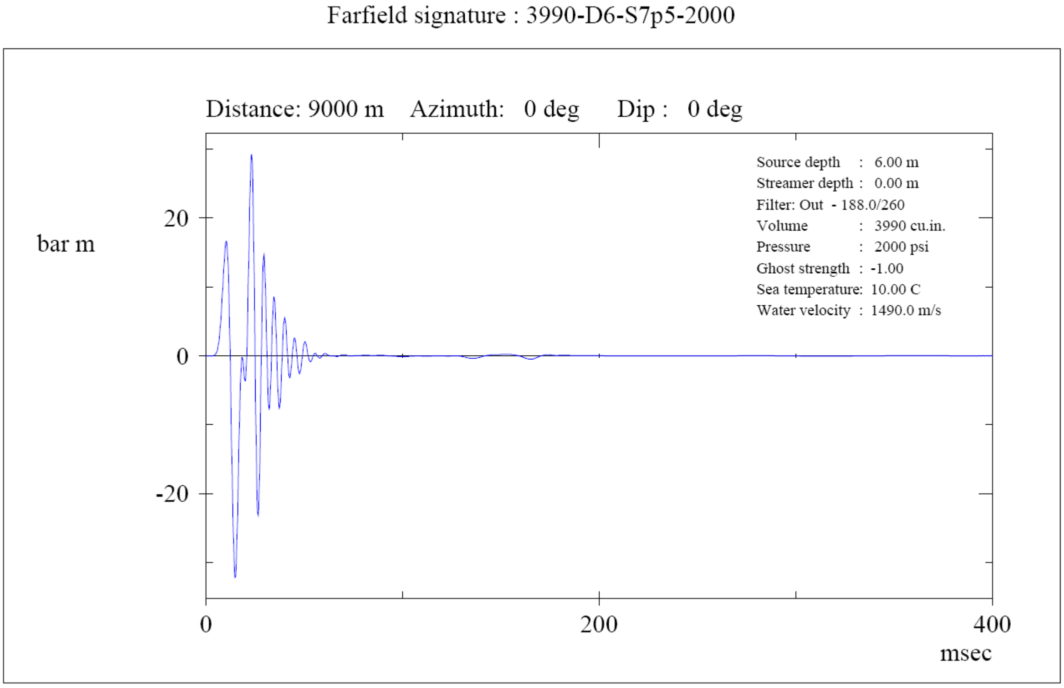


Figure 8. Derivative Far Field Signature

Figure 9. Derivative Far Field Signature Amplitude Spectrum

2.8 VSO System Impulse Response

Graphical displays are provided on the following pages which show the VSO system impulse response for the hydrophone and accelerometer sensors. The VSO system impulse response listings is provided in Section 11.3 (pressure response only as provided by ION). Note that the accelerometer impulse response is very similar to the P response except for a small difference at the low freq.

It should be apparent from looking at the displays that the system response (and therefore the far field signature) has a 10 ms delay. The correction for this delay was not done in the field**.**

The ringing in the impulse response is caused by the sharp anti-alias filter at ¾ Nyquist. The data processing contractor will want to use a more gradual slope for the anti-alias filter prior to re-sampling the data to 4ms.

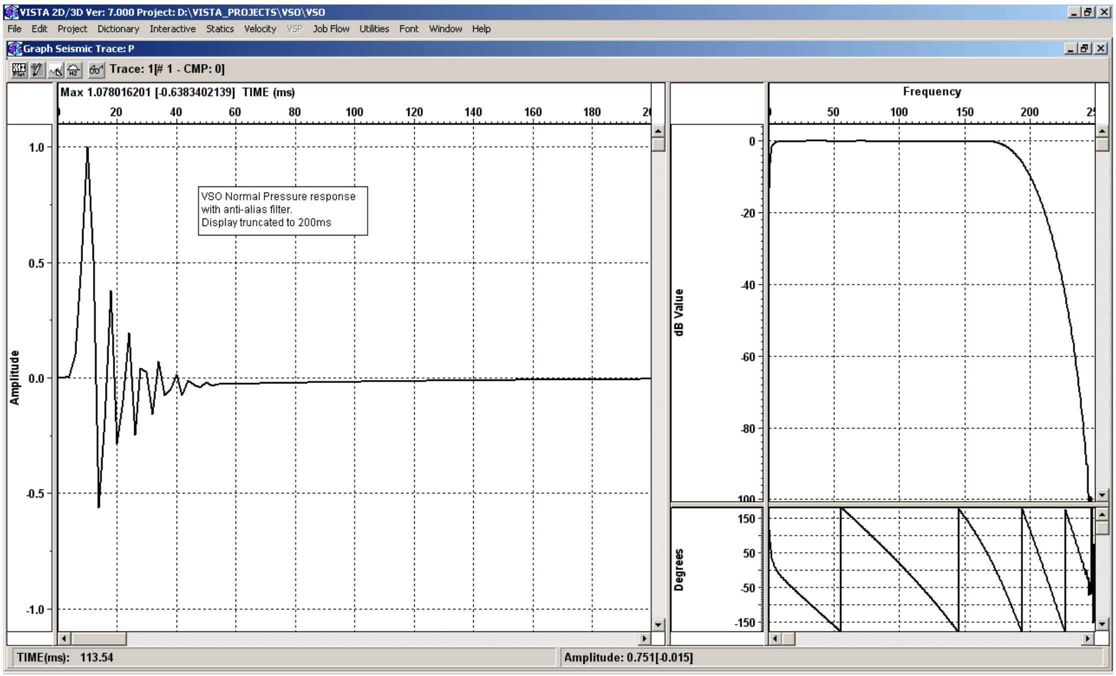


Figure 10. Hydrophone VSO System Impulse Response

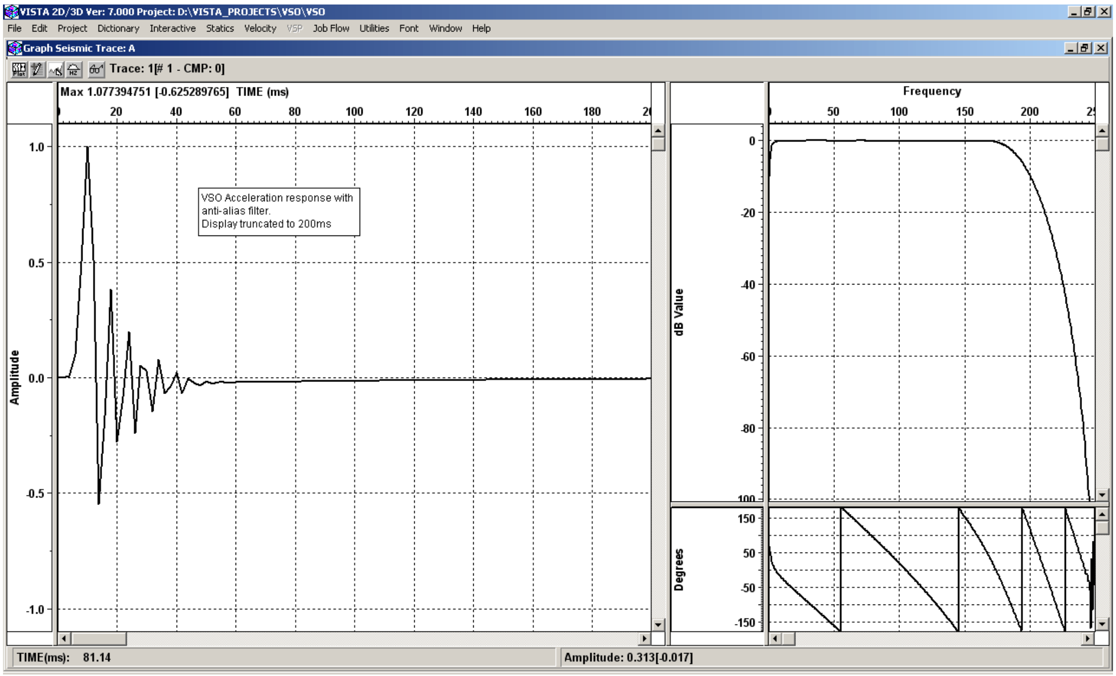


Figure 11. Accelerometer VSO System Impulse Response

3 SEISMIC QC METHOD

3.1 Overview

The Seismic QC method employed can be broken down into two essential stages; that which took place in real time or near real time, and that which took place after the data was retrieved from the buoy and loaded into the Vista offline QC system. Between these two stages, the data was transcribed using the ION/Concept DBU (Data Bucket Unloader) system. These various steps are described in detail in the following sections.

3.2 Flow Diagram

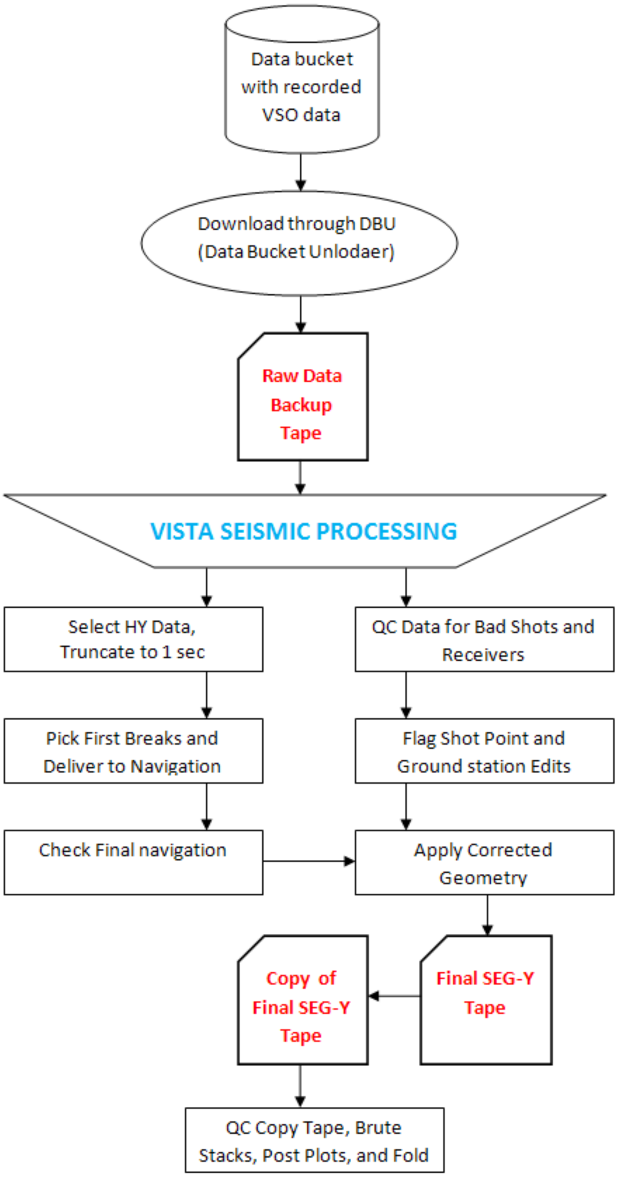


Figure 12. VSO Data Flow

4 VSO SENSOR ROTATION

4.1 Introduction

The objective is to highlight the key features of the VSO recording system, in particular the 'VOR' process of rotating the 3C sensor to 1 vertical and 2 horizontal axes.

This document is intended for external distribution. Acknowledgement is extended to ION Geophysical Corp. who assisted with displays and explanations.

4.1.1 Glossary of Terms

VSO	Vectorseis Ocean
VOA	Vertical Orientation Angle
VOR	Vertical Orientation Rotation
HOA	Horizontal Orientation Angle
HOR	Horizontal Orientation Rotation
HPR	Horizontal Polarity Reversal
NODE	The 4C module comprising 1 hydrophone + 3 MEMS accelerometers
MEMS	Micro Electrical Mechanical Systems
DBU	Data Bucket Unloader

4.1.2 The 3C Sensor

The VSO 4C node comprises a hydrophone and 3 MEMS linear accelerometers aligned orthogonally. The latter is referred to as the 3C sensor. Each accelerometer measures acceleration in units of gravity g. [1g is approximately 9.8 m/s2].

The sensors are mechanically fixed to the sensor package. One of the accelerometers (the 'X' sensor) is fixed along the cable axis parallel to the sensor housing. During deployment the other 2 accelerometers (the 'Y' and 'Z' sensors), being orthogonal to the cable axis, are oriented unpredictably at any particular station. Positive acceleration is recorded in the direction of the sensor axis.

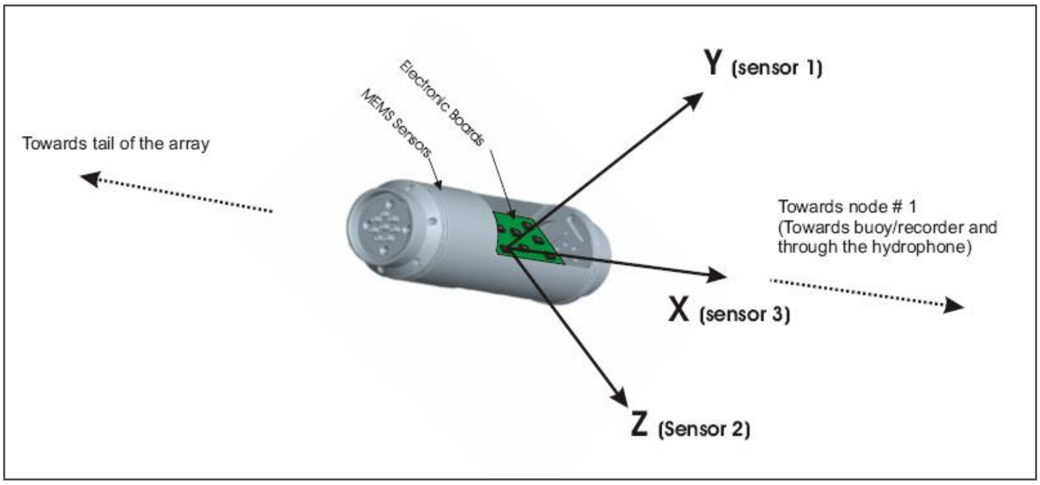


Figure 13. VSO 3C Node Orientation

The VSO system has self-contained functions to self-determine each sensor's orientation to vertical, and to automatically correct the sensor component data to a consistent orientation. The full rotation process includes three important coordinate frames that are discussed further in Section 3:

1) Sensor Frame
2) Cable Frame
3) Prospect Frame

The transform from sensor to cable frame is the VOR transform. This rotates the sensor frame to one axis true vertical and two axes true horizontal alignment. The rotation preserves the sensor heading with the axis of the cable.

The transform from cable to prospect frame is the HPR transform (or cable flip). This inverts the cable's coordinate frame whenever cables are placed back-to-back or in a serpentine fashion.

The prospect frame, representing the final state of all data rotations, is the basis upon which the Seismic Image data is output from the VSO system

4.1.3 The Right Hand Rule

The VSO node design follows the right hand rule as depicted below (ref. Sensor Frame). For a three dimensional Cartesian coordinate system, the relationship of positive axes of x, y, and z follows the thumb and next two fingers of the right hand respectively. For example, if positive Z is vertically down, then positive Y is always to the right while facing the direction of positive X.

The application of cable flip (ref. HPR) is equivalent to a 180 deg rotation about the vertical Z-axis; it is necessary to reverse the polarity of both X and Y sensors to preserve the right-hand rule.

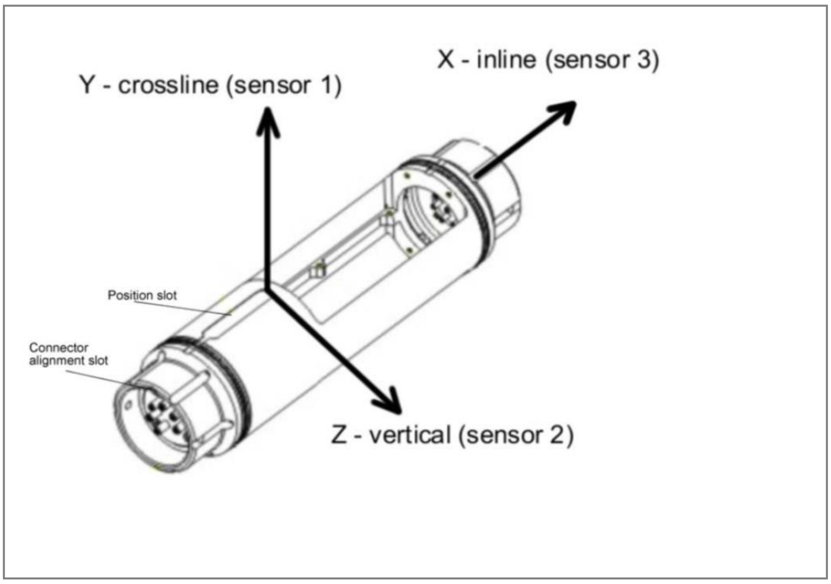


Figure 14. The relative orientation of the 3 sensors corresponding to the right hand rule.

4.1.4 VSO Acquisition Overview

Unlike other OBC recording systems, each VSO cable is attached to a recording buoy (figure 13). This allows flexibility in deploying cables, and the deployment itself can be in the forward or reverse direction (i.e.; the buoy sits at the start or end of a given preplot line). In normal operations a VSO cable comprises 240 nodes (or 960 channels of 4C data).

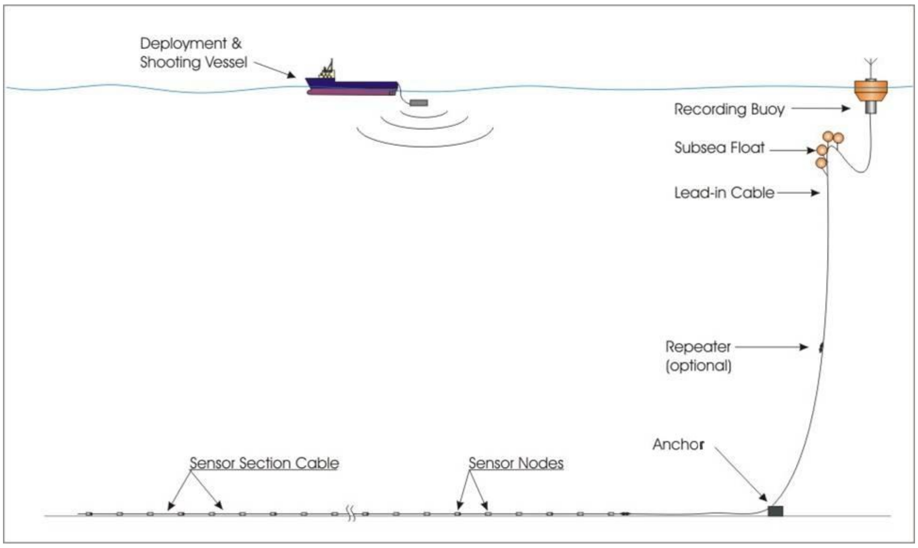


Figure 15. VSO buoy based acquisition

VSO is integrated with the Gator navigation system to define a relationship between node number (VSO) and station number (Gator). In the case of a cable looping over 2 or more preplot lines, Gator will also relate nodes to individual line number.

The recording buoy is always deployed after the cable and is retrieved before the cable. It is attached at the end of the cable where node 1 is, so that node 1 is the last to spool off the vessel. A lead-in cable connects the cable at node 1 to the buoy.

The cable is engineered so that the X sensor points toward the buoy (ie. the positive X direction is along the cable toward the buoy). A cable may be laid in the reverse direction (with respect to the prospect frame) for operational efficiency, such that a survey will ultimately comprise both forward and reverse laid cables, and therefore conflicting polarities of the horizontal components.

These acquisition features are coded in the VSO SEGY. At a later stage in the data flow the system establishes consistency in polarity of the horizontal components, effectively by orienting the cables to be all in the same direction (ref. HPR).

4.1.5 The Recording Buoy

Each recording buoy contains both a recorder and a QC computer. The raw VSO files are written to a redundant array of disks (variable size but usually 500Gb) that are connected to the recorder via daisy chained Firewire. These disks are contained in a rugged cylindrical data 'bucket' that can be readily detached (and re-attached) once the buoy has been taken onboard. Each buoy records the data for only one cable.

Immediately after recording a copy-convert process writes a copy of the data to the QC computer disk. These files on the QC computer form the basis of all real-time attributes generated for QC. They also provide an independent secondary raw dataset in the event that the data cannot be read from the primary source.

There are 2 radios attached to the buoy that communicate with the master vessel. The higher bandwidth 2.4 GHz link allows for QC information to be relayed to the master vessel, including full attribute analysis, raw shots, etc. The 900 MHz radio allows the master vessel to communicate with each buoy / cable and synchronize recording. A limited amount of QC data, typically the RMS noise values for each trace, is also transferred over the 900 MHz link (figure 14).

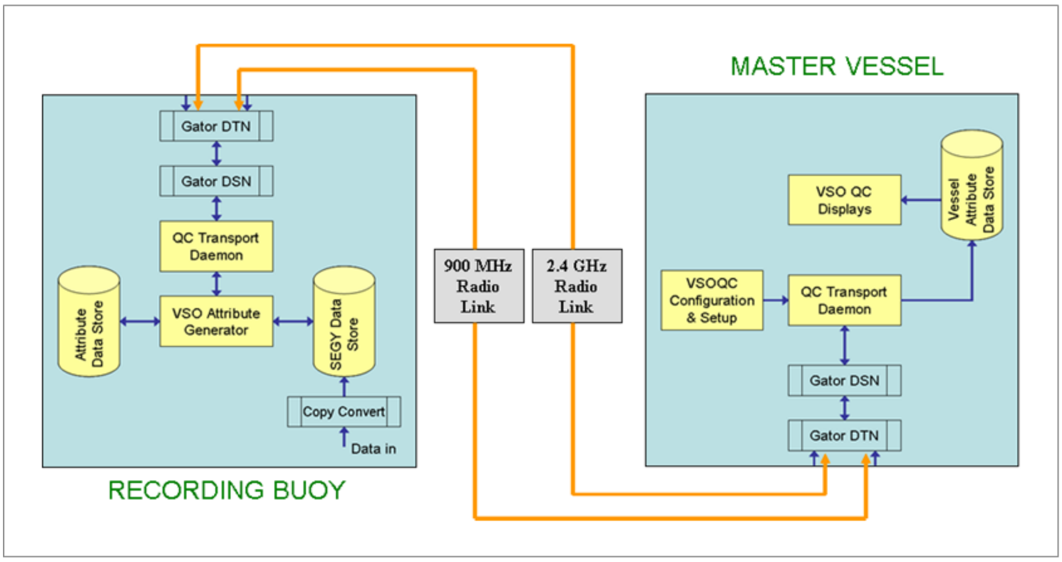


Figure 16. VSO Vessel-Buoy Communication

4.1.6 The Data Bucket Unloader (DBU)

The DBU is that part of the recording system that resides onboard. The functionality includes the following:

<u>Transcribing</u>. The DBU inputs raw VSO data from the buoy disks, or as a contingency it can read from the QC computer. Output is to SEGY on disk.

<u>VOR rotation</u>. Output is one axis true vertical and two axes true horizontal alignment.

<u>HPR rotation</u>. Reverse laid cables are flipped. The cable lay geometry is defined in Gator and the forward direction is defined by decreasing station number.

Header processing includes merging preliminary navigation data with the seismic, and header flags are created for several state-of-health checks performed by the system on itself (separate to instrument tests).

The DBU is integrated with the VSO Web Database that manages the bookkeeping for the survey, creates a relational SPS 'X' file, and cross-checks what has been acquired to what is expected to be acquired.

Note that data processing is limited to only VOR and HPR. These processes are reversible.

4.1.7 VSO Data Flow Summary

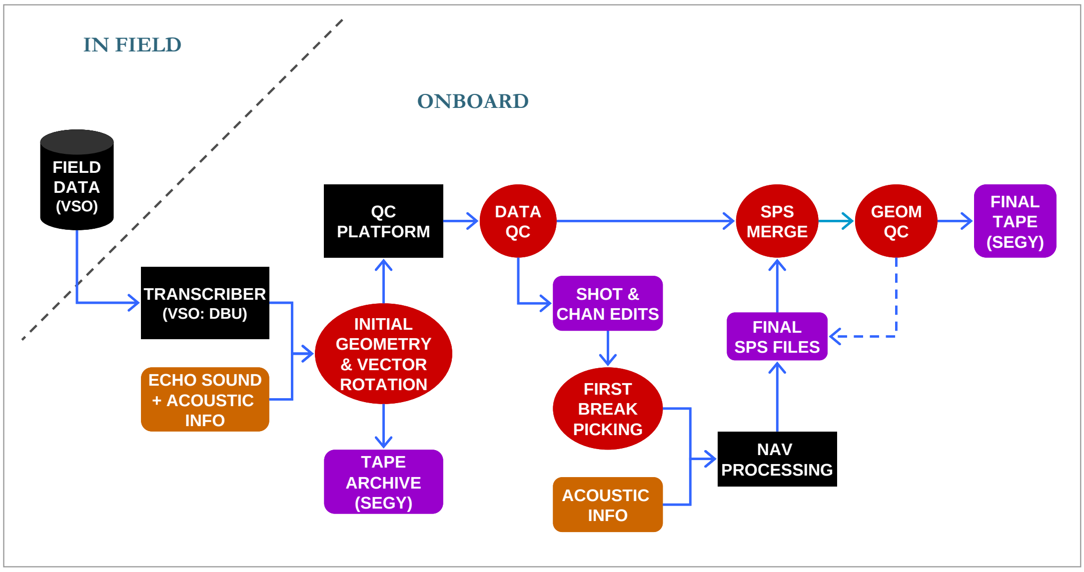


Figure 17. VSO Data Flow schematic

A generalized chronology of the VSO Data Flow is as follows.

#	STEP	DESCRIPTION
1.	Data Recording	Data is recorded in internal format to the multi-disk array inside the buoy.
2.	Online QC	Seismic attributes computed in the QC computer in the buoy are relayed to master vessel. Decisions made regarding line acceptability before cables are rolled.
3	Data Transfer	After buoy retrieval, data is transferred from the buoy disks to computers onboard.
4	Processing	VOR and HPR applied to trace data. Preliminary geometry uploaded to the seismic headers.
5	VSO SEGY Output	Raw Data output in SEGY format to disk.
6	Offline QC	Create final SPS data, data edits, and final obs logs
7	SEGY Output	Final Data output in Client SEGY format to tape with final SPS info uploaded to data headers. Non-chargeable data (e.g. NTBP lines, etc.) removed from dataset.

In Step 3, data is transferred from the field to the vessel computers in two ways:

The buoy is recovered onboard the cable vessel where the QC processing is housed, the raid disks are removed from the buoy and hooked up directly to the DBU.

The buoy is recovered onboard a cable handler where the QC processing is not housed, a bit-bit copy of the raw data is made to separate disks that are dispatched to the main cable vessel.

Steps 3-5 are all carried out in the DBU. The DBU front-end software resides in the instrument room with the QC computers.

Step 7 is optional, in that it does not provide extra info to the deliverables created in steps 5 and 6.

4.2 VSO Rotation Attributes

4.2.1 VOA

The system intrinsically determines the vertical orientation angle (VOA) for each sensor via gravity measurements. With this information the system applies VOR, which is a rotation of the 3 axes digitally (i.e. via processing) so that the X and Y sensors are aligned horizontally and the Z sensor is aligned vertically down.

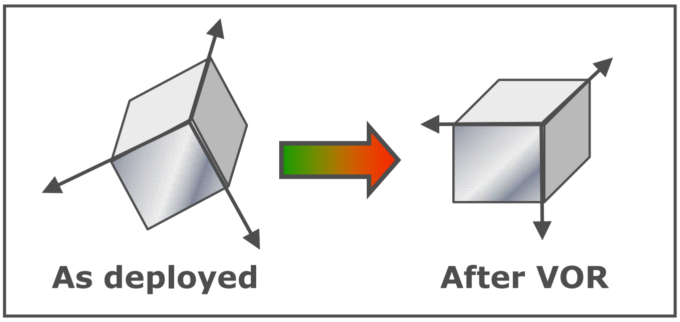


Figure 18. Depiction of the 3C sensor and the VOR process.

Note that the VOR process can be turned off in the Data Bucket Unloader (DBU) strictly for test purposes.

VOA is recorded by the system in units of radians * 10000 and is always positive (ranging 0 to 31416, zero being vertically up). In the VSO SEGY archive tape it is saved automatically as a short integer at bytes 205-206.

VOA(x) is the angle from vertical of the sensor aligned along the cable axis; it is generally close to 15708 (i.e. 90 degrees.) if the seafloor is flat. VOA(y) and VOA(z) vary unpredictably from node to node.

The as-laid sensor orientation from the vertical axis is determined along the following steps:

The system records a DC measurement for each accelerometer at every SP. This gives the projected (vertical) gravity in units of gravity g, ranging from -1 to 1.

The orientation angles are related to gravity according to the relations below:

g(x) = cos (VOAx/10000)
g(y) = cos (VOAy/10000)
g(z) = cos (VOAz/10000)
where `g(x), g(y), g(z)` are the components of gravity for each of the sensors.

4.2.2 Vector Fidelity

Vector fidelity infers that particle motion along the axis of one sensor registers a full wave recording at that sensor, and zero at the 2 orthogonal sensors. To achieve this, accurate VOR and sensor fidelity are required.

When VOR rotates to 3 components of 1 vertical + 2 horizontal, it infers that the vertical (Z) component registers only vertically propagating energy, and the horizontal (X and Y) components register only horizontally propagating energy.

Therefore a requirement for successful VOR, and therefore for vector fidelity, is to have accurately known as-laid orientation angles.

The accuracy of the as-laid sensor orientations is checked via the vector sum of the 3 components. Since the 3 sensors are orthogonal the vector sum of the 3 gravity readings (DC recording) should be 1.0.

Gravity Sum = sqrt { g(x)^2 + g(y)^2 + g(z)^2 }

The other requirement for vector fidelity is sensor fidelity. The process of analogue to digital conversion, from the field to the recorder, has to be consistent and within operating specs. If only 2 sensors are live, for example, then the entire 3C sensor (and arguably the 4C node) is not bona fide.

Below is an example gravity sum result over 120 nodes. According to the manufacturers specifications a gravity sum to within 3% of unity is considered acceptable; in all field cases the gravity sum is generally accurate to within a fraction of a percent.

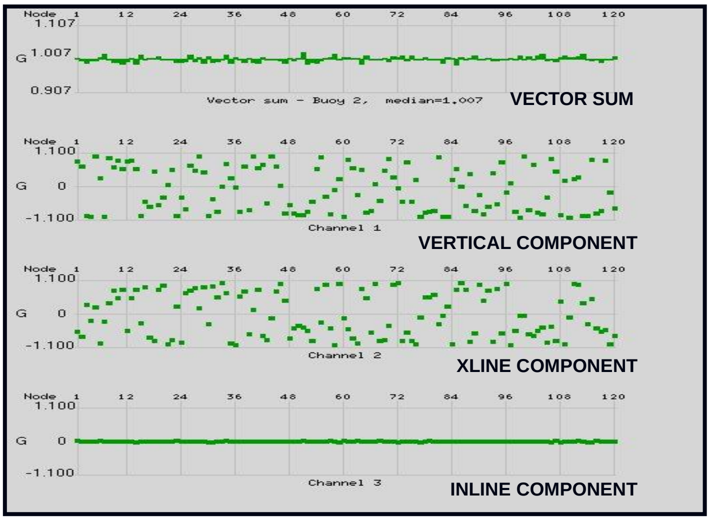


Figure 19. Vector Fidelity as demonstrated by vector sum.

4.2.3 HOR

During recording the X sensor is aligned in the direction of the node housing on the cable. The X-sensor axis is not the same as the X-axis because a) the sensor is not necessarily horizontal and b) the cable may not be deployed dead straight.

VOR is the process that rotates the X sensor to the horizontal plane, and HOR is the process that rotates the X sensor exactly along the X-axis (i.e. the inline direction), since there may be deviations during deployment.

The VSO system applies VOR but does not support HOR.

Other use of HOR is to rotate the horizontal data into radial and transverse components.

4.2.4 HPR

HPR is a means to establish a consistent polarity of the horizontal components across an entire survey.

HPR is effectively HOR limited to 0 or 180 degrees. It represents a polarity reversal of the horizontal X and Y components after the application of VOR.

4.3 Vertical Orientation Rotation

4.3.1 Frames of Reference

The process of VOR and HPR is explained via the movement between three frames of reference.

Sensor Frame
Refers to a frame of reference of the as-laid sensors. While each node is uniquely different, each 3C sensor follows the right-hand rule within the sensor frame.

Cable Frame
Refers to a frame of reference after rotation from the Sensor Frame, but before rotation due to deployed cable. Thus each 3C sensor has been rotated to 1 vertical + 2 horizontal to achieve consistency within each cable. Consistency between cables has not been attained at this stage.

The cable frame considers an entire group of nodes within a single cable. The node to node relation should be consistent and is achieved by the application of VOR. The output is a consistent set of nodes in which the principle axes of the 3 sensors have been redefined.

VSO sets these axes such that Z points vertically down, X points horizontally along the cable towards node 1 (ie. the buoy) and Y points horizontally to the right while facing the buoy.

In the diagram below 3 scenarios are presented for which each Cable Frame is consistent.

Prospect Frame
Refers to a frame of reference represented by the prospect coordinate system in which all data is rotated to for uniformity.

In the Prospect Frame the cable to cable relation should be consistent and is achieved by the application of HPR. This process inverts the cable’s coordinate frame whenever cables are placed back-to-back or in a serpentine fashion. The output is a consistent set of cables within the prospect, in which a single lay direction is defined.

VSO by default sets the cable lay direction to be in the direction of decreasing station number. This is the direction of positive X; the seismogram therefore registers the first break as a negative loop for a compression wave.

The station numbering system is accessed in the Gator database. The process of HPR is equivalent to HOR limited to an HOA angle of 0 or 180 degrees; so if a cable is reversed by HPR the polarity of the X and Y components is simply flipped.

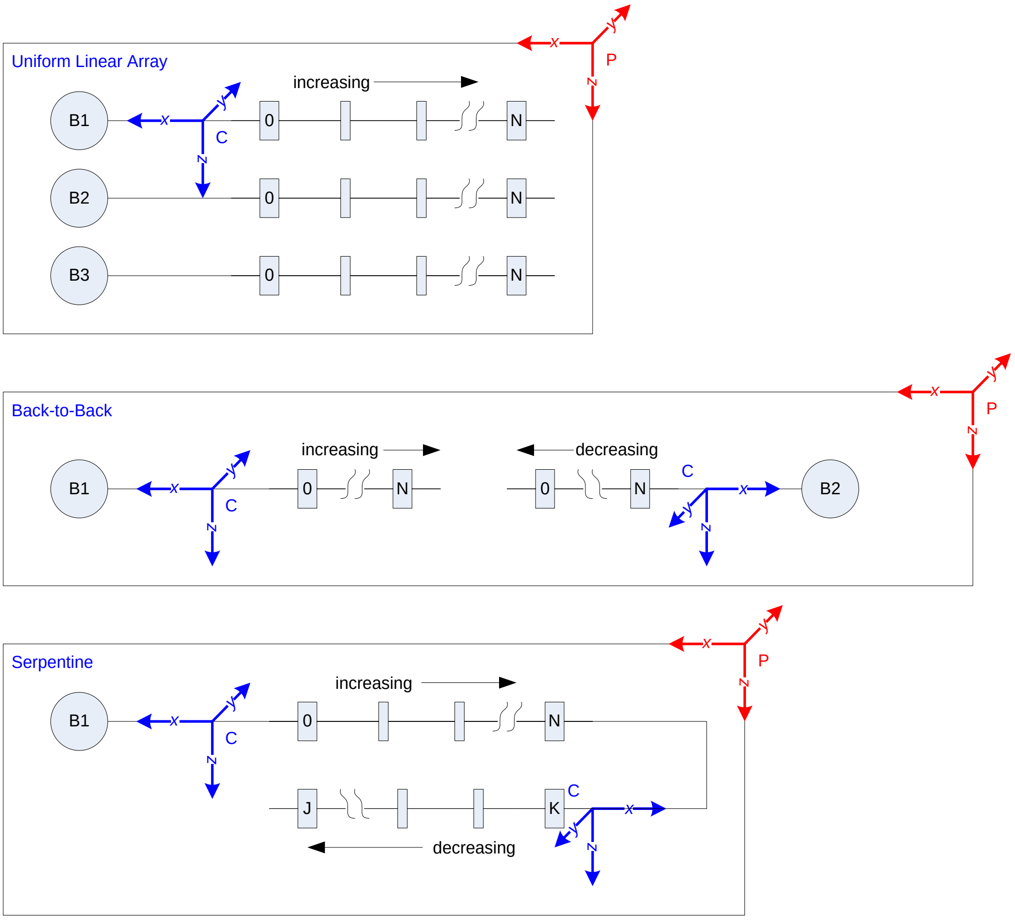


Figure 20. 3 acquisition scenarios referencing all nodes in the cable frame.

The cables can all be deployed in the same direction, or they can be laid back to back, or a single cable can be looped over one or more receiver lines.

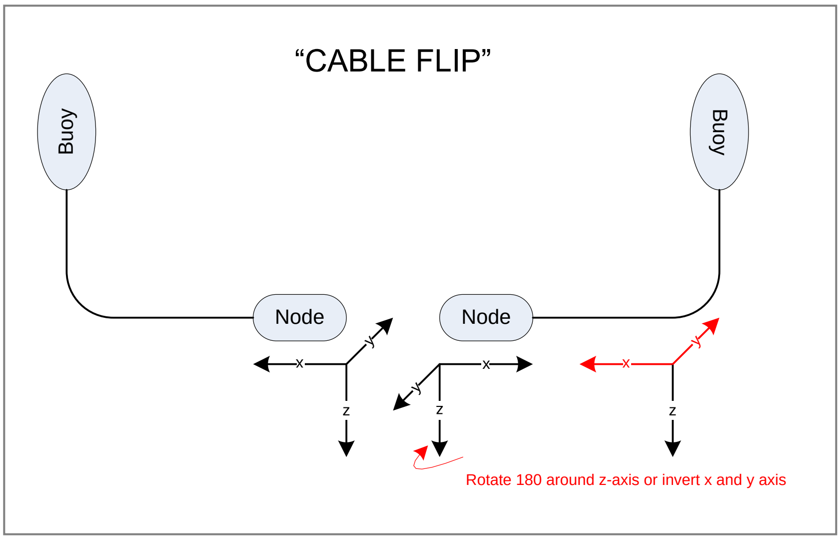


Figure 21. Application of HPR: cable to prospect frame.

4.3.2 The VOR Transform Matrix

The transform matrix is best represented using a Euler Angle approach where the angles pitch, roll and yaw are measured in the vertical plane.

AXIS	ANGLE	Symbol
Y	Pitch	θ
X	Roll	Ψ
Z	Yaw	Φ

The definitions of pitch, roll and yaw are illustrated below.

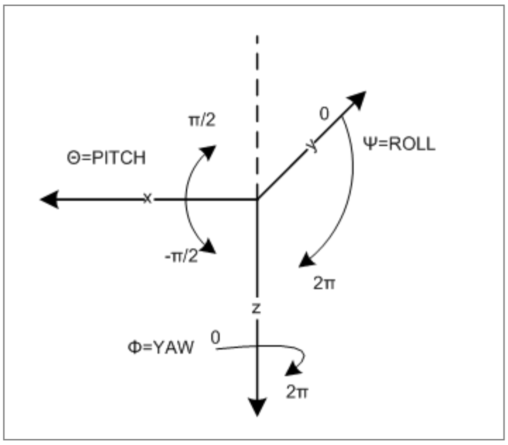


Figure 22. Representations of pitch roll and yaw.

The full 3D transform [*R*] that rotates from the x-y-z axes to the *ψ*-*θ*-*Φ* axes, as shown in the illustration, can be represented as a multiplication of 3 transform steps.

$$[R] = \begin{bmatrix} 1 & 0 & 0 \\ 0 & \cos\Psi & \sin\Psi \\ 0 & -\sin\Psi & \cos\Psi \end{bmatrix} \begin{bmatrix} \cos\theta & 0 & -\sin\theta \\ 0 & 1 & 0 \\ \sin\theta & 0 & \cos\theta \end{bmatrix} \begin{bmatrix} \cos\Phi & \sin\Phi & 0 \\ -\sin\Phi & \cos\Phi & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

These Euler angles can be related to VOA angles as follows:

$$\theta = \text{asin}\left(\cos(VOA_x) \right)$$

$$\psi = \text{atan2}\left(\frac{\cos(VOA_y)}{\cos(VOA_z)} \right) \quad \textit{where } -\pi < \psi < +\pi$$

$$\Phi = 0 \text{ or } \pi$$

In the context of VOR application in the VSO system *Φ* is limited to 0 or pi.

Note that the *atan2* function is a special case of arctangent where the output is limited to within +/- pi. The *atan* function has an output limited to +/- pi/2.

The matrix [*R*] above is equivalent to the reverse VOR-HPR process since it is rotating from 2 horizontal + 1 vertical (x-y-z) to new axes defined by the Euler angles (*ψ*-*θ*-*Φ*). The first 2 matrices define the reverse VOR process which can be rewritten as follows:

$$[VOR^{-1}] = \begin{bmatrix} 1 & 0 & 0 \\ 0 & \cos\Psi & \sin\Psi \\ 0 & -\sin\Psi & \cos\Psi \end{bmatrix} \begin{bmatrix} \cos\theta & 0 & -\sin\theta \\ 0 & 1 & 0 \\ \sin\theta & 0 & \cos\theta \end{bmatrix} = \begin{bmatrix} \cos\theta & 0 & -\sin\theta \\ \sin\Psi.\sin\theta & \cos\Psi & \sin\Psi.\cos\theta \\ \cos\Psi.\sin\theta & -\sin\Psi & \cos\Psi.\cos\theta \end{bmatrix}$$

The forward VOR application is the transpose of [VOR^{-1}].

$$[VOR] = \begin{bmatrix} \cos\theta & 0 & \sin\theta \\ 0 & 1 & 0 \\ -\sin\theta & 0 & \cos\theta \end{bmatrix} \begin{bmatrix} 1 & 0 & 0 \\ 0 & \cos\Psi & -\sin\Psi \\ 0 & \sin\Psi & \cos\Psi \end{bmatrix} = \begin{bmatrix} \cos\theta & \sin\Psi.\sin\theta & \cos\Psi.\sin\theta \\ 0 & \cos\Psi & -\sin\Psi \\ -\sin\theta & \sin\Psi.\cos\theta & \cos\Psi.\cos\theta \end{bmatrix}$$

If a 3C data sample before VOR is defined as U(x,y,z), and after VOR as V(x',y',z'), then the output of VOR can be determined simply by the matrix multiplication [V] = [VOR] . [U]

5 ONLINE QC

The purpose of online QC was to verify the performance of the guns, sensors, and the quality of the recorded data during acquisition of the survey. This QC can be broken down into the following stages:

- VSO QC
- Source QC
- Raw Shot Analysis
- Logging
- Instrument Tests

5.1 VSO QC

With the VectorSeis Ocean (VSO) buoy based recording system it can be some days from the time the data is shot until the complete seismic dataset is retrieved from the field. In order to assess line acceptability, a quick and accurate analysis of the data quality is required. This process, known as VSO QC, was developed by ION/Concept with specifications provided by RXT.

Onboard each recording buoy, a series of attributes is calculated from the raw seismic trace data as it is being acquired. The calculated attributes include:

- RMS Noise Displays
- General Shot Anomaly Detection
- General Node Anomaly Detection
- Count of the Number of Dead / Weak Traces
- Spike Detection
- Cable Rocking

Several of these attributes are still under development and as such were not used for line acceptance decisions on the RXT10010 survey. Efforts for this survey concentrated primarily on the use of the RMS Noise displays and the counts of the number of dead/weak traces in conjunction with Raw Shot data analysis and online logging of anomalies.

The VSO QC system operates via two radios. A 900 MHz radio system is used primarily for recording control, but is also used for Level 1 QC displays, a single RMS display (Hydrophone component for this survey), and data logging to ensure that we are never shooting blind. The remaining QC data was transferred over the broader band 2.4 GHz radio system. The operation of the recording system was not dependent on the 2.4 GHz radios to function properly.

The VSO QC information is broken up into three distinct "levels" that include:

- Level 1 consisted of an overall GOOD / BAD indicator for the entire shot / receiver line combination based on a number of test results for each shot-buoy ensemble. Level 1 also includes the RMS display of a single sensor, selected as the hydrophone component for this survey.
- Level 2 consisted of various seismic trace attributes, including RMS noise displays, of all of the 4 component sensors.
- Level 3 consisted of raw seismic trace data displayed by shot.

All Level 1 information, along with recording control data and data logging information is transmitted via the long wave radio (900 MHz) and thereby available at all times. Level 2 and Level 3 information is transmitted by the short wave radio (2.4 GHz) and therefore dependent on the proximity of the vessel to the buoy. For this survey it was found that during the normal course of acquisition, data was retrievable most of the time via the short wave radio.

5.1.1 Level 1 VSOQC

The Level 1 QC Display (figure 21) shows the shot quality indicator for each buoy/shot. The shot status (good, bad, missing) was colour coded with the most recent shot appearing at the right of the screen and rolling to the left as new shots were acquired.

The attributes calculated onboard the recording buoys are checked automatically against a set of user defined failure thresholds. Any shot / receiver combination which has more than a user defined number of individual trace failures for any of these attributes is flagged as bad. The reason for the failure and the number of affected sensors is shown on the right hand side of this "Level 1" QC display.

The Level 1 shot status was determined through a series of tests performed on the buoy’s onboard QC computer, with each test designed to identify a particular problem.

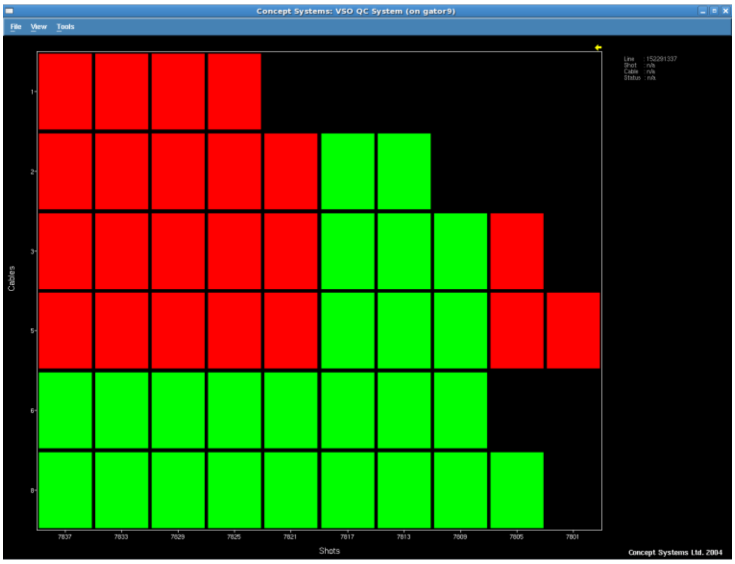
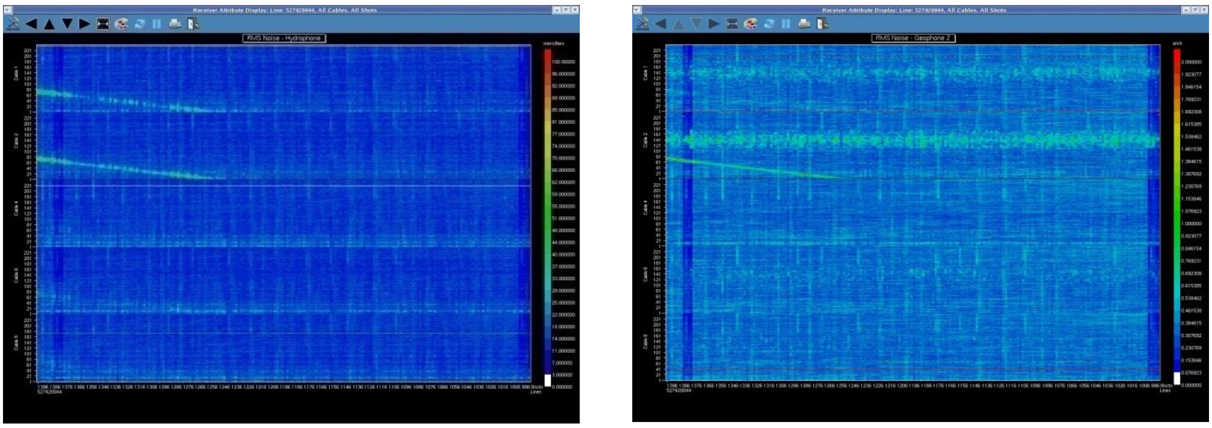


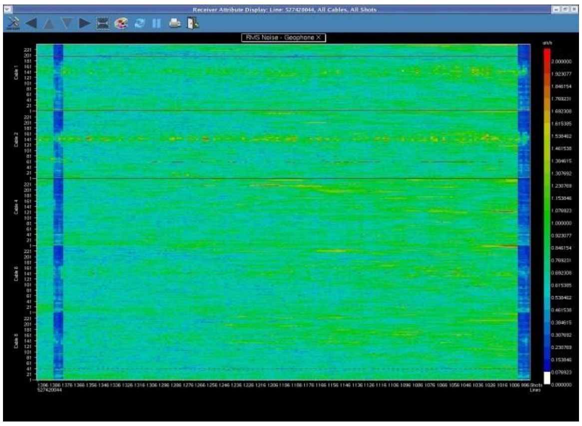
Figure 23. Level 1 online attribute analysis display

10 shots, 6 cables. In this example we see the 5 noise records taken at the end of line being flagged as "general shot anomalies"

5.1.2 Level 2 VSOQC

Level 2 VSOQC consisted of a dedicated online attribute display (figure 22). The VSOQC could display online any of the calculated attributes for each component (the cable rolling attribute has a single value per node). For the duration of this survey the RMS noise attributes for each component were displayed online for each sail sequence. The Y-axis shows the node number with distinction made for each cable, and X-axis is the different shots. The RMS level for each channel was shown by colour intensities. The RMS values were calculated in the recording buoys, and the results were stored onboard the shooting vessel in a database that could be interrogated after line completion. Several sequences of attribute data could be displayed in order to provide line to line comparisons against client defined benchmarks.





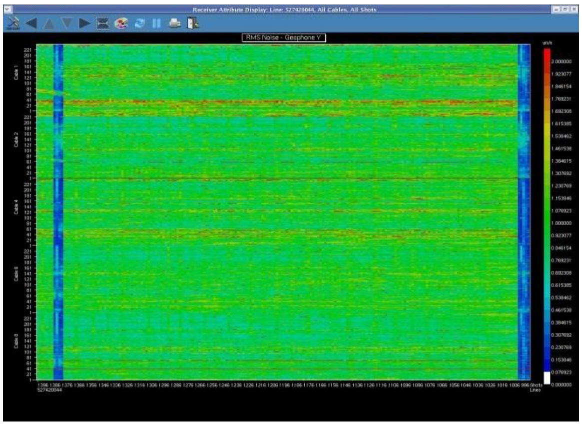


Figure 24. Online RMS attribute analysis displays (sequence 0044).

Hydrophone and vertical accelerometer top, Inline and Cross line components bottom. The scale for hydrophone is 0-100 µBar. Occassionally data was missing from the RMS displays due to slow data transmission displays. The vertical blue bar in each display are noise records.

5.1.3 Level 3 VSOQC

The level 3 VSOQC is the transfer of raw data across the radio link. A compressed shot record can be launched using a simple click from either the Level 1 or Level 2 QC displays (figure 23). This allows the user to see an 8-bit representation of the raw shot data for any cable / component.

Raw shot data was sometimes transferred on the 2.4GHz radio bandwidth from the buoy recorders to the master vessel for review when necessary to evaluate noise. This was routinely done in areas where excess environmental noise was present, especially in the zones around working production and/or storage platforms.

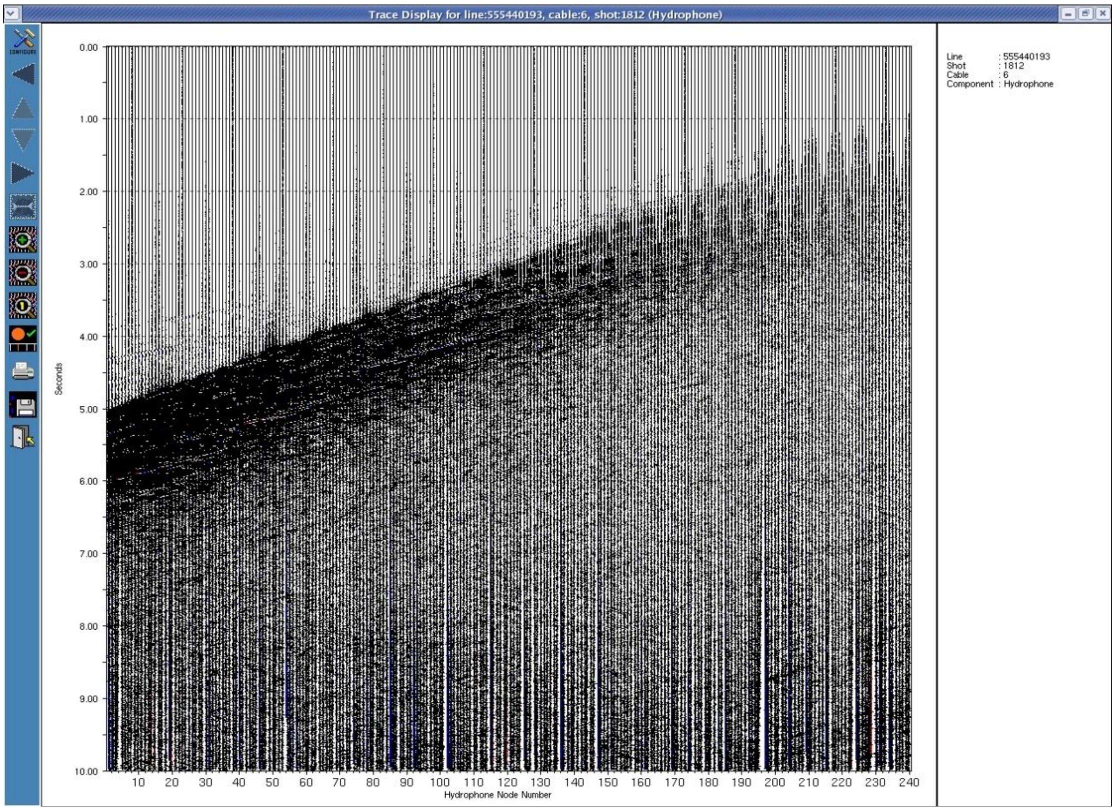


Figure 25. Example Level 3 Raw Shot Record with low cut filter and time variant gain.

5.2 Source QC

RXT employs the Big Shot gun controller system supplied by Real Time Systems.

5.2.1 Online Gun QC and Reporting

The gun controller provides volume and pressure information online, as well as automated reporting of misfires, autofires, delta errors, and other gun related errors.

A hydrophone is attached to each gun cluster and suspended approximately 1 meter above the gun ports. These sensors are referred to as the near field hydrophones. The near field hydrophone data is displayed in real time on the Big Shot HYD graphical interface as shown below. Discrepancies in gun volume, pressure, and timing are most easily observed in the character of the bubble.

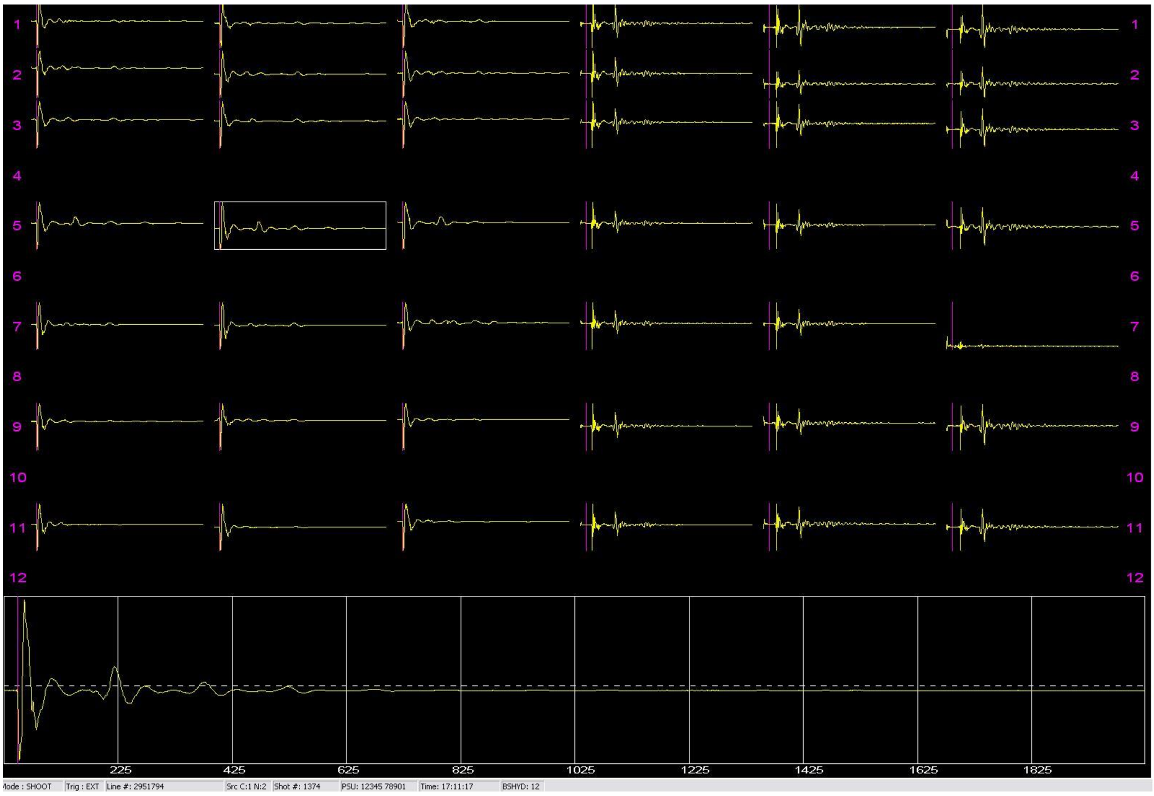


Figure 26. Big shot HYD real time screen display

5.2.2 End of Line Near Field QC

Near field hydrophones were used to check for any problems in the source output. Each hydrophone signature was displayed online on the Real Time Systems Big Shot HYD window. In addition a SEGY file was generated online and was analyzed at the end of each sequence, or during the line if required. The near field SEGY data was displayed in a manner such that source inconsistencies were clearly detected. Even those sequences that were not to be processed were checked in order to catch potential air leaks which will essentially carry on to the next line. The following is a list of the data analysis techniques performed at the end of each sequence.

Four different data analysis techniques were performed in order to detect possible source anomalies such as air leaks, timing errors, auto-fires, incorrect volume usage, pressure drops, and delta errors (Table 3).

Technique	Description	Primary Purpose	Display
Spliced Array	Individual channels spliced together for each array in order from front to back. One trace per shot.	Air Leak Detection, Volume changes.	Figure 25
Amplitude Comparison	Port array channels are spliced together with Starboard array channels.	Volume Control	Figure 26
Autofire detection	Stack of all the channels for each shot, one trace per shot. Display of 12 sec	Autofires	
Consecutive source stack	The previous shot is inverted and stacked wih the current shot	Detection of autofires or misfires	Figure 27

Table 3. Near field source anomaly detection methods used on each sail sequence.

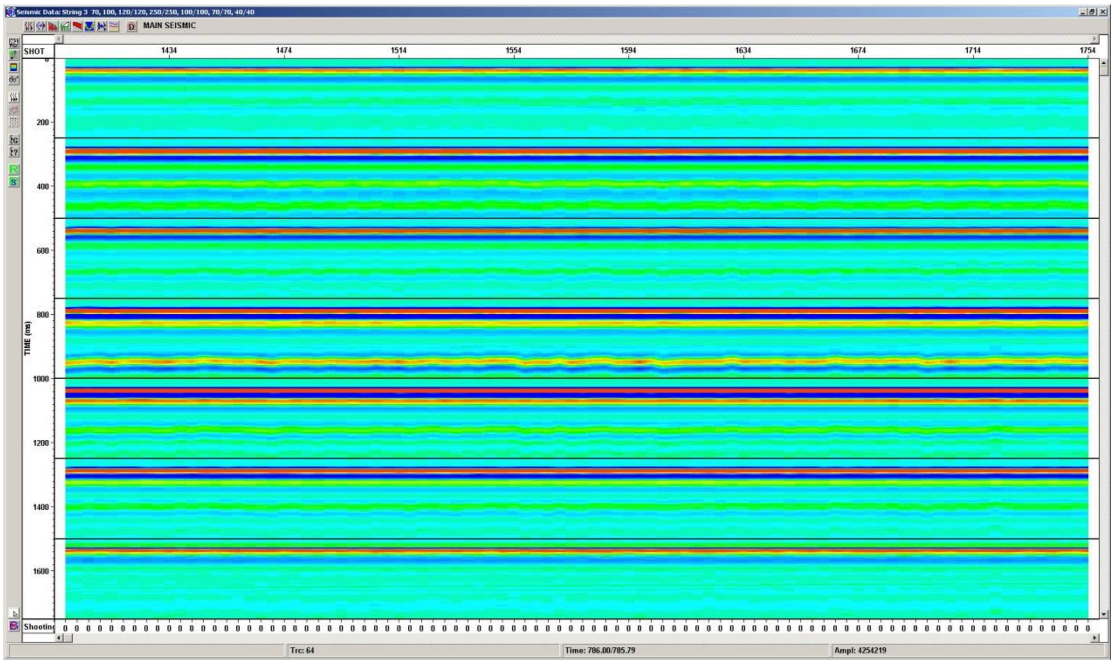


Figure 27. Spliced near field display for air leak detection, sequence 109 string3

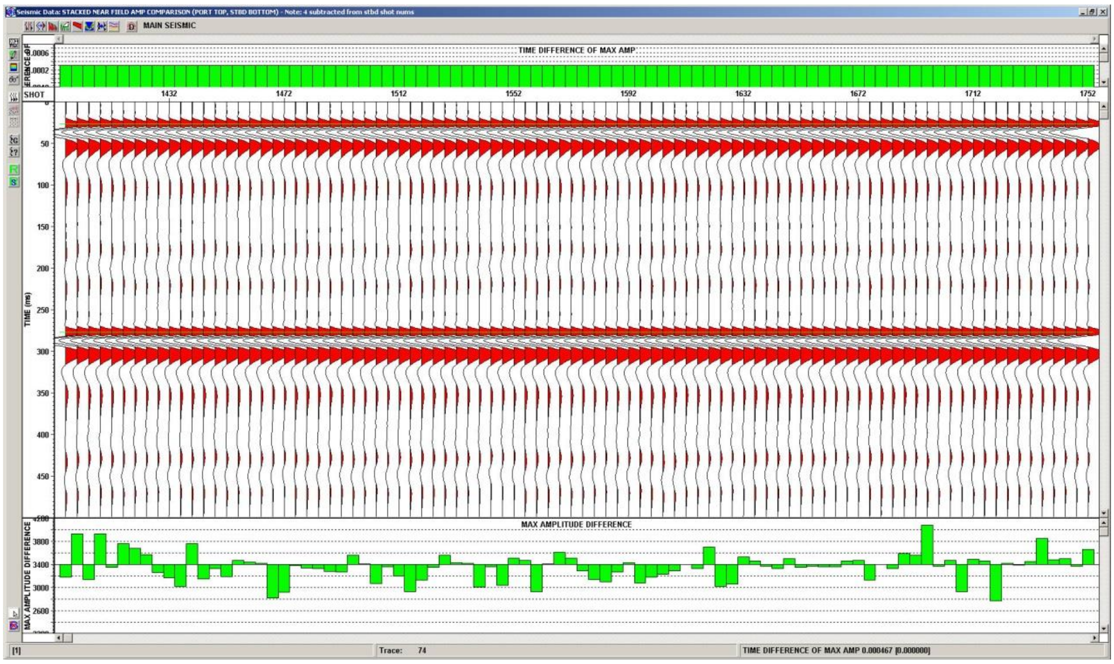


Figure 28. Amplitude comparisons.

Port Array is on top and Starboard Array is on the bottom, sequence 109.

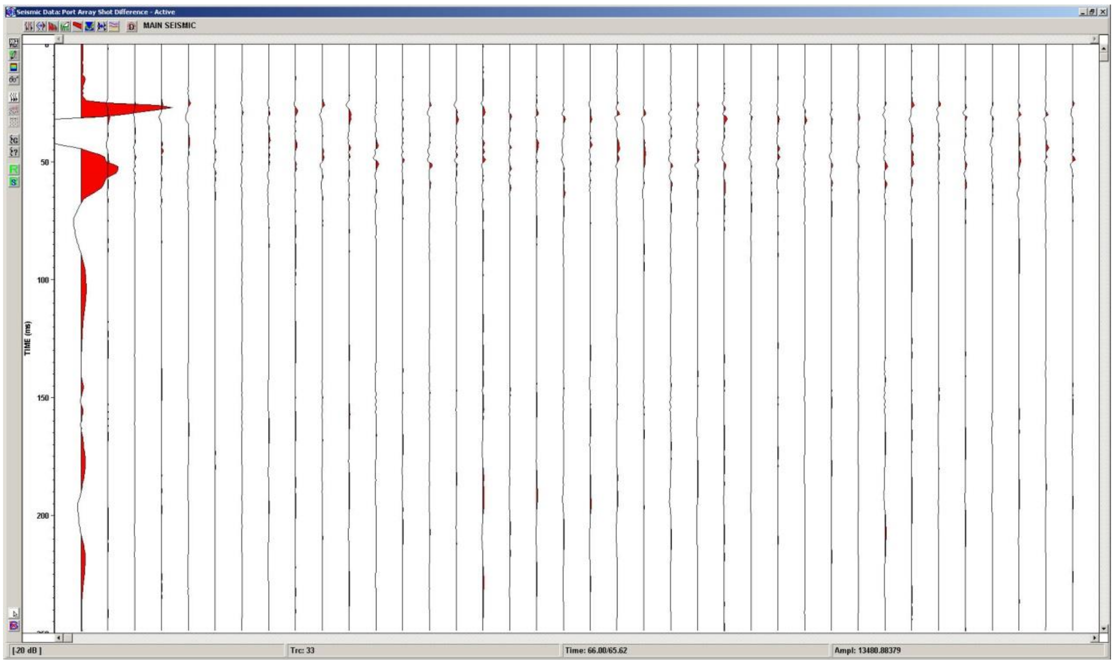


Figure 29. Auto fire detection display, sequence 109. The first shot has no previous shot to compare.

5.2.3 Gun Volume Verification (Bubble Test)

In addition to the online QC techniques, a 'bubble test' was performed at the beginning of the Njord survey completed just prior to shooting Volve. The test was run with a production cycle time of 12 seconds between the guns being fired. This test was performed in order to verify that the bubble period of each gun matched that expected using the Rayleigh-Willis Formula. This was achieved by firing each individual gun up to 5 times and calculating the average bubble period. The Rayleigh-Willis constant was calculated for each gun and compared against the average value for that particular volume throughout the array.

The period of each gun was plotted against the cubic root of the individual gun volume and a linear best fit was calculated (figure 28). For this project, it was found that no bubble periods deviated by more than 7.1% from the best line fit gradient value.

It is standard procedure to perform a new bubble test for every project. In this case though, the gun configurations were not altered between the Njord and Volve surveys and since the surveys were back to back, the client was comfortable with the bubble test results from Njord. Any time a gun was changed out due to failure, that particular gun was re-bubble tested to ensure conformity.

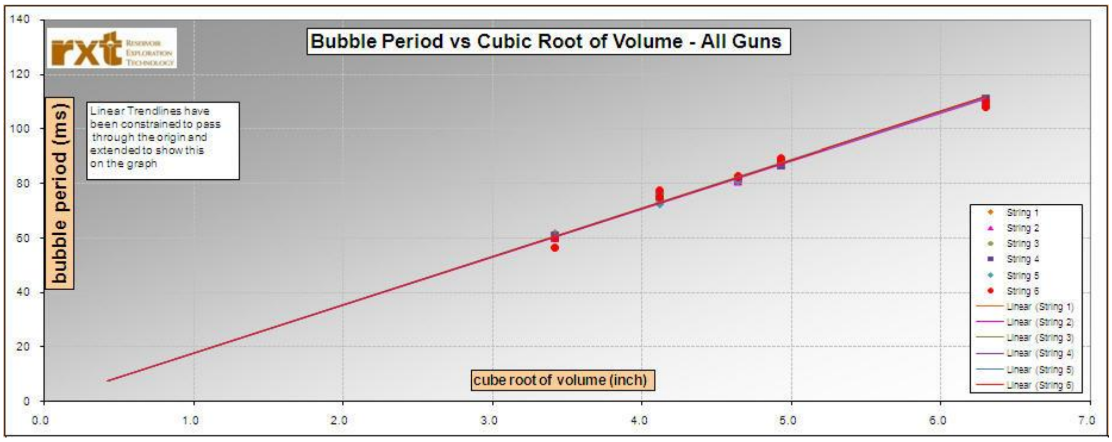


Figure 30. Bubble period versus cube root of volume for all guns.

5.3 Instrument Tests

Instrument tests were performed for each cable deployment. The following suite of tests was performed using VSO system:

- Accelerometer Gravity Sum Test
- Digital Loopback
- Hydrophone Channel Noise
- Hydrophone Channel Impulse (no sensor)
- Hydrophone Channel Impulse (with sensor)
- Sensor Noise (lo-cut 18Hz)
- Sensor Noise (lo-cut out)

The results from the instrument tests were analysed to ensure consistently failing hydrophones or nodes were identified and entered into the acquisition logs. Nodes or hydrophones that failed the same test over two different cable lays were changed out when feasible.

6 DBU PROCESS

The VSO Data Bucket Unloader (DBU) is a system for unloading, converting and reading seismic data (files) from the VSO buoys. The DBU transfers data from the data buckets to disk and applies de-multiplexing, scaling and vector rotation. It utilizes information from the VSO recording system and database and keeps track of any missing data.

After the data ‘bucket’ was recovered from the buoy, it was connected to one of the two Data Bucket Unloader (DBU) onboard the cable handling vessel. There the data was copied onto the DBU station's hard drive and converted to SEG-Y format. Once the data was read into Vista processing software and verified, a seismic data backup tape in SEG-Y format was output (referred to as the "raw" tape).

After creating the raw data backup tape, the data was deleted from the bucket and the bucket returned to the "available" bucket pool ready for redeployment.

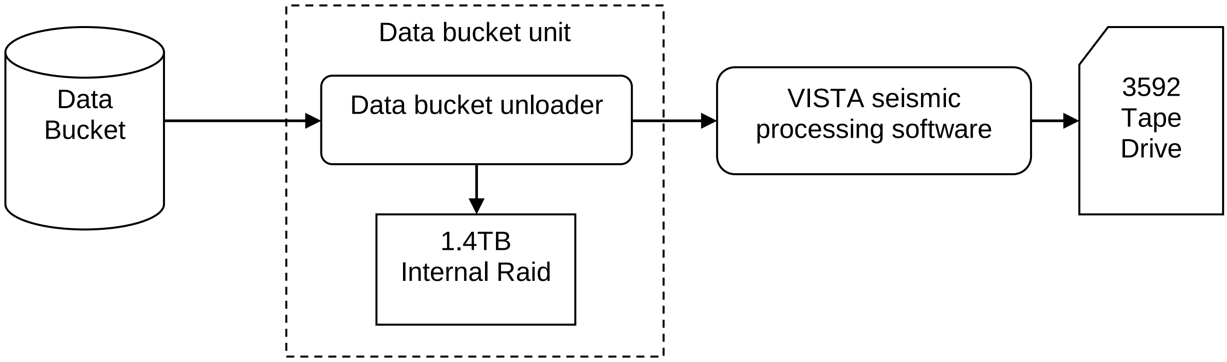


Figure 31. Configuration of data retrieval system

6.1 Raw data retrieval/transcription (DBU)

The primary function of the DBU process is as follows:

- Hardware/VSO database interface for retrieving buoy data and storing on RAID media
- Conversion from VSO buoy storage media format to SEGY format
- 3-C Data rotation (VOR) (figure 30)
- Horizontal Polarity reversal (HPR) (figure 31)
- Output of SEGY disk datasets for input to VISTA offline processing system

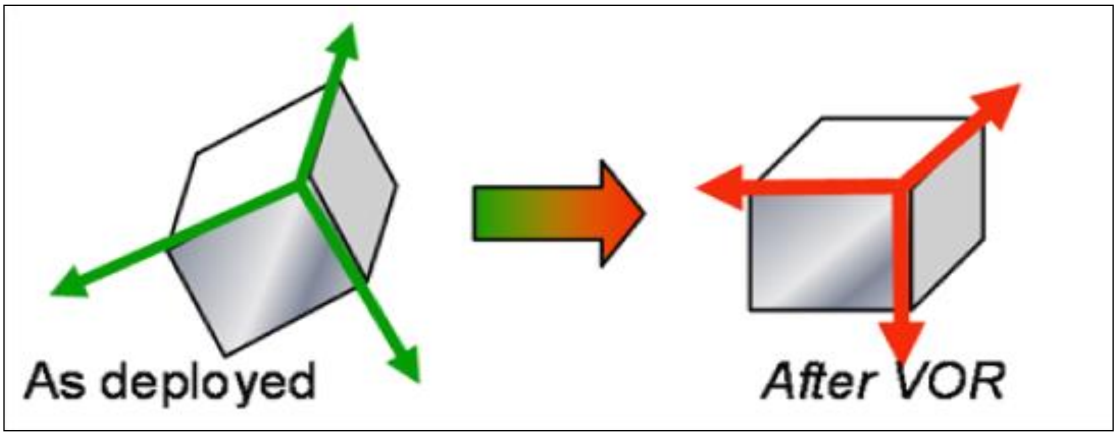


Figure 32. VOR Correction

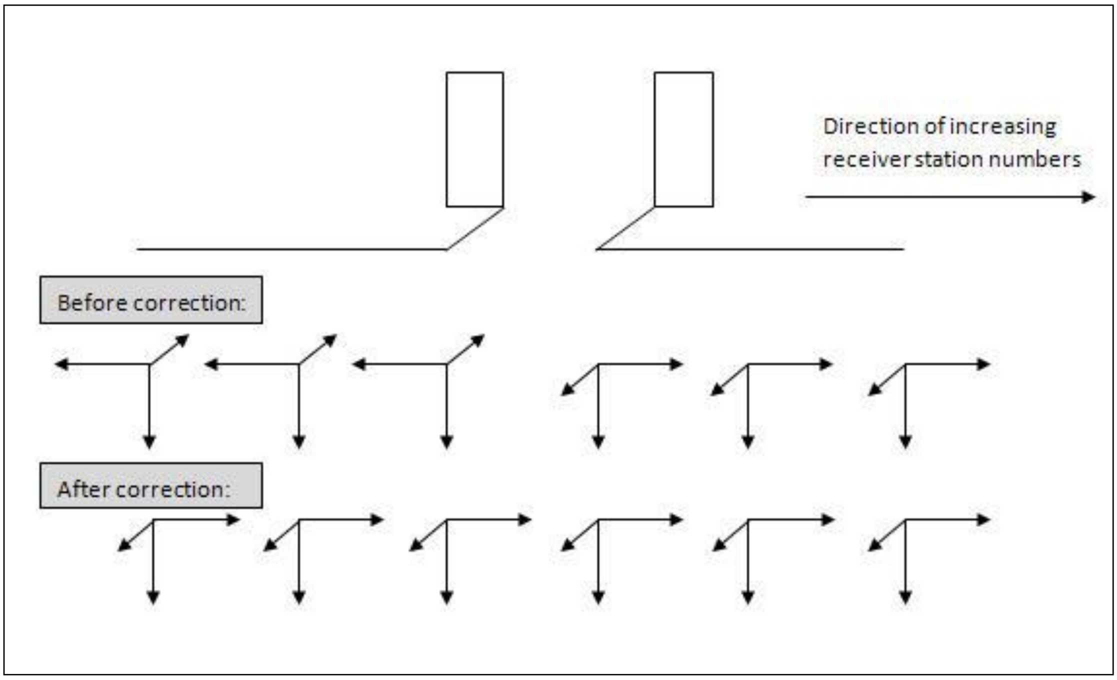


Figure 33. HOR Correction

7 OFFLINE QC

The offline QC effort utilizing the VISTA 3D software package was the primary function of the onboard data QC department. The focus of the QC effort can be summarized by the following 4 primary goals:

- that all recorded seismic data was completely downloaded from the data buckets and accounted for (trace accounting)
- that final SPS navigation data (source and receiver positions) was correct and error free
- that the seismic data met contract requirements with regard to acquisition and data quality
- that all final SEGY client tapes contained the correct information and were complete

To facilitate the accuracy and coordination of this effort, all QC processing was performed on a Receiver Line (RL) basis.

7.1 DBU (Data Bucket Unloader) Data Input

The raw data stored on the DBU machine raid drives were read directly into the Vista QC processing machines, merged with preliminary receiver SPS data from navigation and prepped for offline data QC. This preparation process involved the creation of several individual QC datasets that were used in the subsequent QC steps. These output QC datasets included:

1. Near trace data (-1000 to +1000 meters offset or more, depending on the water depth)
2. FB pick ASCII file (passed to navigation for shot and receiver positioning, Hy only)
3. Spike QC dataset
4. DBU post-plot (for aerial display of the initial shot and receiver locations)
5. Missing Shots dataset (for interactive graphical display of all shots for a given RL)
6. VOR edits dataset
7. Raw dataset including every 8th receiver
8. Raw dataset including every 15th FFID
9. Raw dataset including all recorded data for a given RL (for use in final SEGY tape output)

The above datasets had minimal processing applied that included only data sorting for the specific QC process, data resample to 4 msec. and in some cases a 4-94 Ormsby band-pass filter application.

7.2 Data Trace Accounting

7.2.1 Initial Trace Accounting

Using the Raw dataset for a given receiver line that included all recorded data, the data were sorted by sequence and the total number of traces for each sequence were carefully checked against the theoretical number of traces expected based on the acquisition parameters. The theoretical number of traces can be determined by the following simple equation:

(Number of shots) x (Number of ground stations) x (Number of Components)

After considering the number of NDR (no data recorded) shots present for the receiver line, any discrepancies were thoroughly investigated to ensure that no data were lost during the data download. Trace account discrepancies were crosschecked against the Acquisition logs, Navigation Department QC log, and the VSO web interface. All trace accounting information was entered in the QC Log spreadsheet.

7.2.2 Missing Shot Data Check

After the initial trace accounting was performed, an interactive cross-plot of the shots (shot point number) versus sequence number was displayed. Shots that were missing from the cross-plot were missing from the receiver line dataset and were checked against expected NDR shots and edited (bad) shots in the Acquisition logs. As before, all missing shots were accounted for and documented in the QC Log spreadsheet before the QC process continued.

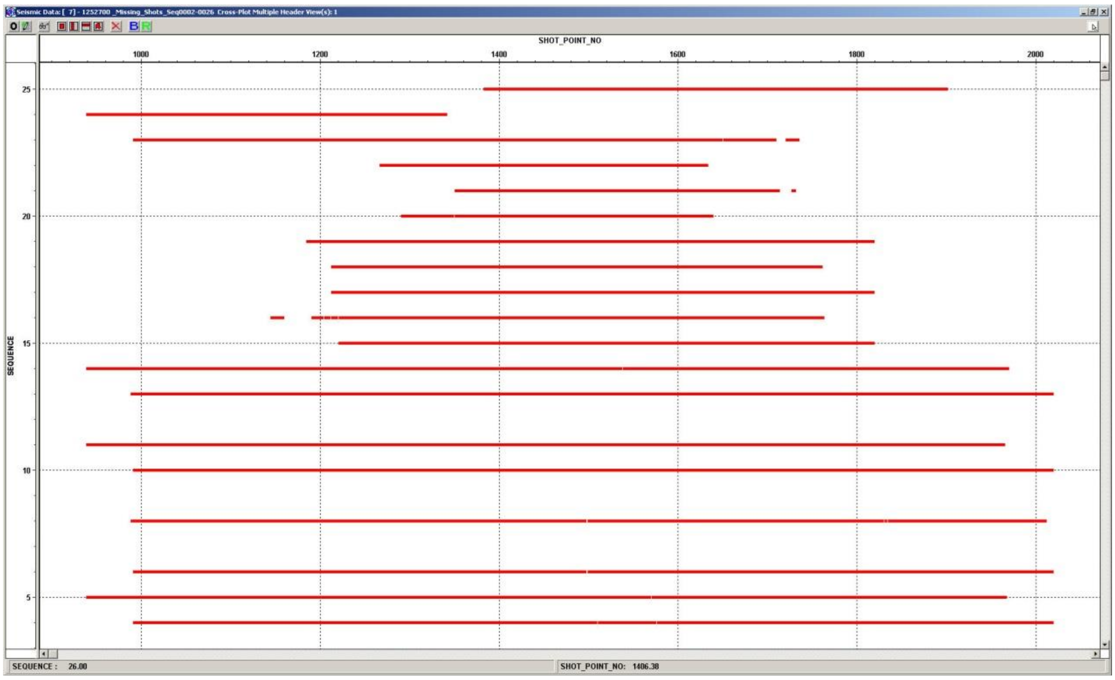


Figure 34. Missing shot point display

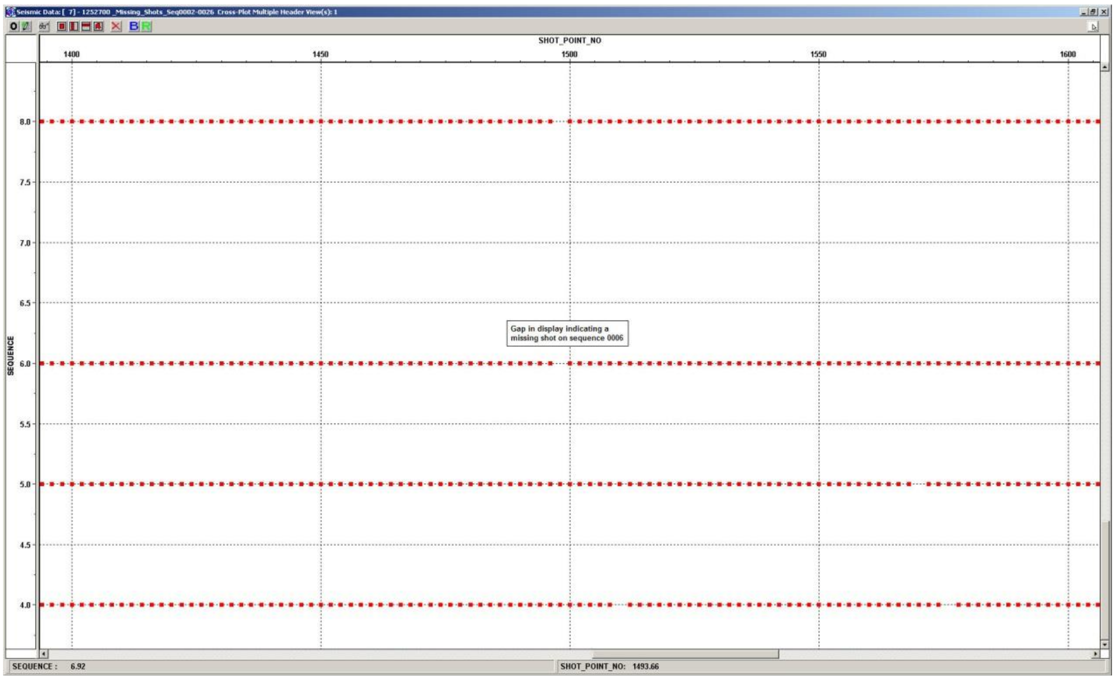


Figure 35. Zoomed display showing missing shots

7.3 QC Data Analysis

7.3.1 Frequency Analysis

F-X analysis displays were produced for each receiver line to check the signal content while monitoring the water layer reverberations within the spectrum. Their main purposes were to ensure that the contract requirements with regard to spectral content were satisfied and that the signal bandwidth was generally consistent between lines. In addition, these analyses are also a good indicator of any electrical interference present in the cables. In most of the F-X displays noise from the propellers of the source vessel could be seen in the near offsets. The noise appeared on all four components and covered the full frequency spectrum with slightly higher lower frequency amplitudes.

Four analysis displays were produced and included:

- Common shot P-wave (Hydrophone and Vertical accelerometer)
- Common receiver P-wave (Hydrophone and Vertical accelerometer)
- Common shot C-wave (IL and XL components)
- Common receiver C-wave (IL and XL components)

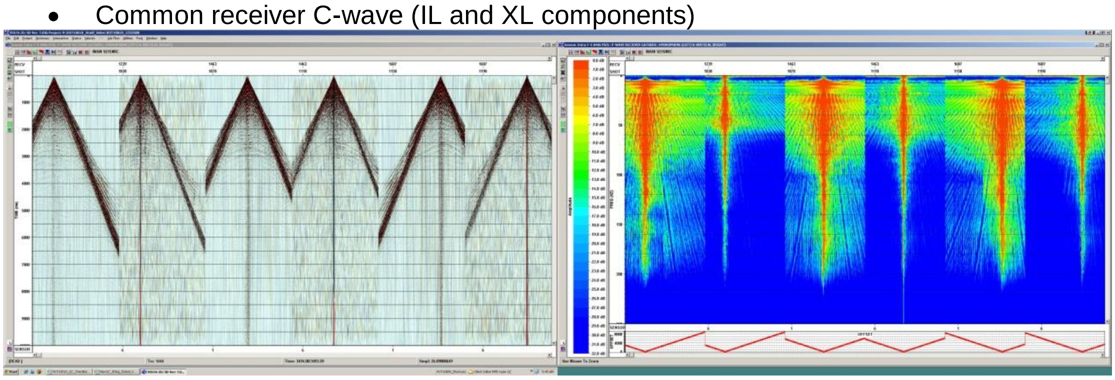


Figure 36. Common Receiver FX display of Hydrophone and Vertical Accelerometer

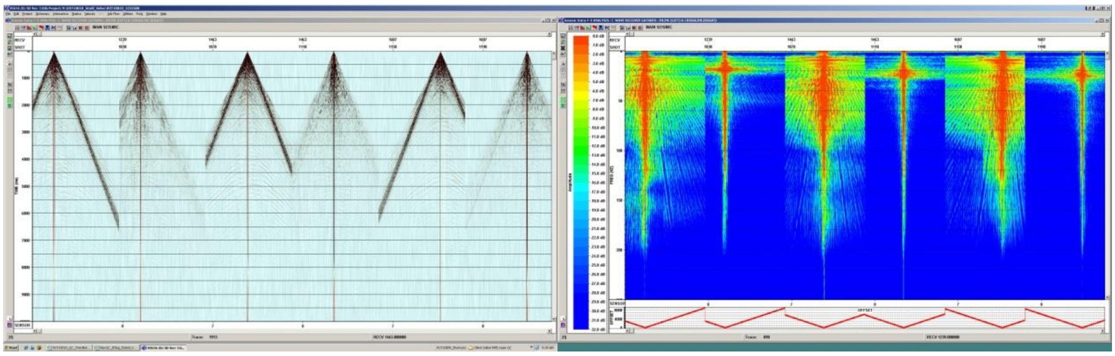


Figure 37. Common Receiver FX display of Inline and Xline Accelerometer

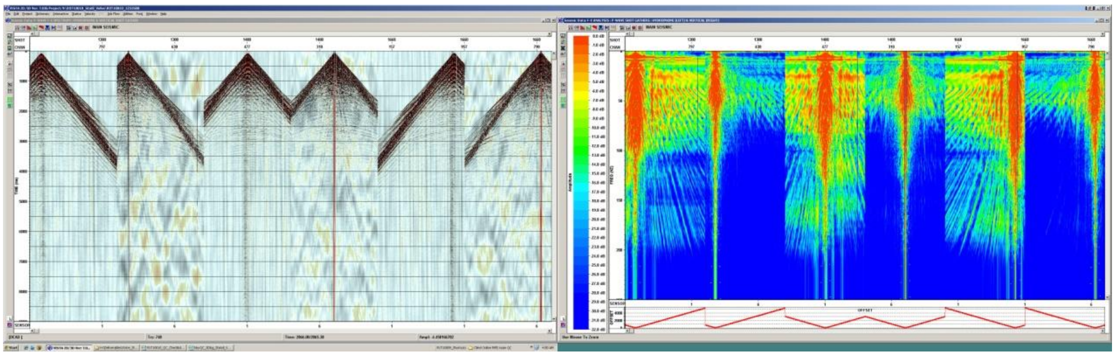


Figure 38. Common Shot FX display of Hydrophone and Vertical Accelerometer

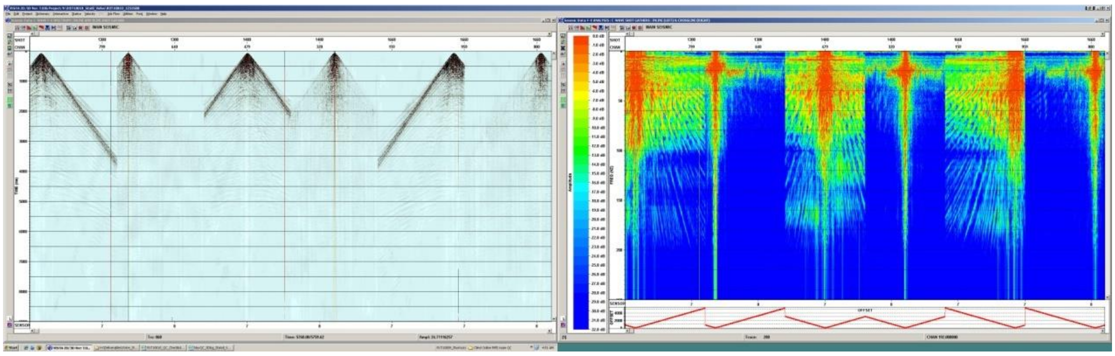


Figure 39. Common Shot FX display of Inline and Xline Accelerometer

7.3.2 Bad Shot Identification

All shots for each sequence contributing to a given receiver line were decimated and displayed for an initial review of overall data quality and to determine bad shots for editing. It was also utilized to identify the presence of noise phenomena such as spiking/electrical leakage, parity errors, seismic interference (SI), and boat/tanker noise. All shots that displayed timing errors, auto-fires and misfires were entered into the acquisition logs and flagged in the SEGY headers for editing. These identified bad shots were cross checked against the Acquisition logs with additional edits added to these logs if necessary.

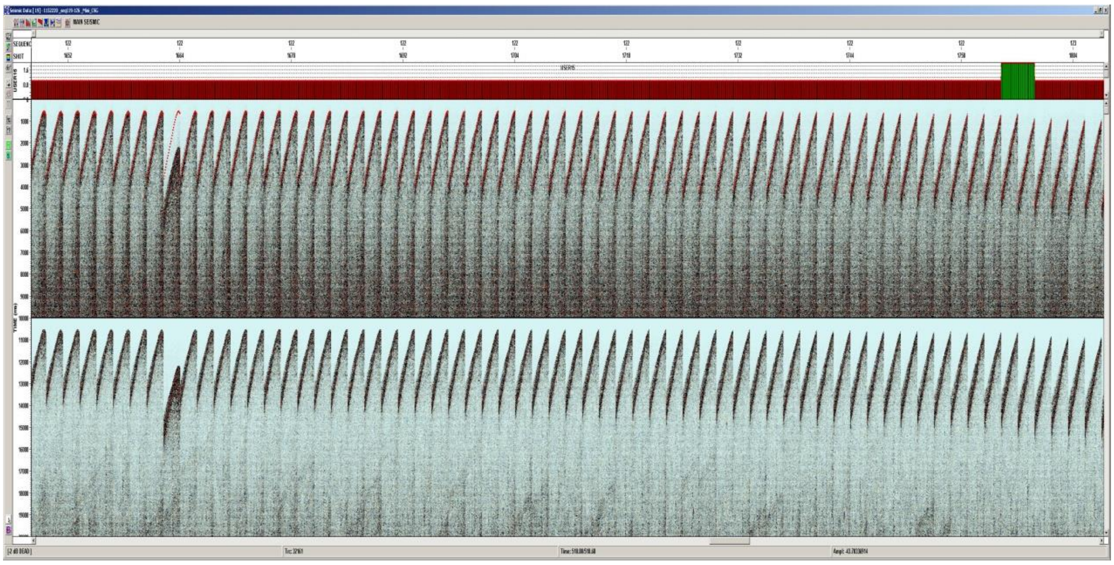


Figure 40. Decimated hydrophone and vertical component shot gathers. The bar graph at the top of the display is used to indicate the production range (red) and first or last shotpoint (green). A buoy timing error can also be seen towards the left on the display. Example from receiver line 1152220.

7.3.3 Bad Channel Identification

This QC was performed on every acquisition sequence by visual inspection of common receiver gathers for each component. The receivers that were consistently noisy, weak, dead or otherwise bad were flagged and added to the list bad receivers on the acquisition log. A list of these edits can also be found in the provided text edit files included as part of the client deliverables. A distinction was made in the channel edit files between those channels which were bad due to instrument problems and those failing due to environmental or external sources.

Note that these edit files and header flags are meant to be a guideline for the processing contractor. The channels have been flagged in the field on the basis of noise and instrument specifications provided by the client. The actual number of traces requiring editing will be a function of the techniques employed by the processing contractor. Edits were flagged for the entire node (i.e. 4 components) if one of the components was bad.

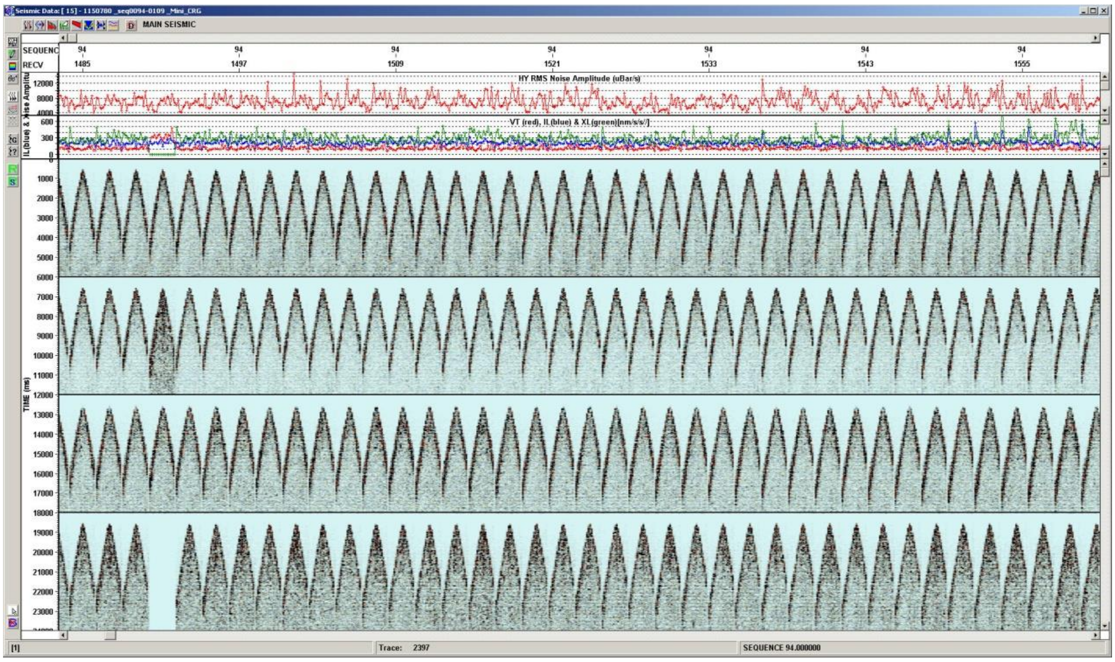


Figure 41. Hydrophone (top), followed by vertical, IL and XL component receiver gathers. A dead accelerometer node is present, RL1150780.

7.3.4 Polarity QC

The purpose behind this QC was the identification and verification of any channels that were recorded with the incorrect polarity. It was also used to confirm that the VSO system adhered to the Society of Exploration Geophysicists (SEG) multi-component polarity standards (GEOPHYSICS Vol. 67. p1028-1037). The forward line direction is in the decreasing receiver station direction. The VSO co-ordinate system is right handed.

• X (inline): The polarity is negative if motion towards high receiver station no.
(right-hand index finger pointing away from body while looking in the increasing receiver station direction).

• Y (crossline): The polarity is negative if motion towards right of cable, facing high receiver station no. (Right-hand middle finger pointing to the right).

• Z (vertical): The polarity is negative if motion is upwards**.** (Right-hand thumb pointing up). Positive polarity if motion is downwards.

• P: compression gives negative output, rarefaction caused a positive output

Near offset linear event data was corrected using LMO (Linear Move-Out) and stacked for each receiver station. The offset range of the pre-stack data is determined by the event being stacked.

This display was also used to determine any receiver station electrical faults. A receiver stack display was investigated for each receiver line deployment. Any trace which was found to have a polarity reversal was corrected and flagged prior to outputting the final SEGY field tapes.

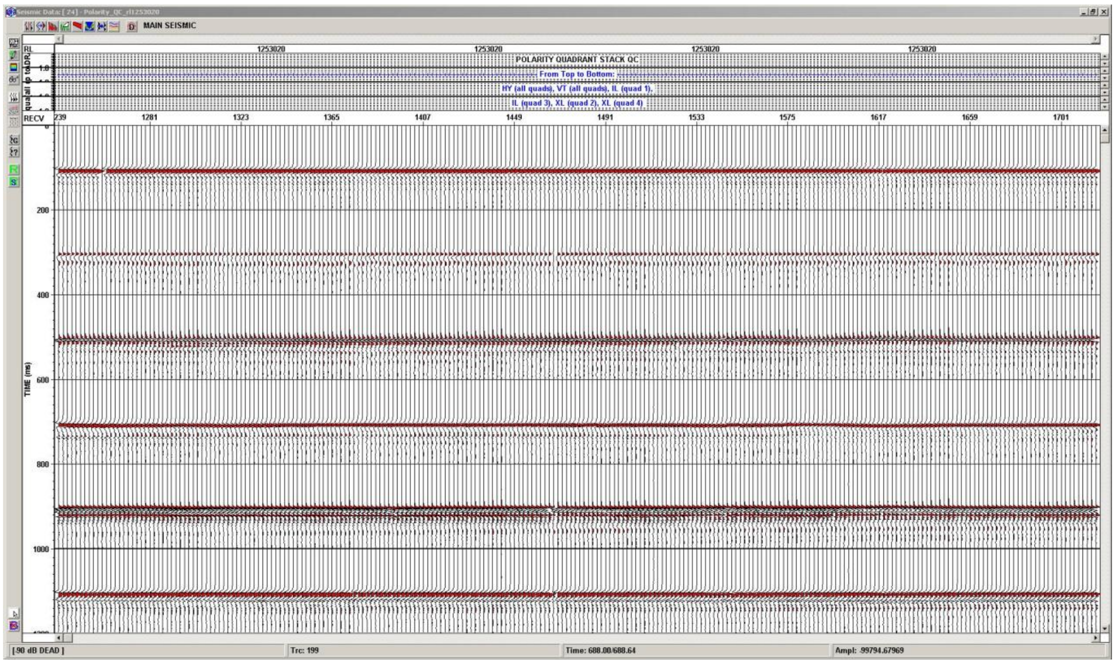


Figure 42. Polarity QC via receiver stack

Image corresponding to receiver line 1253020. On the first 200 ms the hydrophone traces are displayed. From 200-400 ms vertical component traces are displayed. From 400-800 ms inline component traces are displayed (Quadrants 1 and 3). From 800-1200 ms crossline component traces are displayed (Quadrants 2 and 4).

7.3.5 Brute Stacks

Brute stacks of the hydrophone (HY), vertical component (VT), dual sensor (HY and VT) summation, and inline component were created for every RL in the project. The data was gathered from the nearest Sail-Line adjacent to the RL to ensure near offset contribution. The hydrophone and summation stacks were representative of the P-wave data while the inline stack was representative of the C-wave data. All stacks were displayed in full time and the displays were provided as client deliverables.

7.3.5.1 P-Wave Stacks

The following brute stack processing flow was applied to both the hydrophone and vertical accelerometer data:

- Brute stack input (adjacent Sail-Line gather)
- Offset limit to 0-3000 meters
- Datum static correction (source and receiver correction)
- Spherical divergence correction (average regional velocity)
- Ormsby Band Pass filter (3-90 Hz)
- CMP bin grid application
- Trace mute (Top and bottom mutes)
- NMO (Stretch mute: 15 %)
- CMP stack
- Time variant scaling

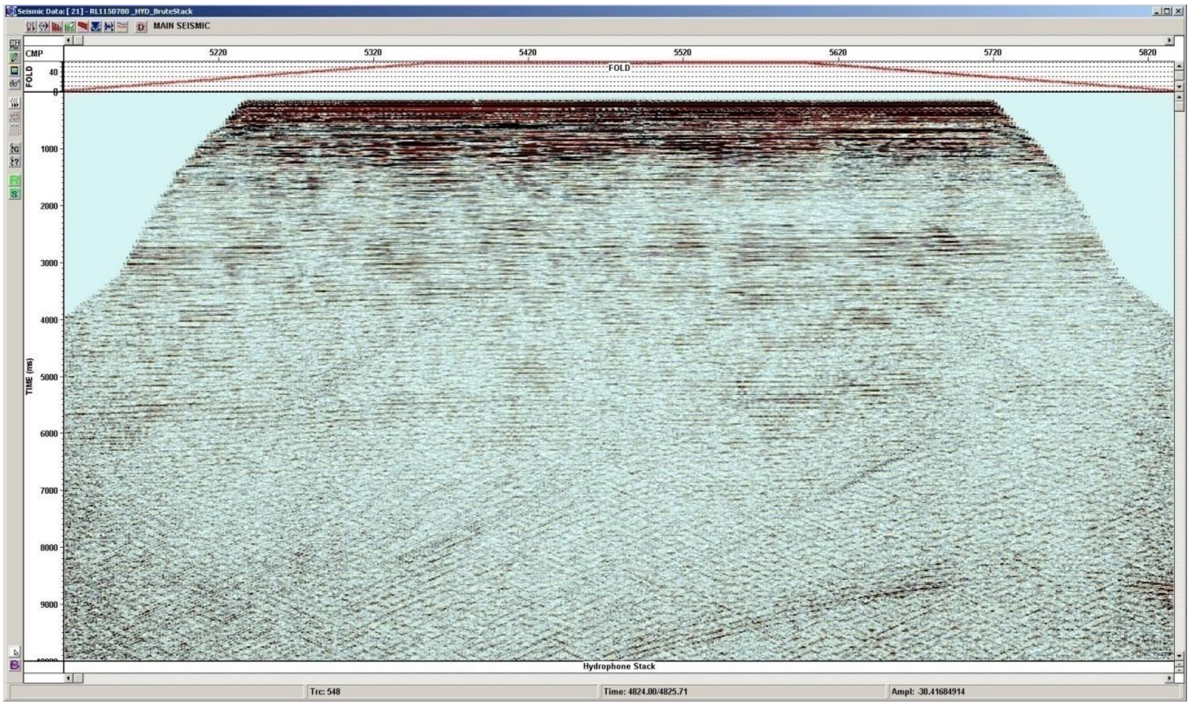


Figure 43. Hydrophone component brute stack. Receiver line 1150780.

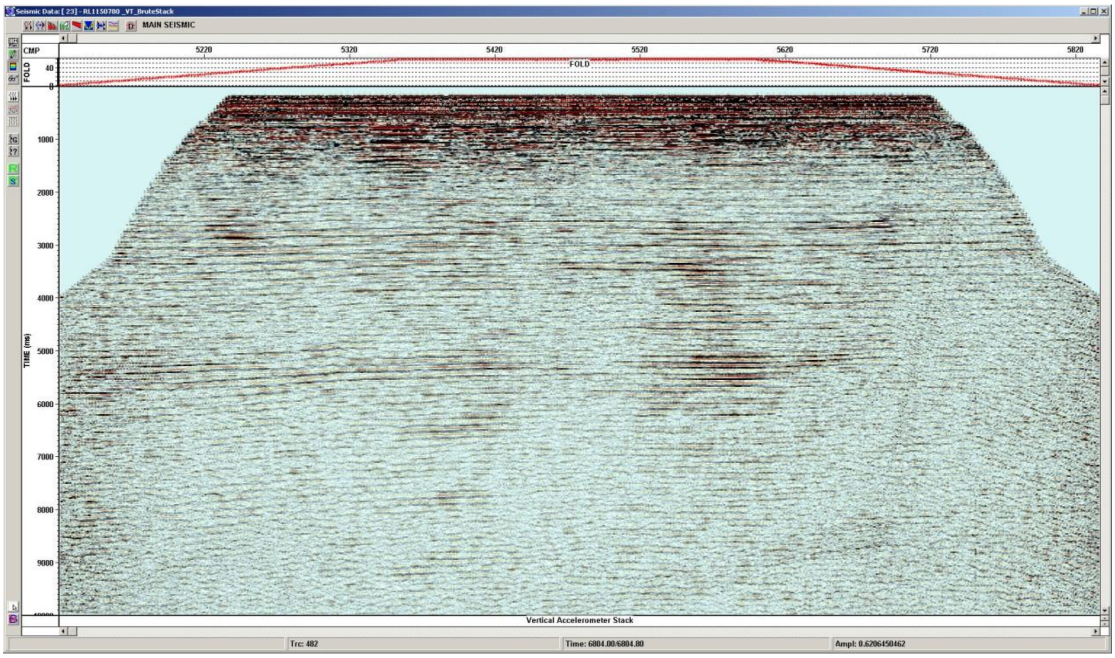


Figure 44. Vertical component brute stack. Receiver line 1150780.

7.3.5.2 HY and VT Summed Stack

The hydrophone (HY) and vertical component (VT) summed stacks were created by multiplying the VT sample values by a simple constant prior to summation with the HY data. The scalar used was 29.4. No post summation scaling was applied.

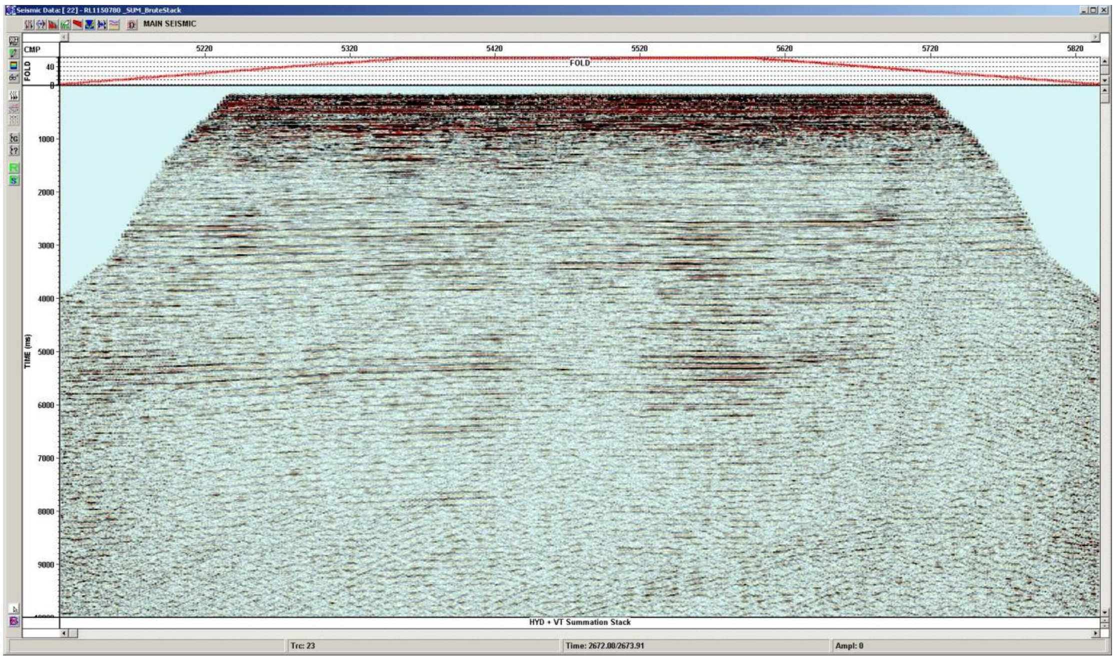


Figure 45. Dual sensor (HY + VT) summed brute stack. Receiver line 1150780.

7.3.5.3 Converted Wave (C-wave) Stack

The following brute stack processing flow was applied to the inline component:

- Brute stack input (adjacent Sail-Line gather)
- Offset limit to 150-3000 meters
- Datum static correction (source and receiver correction)
- Spherical divergence correction (average regional velocity)
- Ormsby Band Pass filter (3-90 Hz)
- Trace mute (Top and bottom mutes)
- CCP bin grid application
- Data sort (In-Line)
- CCP 3D stack
- Time variant Band Pass filter

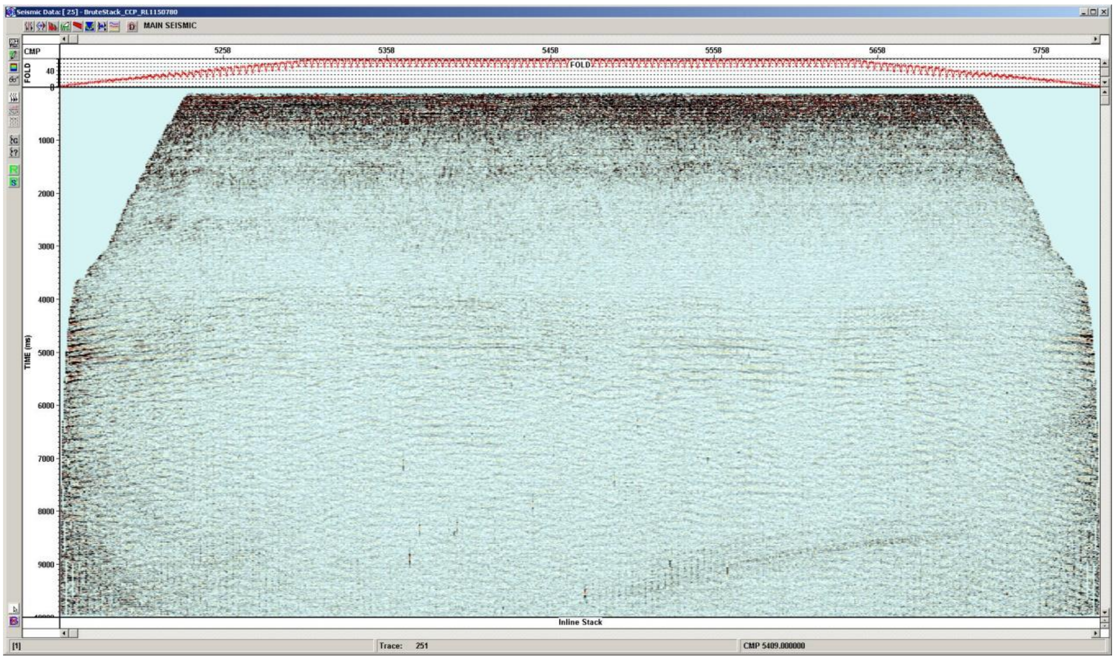


Figure 46. Inline converted wave brute stack. Receiver line 1150780.

7.3.6 RMS Decay

Statoil required an RMS shot decay analysis at the start and end of line. Due to the short interval inherent in OBC line changes, it was agreed with the client that there would be one RMS decay analysis between line changes rather than two unless there was a prolonged line change for some reason, i.e. weather downtime, equipment repair, etc.

Statoil's procedure for the shot decay analysis was to record a shot for 30s and then have a running RMS analysis for each component to evaluate how quickly and to what background the RMS level decayed. In practice, a 10s shot record was taken followed by two 10s noise records were combined in processing to create a pseudo 30s record. A graph and a text file of values were output which contained the overall running RMS average, the RMS average for nodes 1-120, and the RMS average for nodes 121-240. An example graphical output can be seen below in figure 45.

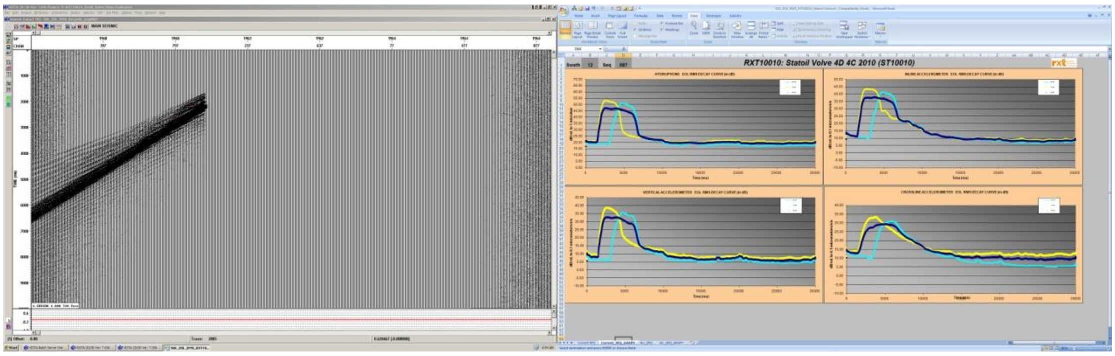


Figure 47. Example RMS decay. The decay data is displayed on the left and the RMS running average for all four components are on the right. The light blue curve is nodes 1-120, yellow is nodes 121-240, dark blue is the entire cable nodes 1-240.

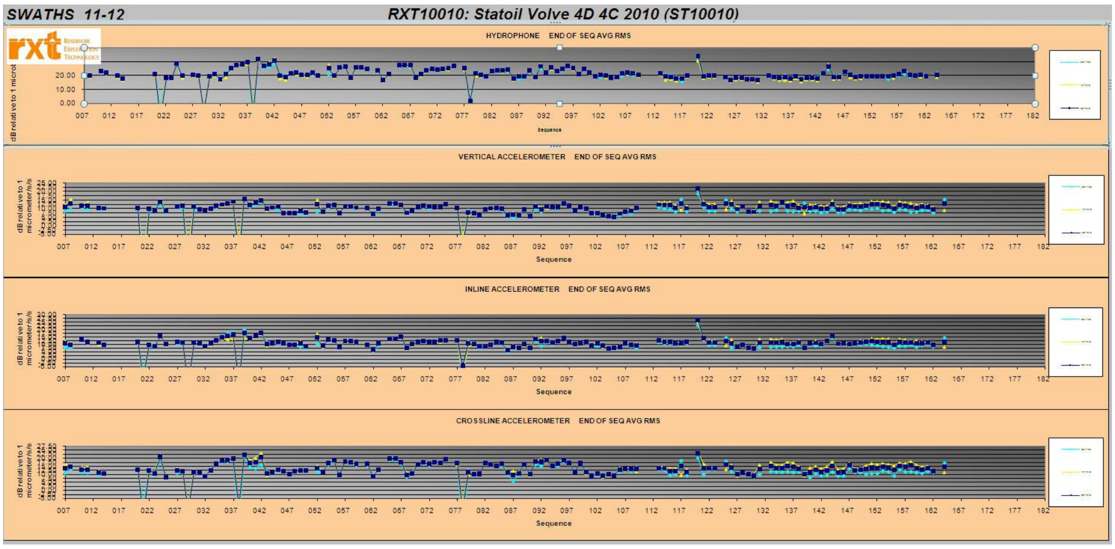


Figure 48. Combined RMS decay plot for all sequences.

7.4 Geometry (Source and Receiver positions) and General QC

One of the most important goals of data QC was to ensure that both shots and receivers are positioned correctly. Therefore, special attention was paid to the process of data positioning and any problems encountered were discussed promptly with the navigation department. Two processes were utilized for receiver line (RL) data positioning QC that included primarily Quadrant stack creation, display and analysis as well as the VISTA software RLP (Receiver location prediction) package performed as a secondary QC step. For the shot position QC, LMO corrected common receivers were gathered by shot point ensemble and summed for display and analysis.

7.4.1 RL Quadrant Stack QC

Utilizing the Near Trace dataset as input, four 90° quadrants were defined surrounding a receiver station with the receiver line direction pointing towards quadrant 1. Since the project RL orientation was 104° from true north, the quadrant boundaries (again from true north) were defined as:

- Q1: 59.0 – 149.0 Degrees
- Q2: 149.0 – 239.0 Degrees
- Q3: 239.0 – 329.0 Degrees
- Q4: 329.0 – 59.0 Degrees

Quadrants 1 and 3 were defined as In-Line and Quadrants 2 and 4 were defined as Cross-Line. The following diagram shows the quadrant specifications for the project:

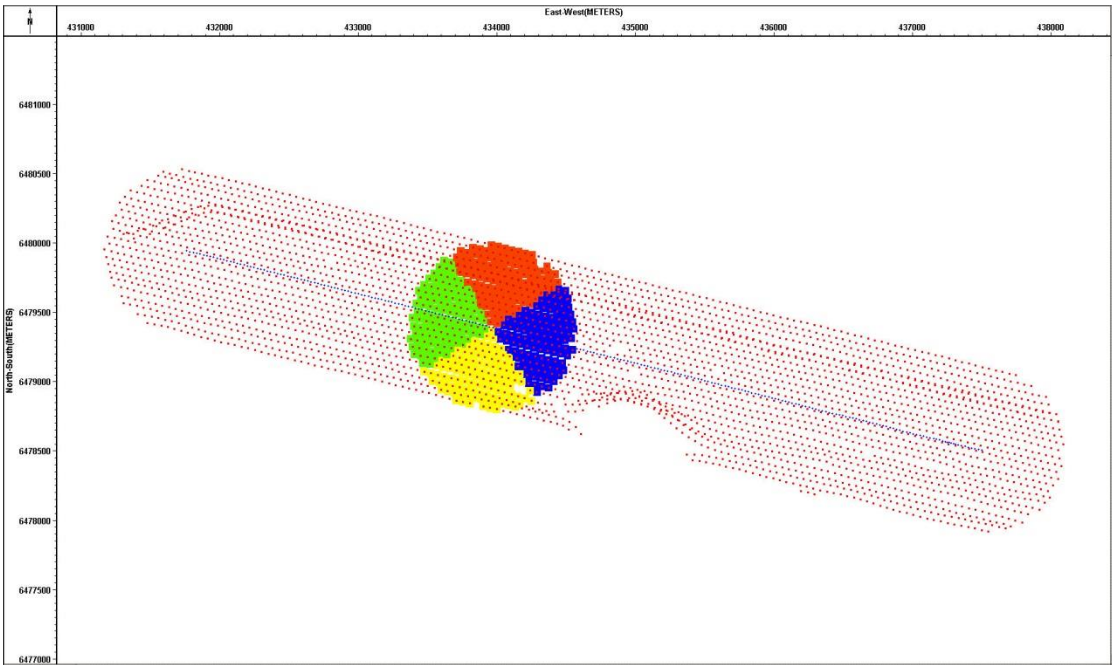


Figure 49. Quadrant definition

Blue=Quadrant 1, Yellow=Quadrant 2, Green=Quadrant 3, and Red=Quadrant 4

Using a single velocity layer approach, the Near Trace data were LMO corrected and stacked for each quadrant. The stacked data was first break picked and the pick times of opposing quadrants compared to establish positioning errors. A composite display was created with all four stacked quadrants (2 In-line and 2 X-Line) displayed with the In-Line and X-Line total error plotted graphically. The stacked quadrant data were checked for overall conformity and "flatness" and were also analyzed for uniform phase shifts that would indicate potential receiver timing problems..

The following representative display shows the stacked quadrant data with all 4 quadrants indicating a smooth flat character that is indicative of proper receiver positioning.

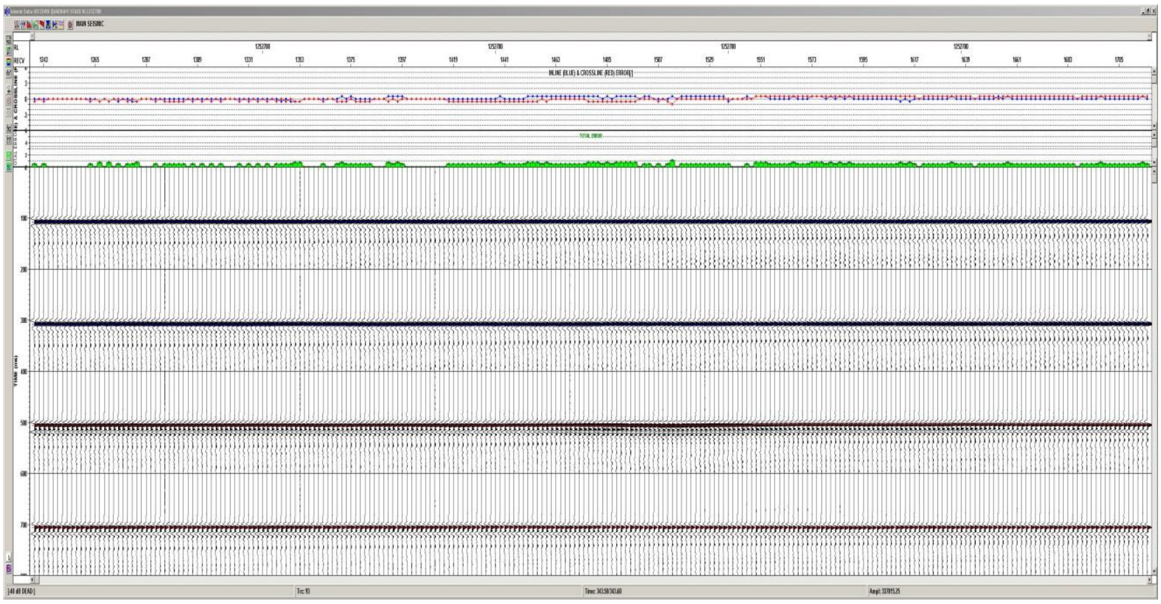


Figure 50. Quadrant Stack QC Display, RL1252700. Indicated errors are less than 1m.

If any anomalies or "busts" are observed in any one of the four displayed quadrants, the navigation department is informed and a new RL solution is solved and passed back to the QC department. This process is iterative until an acceptable RL solution is obtained.

7.4.2 Receiver Location Predictor

A second method of receiver position verification used relied on individual FBP times rather than stacked FBP times. This method utilized Vista's Receiver Location Predictor tool or RLP. This tool required accurately picked FBP to invert receiver position based on fixed shot positions. An example output is given as Figure 49.

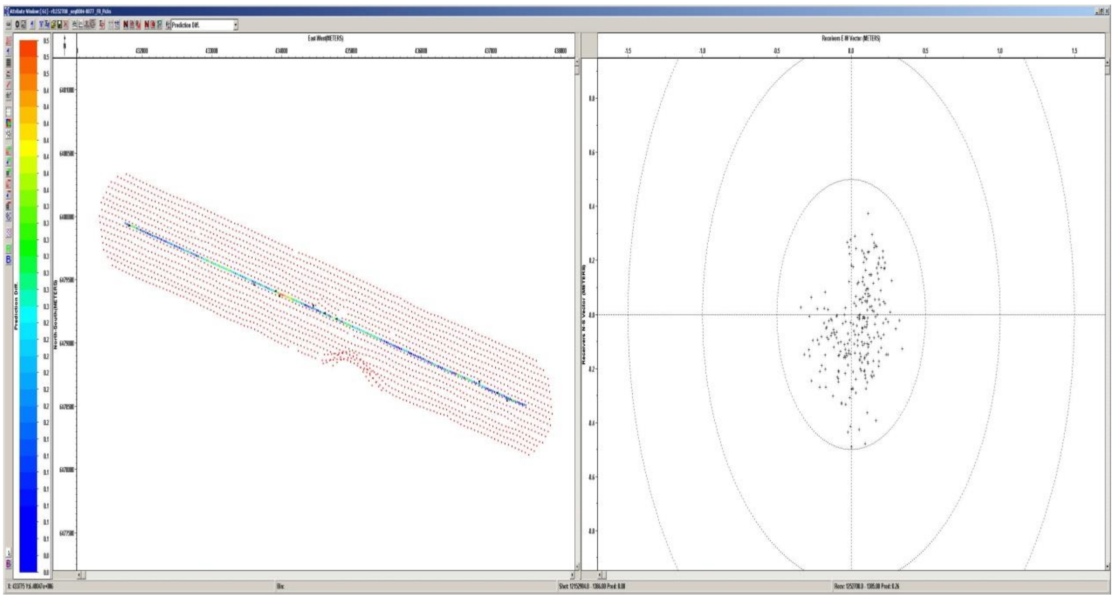


Figure 51. Output from Vista's RLP tool from RL1252700. Predicted error less than 1m. The left side of the figure is a post plot showing direction of error on a ground station basis and the right side is a bull's eye diagram showing overall error.

The well distributed azimuths and offsets led to very accurate receiver positions.

Final Receiver Line Geometry QC results:

Receiver positions for the project were solved with a maximum error tolerance of 3 meters for the four extracted quadrants (2 inline quadrants and 2 crossline quadrants). All receiver positions that were observed to be outside of this maximum tolerance for any given quadrant were repositioned through the iterative process explained above until an acceptable result was obtained. In conclusion, all final data delivered had receiver positions that met this criterion and for the overwhelming majority of receiver lines, solutions were found to be much less than the 3 meter maximum.

7.4.3 Source Position QC

Source positions were checked by using LMO corrected common receiver gathers (HY component). For each receiver line, 5 evenly spaced receivers were selected. Each of the common receiver gathers (all shots as recorded into a unique receiver station) were LMO corrected using the offset calculated from the processed navigation source and receiver coordinates. A velocity equal to the water column velocity was used in order to flatten the direct arrival event. These five gathers were then spliced on top of one another, providing redundancy in the shot positioning check.

The displays were analyzed for inconsistent traces, inline phase shifts, and other anomalies which could indicate problems with the source coordinates. All problems were investigated and reported to the navigation department for investigation. If problems were encountered, this process was iterated until an acceptable and accurate shot position solution was achieved.

These displays were also checked to confirm that all shots were present. The first and last shot points merged were carefully checked against the acquisition and navigation logs and missing shots and shot ranges were re-verified at this stage.

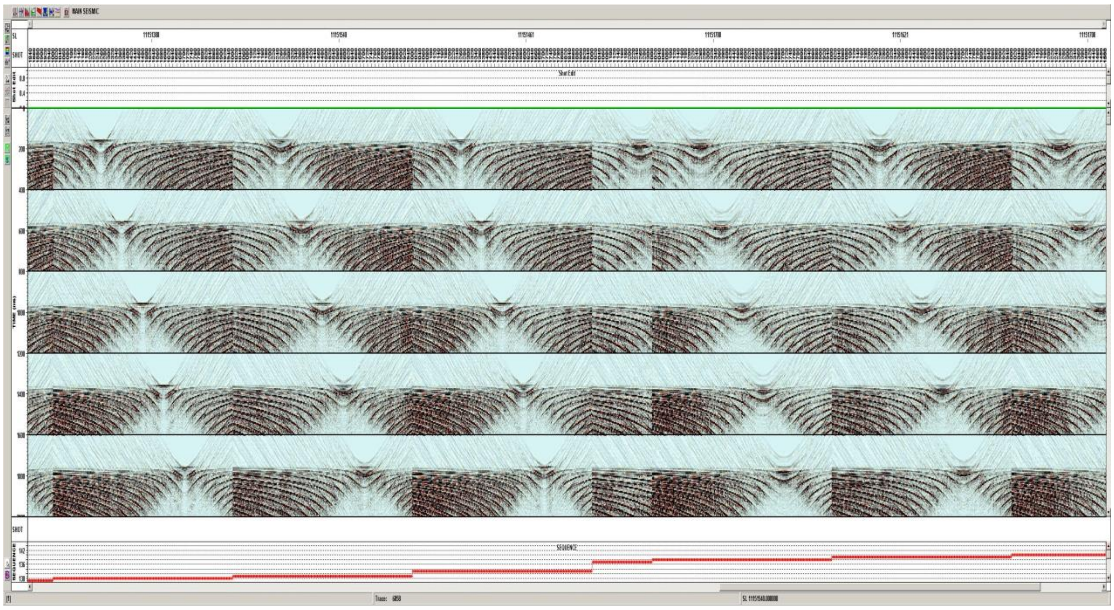


Figure 52. Source Position QC (no source position errors)

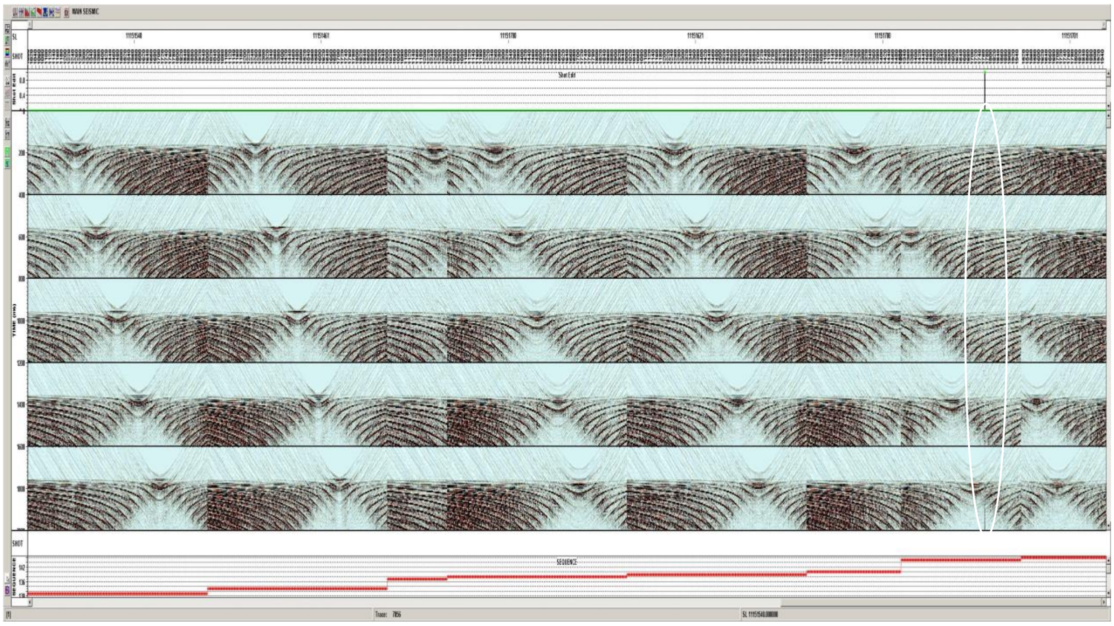


Figure 53. Source Position QC (indicating source position error)

An error in source positioning as indicated by the break along the otherwise smooth stacked direct arrivals (figure 51).

7.4.4 Client final SEGY tapes

Final client SEGY tapes were created containing one single receiver line per tape with final SPS navigation merge. The data were output to 3592 E05 500 GB cartridge tapes in IEEE floating point format. All final SEGY tapes contained both EBCDIC and binary headers.
All edits pertaining to shots, receivers, and polarity reversals were flagged in the headers but not applied. In addition, a bit to bit tape copy was made for all final SEGY tapes as a backup and for use in the SEGY tape verification step.

7.4.5 Client OBC SEGY Header Description

All final SEGY data headers (binary, EBCDIC and trace headers) were created via header templates and descriptions provided by Statoil. Thorough QC of all header information was conducted on all final data to ensure that the required header information and fields met client requirements. Header examples and listings can be found in appendices 11.4 through 11.7.

7.4.6 Navigation merge Flow

As mentioned, one of the principal aims of the onboard QC department was to ensure the seismic data on tape were properly merged with the final SPS data from navigation. Final client SEGY tapes were only created after all geometry and seismic QC steps had been completed. Strict file handling procedures were implemented to ensure the correct version of SPS data were used for navigation assignment.

The final navigation files merged with the seismic data were provided by the onboard navigation department. Please refer to the navigation final report for additional details.

Examples of the source, receiver, and relational SPS file headers are provided in appendixes 11.13-11.15 of this report.

7.4.7 Client SEGY Tape Verification

All final SEGY tape copies were read back into the processing system before shipping. Shot gathers, trace counts, post plots, water depths displays, fold displays and limited offset cube datasets were created from output from the SEGY tape verification flow. These QC datasets were thoroughly examined to ensure that all information regarding the RL was correct.

7.4.8 Post Plot

Within the navigation merge final SEGY tape output flow an output header dataset was created in the VISTA database in order to graphically verify the correct co-ordinate assignment. A postplot display of all shots and receivers was generated by reading the final SEGY tape. This was used to check the overall validity of the shot and receiver positions, as well as to check that all data were properly recorded and merged.

In these postplot displays, source locations are shown in red, while receiver stations are shown in blue.

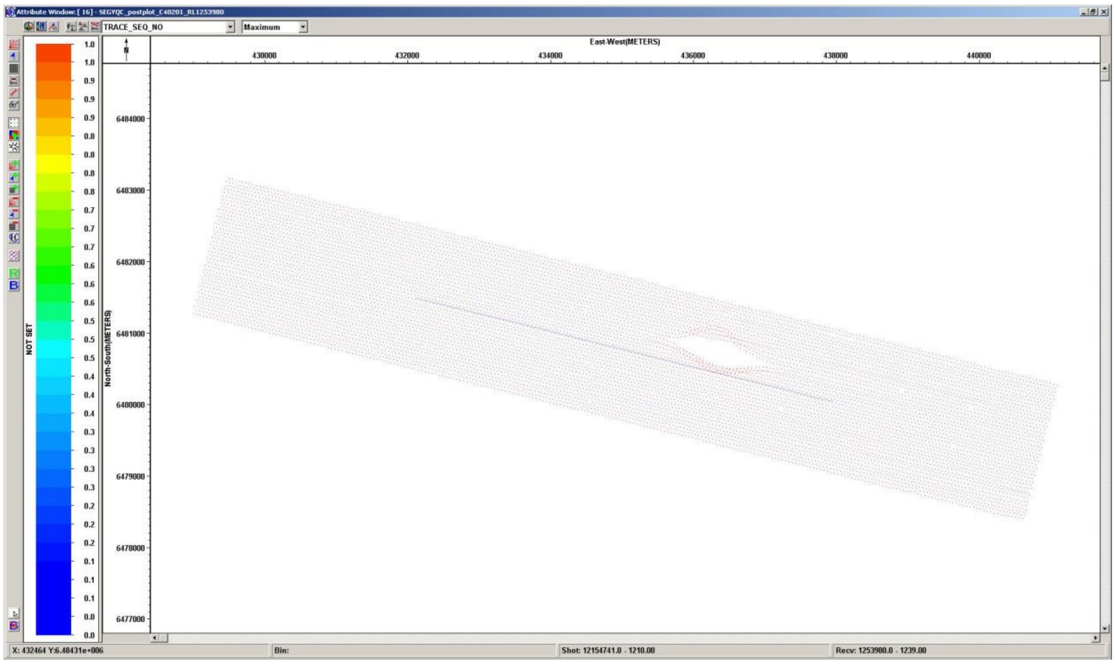


Figure 54. XY post plot extracted from client SEGY tape headers, rl1253980

7.4.9 Trace Accounting

After the final SEGY tape was input to VISTA, the trace count file was checked to verify the number of traces passed for each sequence. These trace counts were then compared to the theoretical number of traces and any discrepancies investigated. The same procedure was employed for the navigation-seismic merge job. At this stage, the number of traces with edit flags in the headers were also investigated and compared to the theoretical number expected. All trace counts were logged in a QC Log spreadsheet, and any acceptable discrepancies explained.

7.4.10 Receiver line depth QC

Special attention was paid to ensure that receiver water depths were solved correctly by navigation. The basic steps of the job were:

1) Select an offset range of approximately -600 to 600 meters, hydrophone data only (near trace data input)

2) Merge with final navigation SPS data

3) Select only that shot nearest to each receiver station

4) The total offset from shot to receiver is calculated for each station using the nearest source to receiver offset and the water depth at the receiver as written in the final navigation SPS files

5) A calculated arrival time is made using this offset and the average water velocity

6) This calculated arrival time is overlain on the seismic near trace dataset

7) The difference between the calculated arrival time based on the navigation depth and offset values and the automatically picked actual arrival time as seen on the near trace seismic dataset is then calculated and displayed as an error at the top of the display

8) Any errors in excess of 3ms are highlighted in red and investigated

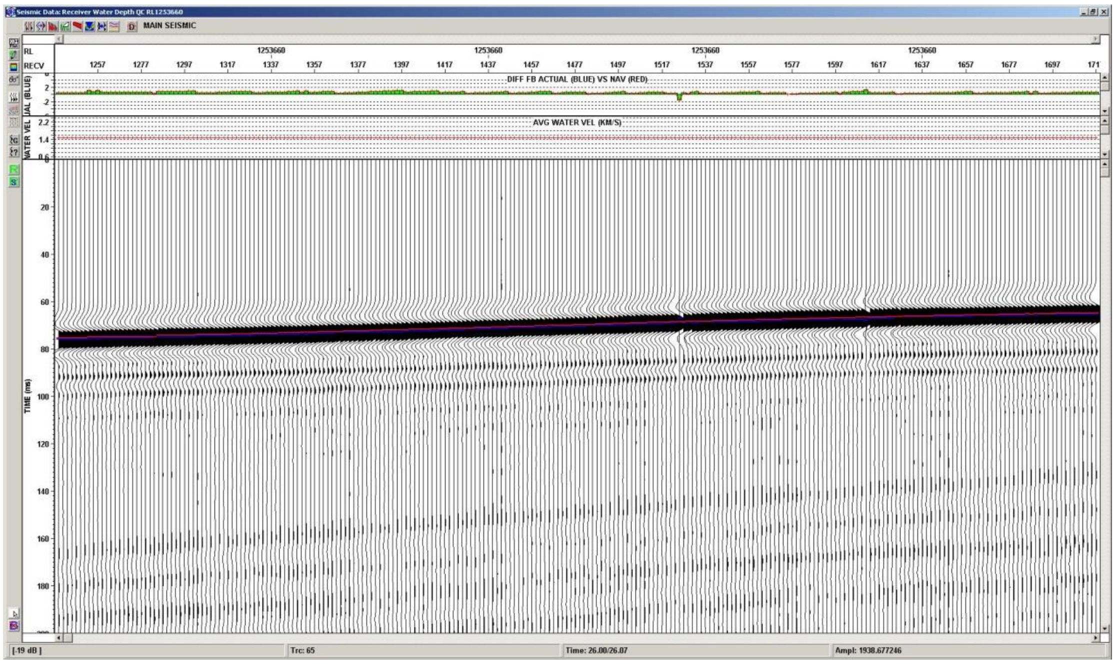


Figure 55. Receiver water depth QC, rl1253660

The above display indicates no errors in the water depths. This can be concluded by the fact that the arrival times based on water depths from the navigation SPS data and the calculated arrival times based on the near trace data using an average water velocity are within the 3 millisecond tolerance specification (green for all receivers).

7.4.11 Aerial Plot Water Depth QC (Source and receiver)

The receiver elevation, water depth at source, source depth and source elevation information was extracted from the SPS files and inserted into the appropriate SEGY data headers. This header information was then displayed spatially to check for any anomalies (Figures 54-58). All elevation, depth and tidal information as contained in the final SPS files were provided by the onboard Navigation department.

This QC was performed only as a secondary verification after the original SPS file had been created and checked by the navigation department. It was not designed to identify global survey errors, such as incorrect ellipsoids or other shifts of this nature. Additionally, it would not detect minor interpolation problems.

A diagram illustrating the water depth and tidal correction naming and sign conventions is provided in appendix 11.12. The byte locations for each related SEGY trace header and the position of this information in the navigation SPS files can also be found on this diagram.

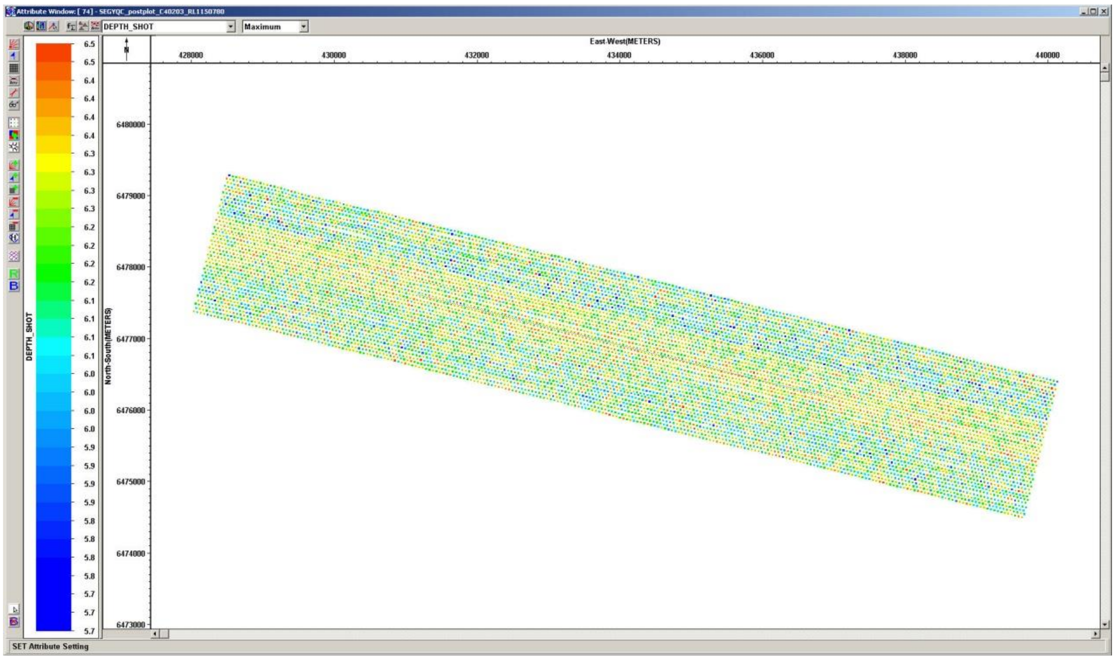


Figure 56. Source Depth QC

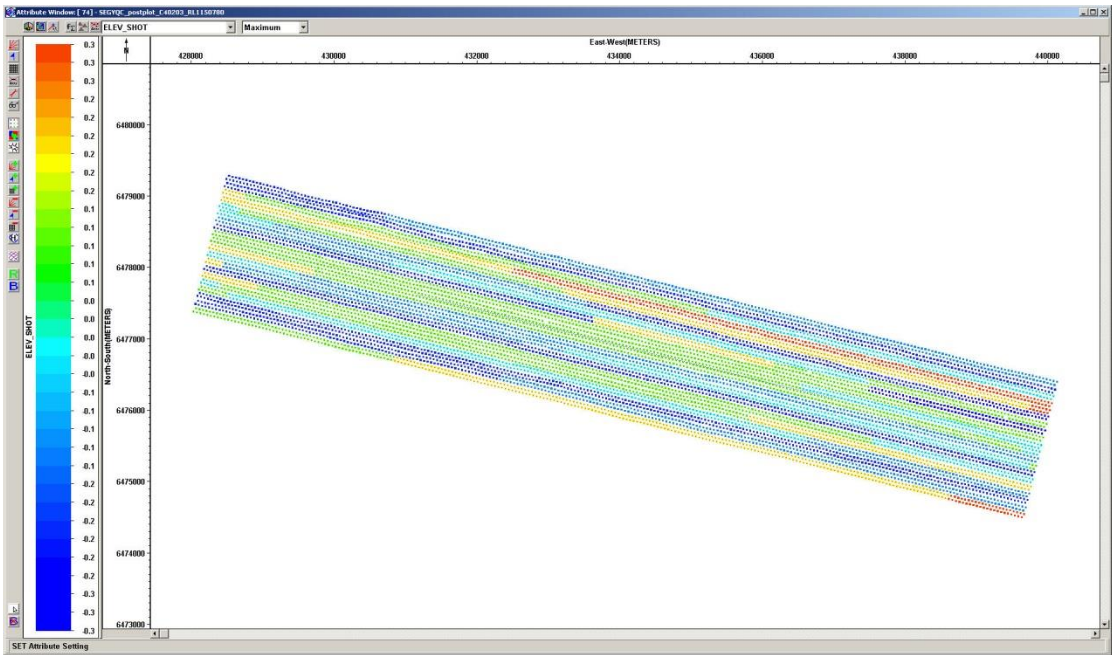


Figure 57. Source Elevation (Tide) QC

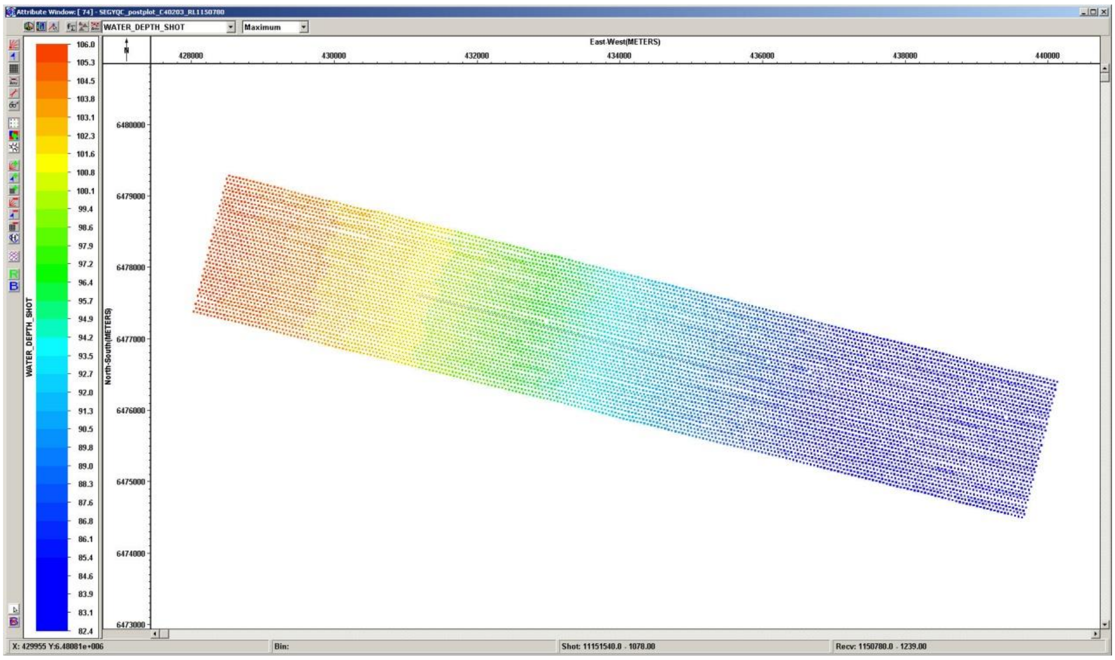


Figure 58. Water Depth at Source position QC

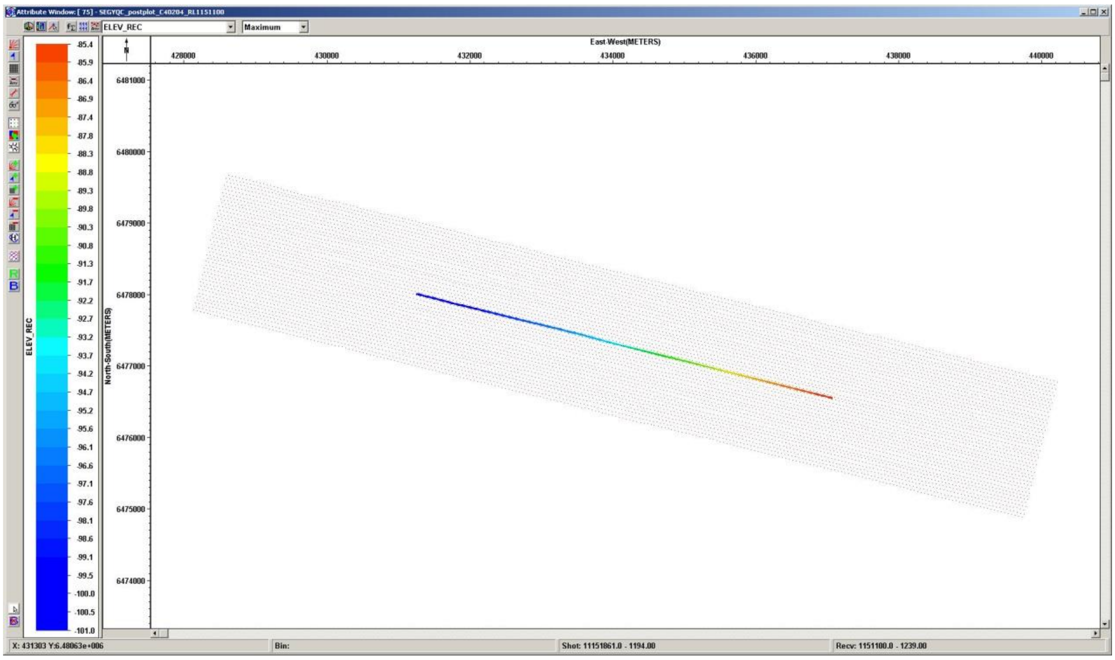


Figure 59. Receiver Elevation QC

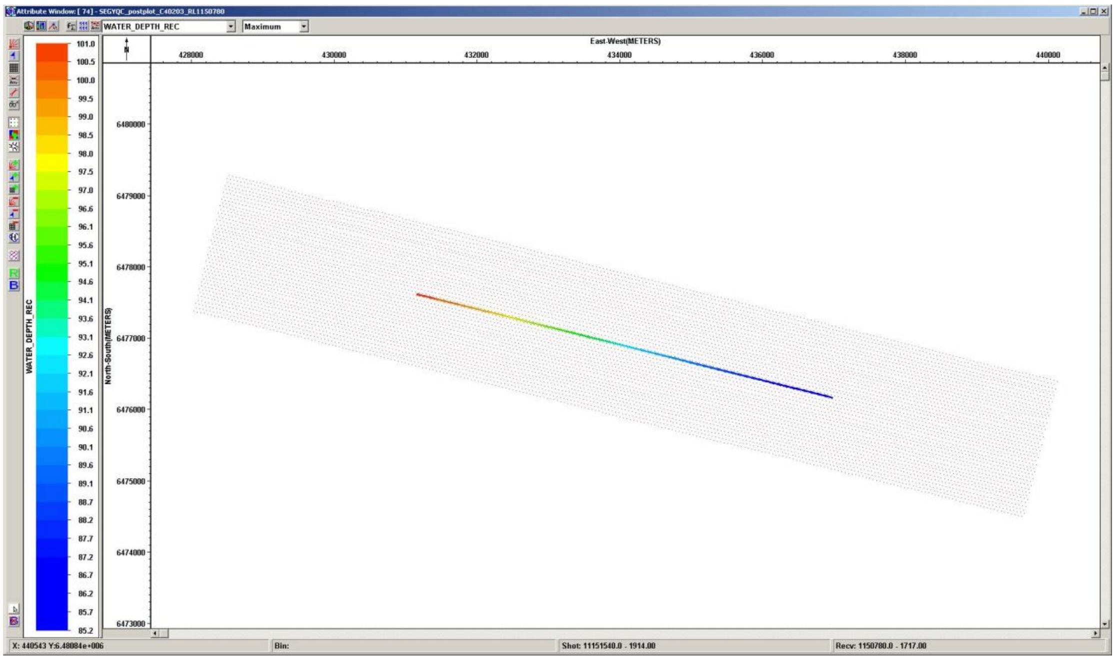


Figure 60. Water Depth At Receiver

7.4.12 Fold QC

Fold displays were created for every receiver line to ensure that all the data was written to the final SEGY tapes and that the final SPS navigation data and seismic data were merged correctly. Any variations or anomalies found in the fold coverage were investigated thoroughly with the aid of the navigation department. If needed, corrections were made and applied and the final SEGY tape written again followed by another iteration of the QC process.

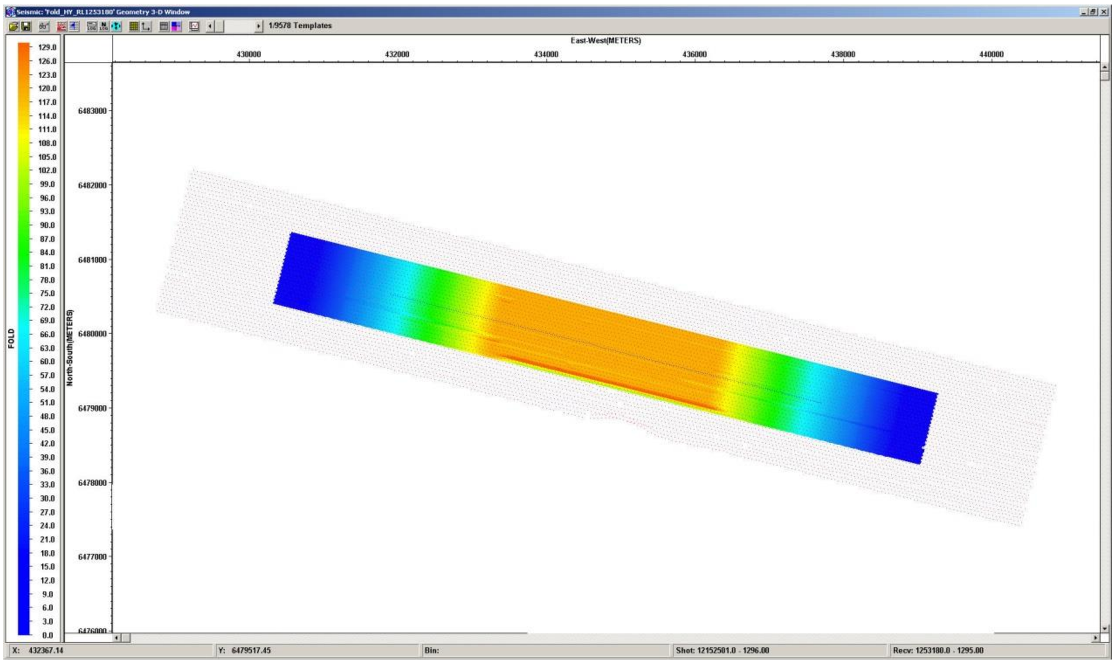


Figure 61. Fold display

7.4.13 Limited Offset 3D Cube

The main function of the limited offset cube was to ensure that the data from all individual receiver lines merged properly without any apparent coverage problems (missing data). In addition, the cube can be used to check for busts in the final navigation as well as overall data quality. It's a good initial "quick" look at the cube data volume.

To create the limited offset cube, raw data input to the final SEGY tape job was offset limited from 0 to 1000 meters. After the application of a basic pre-stack processing flow, the data was stacked and displayed interactively for evaluation. The cube was displayed in the inline and crossline directions as well as time slices. These displays were then checked ensuring there were no shifts or breaks in the data and that noticeable seismic events tied together across the entire project area.

The following processing flow was applied to the limited offset 3D cube:

- Raw data from final SEGY input (HY only)
- Offset limit to 0-1000 meters
- Datum static correction (source and receiver correction)
- Spherical divergence correction (average regional velocity)
- Ormsby Band Pass filter (1-80 Hz)
- CMP bin grid application
- NMO (Stretch mute: 30 %)
- Trace mute (Top and bottom mutes)
- CMP stack
- Time variant Band Pass filter
- Time variant scaling

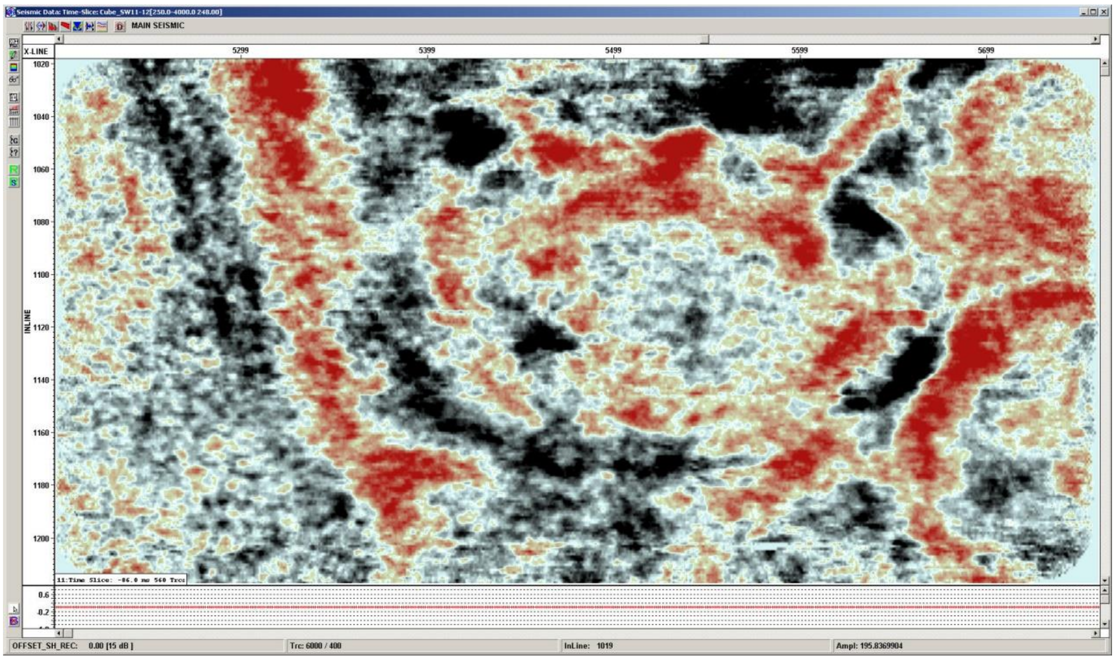


Figure 62. Limited Offset Cube time slice – 2500ms

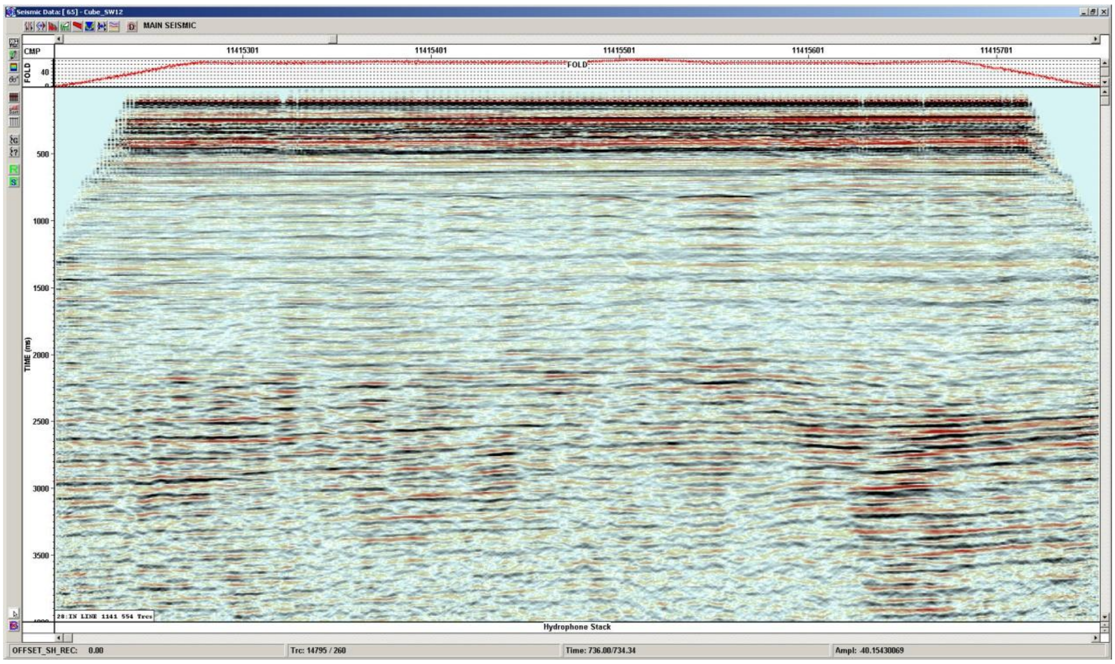


Figure 63. Limited Offset Cube inline display. Inline 1141.

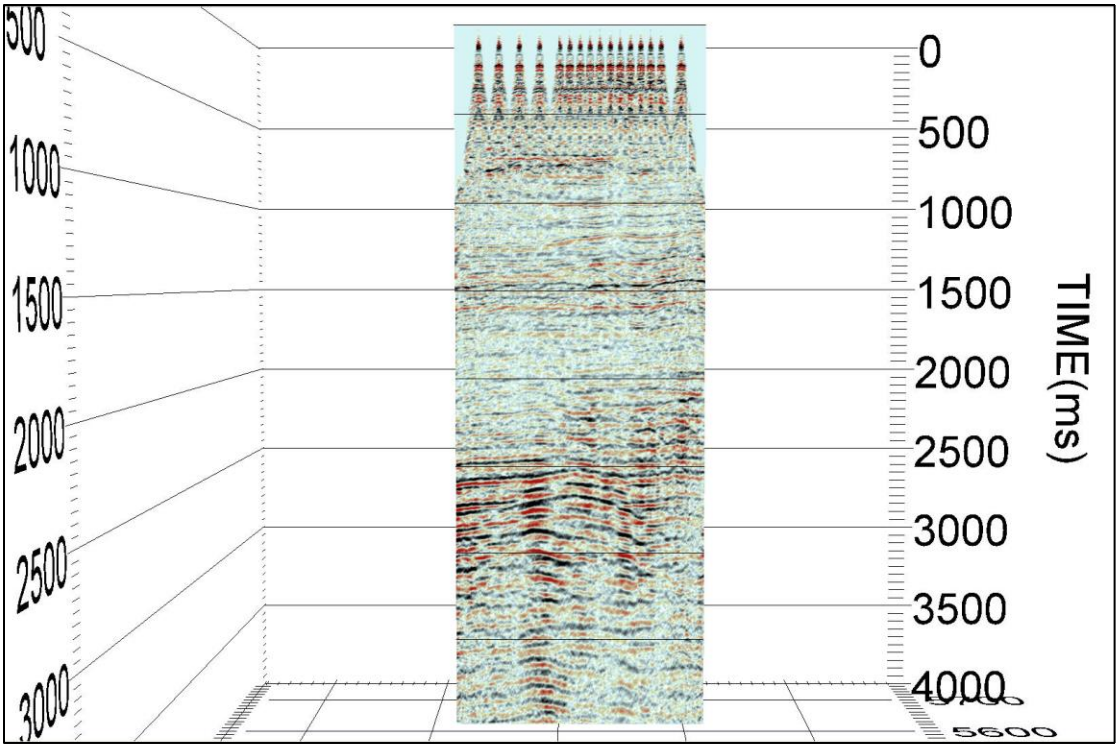


Figure 64. Limited Offset Cube crossline display. Crossline 5623.

8 SUMMARY OF SEISMIC QC DELIVERABLES

There were several client deliverables created for the project. Client deliverables consisted of both seismic data with associated QC information and documentation that included spreadsheets, acquisition logs and shipment information. A complete listing is located in appendix 11.11.

Final seismic data delivered included:

- Final SEGY tapes (IBM 3592 cartridge tapes / 1 per receiver line)
- Copy of Final SEGY tapes (IBM 3592 cartridge tapes / 1 per receiver line)
- Edit files (shot, receiver, and reverse traces)
- Navigation QC displays
- Seismic QC displays
- Data completeness displays
- Brute stack displays and SEGY files
- First break pick files
- Near field hydrophone displays and SEGY files

All data delivered excluding the final tapes were downloaded to external hard drive.

Final documentation delivered included:

- Acquisition logs (1 per sequence)
- Shipment documentation (proforma and tape listing)
- TOC files (table of contents files)

All documentation was also delivered on flash drive media.

Note: All deliveries included final SPS navigation data created by the on board navigation department and forwarded to the QC department.

8.1 Final navigation merged SEGY Tapes

As discussed previously, the output media used for final SEGY data tapes were IBM 3592 E05 cartridge tapes. Final data was output in units of microbar/sec for the hydrophone component and micrometers/sec^2 for the accelerometer components. The final Navigation-Seismic merged dataset contained a total of 16 original SEGY tapes and 16 SEGY copy tapes. A listing of all Final SEGY Tapes can be found in appendix 11.10.

8.2 Acquisition Logs

Acquisition logs were provided for each sail line sequence. These logs contain information provided by both online and offline QC. These logs contain 3 sheets with the first sheet providing an overview of the acquired spread, recording parameters, and line information. The second sheet ('Line Log') is essentially a shot by shot event log, extracting information from the online recording system, real-time observations, and later edited during offline QC after data analysis. The third sheet ('bad channels') is used to flag channels with problems identified by instrument tests or online/offline QC analysis. In addition, the acquisition logs included general information and comments highlighting events that took place during acquisition including shots or traces (stations) that could be considered bad, external noise (estimated frequency, source, orientation, amplitude) present, and information concerning observed anomalies or recording problems. An example of an Acquisition log is provided in appendix 11.8.

8.3 SEGY Log

A Seismic QC log spreadsheet was used to check the information contained in the acquisition logs and the navigation production log against the actual recorded seismic data. In addition, it was also used as the primary tool for trace accounting. Although only used internally within the Seismic QC department, this was a very useful tool in identifying any acquisition data problems.

8.4 TOC Files

Table of Contents (TOC) files were also produced that contain tape information as related to the contents of each individual final SEGY tape.

8.5 Edit Files

Edits were provided for each individual receiver line in the form of edit spreadsheets and were identical to those used to flag the bad seismic data in the final SEGY tape headers.

Three separate spreadsheets were created that included edits for:

- Bad Channels
- Reverse polarity channels
- Bad shots

8.6 Near Field Hydrophone Data

Near field SEGY data were included on the external hard drive. The file extension of these SEGY files is *.HYD. The sail line, starting shot point header and whether the shot number increased or decreased was hand entered at the beginning of each line. For this reason there can be discrepancies in the sail line and shot point headers within the SEGY file. The SEGY file is written in standard SEGY format. The following table gives the SEGY header locations to read the near field hydrophone data

Header	Format	Starting Byte
Shot Point	Integer Long	17
Channel	Integer Long	13

Table 4. Near field hydrophone SEGY header definition

8.7 Brute stacks (SEGY format)

All QC brute stacks created (HY, VT, Sum, and IL CCP) were written out in SEGY disk format and delivered along with displays (screen captures) for all receiver lines in the project.

8.8 Seismic QC Displays

Various images were screen captured during the QC process (as detailed previously). The following images were included as part of the final client deliverables downloaded to flash drives:

- Brute Stacks: displays were created for the hydrophone, vertical and summed (HY and VT) brute stacks. In addition, an Inline (CCP) stack display was also captured.

- Polarity QC: polarity QC displays were created for all 4 components on each cable.

- F-X Analysis: comparison FX and TX displays were created for both shot and receiver gathers for each receiver line.

- RMS Displays: These displays were provided by the on-line VSO QC

- RMS Spatial Displays: all channels for each shot were stacked and the average RMS values were displayed in a post plot

- Nearfield Source Balance QC: The difference between the maximum amplitudes and the time of the maximum amplitudes for both gun arrays.

8.9 Navigation QC Displays

One of the QC departments primary jobs is to ensure the source and receiver positions recieved from the navigation are correct. Screen captures from these QC steps were included in the final client deliverables, they were:

- Receiver Positioning Quadrant Stack: quadrant stack displays were generated for each receiver line cable lay.

- SEGY Final Nav-merge Post plot: positioning QC post plots were generated for each receiver line SEGY dataset generated.

- SEGY Final Nav-merge Water Depths: water depth at source, water depth at receiver

- VISTA RLP: VISTA receiver location prediction display

- Cable Movement QC: For each cable and lay a comparison graph was made detailing the difference in VOA value between the first and last shots fired into the respective cable and lay.

8.10 Data Completeness QC Displays

During complicated shooting seen in OBC operations it’s vital that all required sequences are identified and written to tape. To ensure this was done fold and data cube displays were used. The following displays were included in the final client dilverables.

- Fold Display: full offset fold display for each receiver line.

- Limited Offset Cube: all swaths contributing to an individual receiver line.

9 SEISMIC QC REVIEW

9.1 Seismic Interference

During the survey some seismic interference was seen. The interference was mainly caused by the PGS vessel, Ramform Valiant working for BP to the south of the Volve survey. Noise levels from this vessel were in excess of +100µB. Gardline Geosurvey's vessel the Sea Explorer was also operating in the area, just north of the Volve survey and while we were not affected by their low volume guns they were affected by our larger volume arrays. The Sea Explorer was also working for Statoil.

As a consequrence we did time share with both the Valiant and the Sea Explorer.

At the clients request a spreadsheet was created to keep track of the noise created by seismic interference and other external sources. (Appendix 11.16)
Some examples of typical seismic interference can be seen below.

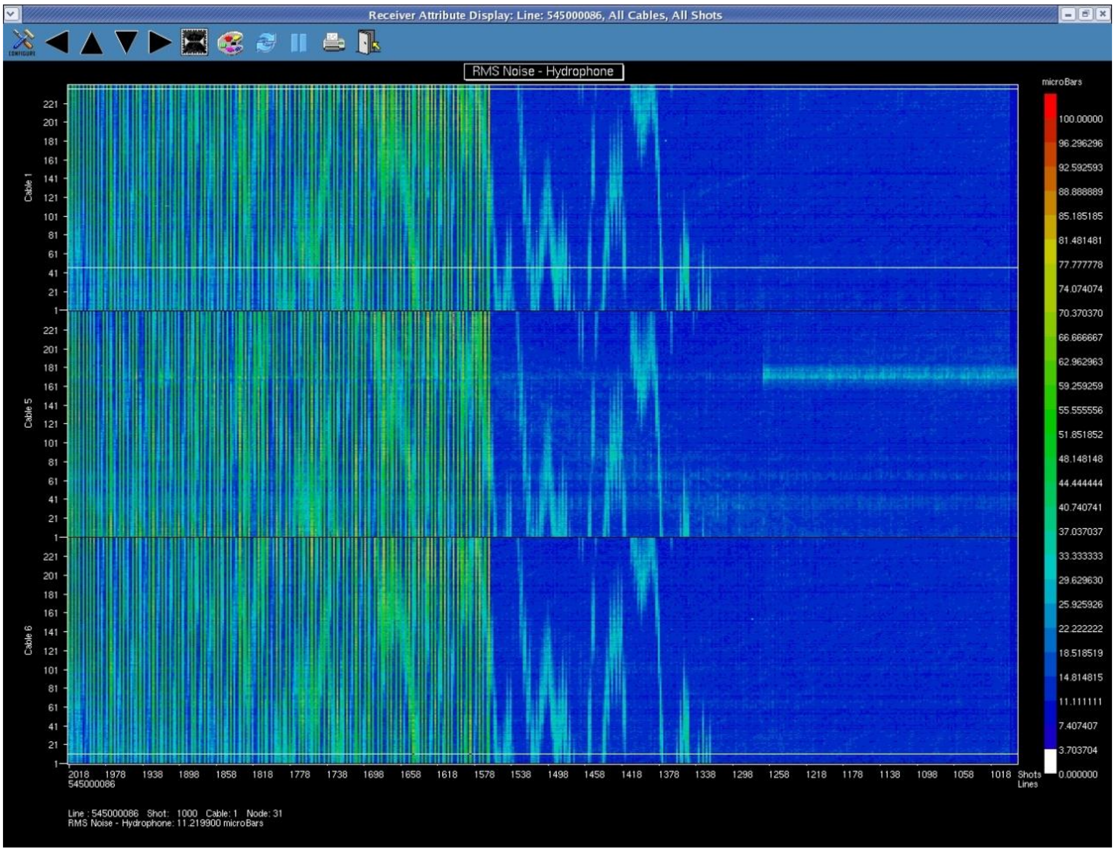


Figure 65. RMS Display showing Seismic Interference, Sequence 86

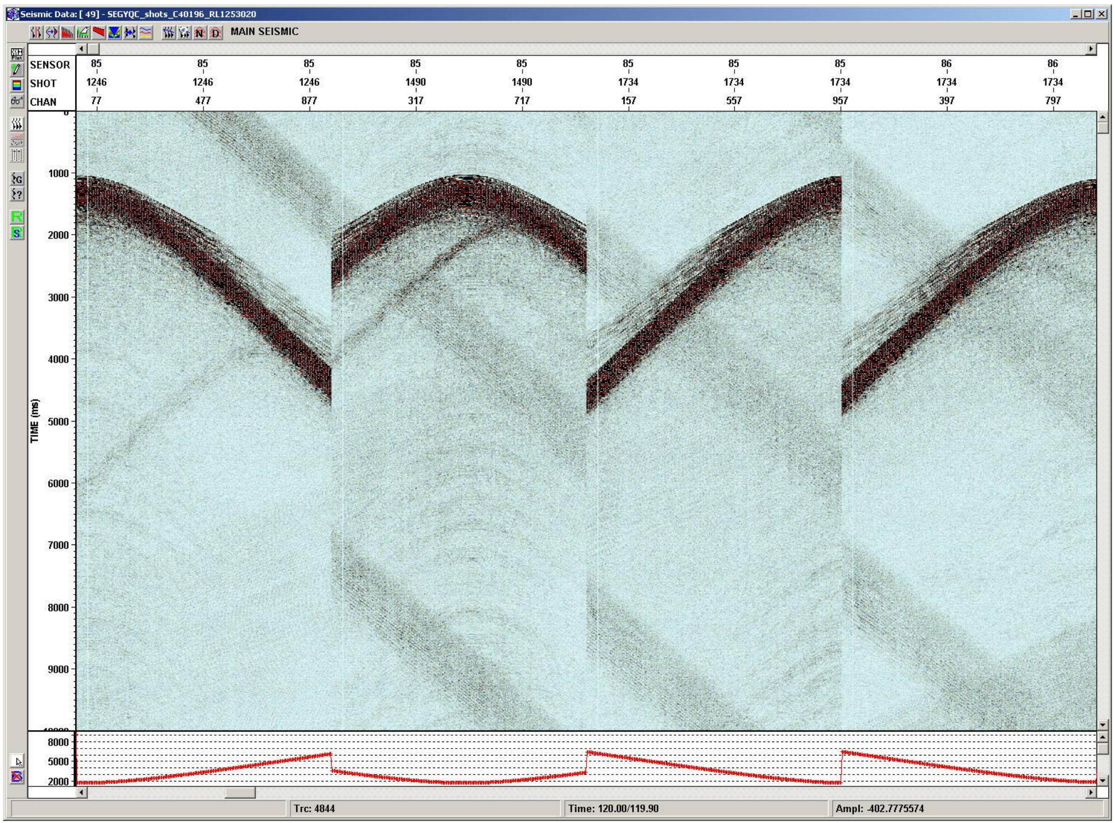


Figure 66. Shot records showing Seismic Interference, Sequences 85 and 86

9.2 Supply Vessel Noise

Several supply and support vessels were in the area working around the Maersk Inspirer and Navion Saga installations within the Volve survey area. Noise from these vessels was occasionally present and at times reached in excess of 100µB. Whenever noise from the vessels was noticed on the VSOQC Level 2 displays the vessels were asked to move off the line. Generally the vessels were receptive and moved off the spread. Some line portions were reshot due to supply vessel noise.

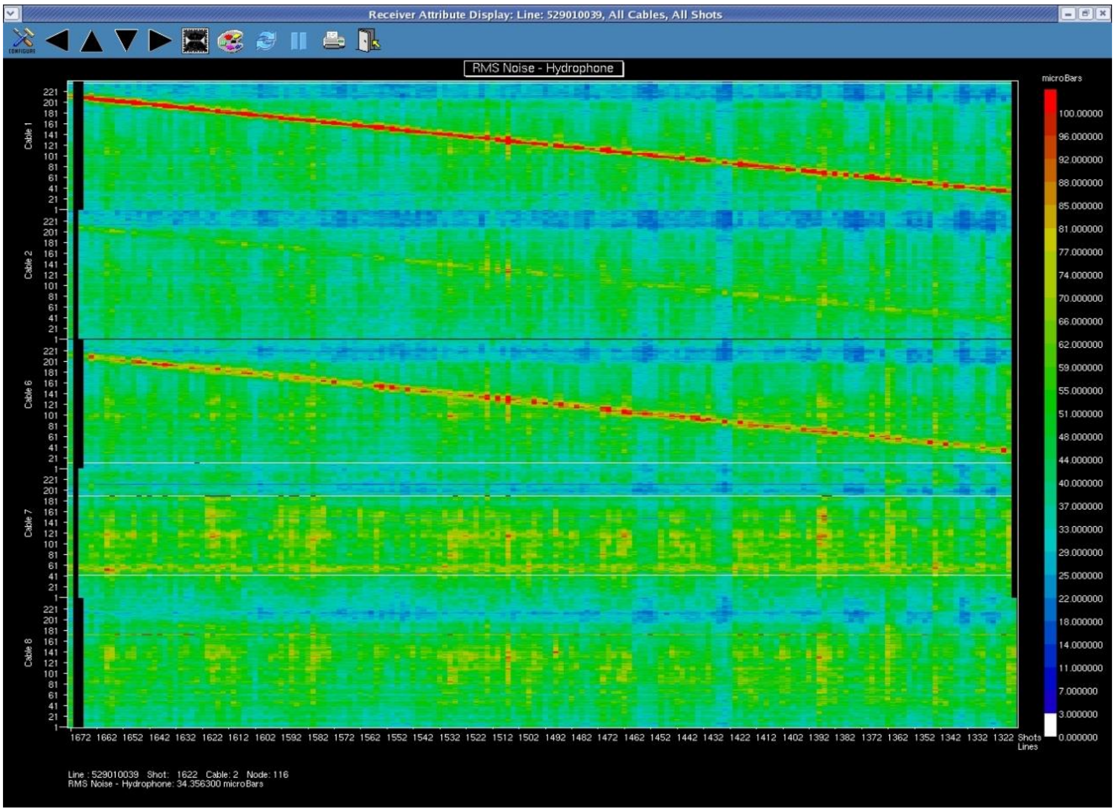


Figure 67. RMS display showing supply vessel noise up to 60µB affecting all cables.

9.3 Maersk Inspirer and Navion Saga Noise

As mentioned the Maersk Inspirer and the Navion Saga oil field rigs were both on the survey area and noise related to these installations was occasionally seen. Noise levels in excess of +100µB were seen and some line portions were reshot for excessive noise. Typical examples of noise can be seen below.

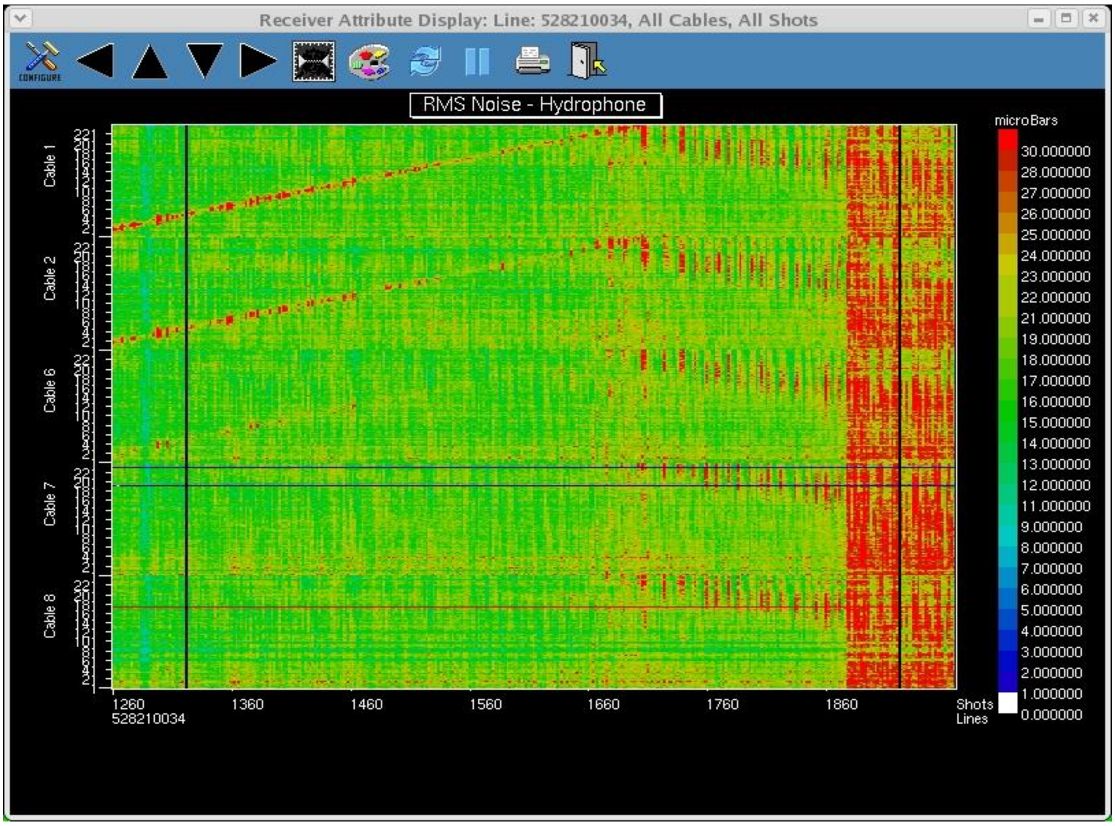


Figure 68. RMS display showing noise from Maersk Inspirer on the right of the display

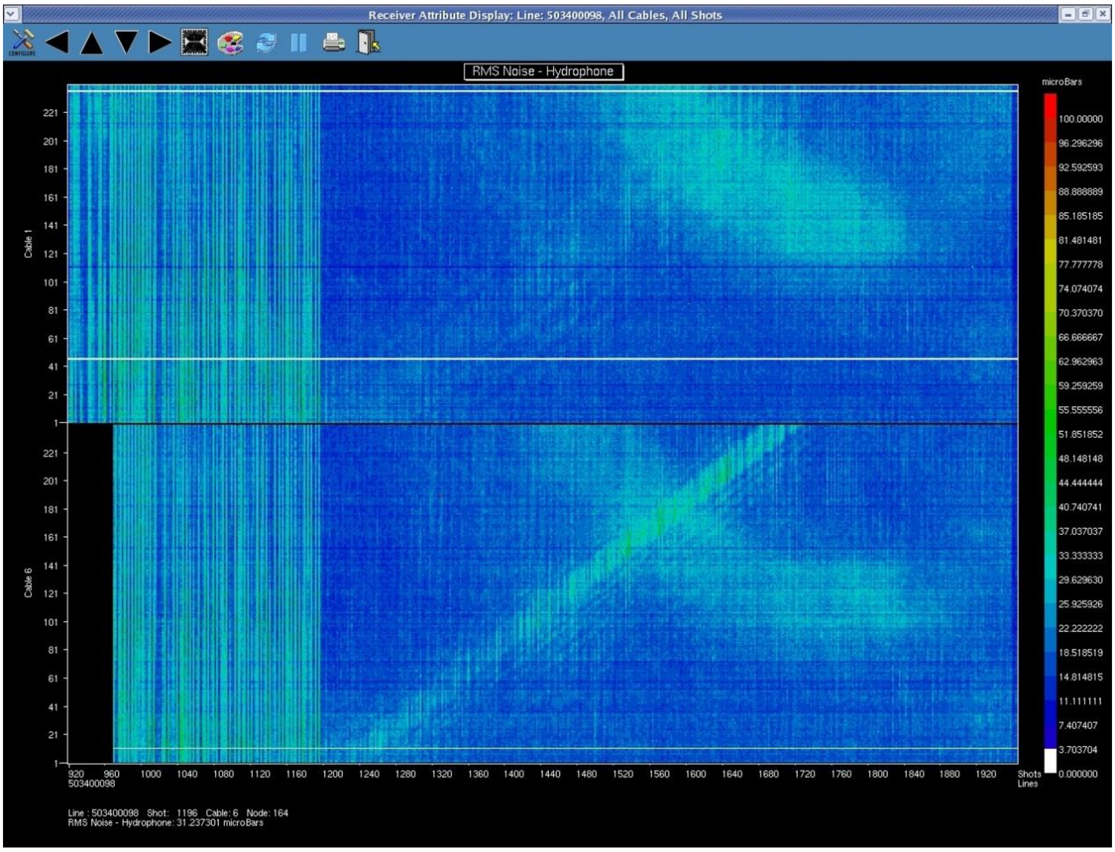


Figure 69. RMS display showing noise from Navion Saga on the left of the display

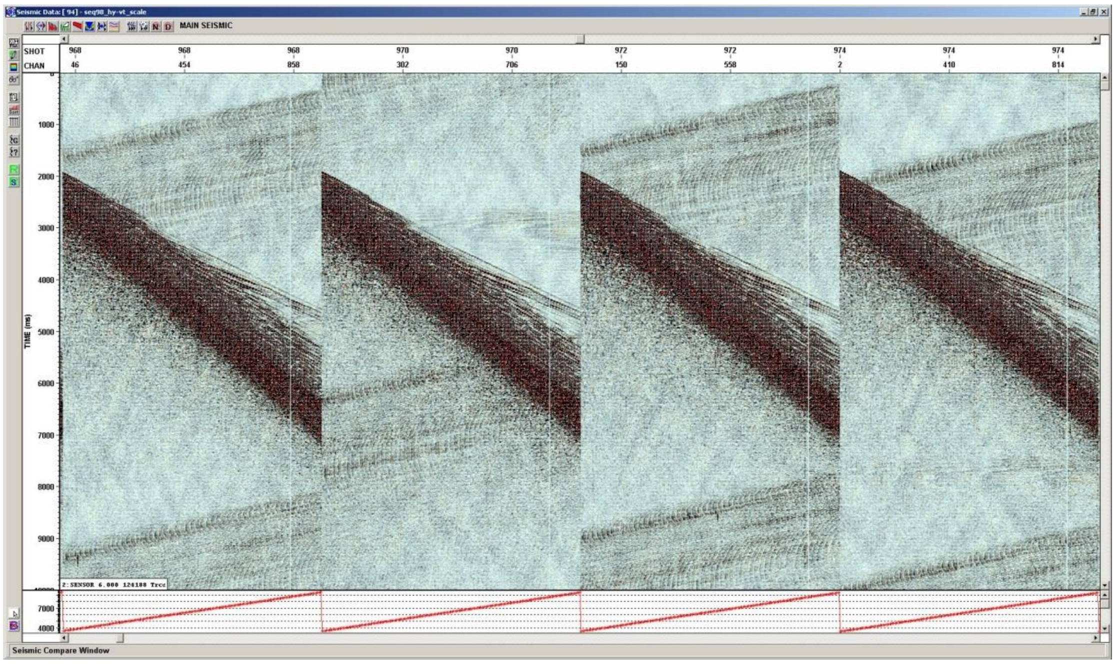


Figure 70. Shot records showing noise from Navion Saga

9.4 Vikland Noise

Some noise was generated by the cable handling vessel the M/V Vikland. This is inherent with this type of OBC operation but was kept to a minimum. Noise levels were generally lower than other vessel noise and levels of up to 30µB were occasionally seen. In these instances the Vikland moved away from the cables to reduce noise levels. A typical example of Vikland generated noise can be seen below.

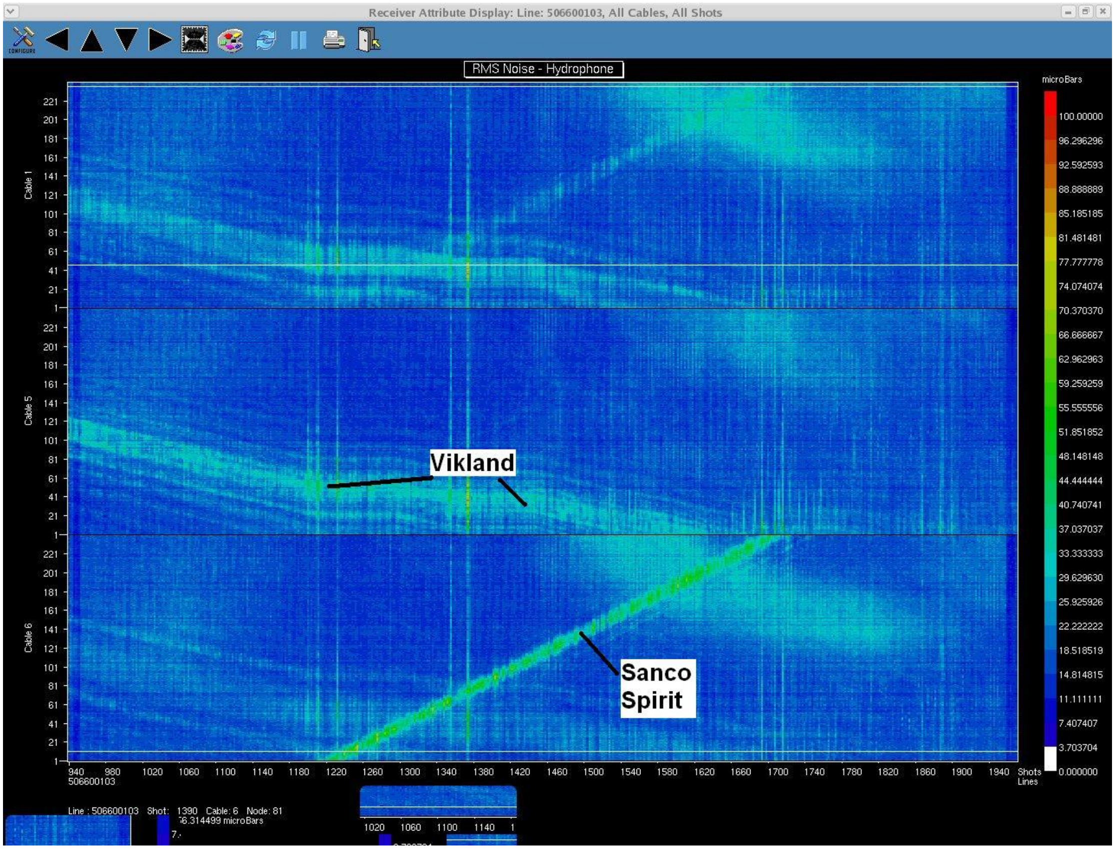


Figure 71. RMS display showing vessel noise from the Vikland

10 DATA SHIPMENTS

Shipment #	Date	Destination	Description
VIKS10-024	20th Oct. 2010	WesternGeco	Final SEGY Tape numbers C40194-C40201, Swath 12
VIKS10-027	8th Nov. 2010	WesternGeco	Final SEGY Tape numbers C40203-C40210, Swath 11 and C45014, RMS Decay files
VIKS10-028	15th Nov. 2010	Iron Mountain	Final SEGY Copy Tape numbers C40194-C40201, Swath 12; C40203-C40210, Swath 11; C45015, RMS Decay files

Table 5. Data shipments for the RXT10010 project.

11 APPENDICES

11.1 Processing Hardware

Hardware Component	# Units	Specifications
Data buckets	22	5*140GB firewire drives
Tape Drives	8	IBM 3592 E05
DBU Computers	3	Dell 2900, 16GB Ram, 3Ghz Dual-Quad Core, 2x80GB + 8x1TB
VISTA Computers	5	Dell 2900, 16GB Ram, 3Ghz Dual-Quad Core, 2x80GB + 8x1TB
QC Util. computer	2	2GB Ram, 3Ghz Dual Core, 1x450GB
Monitors	7	Dell 27"

Table 6. Processing Hardware

11.2 Far Field Signature Listing

This filter both differentiates and applies recording filter to the unfiltered source signature. This filter should be used for deconvolution of the accelerometer data and hydrophone data in differentiated mode.

FARFIELD SIGNATURE LISTING

```
Array name          :  3990-D6-S7p5-2000
Total volume        :    3990 cu.in.
Source depth        :    6.00 m
Streamer depth      :    0.00 m
Group length        :   12.50 m
Average pressure    :    2000 psi
Ghost strength      :   -1.00
Primary amplitude   :   62.05 bar m
Peak-peak amplitude :  114.88 bar m
P/B-ratio           :   23.05
Bubble period (+)   :   80.25 msec
Bubble period (-)   :  149.75 msec
Seawater temperature:   10.00 C
Seawater velocity   :  1490.0 m/s
Filter              :
  Low-cut           :  OUT
  High-cut frequency:  187.00 Hz
  High-cut slope    :  260.00 dB/oct
  Instrument        :
  Time of 1st sample:    0.00 msec i.e. index of time zero =    1.00
Sample interval     :    1.00 msec
Farfield position   :
  Distance          : 9000.00 m
  Azimuth           :    0.00 deg
  Angle of vertical :    0.00 deg

Amplitudes are in bar m
Time is increasing horizontally
```

0.000	0.000	-0.001	0.002	0.035	0.227	1.026
3.495	9.372	20.324	36.120	52.634	61.892	55.875
32.647	-0.156	-29.104	-44.594	-47.996	-48.469	-51.611
-51.967	-39.030	-11.619	15.761	24.185	9.078	-14.004
-24.260	-15.786	-1.290	3.761	-2.261	-8.092	-4.851
3.678	7.156	1.932	-5.264	-6.407	-1.534	2.754
2.134	-0.979	-1.824	0.393	2.274	1.236	-1.343
-2.372	-0.952	1.035	1.641	0.930	0.244	0.306
0.664	0.674	0.365	0.208	0.408	0.746	0.955
1.012	1.017	1.001	0.932	0.835	0.804	0.901
1.087	1.259	1.346	1.354	1.335	1.334	1.369
1.433	1.509	1.588	1.671	1.762	1.857	1.944
2.014	2.068	2.122	2.195	2.292	2.404	2.507
2.581	2.617	2.620	2.599	2.558	2.496	2.409
2.294	2.160	2.020	1.886	1.765	1.660	1.574
1.509	1.465	1.439	1.421	1.398	1.360	1.307
1.246	1.186	1.135	1.098	1.076	1.065	1.061
1.058	1.049	1.029	0.997	0.957	0.916	0.884
0.862	0.850	0.838	0.809	0.746	0.629	0.446
0.193	-0.122	-0.480	-0.855	-1.218	-1.540	-1.799
-1.978	-2.070	-2.079	-2.018	-1.906	-1.759	-1.587
-1.401	-1.205	-1.005	-0.800	-0.587	-0.366	-0.138
0.087	0.301	0.496	0.661	0.780	0.834	0.801
0.667	0.428	0.088	-0.336	-0.811	-1.291	-1.722
-2.058	-2.271	-2.357	-2.327	-2.207	-2.030	-1.834
-1.656	-1.514	-1.407	-1.321	-1.236	-1.144	-1.042
-0.935	-0.828	-0.726	-0.633	-0.552	-0.484	-0.427
-0.374	-0.318	-0.257	-0.192	-0.128	-0.071	-0.023
0.015	0.049	0.082	0.116	0.150	0.181	0.209
0.233	0.253	0.267	0.274	0.275	0.272	0.267
0.260	0.250	0.236	0.219	0.200	0.178	0.152
0.124	0.094	0.064	0.034	0.004	-0.026	-0.055
-0.083	-0.108	-0.132	-0.153	-0.172	-0.188	-0.200
-0.208	-0.214	-0.215	-0.213	-0.208	-0.200	-0.188
-0.174	-0.157	-0.138	-0.120	-0.103	-0.088	-0.075

-0.065	-0.054	-0.042	-0.028	-0.012	0.005	0.022
0.039	0.056	0.072	0.085	0.092	0.094	0.095
0.096	0.097	0.098	0.099	0.100	0.104	0.112
0.124	0.138	0.155	0.175	0.198	0.225	0.254
0.284	0.315	0.348	0.382	0.416	0.451	0.486
0.521	0.556	0.590	0.624	0.657	0.689	0.720
0.749	0.777	0.802	0.825	0.845	0.862	0.875
0.884	0.889	0.889	0.885	0.876	0.861	0.841
0.815	0.784	0.749	0.708	0.664	0.617	0.565
0.511	0.453	0.392	0.329	0.262	0.191	0.118
0.042	-0.037	-0.116	-0.196	-0.275	-0.351	-0.424
-0.492	-0.555	-0.610	-0.660	-0.703	-0.740	-0.774
-0.805	-0.833	-0.861	-0.889	-0.917	-0.946	-0.975
-1.002	-1.027	-1.048	-1.064	-1.074	-1.076	-1.071
-1.058	-1.038	-1.013	-0.982	-0.948	-0.912	-0.873
-0.834	-0.794	-0.754	-0.713	-0.672	-0.631	-0.590
-0.549	-0.510	-0.471	-0.432	-0.395	-0.358	-0.323
-0.288	-0.254	-0.221	-0.189	-0.157	-0.126	-0.096
-0.067	-0.038	-0.010	0.018	0.045	0.072	0.098
0.125	0.150	0.176	0.201	0.226	0.251	0.276
0.301	0.326	0.350	0.375	0.399	0.424	0.448
0.473	0.497	0.522	0.546	0.570	0.594	0.618
0.642	0.666					

DERIVATIVE FARFIELD SIGNATURE LISTING

```
Array name          :  3990-D6-S7p5-2000
Total volume        :    3990 cu.in.
Source depth        :    6.00 m
Streamer depth      :    0.00 m
Group length        :   12.50 m
Average pressure    :    2000 psi
Ghost strength      :   -1.00
Primary amplitude   :    NA
Peak-peak amplitude :    NA
P/B-ratio           :    NA
Bubble period (+)   :    NA
Bubble period (-)   :    NA
Seawater temperature:   10.00 C
Seawater velocity   :  1490.0 m/s
Filter              :
  Low-cut           :  OUT
  High-cut frequency:  187.00 Hz
  High-cut slope    :  260.00 dB/oct
  Instrument        :  VSO derivative pressure recording
  Time of 1st sample:    0.00 msec i.e. index of time zero =    1.00
Sample interval     :    1.00 msec
Farfield position   :
  Distance          : 9000.00 m
  Azimuth           :    0.00 deg
  Angle of vertical :    0.00 deg

Amplitudes are in bar m
Time is increasing horizontally
```

0.000	0.000	-0.001	0.005	0.058	0.312	1.178
3.344	7.344	12.578	16.394	14.616	4.357	-12.281
-27.397	-31.992	-23.594	-9.520	-0.836	-1.425	-3.638
3.065	18.524	29.160	21.558	-1.360	-20.659	-19.933
-2.388	12.968	12.051	-0.182	-7.707	-2.800	6.416
7.719	-0.120	-7.162	-5.473	1.756	5.536	2.487
-2.244	-2.712	0.584	2.608	0.858	-1.997	-2.296
0.006	1.942	1.576	-0.053	-0.877	-0.393	0.290
0.274	-0.162	-0.304	-0.014	0.290	0.304	0.137
0.023	0.002	-0.026	-0.083	-0.083	0.018	0.143
0.190	0.141	0.054	-0.006	-0.014	0.016	0.051
0.072	0.079	0.081	0.087	0.095	0.096	0.084
0.066	0.055	0.063	0.085	0.108	0.115	0.098
0.065	0.029	0.000	-0.020	-0.038	-0.061	-0.087
-0.111	-0.126	-0.127	-0.119	-0.104	-0.088	-0.070
-0.050	-0.030	-0.016	-0.013	-0.023	-0.038	-0.051

-0.056	-0.051	-0.040	-0.027	-0.014	-0.004	0.001
-0.001	-0.009	-0.021	-0.032	-0.037	-0.034	-0.025
-0.013	-0.007	-0.013	-0.035	-0.076	-0.133	-0.200
-0.267	-0.321	-0.355	-0.361	-0.339	-0.293	-0.226
-0.145	-0.062	0.013	0.073	0.117	0.146	0.166
0.179	0.186	0.190	0.196	0.205	0.214	0.218
0.213	0.200	0.179	0.146	0.095	0.024	-0.065
-0.165	-0.266	-0.359	-0.431	-0.467	-0.453	-0.388
-0.285	-0.163	-0.044	0.059	0.135	0.176	0.180
0.154	0.117	0.087	0.076	0.079	0.089	0.097
0.100	0.099	0.093	0.083	0.071	0.058	0.051
0.050	0.054	0.060	0.062	0.059	0.051	0.041
0.034	0.032	0.032	0.033	0.032	0.029	0.026
0.023	0.018	0.011	0.005	0.000	-0.003	-0.004
-0.007	-0.010	-0.014	-0.016	-0.019	-0.022	-0.025
-0.028	-0.029	-0.029	-0.028	-0.028	-0.028	-0.028
-0.026	-0.024	-0.022	-0.020	-0.017	-0.014	-0.011
-0.008	-0.004	-0.001	0.002	0.006	0.009	0.012
0.014	0.016	0.017	0.017	0.016	0.013	0.011
0.010	0.010	0.012	0.014	0.016	0.016	0.016
0.017	0.017	0.015	0.010	0.005	0.001	0.001
0.001	0.002	0.001	0.001	0.002	0.006	0.010
0.013	0.015	0.017	0.021	0.024	0.027	0.029
0.030	0.031	0.033	0.034	0.035	0.035	0.035
0.035	0.035	0.035	0.034	0.033	0.032	0.031
0.030	0.028	0.026	0.023	0.021	0.017	0.014
0.010	0.006	0.001	-0.003	-0.008	-0.013	-0.019
-0.024	-0.029	-0.034	-0.038	-0.042	-0.045	-0.049
-0.052	-0.055	-0.058	-0.061	-0.064	-0.068	-0.071
-0.074	-0.076	-0.077	-0.077	-0.076	-0.073	-0.069
-0.065	-0.059	-0.053	-0.047	-0.041	-0.037	-0.033
-0.031	-0.030	-0.029	-0.029	-0.030	-0.030	-0.030
-0.029	-0.026	-0.022	-0.016	-0.010	-0.003	0.005
0.012	0.018	0.023	0.028	0.031	0.033	0.034
0.035	0.036	0.037	0.037	0.037	0.037	0.037
0.037	0.036	0.036	0.035	0.034	0.034	0.033
0.032	0.031	0.031	0.030	0.029	0.029	0.028
0.028	0.027	0.027	0.026	0.026	0.026	0.025
0.025	0.025	0.025	0.025	0.025	0.025	0.025
0.025	0.025	0.025	0.025	0.025	0.025	0.025
0.025	0.025	0.025	0.025	0.025	0.025	0.025
0.025	0.025					

11.3 VSO System Impulse Response Listing

INPUT/OUTPUT, Inc.

Tabular data for I/O VectorSeis Ocean response
Compilation Date: May, 2007
Number of points evaluated = 2048

Parametric Data:

Sample Rate:	2 ms.
Anti-Alias Filter:	3/4 Nyquist Minimum Phase
DC Offset Blocking Filter:	Fc= 1.463Hz; 6 dB/octave; (0x80 configuration)
Low Cut Filter:	Out

Response Definitions:

Pressure	The detector, channel, and tape format data deliver *pressure domain* results. The impulse response shown is the full transfer function of the detector and channel.
dP/dt wrt dP	The detector, channel, and tape format data deliver *derivative pressure domain* results. The impulse response shown is the full transfer function fo the detector and channel.
Accel wrt accel	The detector, channel, and tape format data deliver *acceleration domain* results. The impulse response shown is the full transfer function fo the detector and channel.
dP/dt wrt Press	This impulse response is used to convert a hydrophone pressure signal of the user into a derivative pressure response including the VSO derivative pressure transfer function. An example of such use is if a pressure domain near- or far-field response is to be converted to a VSO derivative pressure signature. The input response should not include any other instrumentation filter responses.

MINIMUM PHASE 2ms					MINIMUM PHASE 2ms				
time	Pressure	dP/dt wrt dP	Accel	dP/dt wrt Press	time	Pressure	dP/dt wrt dP	Accel	dP/dt wrt Press
0	0.000000	0.000000	0.000000	0.000000	2050	0.000009	0.000000	0.000000	0.000000
2	0.000081	0.000060	0.000084	0.000347	2052	0.000009	0.000000	0.000000	0.000000
4	0.006857	0.005789	0.006981	0.018548	2054	0.000009	0.000000	0.000000	0.000000
6	0.099752	0.089783	0.100719	0.179786	2056	0.000009	0.000000	0.000000	0.000000
8	0.501406	0.474485	0.503491	0.533872	2058	0.000009	0.000000	0.000000	0.000000
10	1.000000	1.000000	1.000000	0.232074	2060	0.000009	0.000000	0.000000	0.000000
12	0.508210	0.585133	0.508134	-1.000000	2062	0.000009	0.000000	0.000000	0.000000
14	-0.560337	-0.516064	-0.547895	-0.598188	2064	0.000009	0.000000	0.000000	0.000000
16	-0.180833	-0.229117	-0.163517	0.915081	2066	0.000009	0.000000	0.000000	0.000000
18	0.378755	0.399179	0.383799	-0.125692	2068	0.000009	0.000000	0.000000	0.000000
20	-0.285992	-0.243227	-0.277177	-0.564164	2070	0.000009	0.000000	0.000000	0.000000
22	-0.095621	-0.125962	-0.081404	0.628391	2072	0.000009	0.000000	0.000000	0.000000
24	0.193776	0.219132	0.199181	-0.237757	2074	0.000009	0.000000	0.000000	0.000000
26	-0.248694	-0.229387	-0.238625	-0.195528	2076	0.000008	0.000000	0.000000	0.000000
28	0.040019	0.024384	0.050685	0.396958	2078	0.000008	0.000000	0.000000	0.000000
30	0.024474	0.053204	0.030379	-0.323260	2080	0.000008	0.000000	0.000000	0.000000
32	-0.157375	-0.156834	-0.146940	0.106427	2082	0.000008	0.000000	0.000000	0.000000
34	0.070910	0.073454	0.078634	0.097018	2084	0.000008	0.000000	0.000000	0.000000
36	-0.073310	-0.054661	-0.066063	-0.182541	2086	0.000008	0.000000	0.000000	0.000000
38	-0.047477	-0.049881	-0.038475	0.156830	2088	0.000008	0.000000	0.000000	0.000000
40	0.016845	0.028660	0.023490	-0.068258	2090	0.000008	0.000000	0.000000	0.000000
42	-0.074407	-0.066458	-0.066646	-0.019386	2092	0.000008	0.000000	0.000000	0.000000
44	-0.012696	-0.009311	-0.005311	0.057873	2094	0.000008	0.000000	0.000000	0.000000
46	-0.028644	-0.018922	-0.021964	-0.049305	2096	0.000008	0.000000	0.000000	0.000000
48	-0.039446	-0.034610	-0.032344	0.025373	2098	0.000008	0.000000	0.000000	0.000000
50	-0.019649	-0.013093	-0.013138	-0.003252	2100	0.000008	0.000000	0.000000	0.000000
52	-0.033648	-0.027164	-0.027176	-0.006527	2102	0.000008	0.000000	0.000000	0.000000

54	-0.026389	-0.020980	-0.020075	0.008747	2104	0.000008	0.000000	0.000000	0.000000
56	-0.026597	-0.020507	-0.020538	-0.005080	2106	0.000008	0.000000	0.000000	0.000000
58	-0.027751	-0.022307	-0.021796	0.002483	2108	0.000008	0.000000	0.000000	0.000000
60	-0.025374	-0.019943	-0.019624	0.000259	2110	0.000008	0.000000	0.000000	0.000000
62	-0.025858	-0.020566	-0.020264	-0.000177	2112	0.000008	0.000000	0.000000	0.000000
64	-0.025009	-0.019932	-0.019575	0.000783	2114	0.000008	0.000000	0.000000	0.000000
66	-0.024469	-0.019505	-0.019197	0.000158	2116	0.000007	0.000000	0.000000	0.000000
68	-0.024028	-0.019228	-0.018910	0.000368	2118	0.000007	0.000000	0.000000	0.000000
70	-0.023496	-0.018840	-0.018530	0.000331	2120	0.000007	0.000000	0.000000	0.000000
72	-0.023008	-0.018495	-0.018191	0.000322	2122	0.000007	0.000000	0.000000	0.000000
74	-0.022524	-0.018151	-0.017853	0.000317	2124	0.000007	0.000000	0.000000	0.000000
76	-0.022050	-0.017815	-0.017522	0.000311	2126	0.000007	0.000000	0.000000	0.000000
78	-0.021585	-0.017484	-0.017197	0.000305	2128	0.000007	0.000000	0.000000	0.000000
80	-0.021129	-0.017160	-0.016878	0.000300	2130	0.000007	0.000000	0.000000	0.000000
82	-0.020682	-0.016841	-0.016565	0.000294	2132	0.000007	0.000000	0.000000	0.000000
84	-0.020244	-0.016529	-0.016257	0.000289	2134	0.000007	0.000000	0.000000	0.000000
86	-0.019814	-0.016222	-0.015956	0.000283	2136	0.000007	0.000000	0.000000	0.000000
88	-0.019392	-0.015921	-0.015660	0.000278	2138	0.000007	0.000000	0.000000	0.000000
90	-0.018978	-0.015626	-0.015369	0.000273	2140	0.000007	0.000000	0.000000	0.000000
92	-0.018573	-0.015336	-0.015084	0.000268	2142	0.000007	0.000000	0.000000	0.000000
94	-0.018175	-0.015051	-0.014804	0.000263	2144	0.000007	0.000000	0.000000	0.000000
96	-0.017785	-0.014772	-0.014529	0.000258	2146	0.000007	0.000000	0.000000	0.000000
98	-0.017403	-0.014498	-0.014260	0.000253	2148	0.000007	0.000000	0.000000	0.000000
100	-0.017028	-0.014229	-0.013995	0.000248	2150	0.000007	0.000000	0.000000	0.000000
102	-0.016660	-0.013965	-0.013736	0.000244	2152	0.000007	0.000000	0.000000	0.000000
104	-0.016300	-0.013706	-0.013481	0.000239	2154	0.000007	0.000000	0.000000	0.000000
106	-0.015946	-0.013451	-0.013231	0.000235	2156	0.000007	0.000000	0.000000	0.000000
108	-0.015600	-0.013202	-0.012985	0.000231	2158	0.000007	0.000000	0.000000	0.000000
110	-0.015260	-0.012957	-0.012744	0.000226	2160	0.000007	0.000000	0.000000	0.000000
112	-0.014926	-0.012717	-0.012508	0.000222	2162	0.000006	0.000000	0.000000	0.000000
114	-0.014600	-0.012481	-0.012276	0.000218	2164	0.000006	0.000000	0.000000	0.000000
116	-0.014279	-0.012249	-0.012048	0.000214	2166	0.000006	0.000000	0.000000	0.000000
118	-0.013965	-0.012022	-0.011824	0.000210	2168	0.000006	0.000000	0.000000	0.000000
120	-0.013657	-0.011799	-0.011605	0.000206	2170	0.000006	0.000000	0.000000	0.000000
122	-0.013355	-0.011580	-0.011390	0.000202	2172	0.000006	0.000000	0.000000	0.000000
124	-0.013059	-0.011365	-0.011178	0.000198	2174	0.000006	0.000000	0.000000	0.000000
126	-0.012769	-0.011154	-0.010971	0.000195	2176	0.000006	0.000000	0.000000	0.000000
128	-0.012484	-0.010947	-0.010767	0.000191	2178	0.000006	0.000000	0.000000	0.000000
130	-0.012205	-0.010744	-0.010567	0.000188	2180	0.000006	0.000000	0.000000	0.000000
132	-0.011932	-0.010545	-0.010371	0.000184	2182	0.000006	0.000000	0.000000	0.000000
134	-0.011663	-0.010349	-0.010179	0.000181	2184	0.000006	0.000000	0.000000	0.000000
136	-0.011401	-0.010157	-0.009990	0.000177	2186	0.000006	0.000000	0.000000	0.000000
138	-0.011143	-0.009968	-0.009805	0.000174	2188	0.000006	0.000000	0.000000	0.000000
140	-0.010890	-0.009783	-0.009623	0.000171	2190	0.000006	0.000000	0.000000	0.000000
142	-0.010643	-0.009602	-0.009444	0.000168	2192	0.000006	0.000000	0.000000	0.000000
144	-0.010400	-0.009424	-0.009269	0.000165	2194	0.000006	0.000000	0.000000	0.000000
146	-0.010162	-0.009249	-0.009097	0.000162	2196	0.000006	0.000000	0.000000	0.000000
148	-0.009928	-0.009077	-0.008928	0.000159	2198	0.000006	0.000000	0.000000	0.000000
150	-0.009700	-0.008909	-0.008763	0.000156	2200	0.000006	0.000000	0.000000	0.000000
152	-0.009476	-0.008744	-0.008600	0.000153	2202	0.000006	0.000000	0.000000	0.000000
154	-0.009256	-0.008581	-0.008440	0.000150	2204	0.000006	0.000000	0.000000	0.000000
156	-0.009040	-0.008422	-0.008284	0.000147	2206	0.000006	0.000000	0.000000	0.000000
158	-0.008829	-0.008266	-0.008130	0.000144	2208	0.000006	0.000000	0.000000	0.000000
160	-0.008622	-0.008113	-0.007979	0.000142	2210	0.000006	0.000000	0.000000	0.000000
162	-0.008419	-0.007962	-0.007831	0.000139	2212	0.000006	0.000000	0.000000	0.000000
164	-0.008221	-0.007814	-0.007686	0.000136	2214	0.000005	0.000000	0.000000	0.000000
166	-0.008026	-0.007669	-0.007543	0.000134	2216	0.000005	0.000000	0.000000	0.000000
168	-0.007835	-0.007527	-0.007403	0.000131	2218	0.000005	0.000000	0.000000	0.000000
170	-0.007648	-0.007387	-0.007266	0.000129	2220	0.000005	0.000000	0.000000	0.000000
172	-0.007464	-0.007250	-0.007131	0.000127	2222	0.000005	0.000000	0.000000	0.000000
174	-0.007285	-0.007116	-0.006999	0.000124	2224	0.000005	0.000000	0.000000	0.000000
176	-0.007108	-0.006984	-0.006869	0.000122	2226	0.000005	0.000000	0.000000	0.000000
178	-0.006936	-0.006854	-0.006742	0.000120	2228	0.000005	0.000000	0.000000	0.000000
180	-0.006767	-0.006727	-0.006616	0.000117	2230	0.000005	0.000000	0.000000	0.000000
182	-0.006601	-0.006602	-0.006494	0.000115	2232	0.000005	0.000000	0.000000	0.000000
184	-0.006438	-0.006480	-0.006373	0.000113	2234	0.000005	0.000000	0.000000	0.000000
186	-0.006279	-0.006359	-0.006255	0.000111	2236	0.000005	0.000000	0.000000	0.000000

188	-0.006123	-0.006241	-0.006139	0.000109	2238	0.000005	0.000000	0.000000	0.000000
190	-0.005970	-0.006126	-0.006025	0.000107	2240	0.000005	0.000000	0.000000	0.000000
192	-0.005821	-0.006012	-0.005913	0.000105	2242	0.000005	0.000000	0.000000	0.000000
194	-0.005674	-0.005900	-0.005803	0.000103	2244	0.000005	0.000000	0.000000	0.000000
196	-0.005530	-0.005791	-0.005696	0.000101	2246	0.000005	0.000000	0.000000	0.000000
198	-0.005389	-0.005683	-0.005590	0.000099	2248	0.000005	0.000000	0.000000	0.000000
200	-0.005251	-0.005578	-0.005486	0.000097	2250	0.000005	0.000000	0.000000	0.000000
202	-0.005116	-0.005474	-0.005385	0.000096	2252	0.000005	0.000000	0.000000	0.000000
204	-0.004984	-0.005373	-0.005285	0.000094	2254	0.000005	0.000000	0.000000	0.000000
206	-0.004854	-0.005273	-0.005187	0.000092	2256	0.000005	0.000000	0.000000	0.000000
208	-0.004727	-0.005175	-0.005090	0.000090	2258	0.000005	0.000000	0.000000	0.000000
210	-0.004602	-0.005079	-0.004996	0.000089	2260	0.000005	0.000000	0.000000	0.000000
212	-0.004480	-0.004985	-0.004903	0.000087	2262	0.000005	0.000000	0.000000	0.000000
214	-0.004361	-0.004893	-0.004812	0.000085	2264	0.000005	0.000000	0.000000	0.000000
216	-0.004243	-0.004802	-0.004723	0.000084	2266	0.000005	0.000000	0.000000	0.000000
218	-0.004129	-0.004713	-0.004635	0.000082	2268	0.000005	0.000000	0.000000	0.000000
220	-0.004017	-0.004625	-0.004549	0.000081	2270	0.000005	0.000000	0.000000	0.000000
222	-0.003907	-0.004539	-0.004465	0.000079	2272	0.000005	0.000000	0.000000	0.000000
224	-0.003799	-0.004455	-0.004382	0.000078	2274	0.000005	0.000000	0.000000	0.000000
226	-0.003693	-0.004373	-0.004301	0.000076	2276	0.000005	0.000000	0.000000	0.000000
228	-0.003590	-0.004291	-0.004221	0.000075	2278	0.000004	0.000000	0.000000	0.000000
230	-0.003489	-0.004212	-0.004143	0.000074	2280	0.000004	0.000000	0.000000	0.000000
232	-0.003390	-0.004134	-0.004066	0.000072	2282	0.000004	0.000000	0.000000	0.000000
234	-0.003293	-0.004057	-0.003990	0.000071	2284	0.000004	0.000000	0.000000	0.000000
236	-0.003197	-0.003982	-0.003916	0.000070	2286	0.000004	0.000000	0.000000	0.000000
238	-0.003104	-0.003908	-0.003844	0.000068	2288	0.000004	0.000000	0.000000	0.000000
240	-0.003013	-0.003835	-0.003772	0.000067	2290	0.000004	0.000000	0.000000	0.000000
242	-0.002924	-0.003764	-0.003702	0.000066	2292	0.000004	0.000000	0.000000	0.000000
244	-0.002837	-0.003694	-0.003634	0.000065	2294	0.000004	0.000000	0.000000	0.000000
246	-0.002751	-0.003626	-0.003566	0.000063	2296	0.000004	0.000000	0.000000	0.000000
248	-0.002667	-0.003558	-0.003500	0.000062	2298	0.000004	0.000000	0.000000	0.000000
250	-0.002585	-0.003492	-0.003435	0.000061	2300	0.000004	0.000000	0.000000	0.000000
252	-0.002505	-0.003428	-0.003371	0.000060	2302	0.000004	0.000000	0.000000	0.000000
254	-0.002427	-0.003364	-0.003309	0.000059	2304	0.000004	0.000000	0.000000	0.000000
256	-0.002350	-0.003302	-0.003247	0.000058	2306	0.000004	0.000000	0.000000	0.000000
258	-0.002274	-0.003240	-0.003187	0.000057	2308	0.000004	0.000000	0.000000	0.000000
260	-0.002201	-0.003180	-0.003128	0.000056	2310	0.000004	0.000000	0.000000	0.000000
262	-0.002129	-0.003121	-0.003070	0.000055	2312	0.000004	0.000000	0.000000	0.000000
264	-0.002058	-0.003063	-0.003013	0.000053	2314	0.000004	0.000000	0.000000	0.000000
266	-0.001989	-0.003006	-0.002957	0.000053	2316	0.000004	0.000000	0.000000	0.000000
268	-0.001921	-0.002951	-0.002902	0.000052	2318	0.000004	0.000000	0.000000	0.000000
270	-0.001855	-0.002896	-0.002848	0.000051	2320	0.000004	0.000000	0.000000	0.000000
272	-0.001790	-0.002842	-0.002796	0.000050	2322	0.000004	0.000000	0.000000	0.000000
274	-0.001727	-0.002789	-0.002744	0.000049	2324	0.000004	0.000000	0.000000	0.000000
276	-0.001665	-0.002738	-0.002693	0.000048	2326	0.000004	0.000000	0.000000	0.000000
278	-0.001604	-0.002687	-0.002643	0.000047	2328	0.000004	0.000000	0.000000	0.000000
280	-0.001545	-0.002637	-0.002594	0.000046	2330	0.000004	0.000000	0.000000	0.000000
282	-0.001487	-0.002588	-0.002546	0.000045	2332	0.000004	0.000000	0.000000	0.000000
284	-0.001430	-0.002540	-0.002498	0.000044	2334	0.000004	0.000000	0.000000	0.000000
286	-0.001375	-0.002493	-0.002452	0.000044	2336	0.000004	0.000000	0.000000	0.000000
288	-0.001320	-0.002447	-0.002407	0.000043	2338	0.000004	0.000000	0.000000	0.000000
290	-0.001267	-0.002401	-0.002362	0.000042	2340	0.000004	0.000000	0.000000	0.000000
292	-0.001215	-0.002357	-0.002318	0.000041	2342	0.000004	0.000000	0.000000	0.000000
294	-0.001164	-0.002313	-0.002275	0.000040	2344	0.000004	0.000000	0.000000	0.000000
296	-0.001115	-0.002270	-0.002233	0.000040	2346	0.000004	0.000000	0.000000	0.000000
298	-0.001066	-0.002228	-0.002191	0.000039	2348	0.000004	0.000000	0.000000	0.000000
300	-0.001018	-0.002187	-0.002151	0.000038	2350	0.000004	0.000000	0.000000	0.000000
302	-0.000972	-0.002146	-0.002111	0.000037	2352	0.000004	0.000000	0.000000	0.000000
304	-0.000926	-0.002106	-0.002072	0.000037	2354	0.000004	0.000000	0.000000	0.000000
306	-0.000882	-0.002067	-0.002033	0.000036	2356	0.000004	0.000000	0.000000	0.000000
308	-0.000839	-0.002029	-0.001996	0.000035	2358	0.000003	0.000000	0.000000	0.000000
310	-0.000796	-0.001991	-0.001958	0.000035	2360	0.000003	0.000000	0.000000	0.000000
312	-0.000755	-0.001954	-0.001922	0.000034	2362	0.000003	0.000000	0.000000	0.000000
314	-0.000714	-0.001918	-0.001886	0.000033	2364	0.000003	0.000000	0.000000	0.000000
316	-0.000674	-0.001882	-0.001851	0.000033	2366	0.000003	0.000000	0.000000	0.000000
318	-0.000636	-0.001847	-0.001817	0.000032	2368	0.000003	0.000000	0.000000	0.000000
320	-0.000598	-0.001813	-0.001783	0.000032	2370	0.000003	0.000000	0.000000	0.000000

322	-0.000561	-0.001780	-0.001750	0.000031	2372	0.000003	0.000000	0.000000	0.000000
324	-0.000525	-0.001747	-0.001718	0.000031	2374	0.000003	0.000000	0.000000	0.000000
326	-0.000489	-0.001714	-0.001686	0.000030	2376	0.000003	0.000000	0.000000	0.000000
328	-0.000455	-0.001682	-0.001655	0.000029	2378	0.000003	0.000000	0.000000	0.000000
330	-0.000421	-0.001651	-0.001624	0.000029	2380	0.000003	0.000000	0.000000	0.000000
332	-0.000388	-0.001620	-0.001594	0.000028	2382	0.000003	0.000000	0.000000	0.000000
334	-0.000356	-0.001590	-0.001564	0.000028	2384	0.000003	0.000000	0.000000	0.000000
336	-0.000325	-0.001561	-0.001535	0.000027	2386	0.000003	0.000000	0.000000	0.000000
338	-0.000294	-0.001532	-0.001507	0.000027	2388	0.000003	0.000000	0.000000	0.000000
340	-0.000264	-0.001504	-0.001479	0.000026	2390	0.000003	0.000000	0.000000	0.000000
342	-0.000235	-0.001476	-0.001451	0.000026	2392	0.000003	0.000000	0.000000	0.000000
344	-0.000206	-0.001448	-0.001424	0.000025	2394	0.000003	0.000000	0.000000	0.000000
346	-0.000178	-0.001421	-0.001398	0.000025	2396	0.000003	0.000000	0.000000	0.000000
348	-0.000151	-0.001395	-0.001372	0.000024	2398	0.000003	0.000000	0.000000	0.000000
350	-0.000125	-0.001369	-0.001347	0.000024	2400	0.000003	0.000000	0.000000	0.000000
352	-0.000099	-0.001344	-0.001322	0.000023	2402	0.000003	0.000000	0.000000	0.000000
354	-0.000073	-0.001319	-0.001297	0.000023	2404	0.000003	0.000000	0.000000	0.000000
356	-0.000049	-0.001294	-0.001273	0.000023	2406	0.000003	0.000000	0.000000	0.000000
358	-0.000025	-0.001270	-0.001249	0.000022	2408	0.000003	0.000000	0.000000	0.000000
360	-0.000001	-0.001247	-0.001226	0.000022	2410	0.000003	0.000000	0.000000	0.000000
362	0.000022	-0.001224	-0.001203	0.000021	2412	0.000003	0.000000	0.000000	0.000000
364	0.000044	-0.001201	-0.001181	0.000021	2414	0.000003	0.000000	0.000000	0.000000
366	0.000066	-0.001179	-0.001159	0.000021	2416	0.000003	0.000000	0.000000	0.000000
368	0.000087	-0.001157	-0.001138	0.000020	2418	0.000003	0.000000	0.000000	0.000000
370	0.000108	-0.001135	-0.001117	0.000020	2420	0.000003	0.000000	0.000000	0.000000
372	0.000128	-0.001114	-0.001096	0.000019	2422	0.000003	0.000000	0.000000	0.000000
374	0.000147	-0.001094	-0.001076	0.000019	2424	0.000003	0.000000	0.000000	0.000000
376	0.000166	-0.001073	-0.001056	0.000019	2426	0.000003	0.000000	0.000000	0.000000
378	0.000185	-0.001053	-0.001036	0.000018	2428	0.000003	0.000000	0.000000	0.000000
380	0.000203	-0.001034	-0.001017	0.000018	2430	0.000003	0.000000	0.000000	0.000000
382	0.000221	-0.001015	-0.000998	0.000018	2432	0.000003	0.000000	0.000000	0.000000
384	0.000238	-0.000996	-0.000979	0.000017	2434	0.000003	0.000000	0.000000	0.000000
386	0.000255	-0.000977	-0.000961	0.000017	2436	0.000003	0.000000	0.000000	0.000000
388	0.000271	-0.000959	-0.000943	0.000017	2438	0.000003	0.000000	0.000000	0.000000
390	0.000287	-0.000941	-0.000926	0.000016	2440	0.000003	0.000000	0.000000	0.000000
392	0.000303	-0.000924	-0.000909	0.000016	2442	0.000003	0.000000	0.000000	0.000000
394	0.000318	-0.000907	-0.000892	0.000016	2444	0.000003	0.000000	0.000000	0.000000
396	0.000332	-0.000890	-0.000875	0.000016	2446	0.000003	0.000000	0.000000	0.000000
398	0.000347	-0.000873	-0.000859	0.000015	2448	0.000003	0.000000	0.000000	0.000000
400	0.000360	-0.000857	-0.000843	0.000015	2450	0.000003	0.000000	0.000000	0.000000
402	0.000374	-0.000841	-0.000827	0.000015	2452	0.000003	0.000000	0.000000	0.000000
404	0.000387	-0.000826	-0.000812	0.000014	2454	0.000003	0.000000	0.000000	0.000000
406	0.000400	-0.000810	-0.000797	0.000014	2456	0.000003	0.000000	0.000000	0.000000
408	0.000412	-0.000795	-0.000782	0.000014	2458	0.000003	0.000000	0.000000	0.000000
410	0.000424	-0.000781	-0.000768	0.000014	2460	0.000003	0.000000	0.000000	0.000000
412	0.000436	-0.000766	-0.000754	0.000013	2462	0.000003	0.000000	0.000000	0.000000
414	0.000447	-0.000752	-0.000740	0.000013	2464	0.000003	0.000000	0.000000	0.000000
416	0.000458	-0.000738	-0.000726	0.000013	2466	0.000002	0.000000	0.000000	0.000000
418	0.000469	-0.000724	-0.000712	0.000013	2468	0.000002	0.000000	0.000000	0.000000
420	0.000479	-0.000711	-0.000699	0.000012	2470	0.000002	0.000000	0.000000	0.000000
422	0.000489	-0.000698	-0.000686	0.000012	2472	0.000002	0.000000	0.000000	0.000000
424	0.000499	-0.000685	-0.000673	0.000012	2474	0.000002	0.000000	0.000000	0.000000
426	0.000508	-0.000672	-0.000661	0.000012	2476	0.000002	0.000000	0.000000	0.000000
428	0.000517	-0.000659	-0.000649	0.000012	2478	0.000002	0.000000	0.000000	0.000000
430	0.000526	-0.000647	-0.000637	0.000011	2480	0.000002	0.000000	0.000000	0.000000
432	0.000535	-0.000635	-0.000625	0.000011	2482	0.000002	0.000000	0.000000	0.000000
434	0.000543	-0.000623	-0.000613	0.000011	2484	0.000002	0.000000	0.000000	0.000000
436	0.000551	-0.000612	-0.000602	0.000011	2486	0.000002	0.000000	0.000000	0.000000
438	0.000559	-0.000601	-0.000591	0.000010	2488	0.000002	0.000000	0.000000	0.000000
440	0.000567	-0.000589	-0.000580	0.000010	2490	0.000002	0.000000	0.000000	0.000000
442	0.000574	-0.000578	-0.000569	0.000010	2492	0.000002	0.000000	0.000000	0.000000
444	0.000581	-0.000568	-0.000558	0.000010	2494	0.000002	0.000000	0.000000	0.000000
446	0.000588	-0.000557	-0.000548	0.000010	2496	0.000002	0.000000	0.000000	0.000000
448	0.000594	-0.000547	-0.000538	0.000010	2498	0.000002	0.000000	0.000000	0.000000
450	0.000600	-0.000537	-0.000528	0.000009	2500	0.000002	0.000000	0.000000	0.000000
452	0.000607	-0.000527	-0.000518	0.000009	2502	0.000002	0.000000	0.000000	0.000000
454	0.000612	-0.000517	-0.000508	0.000009	2504	0.000002	0.000000	0.000000	0.000000

456	0.000618	-0.000507	-0.000499	0.000009	2506	0.000002	0.000000	0.000000	0.000000
458	0.000623	-0.000498	-0.000490	0.000009	2508	0.000002	0.000000	0.000000	0.000000
460	0.000629	-0.000489	-0.000481	0.000009	2510	0.000002	0.000000	0.000000	0.000000
462	0.000634	-0.000480	-0.000472	0.000008	2512	0.000002	0.000000	0.000000	0.000000
464	0.000639	-0.000471	-0.000463	0.000008	2514	0.000002	0.000000	0.000000	0.000000
466	0.000643	-0.000462	-0.000454	0.000008	2516	0.000002	0.000000	0.000000	0.000000
468	0.000648	-0.000453	-0.000446	0.000008	2518	0.000002	0.000000	0.000000	0.000000
470	0.000652	-0.000445	-0.000438	0.000008	2520	0.000002	0.000000	0.000000	0.000000
472	0.000656	-0.000437	-0.000430	0.000008	2522	0.000002	0.000000	0.000000	0.000000
474	0.000660	-0.000429	-0.000422	0.000007	2524	0.000002	0.000000	0.000000	0.000000
476	0.000664	-0.000421	-0.000414	0.000007	2526	0.000002	0.000000	0.000000	0.000000
478	0.000667	-0.000413	-0.000406	0.000007	2528	0.000002	0.000000	0.000000	0.000000
480	0.000671	-0.000405	-0.000399	0.000007	2530	0.000002	0.000000	0.000000	0.000000
482	0.000674	-0.000398	-0.000391	0.000007	2532	0.000002	0.000000	0.000000	0.000000
484	0.000677	-0.000390	-0.000384	0.000007	2534	0.000002	0.000000	0.000000	0.000000
486	0.000680	-0.000383	-0.000377	0.000007	2536	0.000002	0.000000	0.000000	0.000000
488	0.000683	-0.000376	-0.000370	0.000007	2538	0.000002	0.000000	0.000000	0.000000
490	0.000685	-0.000369	-0.000363	0.000006	2540	0.000002	0.000000	0.000000	0.000000
492	0.000688	-0.000362	-0.000356	0.000006	2542	0.000002	0.000000	0.000000	0.000000
494	0.000690	-0.000355	-0.000350	0.000006	2544	0.000002	0.000000	0.000000	0.000000
496	0.000692	-0.000349	-0.000343	0.000006	2546	0.000002	0.000000	0.000000	0.000000
498	0.000694	-0.000342	-0.000337	0.000006	2548	0.000002	0.000000	0.000000	0.000000
500	0.000696	-0.000336	-0.000331	0.000006	2550	0.000002	0.000000	0.000000	0.000000
502	0.000698	-0.000330	-0.000324	0.000006	2552	0.000002	0.000000	0.000000	0.000000
504	0.000700	-0.000324	-0.000318	0.000006	2554	0.000002	0.000000	0.000000	0.000000
506	0.000701	-0.000318	-0.000312	0.000006	2556	0.000002	0.000000	0.000000	0.000000
508	0.000703	-0.000312	-0.000307	0.000005	2558	0.000002	0.000000	0.000000	0.000000
510	0.000704	-0.000306	-0.000301	0.000005	2560	0.000002	0.000000	0.000000	0.000000
512	0.000705	-0.000300	-0.000295	0.000005	2562	0.000002	0.000000	0.000000	0.000000
514	0.000706	-0.000295	-0.000290	0.000005	2564	0.000002	0.000000	0.000000	0.000000
516	0.000707	-0.000289	-0.000285	0.000005	2566	0.000002	0.000000	0.000000	0.000000
518	0.000708	-0.000284	-0.000279	0.000005	2568	0.000002	0.000000	0.000000	0.000000
520	0.000709	-0.000279	-0.000274	0.000005	2570	0.000002	0.000000	0.000000	0.000000
522	0.000710	-0.000273	-0.000269	0.000005	2572	0.000002	0.000000	0.000000	0.000000
524	0.000710	-0.000268	-0.000264	0.000005	2574	0.000002	0.000000	0.000000	0.000000
526	0.000711	-0.000263	-0.000259	0.000005	2576	0.000002	0.000000	0.000000	0.000000
528	0.000711	-0.000259	-0.000254	0.000005	2578	0.000002	0.000000	0.000000	0.000000
530	0.000711	-0.000254	-0.000250	0.000004	2580	0.000002	0.000000	0.000000	0.000000
532	0.000712	-0.000249	-0.000245	0.000004	2582	0.000002	0.000000	0.000000	0.000000
534	0.000712	-0.000244	-0.000240	0.000004	2584	0.000002	0.000000	0.000000	0.000000
536	0.000712	-0.000240	-0.000236	0.000004	2586	0.000002	0.000000	0.000000	0.000000
538	0.000712	-0.000235	-0.000232	0.000004	2588	0.000002	0.000000	0.000000	0.000000
540	0.000711	-0.000231	-0.000227	0.000004	2590	0.000002	0.000000	0.000000	0.000000
542	0.000711	-0.000227	-0.000223	0.000004	2592	0.000002	0.000000	0.000000	0.000000
544	0.000711	-0.000223	-0.000219	0.000004	2594	0.000002	0.000000	0.000000	0.000000
546	0.000711	-0.000218	-0.000215	0.000004	2596	0.000002	0.000000	0.000000	0.000000
548	0.000710	-0.000214	-0.000211	0.000004	2598	0.000002	0.000000	0.000000	0.000000
550	0.000710	-0.000210	-0.000207	0.000004	2600	0.000002	0.000000	0.000000	0.000000
552	0.000709	-0.000206	-0.000203	0.000004	2602	0.000002	0.000000	0.000000	0.000000
554	0.000708	-0.000203	-0.000199	0.000004	2604	0.000002	0.000000	0.000000	0.000000
556	0.000708	-0.000199	-0.000196	0.000003	2606	0.000002	0.000000	0.000000	0.000000
558	0.000707	-0.000195	-0.000192	0.000003	2608	0.000002	0.000000	0.000000	0.000000
560	0.000706	-0.000192	-0.000188	0.000003	2610	0.000002	0.000000	0.000000	0.000000
562	0.000705	-0.000188	-0.000185	0.000003	2612	0.000002	0.000000	0.000000	0.000000
564	0.000704	-0.000185	-0.000182	0.000003	2614	0.000002	0.000000	0.000000	0.000000
566	0.000703	-0.000181	-0.000178	0.000003	2616	0.000002	0.000000	0.000000	0.000000
568	0.000702	-0.000178	-0.000175	0.000003	2618	0.000002	0.000000	0.000000	0.000000
570	0.000701	-0.000174	-0.000172	0.000003	2620	0.000002	0.000000	0.000000	0.000000
572	0.000700	-0.000171	-0.000168	0.000003	2622	0.000002	0.000000	0.000000	0.000000
574	0.000698	-0.000168	-0.000165	0.000003	2624	0.000002	0.000000	0.000000	0.000000
576	0.000697	-0.000165	-0.000162	0.000003	2626	0.000002	0.000000	0.000000	0.000000
578	0.000696	-0.000162	-0.000159	0.000003	2628	0.000001	0.000000	0.000000	0.000000
580	0.000694	-0.000159	-0.000156	0.000003	2630	0.000001	0.000000	0.000000	0.000000
582	0.000693	-0.000156	-0.000153	0.000003	2632	0.000001	0.000000	0.000000	0.000000
584	0.000692	-0.000153	-0.000151	0.000003	2634	0.000001	0.000000	0.000000	0.000000
586	0.000690	-0.000150	-0.000148	0.000003	2636	0.000001	0.000000	0.000000	0.000000
588	0.000688	-0.000147	-0.000145	0.000003	2638	0.000001	0.000000	0.000000	0.000000

590	0.000687	-0.000145	-0.000142	0.000003	2640	0.000001	0.000000	0.000000	0.000000
592	0.000685	-0.000142	-0.000140	0.000002	2642	0.000001	0.000000	0.000000	0.000000
594	0.000683	-0.000139	-0.000137	0.000002	2644	0.000001	0.000000	0.000000	0.000000
596	0.000682	-0.000137	-0.000135	0.000002	2646	0.000001	0.000000	0.000000	0.000000
598	0.000680	-0.000134	-0.000132	0.000002	2648	0.000001	0.000000	0.000000	0.000000
600	0.000678	-0.000132	-0.000130	0.000002	2650	0.000001	0.000000	0.000000	0.000000
602	0.000676	-0.000129	-0.000127	0.000002	2652	0.000001	0.000000	0.000000	0.000000
604	0.000675	-0.000127	-0.000125	0.000002	2654	0.000001	0.000000	0.000000	0.000000
606	0.000673	-0.000125	-0.000122	0.000002	2656	0.000001	0.000000	0.000000	0.000000
608	0.000671	-0.000122	-0.000120	0.000002	2658	0.000001	0.000000	0.000000	0.000000
610	0.000669	-0.000120	-0.000118	0.000002	2660	0.000001	0.000000	0.000000	0.000000
612	0.000667	-0.000118	-0.000116	0.000002	2662	0.000001	0.000000	0.000000	0.000000
614	0.000665	-0.000116	-0.000114	0.000002	2664	0.000001	0.000000	0.000000	0.000000
616	0.000663	-0.000113	-0.000112	0.000002	2666	0.000001	0.000000	0.000000	0.000000
618	0.000661	-0.000111	-0.000109	0.000002	2668	0.000001	0.000000	0.000000	0.000000
620	0.000659	-0.000109	-0.000107	0.000002	2670	0.000001	0.000000	0.000000	0.000000
622	0.000656	-0.000107	-0.000105	0.000002	2672	0.000001	0.000000	0.000000	0.000000
624	0.000654	-0.000105	-0.000103	0.000002	2674	0.000001	0.000000	0.000000	0.000000
626	0.000652	-0.000103	-0.000102	0.000002	2676	0.000001	0.000000	0.000000	0.000000
628	0.000650	-0.000101	-0.000100	0.000002	2678	0.000001	0.000000	0.000000	0.000000
630	0.000648	-0.000099	-0.000098	0.000002	2680	0.000001	0.000000	0.000000	0.000000
632	0.000645	-0.000098	-0.000096	0.000002	2682	0.000001	0.000000	0.000000	0.000000
634	0.000643	-0.000096	-0.000094	0.000002	2684	0.000001	0.000000	0.000000	0.000000
636	0.000641	-0.000094	-0.000092	0.000002	2686	0.000001	0.000000	0.000000	0.000000
638	0.000639	-0.000092	-0.000091	0.000002	2688	0.000001	0.000000	0.000000	0.000000
640	0.000636	-0.000091	-0.000089	0.000002	2690	0.000001	0.000000	0.000000	0.000000
642	0.000634	-0.000089	-0.000087	0.000002	2692	0.000001	0.000000	0.000000	0.000000
644	0.000632	-0.000087	-0.000086	0.000002	2694	0.000001	0.000000	0.000000	0.000000
646	0.000629	-0.000086	-0.000084	0.000001	2696	0.000001	0.000000	0.000000	0.000000
648	0.000627	-0.000084	-0.000083	0.000001	2698	0.000001	0.000000	0.000000	0.000000
650	0.000625	-0.000082	-0.000081	0.000001	2700	0.000001	0.000000	0.000000	0.000000
652	0.000622	-0.000081	-0.000080	0.000001	2702	0.000001	0.000000	0.000000	0.000000
654	0.000620	-0.000079	-0.000078	0.000001	2704	0.000001	0.000000	0.000000	0.000000
656	0.000617	-0.000078	-0.000077	0.000001	2706	0.000001	0.000000	0.000000	0.000000
658	0.000615	-0.000077	-0.000075	0.000001	2708	0.000001	0.000000	0.000000	0.000000
660	0.000612	-0.000075	-0.000074	0.000001	2710	0.000001	0.000000	0.000000	0.000000
662	0.000610	-0.000074	-0.000073	0.000001	2712	0.000001	0.000000	0.000000	0.000000
664	0.000608	-0.000072	-0.000071	0.000001	2714	0.000001	0.000000	0.000000	0.000000
666	0.000605	-0.000071	-0.000070	0.000001	2716	0.000001	0.000000	0.000000	0.000000
668	0.000603	-0.000070	-0.000069	0.000001	2718	0.000001	0.000000	0.000000	0.000000
670	0.000600	-0.000068	-0.000067	0.000001	2720	0.000001	0.000000	0.000000	0.000000
672	0.000598	-0.000067	-0.000066	0.000001	2722	0.000001	0.000000	0.000000	0.000000
674	0.000595	-0.000066	-0.000065	0.000001	2724	0.000001	0.000000	0.000000	0.000000
676	0.000593	-0.000065	-0.000064	0.000001	2726	0.000001	0.000000	0.000000	0.000000
678	0.000590	-0.000063	-0.000062	0.000001	2728	0.000001	0.000000	0.000000	0.000000
680	0.000587	-0.000062	-0.000061	0.000001	2730	0.000001	0.000000	0.000000	0.000000
682	0.000585	-0.000061	-0.000060	0.000001	2732	0.000001	0.000000	0.000000	0.000000
684	0.000582	-0.000060	-0.000059	0.000001	2734	0.000001	0.000000	0.000000	0.000000
686	0.000580	-0.000059	-0.000058	0.000001	2736	0.000001	0.000000	0.000000	0.000000
688	0.000577	-0.000058	-0.000057	0.000001	2738	0.000001	0.000000	0.000000	0.000000
690	0.000575	-0.000057	-0.000056	0.000001	2740	0.000001	0.000000	0.000000	0.000000
692	0.000572	-0.000056	-0.000055	0.000001	2742	0.000001	0.000000	0.000000	0.000000
694	0.000570	-0.000055	-0.000054	0.000001	2744	0.000001	0.000000	0.000000	0.000000
696	0.000567	-0.000054	-0.000053	0.000001	2746	0.000001	0.000000	0.000000	0.000000
698	0.000564	-0.000053	-0.000052	0.000001	2748	0.000001	0.000000	0.000000	0.000000
700	0.000562	-0.000052	-0.000051	0.000001	2750	0.000001	0.000000	0.000000	0.000000
702	0.000559	-0.000051	-0.000050	0.000001	2752	0.000001	0.000000	0.000000	0.000000
704	0.000557	-0.000050	-0.000049	0.000001	2754	0.000001	0.000000	0.000000	0.000000
706	0.000554	-0.000049	-0.000048	0.000001	2756	0.000001	0.000000	0.000000	0.000000
708	0.000552	-0.000048	-0.000047	0.000001	2758	0.000001	0.000000	0.000000	0.000000
710	0.000549	-0.000047	-0.000046	0.000001	2760	0.000001	0.000000	0.000000	0.000000
712	0.000546	-0.000046	-0.000045	0.000001	2762	0.000001	0.000000	0.000000	0.000000
714	0.000544	-0.000045	-0.000045	0.000001	2764	0.000001	0.000000	0.000000	0.000000
716	0.000541	-0.000044	-0.000044	0.000001	2766	0.000001	0.000000	0.000000	0.000000
718	0.000539	-0.000044	-0.000043	0.000001	2768	0.000001	0.000000	0.000000	0.000000
720	0.000536	-0.000043	-0.000042	0.000001	2770	0.000001	0.000000	0.000000	0.000000
722	0.000534	-0.000042	-0.000041	0.000001	2772	0.000001	0.000000	0.000000	0.000000

724	0.000531	-0.000041	-0.000041	0.000001	2774	0.000001	0.000000	0.000000	0.000000
726	0.000528	-0.000040	-0.000040	0.000001	2776	0.000001	0.000000	0.000000	0.000000
728	0.000526	-0.000040	-0.000039	0.000001	2778	0.000001	0.000000	0.000000	0.000000
730	0.000523	-0.000039	-0.000038	0.000001	2780	0.000001	0.000000	0.000000	0.000000
732	0.000521	-0.000038	-0.000038	0.000001	2782	0.000001	0.000000	0.000000	0.000000
734	0.000518	-0.000038	-0.000037	0.000001	2784	0.000001	0.000000	0.000000	0.000000
736	0.000516	-0.000037	-0.000036	0.000001	2786	0.000001	0.000000	0.000000	0.000000
738	0.000513	-0.000036	-0.000036	0.000001	2788	0.000001	0.000000	0.000000	0.000000
740	0.000511	-0.000036	-0.000035	0.000001	2790	0.000001	0.000000	0.000000	0.000000
742	0.000508	-0.000035	-0.000034	0.000001	2792	0.000001	0.000000	0.000000	0.000000
744	0.000505	-0.000034	-0.000034	0.000001	2794	0.000001	0.000000	0.000000	0.000000
746	0.000503	-0.000034	-0.000033	0.000001	2796	0.000001	0.000000	0.000000	0.000000
748	0.000500	-0.000033	-0.000032	0.000001	2798	0.000001	0.000000	0.000000	0.000000
750	0.000498	-0.000032	-0.000032	0.000001	2800	0.000001	0.000000	0.000000	0.000000
752	0.000495	-0.000032	-0.000031	0.000001	2802	0.000001	0.000000	0.000000	0.000000
754	0.000493	-0.000031	-0.000031	0.000001	2804	0.000001	0.000000	0.000000	0.000000
756	0.000490	-0.000031	-0.000030	0.000001	2806	0.000001	0.000000	0.000000	0.000000
758	0.000488	-0.000030	-0.000030	0.000001	2808	0.000001	0.000000	0.000000	0.000000
760	0.000485	-0.000029	-0.000029	0.000001	2810	0.000001	0.000000	0.000000	0.000000
762	0.000483	-0.000029	-0.000028	0.000001	2812	0.000001	0.000000	0.000000	0.000000
764	0.000480	-0.000028	-0.000028	0.000000	2814	0.000001	0.000000	0.000000	0.000000
766	0.000478	-0.000028	-0.000027	0.000000	2816	0.000001	0.000000	0.000000	0.000000
768	0.000475	-0.000027	-0.000027	0.000000	2818	0.000001	0.000000	0.000000	0.000000
770	0.000473	-0.000027	-0.000026	0.000000	2820	0.000001	0.000000	0.000000	0.000000
772	0.000470	-0.000026	-0.000026	0.000000	2822	0.000001	0.000000	0.000000	0.000000
774	0.000468	-0.000026	-0.000025	0.000000	2824	0.000001	0.000000	0.000000	0.000000
776	0.000465	-0.000025	-0.000025	0.000000	2826	0.000001	0.000000	0.000000	0.000000
778	0.000463	-0.000025	-0.000024	0.000000	2828	0.000001	0.000000	0.000000	0.000000
780	0.000461	-0.000024	-0.000024	0.000000	2830	0.000001	0.000000	0.000000	0.000000
782	0.000458	-0.000024	-0.000024	0.000000	2832	0.000001	0.000000	0.000000	0.000000
784	0.000456	-0.000024	-0.000023	0.000000	2834	0.000001	0.000000	0.000000	0.000000
786	0.000453	-0.000023	-0.000023	0.000000	2836	0.000001	0.000000	0.000000	0.000000
788	0.000451	-0.000023	-0.000022	0.000000	2838	0.000001	0.000000	0.000000	0.000000
790	0.000448	-0.000022	-0.000022	0.000000	2840	0.000001	0.000000	0.000000	0.000000
792	0.000446	-0.000022	-0.000021	0.000000	2842	0.000001	0.000000	0.000000	0.000000
794	0.000444	-0.000021	-0.000021	0.000000	2844	0.000001	0.000000	0.000000	0.000000
796	0.000441	-0.000021	-0.000021	0.000000	2846	0.000001	0.000000	0.000000	0.000000
798	0.000439	-0.000021	-0.000020	0.000000	2848	0.000001	0.000000	0.000000	0.000000
800	0.000436	-0.000020	-0.000020	0.000000	2850	0.000001	0.000000	0.000000	0.000000
802	0.000434	-0.000020	-0.000020	0.000000	2852	0.000001	0.000000	0.000000	0.000000
804	0.000432	-0.000020	-0.000019	0.000000	2854	0.000001	0.000000	0.000000	0.000000
806	0.000429	-0.000019	-0.000019	0.000000	2856	0.000001	0.000000	0.000000	0.000000
808	0.000427	-0.000019	-0.000018	0.000000	2858	0.000001	0.000000	0.000000	0.000000
810	0.000425	-0.000018	-0.000018	0.000000	2860	0.000001	0.000000	0.000000	0.000000
812	0.000422	-0.000018	-0.000018	0.000000	2862	0.000001	0.000000	0.000000	0.000000
814	0.000420	-0.000018	-0.000017	0.000000	2864	0.000001	0.000000	0.000000	0.000000
816	0.000418	-0.000017	-0.000017	0.000000	2866	0.000001	0.000000	0.000000	0.000000
818	0.000416	-0.000017	-0.000017	0.000000	2868	0.000001	0.000000	0.000000	0.000000
820	0.000413	-0.000017	-0.000017	0.000000	2870	0.000001	0.000000	0.000000	0.000000
822	0.000411	-0.000016	-0.000016	0.000000	2872	0.000001	0.000000	0.000000	0.000000
824	0.000409	-0.000016	-0.000016	0.000000	2874	0.000001	0.000000	0.000000	0.000000
826	0.000406	-0.000016	-0.000016	0.000000	2876	0.000001	0.000000	0.000000	0.000000
828	0.000404	-0.000016	-0.000015	0.000000	2878	0.000001	0.000000	0.000000	0.000000
830	0.000402	-0.000015	-0.000015	0.000000	2880	0.000001	0.000000	0.000000	0.000000
832	0.000400	-0.000015	-0.000015	0.000000	2882	0.000001	0.000000	0.000000	0.000000
834	0.000397	-0.000015	-0.000014	0.000000	2884	0.000001	0.000000	0.000000	0.000000
836	0.000395	-0.000014	-0.000014	0.000000	2886	0.000001	0.000000	0.000000	0.000000
838	0.000393	-0.000014	-0.000014	0.000000	2888	0.000001	0.000000	0.000000	0.000000
840	0.000391	-0.000014	-0.000014	0.000000	2890	0.000001	0.000000	0.000000	0.000000
842	0.000389	-0.000014	-0.000013	0.000000	2892	0.000001	0.000000	0.000000	0.000000
844	0.000386	-0.000013	-0.000013	0.000000	2894	0.000001	0.000000	0.000000	0.000000
846	0.000384	-0.000013	-0.000013	0.000000	2896	0.000001	0.000000	0.000000	0.000000
848	0.000382	-0.000013	-0.000013	0.000000	2898	0.000001	0.000000	0.000000	0.000000
850	0.000380	-0.000013	-0.000012	0.000000	2900	0.000001	0.000000	0.000000	0.000000
852	0.000378	-0.000012	-0.000012	0.000000	2902	0.000001	0.000000	0.000000	0.000000
854	0.000376	-0.000012	-0.000012	0.000000	2904	0.000001	0.000000	0.000000	0.000000
856	0.000374	-0.000012	-0.000012	0.000000	2906	0.000001	0.000000	0.000000	0.000000

858	0.000371	-0.000012	-0.000012	0.000000	2908	0.000001	0.000000	0.000000	0.000000
860	0.000369	-0.000012	-0.000011	0.000000	2910	0.000001	0.000000	0.000000	0.000000
862	0.000367	-0.000011	-0.000011	0.000000	2912	0.000001	0.000000	0.000000	0.000000
864	0.000365	-0.000011	-0.000011	0.000000	2914	0.000001	0.000000	0.000000	0.000000
866	0.000363	-0.000011	-0.000011	0.000000	2916	0.000001	0.000000	0.000000	0.000000
868	0.000361	-0.000011	-0.000011	0.000000	2918	0.000001	0.000000	0.000000	0.000000
870	0.000359	-0.000011	-0.000010	0.000000	2920	0.000001	0.000000	0.000000	0.000000
872	0.000357	-0.000010	-0.000010	0.000000	2922	0.000001	0.000000	0.000000	0.000000
874	0.000355	-0.000010	-0.000010	0.000000	2924	0.000001	0.000000	0.000000	0.000000
876	0.000353	-0.000010	-0.000010	0.000000	2926	0.000001	0.000000	0.000000	0.000000
878	0.000351	-0.000010	-0.000010	0.000000	2928	0.000001	0.000000	0.000000	0.000000
880	0.000349	-0.000010	-0.000009	0.000000	2930	0.000001	0.000000	0.000000	0.000000
882	0.000347	-0.000009	-0.000009	0.000000	2932	0.000001	0.000000	0.000000	0.000000
884	0.000345	-0.000009	-0.000009	0.000000	2934	0.000001	0.000000	0.000000	0.000000
886	0.000343	-0.000009	-0.000009	0.000000	2936	0.000001	0.000000	0.000000	0.000000
888	0.000341	-0.000009	-0.000009	0.000000	2938	0.000001	0.000000	0.000000	0.000000
890	0.000339	-0.000009	-0.000009	0.000000	2940	0.000001	0.000000	0.000000	0.000000
892	0.000337	-0.000009	-0.000008	0.000000	2942	0.000001	0.000000	0.000000	0.000000
894	0.000335	-0.000008	-0.000008	0.000000	2944	0.000001	0.000000	0.000000	0.000000
896	0.000333	-0.000008	-0.000008	0.000000	2946	0.000001	0.000000	0.000000	0.000000
898	0.000331	-0.000008	-0.000008	0.000000	2948	0.000001	0.000000	0.000000	0.000000
900	0.000329	-0.000008	-0.000008	0.000000	2950	0.000001	0.000000	0.000000	0.000000
902	0.000327	-0.000008	-0.000008	0.000000	2952	0.000001	0.000000	0.000000	0.000000
904	0.000325	-0.000008	-0.000008	0.000000	2954	0.000001	0.000000	0.000000	0.000000
906	0.000323	-0.000008	-0.000007	0.000000	2956	0.000001	0.000000	0.000000	0.000000
908	0.000321	-0.000007	-0.000007	0.000000	2958	0.000001	0.000000	0.000000	0.000000
910	0.000320	-0.000007	-0.000007	0.000000	2960	0.000001	0.000000	0.000000	0.000000
912	0.000318	-0.000007	-0.000007	0.000000	2962	0.000001	0.000000	0.000000	0.000000
914	0.000316	-0.000007	-0.000007	0.000000	2964	0.000001	0.000000	0.000000	0.000000
916	0.000314	-0.000007	-0.000007	0.000000	2966	0.000001	0.000000	0.000000	0.000000
918	0.000312	-0.000007	-0.000007	0.000000	2968	0.000001	0.000000	0.000000	0.000000
920	0.000310	-0.000007	-0.000006	0.000000	2970	0.000001	0.000000	0.000000	0.000000
922	0.000308	-0.000006	-0.000006	0.000000	2972	0.000001	0.000000	0.000000	0.000000
924	0.000307	-0.000006	-0.000006	0.000000	2974	0.000001	0.000000	0.000000	0.000000
926	0.000305	-0.000006	-0.000006	0.000000	2976	0.000001	0.000000	0.000000	0.000000
928	0.000303	-0.000006	-0.000006	0.000000	2978	0.000000	0.000000	0.000000	0.000000
930	0.000301	-0.000006	-0.000006	0.000000	2980	0.000000	0.000000	0.000000	0.000000
932	0.000300	-0.000006	-0.000006	0.000000	2982	0.000000	0.000000	0.000000	0.000000
934	0.000298	-0.000006	-0.000006	0.000000	2984	0.000000	0.000000	0.000000	0.000000
936	0.000296	-0.000006	-0.000006	0.000000	2986	0.000000	0.000000	0.000000	0.000000
938	0.000294	-0.000006	-0.000005	0.000000	2988	0.000000	0.000000	0.000000	0.000000
940	0.000292	-0.000005	-0.000005	0.000000	2990	0.000000	0.000000	0.000000	0.000000
942	0.000291	-0.000005	-0.000005	0.000000	2992	0.000000	0.000000	0.000000	0.000000
944	0.000289	-0.000005	-0.000005	0.000000	2994	0.000000	0.000000	0.000000	0.000000
946	0.000287	-0.000005	-0.000005	0.000000	2996	0.000000	0.000000	0.000000	0.000000
948	0.000286	-0.000005	-0.000005	0.000000	2998	0.000000	0.000000	0.000000	0.000000
950	0.000284	-0.000005	-0.000005	0.000000	3000	0.000000	0.000000	0.000000	0.000000
952	0.000282	-0.000005	-0.000005	0.000000	3002	0.000000	0.000000	0.000000	0.000000
954	0.000281	-0.000005	-0.000005	0.000000	3004	0.000000	0.000000	0.000000	0.000000
956	0.000279	-0.000005	-0.000005	0.000000	3006	0.000000	0.000000	0.000000	0.000000
958	0.000277	-0.000005	-0.000005	0.000000	3008	0.000000	0.000000	0.000000	0.000000
960	0.000276	-0.000005	-0.000004	0.000000	3010	0.000000	0.000000	0.000000	0.000000
962	0.000274	-0.000004	-0.000004	0.000000	3012	0.000000	0.000000	0.000000	0.000000
964	0.000272	-0.000004	-0.000004	0.000000	3014	0.000000	0.000000	0.000000	0.000000
966	0.000271	-0.000004	-0.000004	0.000000	3016	0.000000	0.000000	0.000000	0.000000
968	0.000269	-0.000004	-0.000004	0.000000	3018	0.000000	0.000000	0.000000	0.000000
970	0.000267	-0.000004	-0.000004	0.000000	3020	0.000000	0.000000	0.000000	0.000000
972	0.000266	-0.000004	-0.000004	0.000000	3022	0.000000	0.000000	0.000000	0.000000
974	0.000264	-0.000004	-0.000004	0.000000	3024	0.000000	0.000000	0.000000	0.000000
976	0.000263	-0.000004	-0.000004	0.000000	3026	0.000000	0.000000	0.000000	0.000000
978	0.000261	-0.000004	-0.000004	0.000000	3028	0.000000	0.000000	0.000000	0.000000
980	0.000260	-0.000004	-0.000004	0.000000	3030	0.000000	0.000000	0.000000	0.000000
982	0.000258	-0.000004	-0.000004	0.000000	3032	0.000000	0.000000	0.000000	0.000000
984	0.000256	-0.000004	-0.000004	0.000000	3034	0.000000	0.000000	0.000000	0.000000
986	0.000255	-0.000004	-0.000003	0.000000	3036	0.000000	0.000000	0.000000	0.000000
988	0.000253	-0.000003	-0.000003	0.000000	3038	0.000000	0.000000	0.000000	0.000000
990	0.000252	-0.000003	-0.000003	0.000000	3040	0.000000	0.000000	0.000000	0.000000

992	0.000250	-0.000003	-0.000003	0.000000	3042	0.000000	0.000000	0.000000	0.000000
994	0.000249	-0.000003	-0.000003	0.000000	3044	0.000000	0.000000	0.000000	0.000000
996	0.000247	-0.000003	-0.000003	0.000000	3046	0.000000	0.000000	0.000000	0.000000
998	0.000246	-0.000003	-0.000003	0.000000	3048	0.000000	0.000000	0.000000	0.000000
1000	0.000244	-0.000003	-0.000003	0.000000	3050	0.000000	0.000000	0.000000	0.000000
1002	0.000243	-0.000003	-0.000003	0.000000	3052	0.000000	0.000000	0.000000	0.000000
1004	0.000241	-0.000003	-0.000003	0.000000	3054	0.000000	0.000000	0.000000	0.000000
1006	0.000240	-0.000003	-0.000003	0.000000	3056	0.000000	0.000000	0.000000	0.000000
1008	0.000238	-0.000003	-0.000003	0.000000	3058	0.000000	0.000000	0.000000	0.000000
1010	0.000237	-0.000003	-0.000003	0.000000	3060	0.000000	0.000000	0.000000	0.000000
1012	0.000236	-0.000003	-0.000003	0.000000	3062	0.000000	0.000000	0.000000	0.000000
1014	0.000234	-0.000003	-0.000003	0.000000	3064	0.000000	0.000000	0.000000	0.000000
1016	0.000233	-0.000003	-0.000003	0.000000	3066	0.000000	0.000000	0.000000	0.000000
1018	0.000231	-0.000003	-0.000003	0.000000	3068	0.000000	0.000000	0.000000	0.000000
1020	0.000230	-0.000003	-0.000003	0.000000	3070	0.000000	0.000000	0.000000	0.000000
1022	0.000229	-0.000003	-0.000002	0.000000	3072	0.000000	0.000000	0.000000	0.000000
1024	0.000227	-0.000002	-0.000002	0.000000	3074	0.000000	0.000000	0.000000	0.000000
1026	0.000226	-0.000002	-0.000002	0.000000	3076	0.000000	0.000000	0.000000	0.000000
1028	0.000224	-0.000002	-0.000002	0.000000	3078	0.000000	0.000000	0.000000	0.000000
1030	0.000223	-0.000002	-0.000002	0.000000	3080	0.000000	0.000000	0.000000	0.000000
1032	0.000222	-0.000002	-0.000002	0.000000	3082	0.000000	0.000000	0.000000	0.000000
1034	0.000220	-0.000002	-0.000002	0.000000	3084	0.000000	0.000000	0.000000	0.000000
1036	0.000219	-0.000002	-0.000002	0.000000	3086	0.000000	0.000000	0.000000	0.000000
1038	0.000218	-0.000002	-0.000002	0.000000	3088	0.000000	0.000000	0.000000	0.000000
1040	0.000216	-0.000002	-0.000002	0.000000	3090	0.000000	0.000000	0.000000	0.000000
1042	0.000215	-0.000002	-0.000002	0.000000	3092	0.000000	0.000000	0.000000	0.000000
1044	0.000214	-0.000002	-0.000002	0.000000	3094	0.000000	0.000000	0.000000	0.000000
1046	0.000212	-0.000002	-0.000002	0.000000	3096	0.000000	0.000000	0.000000	0.000000
1048	0.000211	-0.000002	-0.000002	0.000000	3098	0.000000	0.000000	0.000000	0.000000
1050	0.000210	-0.000002	-0.000002	0.000000	3100	0.000000	0.000000	0.000000	0.000000
1052	0.000209	-0.000002	-0.000002	0.000000	3102	0.000000	0.000000	0.000000	0.000000
1054	0.000207	-0.000002	-0.000002	0.000000	3104	0.000000	0.000000	0.000000	0.000000
1056	0.000206	-0.000002	-0.000002	0.000000	3106	0.000000	0.000000	0.000000	0.000000
1058	0.000205	-0.000002	-0.000002	0.000000	3108	0.000000	0.000000	0.000000	0.000000
1060	0.000204	-0.000002	-0.000002	0.000000	3110	0.000000	0.000000	0.000000	0.000000
1062	0.000202	-0.000002	-0.000002	0.000000	3112	0.000000	0.000000	0.000000	0.000000
1064	0.000201	-0.000002	-0.000002	0.000000	3114	0.000000	0.000000	0.000000	0.000000
1066	0.000200	-0.000002	-0.000002	0.000000	3116	0.000000	0.000000	0.000000	0.000000
1068	0.000199	-0.000002	-0.000002	0.000000	3118	0.000000	0.000000	0.000000	0.000000
1070	0.000197	-0.000002	-0.000002	0.000000	3120	0.000000	0.000000	0.000000	0.000000
1072	0.000196	-0.000002	-0.000002	0.000000	3122	0.000000	0.000000	0.000000	0.000000
1074	0.000195	-0.000002	-0.000002	0.000000	3124	0.000000	0.000000	0.000000	0.000000
1076	0.000194	-0.000002	-0.000002	0.000000	3126	0.000000	0.000000	0.000000	0.000000
1078	0.000193	-0.000001	-0.000001	0.000000	3128	0.000000	0.000000	0.000000	0.000000
1080	0.000191	-0.000001	-0.000001	0.000000	3130	0.000000	0.000000	0.000000	0.000000
1082	0.000190	-0.000001	-0.000001	0.000000	3132	0.000000	0.000000	0.000000	0.000000
1084	0.000189	-0.000001	-0.000001	0.000000	3134	0.000000	0.000000	0.000000	0.000000
1086	0.000188	-0.000001	-0.000001	0.000000	3136	0.000000	0.000000	0.000000	0.000000
1088	0.000187	-0.000001	-0.000001	0.000000	3138	0.000000	0.000000	0.000000	0.000000
1090	0.000186	-0.000001	-0.000001	0.000000	3140	0.000000	0.000000	0.000000	0.000000
1092	0.000185	-0.000001	-0.000001	0.000000	3142	0.000000	0.000000	0.000000	0.000000
1094	0.000183	-0.000001	-0.000001	0.000000	3144	0.000000	0.000000	0.000000	0.000000
1096	0.000182	-0.000001	-0.000001	0.000000	3146	0.000000	0.000000	0.000000	0.000000
1098	0.000181	-0.000001	-0.000001	0.000000	3148	0.000000	0.000000	0.000000	0.000000
1100	0.000180	-0.000001	-0.000001	0.000000	3150	0.000000	0.000000	0.000000	0.000000
1102	0.000179	-0.000001	-0.000001	0.000000	3152	0.000000	0.000000	0.000000	0.000000
1104	0.000178	-0.000001	-0.000001	0.000000	3154	0.000000	0.000000	0.000000	0.000000
1106	0.000177	-0.000001	-0.000001	0.000000	3156	0.000000	0.000000	0.000000	0.000000
1108	0.000176	-0.000001	-0.000001	0.000000	3158	0.000000	0.000000	0.000000	0.000000
1110	0.000175	-0.000001	-0.000001	0.000000	3160	0.000000	0.000000	0.000000	0.000000
1112	0.000174	-0.000001	-0.000001	0.000000	3162	0.000000	0.000000	0.000000	0.000000
1114	0.000172	-0.000001	-0.000001	0.000000	3164	0.000000	0.000000	0.000000	0.000000
1116	0.000171	-0.000001	-0.000001	0.000000	3166	0.000000	0.000000	0.000000	0.000000
1118	0.000170	-0.000001	-0.000001	0.000000	3168	0.000000	0.000000	0.000000	0.000000
1120	0.000169	-0.000001	-0.000001	0.000000	3170	0.000000	0.000000	0.000000	0.000000
1122	0.000168	-0.000001	-0.000001	0.000000	3172	0.000000	0.000000	0.000000	0.000000
1124	0.000167	-0.000001	-0.000001	0.000000	3174	0.000000	0.000000	0.000000	0.000000

1126	0.000166	-0.000001	-0.000001	0.000000	3176	0.000000	0.000000	0.000000	0.000000
1128	0.000165	-0.000001	-0.000001	0.000000	3178	0.000000	0.000000	0.000000	0.000000
1130	0.000164	-0.000001	-0.000001	0.000000	3180	0.000000	0.000000	0.000000	0.000000
1132	0.000163	-0.000001	-0.000001	0.000000	3182	0.000000	0.000000	0.000000	0.000000
1134	0.000162	-0.000001	-0.000001	0.000000	3184	0.000000	0.000000	0.000000	0.000000
1136	0.000161	-0.000001	-0.000001	0.000000	3186	0.000000	0.000000	0.000000	0.000000
1138	0.000160	-0.000001	-0.000001	0.000000	3188	0.000000	0.000000	0.000000	0.000000
1140	0.000159	-0.000001	-0.000001	0.000000	3190	0.000000	0.000000	0.000000	0.000000
1142	0.000158	-0.000001	-0.000001	0.000000	3192	0.000000	0.000000	0.000000	0.000000
1144	0.000157	-0.000001	-0.000001	0.000000	3194	0.000000	0.000000	0.000000	0.000000
1146	0.000156	-0.000001	-0.000001	0.000000	3196	0.000000	0.000000	0.000000	0.000000
1148	0.000155	-0.000001	-0.000001	0.000000	3198	0.000000	0.000000	0.000000	0.000000
1150	0.000154	-0.000001	-0.000001	0.000000	3200	0.000000	0.000000	0.000000	0.000000
1152	0.000153	-0.000001	-0.000001	0.000000	3202	0.000000	0.000000	0.000000	0.000000
1154	0.000152	-0.000001	-0.000001	0.000000	3204	0.000000	0.000000	0.000000	0.000000
1156	0.000151	-0.000001	-0.000001	0.000000	3206	0.000000	0.000000	0.000000	0.000000
1158	0.000151	-0.000001	-0.000001	0.000000	3208	0.000000	0.000000	0.000000	0.000000
1160	0.000150	-0.000001	-0.000001	0.000000	3210	0.000000	0.000000	0.000000	0.000000
1162	0.000149	-0.000001	-0.000001	0.000000	3212	0.000000	0.000000	0.000000	0.000000
1164	0.000148	-0.000001	-0.000001	0.000000	3214	0.000000	0.000000	0.000000	0.000000
1166	0.000147	-0.000001	-0.000001	0.000000	3216	0.000000	0.000000	0.000000	0.000000
1168	0.000146	-0.000001	-0.000001	0.000000	3218	0.000000	0.000000	0.000000	0.000000
1170	0.000145	-0.000001	-0.000001	0.000000	3220	0.000000	0.000000	0.000000	0.000000
1172	0.000144	-0.000001	-0.000001	0.000000	3222	0.000000	0.000000	0.000000	0.000000
1174	0.000143	-0.000001	-0.000001	0.000000	3224	0.000000	0.000000	0.000000	0.000000
1176	0.000142	-0.000001	-0.000001	0.000000	3226	0.000000	0.000000	0.000000	0.000000
1178	0.000141	-0.000001	-0.000001	0.000000	3228	0.000000	0.000000	0.000000	0.000000
1180	0.000141	-0.000001	-0.000001	0.000000	3230	0.000000	0.000000	0.000000	0.000000
1182	0.000140	-0.000001	-0.000001	0.000000	3232	0.000000	0.000000	0.000000	0.000000
1184	0.000139	-0.000001	-0.000001	0.000000	3234	0.000000	0.000000	0.000000	0.000000
1186	0.000138	-0.000001	-0.000001	0.000000	3236	0.000000	0.000000	0.000000	0.000000
1188	0.000137	-0.000001	-0.000001	0.000000	3238	0.000000	0.000000	0.000000	0.000000
1190	0.000136	-0.000001	-0.000001	0.000000	3240	0.000000	0.000000	0.000000	0.000000
1192	0.000135	-0.000001	-0.000001	0.000000	3242	0.000000	0.000000	0.000000	0.000000
1194	0.000135	-0.000001	0.000000	0.000000	3244	0.000000	0.000000	0.000000	0.000000
1196	0.000134	0.000000	0.000000	0.000000	3246	0.000000	0.000000	0.000000	0.000000
1198	0.000133	0.000000	0.000000	0.000000	3248	0.000000	0.000000	0.000000	0.000000
1200	0.000132	0.000000	0.000000	0.000000	3250	0.000000	0.000000	0.000000	0.000000
1202	0.000131	0.000000	0.000000	0.000000	3252	0.000000	0.000000	0.000000	0.000000
1204	0.000130	0.000000	0.000000	0.000000	3254	0.000000	0.000000	0.000000	0.000000
1206	0.000130	0.000000	0.000000	0.000000	3256	0.000000	0.000000	0.000000	0.000000
1208	0.000129	0.000000	0.000000	0.000000	3258	0.000000	0.000000	0.000000	0.000000
1210	0.000128	0.000000	0.000000	0.000000	3260	0.000000	0.000000	0.000000	0.000000
1212	0.000127	0.000000	0.000000	0.000000	3262	0.000000	0.000000	0.000000	0.000000
1214	0.000126	0.000000	0.000000	0.000000	3264	0.000000	0.000000	0.000000	0.000000
1216	0.000126	0.000000	0.000000	0.000000	3266	0.000000	0.000000	0.000000	0.000000
1218	0.000125	0.000000	0.000000	0.000000	3268	0.000000	0.000000	0.000000	0.000000
1220	0.000124	0.000000	0.000000	0.000000	3270	0.000000	0.000000	0.000000	0.000000
1222	0.000123	0.000000	0.000000	0.000000	3272	0.000000	0.000000	0.000000	0.000000
1224	0.000123	0.000000	0.000000	0.000000	3274	0.000000	0.000000	0.000000	0.000000
1226	0.000122	0.000000	0.000000	0.000000	3276	0.000000	0.000000	0.000000	0.000000
1228	0.000121	0.000000	0.000000	0.000000	3278	0.000000	0.000000	0.000000	0.000000
1230	0.000120	0.000000	0.000000	0.000000	3280	0.000000	0.000000	0.000000	0.000000
1232	0.000120	0.000000	0.000000	0.000000	3282	0.000000	0.000000	0.000000	0.000000
1234	0.000119	0.000000	0.000000	0.000000	3284	0.000000	0.000000	0.000000	0.000000
1236	0.000118	0.000000	0.000000	0.000000	3286	0.000000	0.000000	0.000000	0.000000
1238	0.000117	0.000000	0.000000	0.000000	3288	0.000000	0.000000	0.000000	0.000000
1240	0.000117	0.000000	0.000000	0.000000	3290	0.000000	0.000000	0.000000	0.000000
1242	0.000116	0.000000	0.000000	0.000000	3292	0.000000	0.000000	0.000000	0.000000
1244	0.000115	0.000000	0.000000	0.000000	3294	0.000000	0.000000	0.000000	0.000000
1246	0.000114	0.000000	0.000000	0.000000	3296	0.000000	0.000000	0.000000	0.000000
1248	0.000114	0.000000	0.000000	0.000000	3298	0.000000	0.000000	0.000000	0.000000
1250	0.000113	0.000000	0.000000	0.000000	3300	0.000000	0.000000	0.000000	0.000000
1252	0.000112	0.000000	0.000000	0.000000	3302	0.000000	0.000000	0.000000	0.000000
1254	0.000112	0.000000	0.000000	0.000000	3304	0.000000	0.000000	0.000000	0.000000
1256	0.000111	0.000000	0.000000	0.000000	3306	0.000000	0.000000	0.000000	0.000000
1258	0.000110	0.000000	0.000000	0.000000	3308	0.000000	0.000000	0.000000	0.000000

1260	0.000110	0.000000	0.000000	0.000000	3310	0.000000	0.000000	0.000000	0.000000
1262	0.000109	0.000000	0.000000	0.000000	3312	0.000000	0.000000	0.000000	0.000000
1264	0.000108	0.000000	0.000000	0.000000	3314	0.000000	0.000000	0.000000	0.000000
1266	0.000108	0.000000	0.000000	0.000000	3316	0.000000	0.000000	0.000000	0.000000
1268	0.000107	0.000000	0.000000	0.000000	3318	0.000000	0.000000	0.000000	0.000000
1270	0.000106	0.000000	0.000000	0.000000	3320	0.000000	0.000000	0.000000	0.000000
1272	0.000106	0.000000	0.000000	0.000000	3322	0.000000	0.000000	0.000000	0.000000
1274	0.000105	0.000000	0.000000	0.000000	3324	0.000000	0.000000	0.000000	0.000000
1276	0.000104	0.000000	0.000000	0.000000	3326	0.000000	0.000000	0.000000	0.000000
1278	0.000104	0.000000	0.000000	0.000000	3328	0.000000	0.000000	0.000000	0.000000
1280	0.000103	0.000000	0.000000	0.000000	3330	0.000000	0.000000	0.000000	0.000000
1282	0.000102	0.000000	0.000000	0.000000	3332	0.000000	0.000000	0.000000	0.000000
1284	0.000102	0.000000	0.000000	0.000000	3334	0.000000	0.000000	0.000000	0.000000
1286	0.000101	0.000000	0.000000	0.000000	3336	0.000000	0.000000	0.000000	0.000000
1288	0.000100	0.000000	0.000000	0.000000	3338	0.000000	0.000000	0.000000	0.000000
1290	0.000100	0.000000	0.000000	0.000000	3340	0.000000	0.000000	0.000000	0.000000
1292	0.000099	0.000000	0.000000	0.000000	3342	0.000000	0.000000	0.000000	0.000000
1294	0.000099	0.000000	0.000000	0.000000	3344	0.000000	0.000000	0.000000	0.000000
1296	0.000098	0.000000	0.000000	0.000000	3346	0.000000	0.000000	0.000000	0.000000
1298	0.000097	0.000000	0.000000	0.000000	3348	0.000000	0.000000	0.000000	0.000000
1300	0.000097	0.000000	0.000000	0.000000	3350	0.000000	0.000000	0.000000	0.000000
1302	0.000096	0.000000	0.000000	0.000000	3352	0.000000	0.000000	0.000000	0.000000
1304	0.000096	0.000000	0.000000	0.000000	3354	0.000000	0.000000	0.000000	0.000000
1306	0.000095	0.000000	0.000000	0.000000	3356	0.000000	0.000000	0.000000	0.000000
1308	0.000094	0.000000	0.000000	0.000000	3358	0.000000	0.000000	0.000000	0.000000
1310	0.000094	0.000000	0.000000	0.000000	3360	0.000000	0.000000	0.000000	0.000000
1312	0.000093	0.000000	0.000000	0.000000	3362	0.000000	0.000000	0.000000	0.000000
1314	0.000093	0.000000	0.000000	0.000000	3364	0.000000	0.000000	0.000000	0.000000
1316	0.000092	0.000000	0.000000	0.000000	3366	0.000000	0.000000	0.000000	0.000000
1318	0.000091	0.000000	0.000000	0.000000	3368	0.000000	0.000000	0.000000	0.000000
1320	0.000091	0.000000	0.000000	0.000000	3370	0.000000	0.000000	0.000000	0.000000
1322	0.000090	0.000000	0.000000	0.000000	3372	0.000000	0.000000	0.000000	0.000000
1324	0.000090	0.000000	0.000000	0.000000	3374	0.000000	0.000000	0.000000	0.000000
1326	0.000089	0.000000	0.000000	0.000000	3376	0.000000	0.000000	0.000000	0.000000
1328	0.000089	0.000000	0.000000	0.000000	3378	0.000000	0.000000	0.000000	0.000000
1330	0.000088	0.000000	0.000000	0.000000	3380	0.000000	0.000000	0.000000	0.000000
1332	0.000088	0.000000	0.000000	0.000000	3382	0.000000	0.000000	0.000000	0.000000
1334	0.000087	0.000000	0.000000	0.000000	3384	0.000000	0.000000	0.000000	0.000000
1336	0.000086	0.000000	0.000000	0.000000	3386	0.000000	0.000000	0.000000	0.000000
1338	0.000086	0.000000	0.000000	0.000000	3388	0.000000	0.000000	0.000000	0.000000
1340	0.000085	0.000000	0.000000	0.000000	3390	0.000000	0.000000	0.000000	0.000000
1342	0.000085	0.000000	0.000000	0.000000	3392	0.000000	0.000000	0.000000	0.000000
1344	0.000084	0.000000	0.000000	0.000000	3394	0.000000	0.000000	0.000000	0.000000
1346	0.000084	0.000000	0.000000	0.000000	3396	0.000000	0.000000	0.000000	0.000000
1348	0.000083	0.000000	0.000000	0.000000	3398	0.000000	0.000000	0.000000	0.000000
1350	0.000083	0.000000	0.000000	0.000000	3400	0.000000	0.000000	0.000000	0.000000
1352	0.000082	0.000000	0.000000	0.000000	3402	0.000000	0.000000	0.000000	0.000000
1354	0.000082	0.000000	0.000000	0.000000	3404	0.000000	0.000000	0.000000	0.000000
1356	0.000081	0.000000	0.000000	0.000000	3406	0.000000	0.000000	0.000000	0.000000
1358	0.000081	0.000000	0.000000	0.000000	3408	0.000000	0.000000	0.000000	0.000000
1360	0.000080	0.000000	0.000000	0.000000	3410	0.000000	0.000000	0.000000	0.000000
1362	0.000080	0.000000	0.000000	0.000000	3412	0.000000	0.000000	0.000000	0.000000
1364	0.000079	0.000000	0.000000	0.000000	3414	0.000000	0.000000	0.000000	0.000000
1366	0.000079	0.000000	0.000000	0.000000	3416	0.000000	0.000000	0.000000	0.000000
1368	0.000078	0.000000	0.000000	0.000000	3418	0.000000	0.000000	0.000000	0.000000
1370	0.000078	0.000000	0.000000	0.000000	3420	0.000000	0.000000	0.000000	0.000000
1372	0.000077	0.000000	0.000000	0.000000	3422	0.000000	0.000000	0.000000	0.000000
1374	0.000077	0.000000	0.000000	0.000000	3424	0.000000	0.000000	0.000000	0.000000
1376	0.000076	0.000000	0.000000	0.000000	3426	0.000000	0.000000	0.000000	0.000000
1378	0.000076	0.000000	0.000000	0.000000	3428	0.000000	0.000000	0.000000	0.000000
1380	0.000075	0.000000	0.000000	0.000000	3430	0.000000	0.000000	0.000000	0.000000
1382	0.000075	0.000000	0.000000	0.000000	3432	0.000000	0.000000	0.000000	0.000000
1384	0.000074	0.000000	0.000000	0.000000	3434	0.000000	0.000000	0.000000	0.000000
1386	0.000074	0.000000	0.000000	0.000000	3436	0.000000	0.000000	0.000000	0.000000
1388	0.000073	0.000000	0.000000	0.000000	3438	0.000000	0.000000	0.000000	0.000000
1390	0.000073	0.000000	0.000000	0.000000	3440	0.000000	0.000000	0.000000	0.000000
1392	0.000073	0.000000	0.000000	0.000000	3442	0.000000	0.000000	0.000000	0.000000

1394	0.000072	0.000000	0.000000	0.000000	3444	0.000000	0.000000	0.000000	0.000000
1396	0.000072	0.000000	0.000000	0.000000	3446	0.000000	0.000000	0.000000	0.000000
1398	0.000071	0.000000	0.000000	0.000000	3448	0.000000	0.000000	0.000000	0.000000
1400	0.000071	0.000000	0.000000	0.000000	3450	0.000000	0.000000	0.000000	0.000000
1402	0.000070	0.000000	0.000000	0.000000	3452	0.000000	0.000000	0.000000	0.000000
1404	0.000070	0.000000	0.000000	0.000000	3454	0.000000	0.000000	0.000000	0.000000
1406	0.000069	0.000000	0.000000	0.000000	3456	0.000000	0.000000	0.000000	0.000000
1408	0.000069	0.000000	0.000000	0.000000	3458	0.000000	0.000000	0.000000	0.000000
1410	0.000069	0.000000	0.000000	0.000000	3460	0.000000	0.000000	0.000000	0.000000
1412	0.000068	0.000000	0.000000	0.000000	3462	0.000000	0.000000	0.000000	0.000000
1414	0.000068	0.000000	0.000000	0.000000	3464	0.000000	0.000000	0.000000	0.000000
1416	0.000067	0.000000	0.000000	0.000000	3466	0.000000	0.000000	0.000000	0.000000
1418	0.000067	0.000000	0.000000	0.000000	3468	0.000000	0.000000	0.000000	0.000000
1420	0.000066	0.000000	0.000000	0.000000	3470	0.000000	0.000000	0.000000	0.000000
1422	0.000066	0.000000	0.000000	0.000000	3472	0.000000	0.000000	0.000000	0.000000
1424	0.000066	0.000000	0.000000	0.000000	3474	0.000000	0.000000	0.000000	0.000000
1426	0.000065	0.000000	0.000000	0.000000	3476	0.000000	0.000000	0.000000	0.000000
1428	0.000065	0.000000	0.000000	0.000000	3478	0.000000	0.000000	0.000000	0.000000
1430	0.000064	0.000000	0.000000	0.000000	3480	0.000000	0.000000	0.000000	0.000000
1432	0.000064	0.000000	0.000000	0.000000	3482	0.000000	0.000000	0.000000	0.000000
1434	0.000064	0.000000	0.000000	0.000000	3484	0.000000	0.000000	0.000000	0.000000
1436	0.000063	0.000000	0.000000	0.000000	3486	0.000000	0.000000	0.000000	0.000000
1438	0.000063	0.000000	0.000000	0.000000	3488	0.000000	0.000000	0.000000	0.000000
1440	0.000062	0.000000	0.000000	0.000000	3490	0.000000	0.000000	0.000000	0.000000
1442	0.000062	0.000000	0.000000	0.000000	3492	0.000000	0.000000	0.000000	0.000000
1444	0.000062	0.000000	0.000000	0.000000	3494	0.000000	0.000000	0.000000	0.000000
1446	0.000061	0.000000	0.000000	0.000000	3496	0.000000	0.000000	0.000000	0.000000
1448	0.000061	0.000000	0.000000	0.000000	3498	0.000000	0.000000	0.000000	0.000000
1450	0.000060	0.000000	0.000000	0.000000	3500	0.000000	0.000000	0.000000	0.000000
1452	0.000060	0.000000	0.000000	0.000000	3502	0.000000	0.000000	0.000000	0.000000
1454	0.000060	0.000000	0.000000	0.000000	3504	0.000000	0.000000	0.000000	0.000000
1456	0.000059	0.000000	0.000000	0.000000	3506	0.000000	0.000000	0.000000	0.000000
1458	0.000059	0.000000	0.000000	0.000000	3508	0.000000	0.000000	0.000000	0.000000
1460	0.000059	0.000000	0.000000	0.000000	3510	0.000000	0.000000	0.000000	0.000000
1462	0.000058	0.000000	0.000000	0.000000	3512	0.000000	0.000000	0.000000	0.000000
1464	0.000058	0.000000	0.000000	0.000000	3514	0.000000	0.000000	0.000000	0.000000
1466	0.000058	0.000000	0.000000	0.000000	3516	0.000000	0.000000	0.000000	0.000000
1468	0.000057	0.000000	0.000000	0.000000	3518	0.000000	0.000000	0.000000	0.000000
1470	0.000057	0.000000	0.000000	0.000000	3520	0.000000	0.000000	0.000000	0.000000
1472	0.000056	0.000000	0.000000	0.000000	3522	0.000000	0.000000	0.000000	0.000000
1474	0.000056	0.000000	0.000000	0.000000	3524	0.000000	0.000000	0.000000	0.000000
1476	0.000056	0.000000	0.000000	0.000000	3526	0.000000	0.000000	0.000000	0.000000
1478	0.000055	0.000000	0.000000	0.000000	3528	0.000000	0.000000	0.000000	0.000000
1480	0.000055	0.000000	0.000000	0.000000	3530	0.000000	0.000000	0.000000	0.000000
1482	0.000055	0.000000	0.000000	0.000000	3532	0.000000	0.000000	0.000000	0.000000
1484	0.000054	0.000000	0.000000	0.000000	3534	0.000000	0.000000	0.000000	0.000000
1486	0.000054	0.000000	0.000000	0.000000	3536	0.000000	0.000000	0.000000	0.000000
1488	0.000054	0.000000	0.000000	0.000000	3538	0.000000	0.000000	0.000000	0.000000
1490	0.000053	0.000000	0.000000	0.000000	3540	0.000000	0.000000	0.000000	0.000000
1492	0.000053	0.000000	0.000000	0.000000	3542	0.000000	0.000000	0.000000	0.000000
1494	0.000053	0.000000	0.000000	0.000000	3544	0.000000	0.000000	0.000000	0.000000
1496	0.000052	0.000000	0.000000	0.000000	3546	0.000000	0.000000	0.000000	0.000000
1498	0.000052	0.000000	0.000000	0.000000	3548	0.000000	0.000000	0.000000	0.000000
1500	0.000052	0.000000	0.000000	0.000000	3550	0.000000	0.000000	0.000000	0.000000
1502	0.000051	0.000000	0.000000	0.000000	3552	0.000000	0.000000	0.000000	0.000000
1504	0.000051	0.000000	0.000000	0.000000	3554	0.000000	0.000000	0.000000	0.000000
1506	0.000051	0.000000	0.000000	0.000000	3556	0.000000	0.000000	0.000000	0.000000
1508	0.000050	0.000000	0.000000	0.000000	3558	0.000000	0.000000	0.000000	0.000000
1510	0.000050	0.000000	0.000000	0.000000	3560	0.000000	0.000000	0.000000	0.000000
1512	0.000050	0.000000	0.000000	0.000000	3562	0.000000	0.000000	0.000000	0.000000
1514	0.000049	0.000000	0.000000	0.000000	3564	0.000000	0.000000	0.000000	0.000000
1516	0.000049	0.000000	0.000000	0.000000	3566	0.000000	0.000000	0.000000	0.000000
1518	0.000049	0.000000	0.000000	0.000000	3568	0.000000	0.000000	0.000000	0.000000
1520	0.000049	0.000000	0.000000	0.000000	3570	0.000000	0.000000	0.000000	0.000000
1522	0.000048	0.000000	0.000000	0.000000	3572	0.000000	0.000000	0.000000	0.000000
1524	0.000048	0.000000	0.000000	0.000000	3574	0.000000	0.000000	0.000000	0.000000
1526	0.000048	0.000000	0.000000	0.000000	3576	0.000000	0.000000	0.000000	0.000000

1528	0.000047	0.000000	0.000000	0.000000	3578	0.000000	0.000000	0.000000	0.000000
1530	0.000047	0.000000	0.000000	0.000000	3580	0.000000	0.000000	0.000000	0.000000
1532	0.000047	0.000000	0.000000	0.000000	3582	0.000000	0.000000	0.000000	0.000000
1534	0.000046	0.000000	0.000000	0.000000	3584	0.000000	0.000000	0.000000	0.000000
1536	0.000046	0.000000	0.000000	0.000000	3586	0.000000	0.000000	0.000000	0.000000
1538	0.000046	0.000000	0.000000	0.000000	3588	0.000000	0.000000	0.000000	0.000000
1540	0.000046	0.000000	0.000000	0.000000	3590	0.000000	0.000000	0.000000	0.000000
1542	0.000045	0.000000	0.000000	0.000000	3592	0.000000	0.000000	0.000000	0.000000
1544	0.000045	0.000000	0.000000	0.000000	3594	0.000000	0.000000	0.000000	0.000000
1546	0.000045	0.000000	0.000000	0.000000	3596	0.000000	0.000000	0.000000	0.000000
1548	0.000044	0.000000	0.000000	0.000000	3598	0.000000	0.000000	0.000000	0.000000
1550	0.000044	0.000000	0.000000	0.000000	3600	0.000000	0.000000	0.000000	0.000000
1552	0.000044	0.000000	0.000000	0.000000	3602	0.000000	0.000000	0.000000	0.000000
1554	0.000044	0.000000	0.000000	0.000000	3604	0.000000	0.000000	0.000000	0.000000
1556	0.000043	0.000000	0.000000	0.000000	3606	0.000000	0.000000	0.000000	0.000000
1558	0.000043	0.000000	0.000000	0.000000	3608	0.000000	0.000000	0.000000	0.000000
1560	0.000043	0.000000	0.000000	0.000000	3610	0.000000	0.000000	0.000000	0.000000
1562	0.000043	0.000000	0.000000	0.000000	3612	0.000000	0.000000	0.000000	0.000000
1564	0.000042	0.000000	0.000000	0.000000	3614	0.000000	0.000000	0.000000	0.000000
1566	0.000042	0.000000	0.000000	0.000000	3616	0.000000	0.000000	0.000000	0.000000
1568	0.000042	0.000000	0.000000	0.000000	3618	0.000000	0.000000	0.000000	0.000000
1570	0.000042	0.000000	0.000000	0.000000	3620	0.000000	0.000000	0.000000	0.000000
1572	0.000041	0.000000	0.000000	0.000000	3622	0.000000	0.000000	0.000000	0.000000
1574	0.000041	0.000000	0.000000	0.000000	3624	0.000000	0.000000	0.000000	0.000000
1576	0.000041	0.000000	0.000000	0.000000	3626	0.000000	0.000000	0.000000	0.000000
1578	0.000040	0.000000	0.000000	0.000000	3628	0.000000	0.000000	0.000000	0.000000
1580	0.000040	0.000000	0.000000	0.000000	3630	0.000000	0.000000	0.000000	0.000000
1582	0.000040	0.000000	0.000000	0.000000	3632	0.000000	0.000000	0.000000	0.000000
1584	0.000040	0.000000	0.000000	0.000000	3634	0.000000	0.000000	0.000000	0.000000
1586	0.000039	0.000000	0.000000	0.000000	3636	0.000000	0.000000	0.000000	0.000000
1588	0.000039	0.000000	0.000000	0.000000	3638	0.000000	0.000000	0.000000	0.000000
1590	0.000039	0.000000	0.000000	0.000000	3640	0.000000	0.000000	0.000000	0.000000
1592	0.000039	0.000000	0.000000	0.000000	3642	0.000000	0.000000	0.000000	0.000000
1594	0.000039	0.000000	0.000000	0.000000	3644	0.000000	0.000000	0.000000	0.000000
1596	0.000038	0.000000	0.000000	0.000000	3646	0.000000	0.000000	0.000000	0.000000
1598	0.000038	0.000000	0.000000	0.000000	3648	0.000000	0.000000	0.000000	0.000000
1600	0.000038	0.000000	0.000000	0.000000	3650	0.000000	0.000000	0.000000	0.000000
1602	0.000038	0.000000	0.000000	0.000000	3652	0.000000	0.000000	0.000000	0.000000
1604	0.000037	0.000000	0.000000	0.000000	3654	0.000000	0.000000	0.000000	0.000000
1606	0.000037	0.000000	0.000000	0.000000	3656	0.000000	0.000000	0.000000	0.000000
1608	0.000037	0.000000	0.000000	0.000000	3658	0.000000	0.000000	0.000000	0.000000
1610	0.000037	0.000000	0.000000	0.000000	3660	0.000000	0.000000	0.000000	0.000000
1612	0.000036	0.000000	0.000000	0.000000	3662	0.000000	0.000000	0.000000	0.000000
1614	0.000036	0.000000	0.000000	0.000000	3664	0.000000	0.000000	0.000000	0.000000
1616	0.000036	0.000000	0.000000	0.000000	3666	0.000000	0.000000	0.000000	0.000000
1618	0.000036	0.000000	0.000000	0.000000	3668	0.000000	0.000000	0.000000	0.000000
1620	0.000035	0.000000	0.000000	0.000000	3670	0.000000	0.000000	0.000000	0.000000
1622	0.000035	0.000000	0.000000	0.000000	3672	0.000000	0.000000	0.000000	0.000000
1624	0.000035	0.000000	0.000000	0.000000	3674	0.000000	0.000000	0.000000	0.000000
1626	0.000035	0.000000	0.000000	0.000000	3676	0.000000	0.000000	0.000000	0.000000
1628	0.000035	0.000000	0.000000	0.000000	3678	0.000000	0.000000	0.000000	0.000000
1630	0.000034	0.000000	0.000000	0.000000	3680	0.000000	0.000000	0.000000	0.000000
1632	0.000034	0.000000	0.000000	0.000000	3682	0.000000	0.000000	0.000000	0.000000
1634	0.000034	0.000000	0.000000	0.000000	3684	0.000000	0.000000	0.000000	0.000000
1636	0.000034	0.000000	0.000000	0.000000	3686	0.000000	0.000000	0.000000	0.000000
1638	0.000034	0.000000	0.000000	0.000000	3688	0.000000	0.000000	0.000000	0.000000
1640	0.000033	0.000000	0.000000	0.000000	3690	0.000000	0.000000	0.000000	0.000000
1642	0.000033	0.000000	0.000000	0.000000	3692	0.000000	0.000000	0.000000	0.000000
1644	0.000033	0.000000	0.000000	0.000000	3694	0.000000	0.000000	0.000000	0.000000
1646	0.000033	0.000000	0.000000	0.000000	3696	0.000000	0.000000	0.000000	0.000000
1648	0.000033	0.000000	0.000000	0.000000	3698	0.000000	0.000000	0.000000	0.000000
1650	0.000032	0.000000	0.000000	0.000000	3700	0.000000	0.000000	0.000000	0.000000
1652	0.000032	0.000000	0.000000	0.000000	3702	0.000000	0.000000	0.000000	0.000000
1654	0.000032	0.000000	0.000000	0.000000	3704	0.000000	0.000000	0.000000	0.000000
1656	0.000032	0.000000	0.000000	0.000000	3706	0.000000	0.000000	0.000000	0.000000
1658	0.000031	0.000000	0.000000	0.000000	3708	0.000000	0.000000	0.000000	0.000000
1660	0.000031	0.000000	0.000000	0.000000	3710	0.000000	0.000000	0.000000	0.000000

1662	0.000031	0.000000	0.000000	0.000000	3712	0.000000	0.000000	0.000000	0.000000
1664	0.000031	0.000000	0.000000	0.000000	3714	0.000000	0.000000	0.000000	0.000000
1666	0.000031	0.000000	0.000000	0.000000	3716	0.000000	0.000000	0.000000	0.000000
1668	0.000031	0.000000	0.000000	0.000000	3718	0.000000	0.000000	0.000000	0.000000
1670	0.000030	0.000000	0.000000	0.000000	3720	0.000000	0.000000	0.000000	0.000000
1672	0.000030	0.000000	0.000000	0.000000	3722	0.000000	0.000000	0.000000	0.000000
1674	0.000030	0.000000	0.000000	0.000000	3724	0.000000	0.000000	0.000000	0.000000
1676	0.000030	0.000000	0.000000	0.000000	3726	0.000000	0.000000	0.000000	0.000000
1678	0.000030	0.000000	0.000000	0.000000	3728	0.000000	0.000000	0.000000	0.000000
1680	0.000029	0.000000	0.000000	0.000000	3730	0.000000	0.000000	0.000000	0.000000
1682	0.000029	0.000000	0.000000	0.000000	3732	0.000000	0.000000	0.000000	0.000000
1684	0.000029	0.000000	0.000000	0.000000	3734	0.000000	0.000000	0.000000	0.000000
1686	0.000029	0.000000	0.000000	0.000000	3736	0.000000	0.000000	0.000000	0.000000
1688	0.000029	0.000000	0.000000	0.000000	3738	0.000000	0.000000	0.000000	0.000000
1690	0.000028	0.000000	0.000000	0.000000	3740	0.000000	0.000000	0.000000	0.000000
1692	0.000028	0.000000	0.000000	0.000000	3742	0.000000	0.000000	0.000000	0.000000
1694	0.000028	0.000000	0.000000	0.000000	3744	0.000000	0.000000	0.000000	0.000000
1696	0.000028	0.000000	0.000000	0.000000	3746	0.000000	0.000000	0.000000	0.000000
1698	0.000028	0.000000	0.000000	0.000000	3748	0.000000	0.000000	0.000000	0.000000
1700	0.000028	0.000000	0.000000	0.000000	3750	0.000000	0.000000	0.000000	0.000000
1702	0.000027	0.000000	0.000000	0.000000	3752	0.000000	0.000000	0.000000	0.000000
1704	0.000027	0.000000	0.000000	0.000000	3754	0.000000	0.000000	0.000000	0.000000
1706	0.000027	0.000000	0.000000	0.000000	3756	0.000000	0.000000	0.000000	0.000000
1708	0.000027	0.000000	0.000000	0.000000	3758	0.000000	0.000000	0.000000	0.000000
1710	0.000027	0.000000	0.000000	0.000000	3760	0.000000	0.000000	0.000000	0.000000
1712	0.000027	0.000000	0.000000	0.000000	3762	0.000000	0.000000	0.000000	0.000000
1714	0.000026	0.000000	0.000000	0.000000	3764	0.000000	0.000000	0.000000	0.000000
1716	0.000026	0.000000	0.000000	0.000000	3766	0.000000	0.000000	0.000000	0.000000
1718	0.000026	0.000000	0.000000	0.000000	3768	0.000000	0.000000	0.000000	0.000000
1720	0.000026	0.000000	0.000000	0.000000	3770	0.000000	0.000000	0.000000	0.000000
1722	0.000026	0.000000	0.000000	0.000000	3772	0.000000	0.000000	0.000000	0.000000
1724	0.000026	0.000000	0.000000	0.000000	3774	0.000000	0.000000	0.000000	0.000000
1726	0.000025	0.000000	0.000000	0.000000	3776	0.000000	0.000000	0.000000	0.000000
1728	0.000025	0.000000	0.000000	0.000000	3778	0.000000	0.000000	0.000000	0.000000
1730	0.000025	0.000000	0.000000	0.000000	3780	0.000000	0.000000	0.000000	0.000000
1732	0.000025	0.000000	0.000000	0.000000	3782	0.000000	0.000000	0.000000	0.000000
1734	0.000025	0.000000	0.000000	0.000000	3784	0.000000	0.000000	0.000000	0.000000
1736	0.000025	0.000000	0.000000	0.000000	3786	0.000000	0.000000	0.000000	0.000000
1738	0.000024	0.000000	0.000000	0.000000	3788	0.000000	0.000000	0.000000	0.000000
1740	0.000024	0.000000	0.000000	0.000000	3790	0.000000	0.000000	0.000000	0.000000
1742	0.000024	0.000000	0.000000	0.000000	3792	0.000000	0.000000	0.000000	0.000000
1744	0.000024	0.000000	0.000000	0.000000	3794	0.000000	0.000000	0.000000	0.000000
1746	0.000024	0.000000	0.000000	0.000000	3796	0.000000	0.000000	0.000000	0.000000
1748	0.000024	0.000000	0.000000	0.000000	3798	0.000000	0.000000	0.000000	0.000000
1750	0.000024	0.000000	0.000000	0.000000	3800	0.000000	0.000000	0.000000	0.000000
1752	0.000023	0.000000	0.000000	0.000000	3802	0.000000	0.000000	0.000000	0.000000
1754	0.000023	0.000000	0.000000	0.000000	3804	0.000000	0.000000	0.000000	0.000000
1756	0.000023	0.000000	0.000000	0.000000	3806	0.000000	0.000000	0.000000	0.000000
1758	0.000023	0.000000	0.000000	0.000000	3808	0.000000	0.000000	0.000000	0.000000
1760	0.000023	0.000000	0.000000	0.000000	3810	0.000000	0.000000	0.000000	0.000000
1762	0.000023	0.000000	0.000000	0.000000	3812	0.000000	0.000000	0.000000	0.000000
1764	0.000023	0.000000	0.000000	0.000000	3814	0.000000	0.000000	0.000000	0.000000
1766	0.000022	0.000000	0.000000	0.000000	3816	0.000000	0.000000	0.000000	0.000000
1768	0.000022	0.000000	0.000000	0.000000	3818	0.000000	0.000000	0.000000	0.000000
1770	0.000022	0.000000	0.000000	0.000000	3820	0.000000	0.000000	0.000000	0.000000
1772	0.000022	0.000000	0.000000	0.000000	3822	0.000000	0.000000	0.000000	0.000000
1774	0.000022	0.000000	0.000000	0.000000	3824	0.000000	0.000000	0.000000	0.000000
1776	0.000022	0.000000	0.000000	0.000000	3826	0.000000	0.000000	0.000000	0.000000
1778	0.000022	0.000000	0.000000	0.000000	3828	0.000000	0.000000	0.000000	0.000000
1780	0.000021	0.000000	0.000000	0.000000	3830	0.000000	0.000000	0.000000	0.000000
1782	0.000021	0.000000	0.000000	0.000000	3832	0.000000	0.000000	0.000000	0.000000
1784	0.000021	0.000000	0.000000	0.000000	3834	0.000000	0.000000	0.000000	0.000000
1786	0.000021	0.000000	0.000000	0.000000	3836	0.000000	0.000000	0.000000	0.000000
1788	0.000021	0.000000	0.000000	0.000000	3838	0.000000	0.000000	0.000000	0.000000
1790	0.000021	0.000000	0.000000	0.000000	3840	0.000000	0.000000	0.000000	0.000000
1792	0.000021	0.000000	0.000000	0.000000	3842	0.000000	0.000000	0.000000	0.000000
1794	0.000021	0.000000	0.000000	0.000000	3844	0.000000	0.000000	0.000000	0.000000

1796	0.000020	0.000000	0.000000	0.000000	3846	0.000000	0.000000	0.000000	0.000000
1798	0.000020	0.000000	0.000000	0.000000	3848	0.000000	0.000000	0.000000	0.000000
1800	0.000020	0.000000	0.000000	0.000000	3850	0.000000	0.000000	0.000000	0.000000
1802	0.000020	0.000000	0.000000	0.000000	3852	0.000000	0.000000	0.000000	0.000000
1804	0.000020	0.000000	0.000000	0.000000	3854	0.000000	0.000000	0.000000	0.000000
1806	0.000020	0.000000	0.000000	0.000000	3856	0.000000	0.000000	0.000000	0.000000
1808	0.000020	0.000000	0.000000	0.000000	3858	0.000000	0.000000	0.000000	0.000000
1810	0.000020	0.000000	0.000000	0.000000	3860	0.000000	0.000000	0.000000	0.000000
1812	0.000019	0.000000	0.000000	0.000000	3862	0.000000	0.000000	0.000000	0.000000
1814	0.000019	0.000000	0.000000	0.000000	3864	0.000000	0.000000	0.000000	0.000000
1816	0.000019	0.000000	0.000000	0.000000	3866	0.000000	0.000000	0.000000	0.000000
1818	0.000019	0.000000	0.000000	0.000000	3868	0.000000	0.000000	0.000000	0.000000
1820	0.000019	0.000000	0.000000	0.000000	3870	0.000000	0.000000	0.000000	0.000000
1822	0.000019	0.000000	0.000000	0.000000	3872	0.000000	0.000000	0.000000	0.000000
1824	0.000019	0.000000	0.000000	0.000000	3874	0.000000	0.000000	0.000000	0.000000
1826	0.000019	0.000000	0.000000	0.000000	3876	0.000000	0.000000	0.000000	0.000000
1828	0.000018	0.000000	0.000000	0.000000	3878	0.000000	0.000000	0.000000	0.000000
1830	0.000018	0.000000	0.000000	0.000000	3880	0.000000	0.000000	0.000000	0.000000
1832	0.000018	0.000000	0.000000	0.000000	3882	0.000000	0.000000	0.000000	0.000000
1834	0.000018	0.000000	0.000000	0.000000	3884	0.000000	0.000000	0.000000	0.000000
1836	0.000018	0.000000	0.000000	0.000000	3886	0.000000	0.000000	0.000000	0.000000
1838	0.000018	0.000000	0.000000	0.000000	3888	0.000000	0.000000	0.000000	0.000000
1840	0.000018	0.000000	0.000000	0.000000	3890	0.000000	0.000000	0.000000	0.000000
1842	0.000018	0.000000	0.000000	0.000000	3892	0.000000	0.000000	0.000000	0.000000
1844	0.000018	0.000000	0.000000	0.000000	3894	0.000000	0.000000	0.000000	0.000000
1846	0.000017	0.000000	0.000000	0.000000	3896	0.000000	0.000000	0.000000	0.000000
1848	0.000017	0.000000	0.000000	0.000000	3898	0.000000	0.000000	0.000000	0.000000
1850	0.000017	0.000000	0.000000	0.000000	3900	0.000000	0.000000	0.000000	0.000000
1852	0.000017	0.000000	0.000000	0.000000	3902	0.000000	0.000000	0.000000	0.000000
1854	0.000017	0.000000	0.000000	0.000000	3904	0.000000	0.000000	0.000000	0.000000
1856	0.000017	0.000000	0.000000	0.000000	3906	0.000000	0.000000	0.000000	0.000000
1858	0.000017	0.000000	0.000000	0.000000	3908	0.000000	0.000000	0.000000	0.000000
1860	0.000017	0.000000	0.000000	0.000000	3910	0.000000	0.000000	0.000000	0.000000
1862	0.000017	0.000000	0.000000	0.000000	3912	0.000000	0.000000	0.000000	0.000000
1864	0.000016	0.000000	0.000000	0.000000	3914	0.000000	0.000000	0.000000	0.000000
1866	0.000016	0.000000	0.000000	0.000000	3916	0.000000	0.000000	0.000000	0.000000
1868	0.000016	0.000000	0.000000	0.000000	3918	0.000000	0.000000	0.000000	0.000000
1870	0.000016	0.000000	0.000000	0.000000	3920	0.000000	0.000000	0.000000	0.000000
1872	0.000016	0.000000	0.000000	0.000000	3922	0.000000	0.000000	0.000000	0.000000
1874	0.000016	0.000000	0.000000	0.000000	3924	0.000000	0.000000	0.000000	0.000000
1876	0.000016	0.000000	0.000000	0.000000	3926	0.000000	0.000000	0.000000	0.000000
1878	0.000016	0.000000	0.000000	0.000000	3928	0.000000	0.000000	0.000000	0.000000
1880	0.000016	0.000000	0.000000	0.000000	3930	0.000000	0.000000	0.000000	0.000000
1882	0.000016	0.000000	0.000000	0.000000	3932	0.000000	0.000000	0.000000	0.000000
1884	0.000015	0.000000	0.000000	0.000000	3934	0.000000	0.000000	0.000000	0.000000
1886	0.000015	0.000000	0.000000	0.000000	3936	0.000000	0.000000	0.000000	0.000000
1888	0.000015	0.000000	0.000000	0.000000	3938	0.000000	0.000000	0.000000	0.000000
1890	0.000015	0.000000	0.000000	0.000000	3940	0.000000	0.000000	0.000000	0.000000
1892	0.000015	0.000000	0.000000	0.000000	3942	0.000000	0.000000	0.000000	0.000000
1894	0.000015	0.000000	0.000000	0.000000	3944	0.000000	0.000000	0.000000	0.000000
1896	0.000015	0.000000	0.000000	0.000000	3946	0.000000	0.000000	0.000000	0.000000
1898	0.000015	0.000000	0.000000	0.000000	3948	0.000000	0.000000	0.000000	0.000000
1900	0.000015	0.000000	0.000000	0.000000	3950	0.000000	0.000000	0.000000	0.000000
1902	0.000015	0.000000	0.000000	0.000000	3952	0.000000	0.000000	0.000000	0.000000
1904	0.000015	0.000000	0.000000	0.000000	3954	0.000000	0.000000	0.000000	0.000000
1906	0.000014	0.000000	0.000000	0.000000	3956	0.000000	0.000000	0.000000	0.000000
1908	0.000014	0.000000	0.000000	0.000000	3958	0.000000	0.000000	0.000000	0.000000
1910	0.000014	0.000000	0.000000	0.000000	3960	0.000000	0.000000	0.000000	0.000000
1912	0.000014	0.000000	0.000000	0.000000	3962	0.000000	0.000000	0.000000	0.000000
1914	0.000014	0.000000	0.000000	0.000000	3964	0.000000	0.000000	0.000000	0.000000
1916	0.000014	0.000000	0.000000	0.000000	3966	0.000000	0.000000	0.000000	0.000000
1918	0.000014	0.000000	0.000000	0.000000	3968	0.000000	0.000000	0.000000	0.000000
1920	0.000014	0.000000	0.000000	0.000000	3970	0.000000	0.000000	0.000000	0.000000
1922	0.000014	0.000000	0.000000	0.000000	3972	0.000000	0.000000	0.000000	0.000000
1924	0.000014	0.000000	0.000000	0.000000	3974	0.000000	0.000000	0.000000	0.000000
1926	0.000014	0.000000	0.000000	0.000000	3976	0.000000	0.000000	0.000000	0.000000
1928	0.000013	0.000000	0.000000	0.000000	3978	0.000000	0.000000	0.000000	0.000000

1930	0.000013	0.000000	0.000000	0.000000	3980	0.000000	0.000000	0.000000	0.000000
1932	0.000013	0.000000	0.000000	0.000000	3982	0.000000	0.000000	0.000000	0.000000
1934	0.000013	0.000000	0.000000	0.000000	3984	0.000000	0.000000	0.000000	0.000000
1936	0.000013	0.000000	0.000000	0.000000	3986	0.000000	0.000000	0.000000	0.000000
1938	0.000013	0.000000	0.000000	0.000000	3988	0.000000	0.000000	0.000000	0.000000
1940	0.000013	0.000000	0.000000	0.000000	3990	0.000000	0.000000	0.000000	0.000000
1942	0.000013	0.000000	0.000000	0.000000	3992	0.000000	0.000000	0.000000	0.000000
1944	0.000013	0.000000	0.000000	0.000000	3994	0.000000	0.000000	0.000000	0.000000
1946	0.000013	0.000000	0.000000	0.000000	3996	0.000000	0.000000	0.000000	0.000000
1948	0.000013	0.000000	0.000000	0.000000	3998	0.000000	0.000000	0.000000	0.000000
1950	0.000013	0.000000	0.000000	0.000000	4000	0.000000	0.000000	0.000000	0.000000
1952	0.000013	0.000000	0.000000	0.000000	4002	0.000000	0.000000	0.000000	0.000000
1954	0.000012	0.000000	0.000000	0.000000	4004	0.000000	0.000000	0.000000	0.000000
1956	0.000012	0.000000	0.000000	0.000000	4006	0.000000	0.000000	0.000000	0.000000
1958	0.000012	0.000000	0.000000	0.000000	4008	0.000000	0.000000	0.000000	0.000000
1960	0.000012	0.000000	0.000000	0.000000	4010	0.000000	0.000000	0.000000	0.000000
1962	0.000012	0.000000	0.000000	0.000000	4012	0.000000	0.000000	0.000000	0.000000
1964	0.000012	0.000000	0.000000	0.000000	4014	0.000000	0.000000	0.000000	0.000000
1966	0.000012	0.000000	0.000000	0.000000	4016	0.000000	0.000000	0.000000	0.000000
1968	0.000012	0.000000	0.000000	0.000000	4018	0.000000	0.000000	0.000000	0.000000
1970	0.000012	0.000000	0.000000	0.000000	4020	0.000000	0.000000	0.000000	0.000000
1972	0.000012	0.000000	0.000000	0.000000	4022	0.000000	0.000000	0.000000	0.000000
1974	0.000012	0.000000	0.000000	0.000000	4024	0.000000	0.000000	0.000000	0.000000
1976	0.000012	0.000000	0.000000	0.000000	4026	0.000000	0.000000	0.000000	0.000000
1978	0.000012	0.000000	0.000000	0.000000	4028	0.000000	0.000000	0.000000	0.000000
1980	0.000011	0.000000	0.000000	0.000000	4030	0.000000	0.000000	0.000000	0.000000
1982	0.000011	0.000000	0.000000	0.000000	4032	0.000000	0.000000	0.000000	0.000000
1984	0.000011	0.000000	0.000000	0.000000	4034	0.000000	0.000000	0.000000	0.000000
1986	0.000011	0.000000	0.000000	0.000000	4036	0.000000	0.000000	0.000000	0.000000
1988	0.000011	0.000000	0.000000	0.000000	4038	0.000000	0.000000	0.000000	0.000000
1990	0.000011	0.000000	0.000000	0.000000	4040	0.000000	0.000000	0.000000	0.000000
1992	0.000011	0.000000	0.000000	0.000000	4042	0.000000	0.000000	0.000000	0.000000
1994	0.000011	0.000000	0.000000	0.000000	4044	0.000000	0.000000	0.000000	0.000000
1996	0.000011	0.000000	0.000000	0.000000	4046	0.000000	0.000000	0.000000	0.000000
1998	0.000011	0.000000	0.000000	0.000000	4048	0.000000	0.000000	0.000000	0.000000
2000	0.000011	0.000000	0.000000	0.000000	4050	0.000000	0.000000	0.000000	0.000000
2002	0.000011	0.000000	0.000000	0.000000	4052	0.000000	0.000000	0.000000	0.000000
2004	0.000011	0.000000	0.000000	0.000000	4054	0.000000	0.000000	0.000000	0.000000
2006	0.000011	0.000000	0.000000	0.000000	4056	0.000000	0.000000	0.000000	0.000000
2008	0.000010	0.000000	0.000000	0.000000	4058	0.000000	0.000000	0.000000	0.000000
2010	0.000010	0.000000	0.000000	0.000000	4060	0.000000	0.000000	0.000000	0.000000
2012	0.000010	0.000000	0.000000	0.000000	4062	0.000000	0.000000	0.000000	0.000000
2014	0.000010	0.000000	0.000000	0.000000	4064	0.000000	0.000000	0.000000	0.000000
2016	0.000010	0.000000	0.000000	0.000000	4066	0.000000	0.000000	0.000000	0.000000
2018	0.000010	0.000000	0.000000	0.000000	4068	0.000000	0.000000	0.000000	0.000000
2020	0.000010	0.000000	0.000000	0.000000	4070	0.000000	0.000000	0.000000	0.000000
2022	0.000010	0.000000	0.000000	0.000000	4072	0.000000	0.000000	0.000000	0.000000
2024	0.000010	0.000000	0.000000	0.000000	4074	0.000000	0.000000	0.000000	0.000000
2026	0.000010	0.000000	0.000000	0.000000	4076	0.000000	0.000000	0.000000	0.000000
2028	0.000010	0.000000	0.000000	0.000000	4078	0.000000	0.000000	0.000000	0.000000
2030	0.000010	0.000000	0.000000	0.000000	4080	0.000000	0.000000	0.000000	0.000000
2032	0.000010	0.000000	0.000000	0.000000	4082	0.000000	0.000000	0.000000	0.000000
2034	0.000010	0.000000	0.000000	0.000000	4084	0.000000	0.000000	0.000000	0.000000
2036	0.000010	0.000000	0.000000	0.000000	4086	0.000000	0.000000	0.000000	0.000000
2038	0.000010	0.000000	0.000000	0.000000	4088	0.000000	0.000000	0.000000	0.000000
2040	0.000009	0.000000	0.000000	0.000000	4090	0.000000	0.000000	0.000000	0.000000
2042	0.000009	0.000000	0.000000	0.000000	4092	0.000000	0.000000	0.000000	0.000000
2044	0.000009	0.000000	0.000000	0.000000	4094	0.000000	0.000000	0.000000	0.000000
2046	0.000009	0.000000	0.000000	0.000000					
2048	0.000009	0.000000	0.000000	0.000000					

Table 9. VSO System Impulse Response Listing

11.4 DBU SEGY Header

HEADER NAME	TYPE	SIZE	LOC.	DESCRIPTION
TRACE_SEQ_NO	Integer Long	4	1	Trace Seq. no. Within Line
TRACE_SEQ_REEL	Integer Long	4	5	Trace Seq. within Reel
FIELD_RECORD_NO	Integer Long	4	9	Original Field record
CHANNEL_NO	Integer Long	4	13	Trace no. Within Original Field Record.
TRACE_ID_CODE	Integer Long	4	29	Trace ID Code 1=seis, 2=dead trace
TEST_CODE	Integer Long	2	35	1-Production, 2-Test
OFFSET_SH_REC	Integer Short	2	37	Distance from shot to recv(May be -ve)
ELEV_REC	Integer Short	2	41	Elevation of receiver group.
ELEV_SHOT	Integer Short	2	45	Surface elevation of shot
DEPTH_SHOT	Integer Short	2	49	Source depth below surface.
ELEV_FLOATDATUM_REC	Integer Short	2	53	Floating Datum elevation of receiver group.
ELEV_FLOATDATUM_SHOT	Integer Short	2	57	Floating Datum elevation of source.
WATER_DEPTH_SHOT	Integer Short	2	61	Water depth at source.
WATER_DEPTH_REC	Integer Short	2	65	Water depth at receiver group.
ELEV_DEPTH_SCALER	Integer Long	4	69	Scalar to be applied to all elevations and depths.
COORD_SCALER	Integer Long	4	71	Scalar to be applied to all coordinates.
XSHOT	Integer Short	2	73	Shot X Coordinate
YSHOT	Integer Short	2	77	Shot Y Coordinate
XREC	Integer Short	2	81	Receiver group X Coordinate
YREC	Integer Short	2	85	Receiver group Y Coordinate
UNITS	Integer Long	4	89	1-Length,2-Lat/long,3-Meters,4-Feet
NSAMPLES	Integer Long	4	115	Number of samples for this trace.
SAMPLERATE	Integer Long	4	117	Sample interval in microseconds for this trace.
GAIN_TYPE	Integer Long	4	119	Gain type of field instruments 1-Fixed/2-Binary/3-Float/4-Optional
GAIN_CONSTANT	Integer Long	4	121	Instrument gain constant (preamp K gain)
GAIN_INITIAL	Integer Long	4	123	Instrument early or initial gain(dB).
ALIAS_FILTER_FREQ	Integer Long	4	141	Alias filter frequency, if used.
ALIAS_FILTER_SLOPE	Integer Long	4	143	Alias filter slope.
NOTCH_FILTER_FREQ	Integer Long	4	145	Notch filter frequency, if used.
NOTCH_FILTER_SLOPE	Integer Long	4	147	Notch filter slope.
LOWCUT_FREQ	Integer Long	4	149	Low cut frequency, if used.
HIGHCUT_FREQ	Integer Long	4	151	High cut frequency, if used.
LOWCUT_SLOPE	Integer Long	4	153	Low cut slope.
HIGHCUT_SLOPE	Integer Long	4	155	High cut slope.
DATARECORDED_YEAR	Integer Long	4	157	Year data recorded.
DATARECORDED_DAY	Integer Long	4	159	Day of year data recorded.
DATARECORDED_HOUR	Integer Long	4	161	Hour of day(24 Hour clock).
DATARECORDED_MINUTE	Integer Long	4	163	Minute of hour data recorded.
DATARECORDED_SECOND	Integer Long	4	165	Second of Minute data recorded.
TIME_BASIS_CODE	Integer Long	4	167	Time basis code: 1=local, 2=GMT, 3=other.
NODE NUMBER	Integer Long	4	175	RXT: Module or Node Number (0-240)
CABLE NUMBER	Integer Long	4	177	RXT: Cable Number (0=not yet implemented)
BUOY NUMBER	Integer Long	4	178	RXT: Buoy Number (0=not yet implemented)
BUCKET NUMBER	Integer Long	4	179	RXT: Bucket Number
TIME STAMP	Integer Long	4	185	RXT: Transcriber Time Stamp
SHOTLINE_NUMBER	Integer Long	4	189	Shot Line Number (Seq + line no.)
SHOT_POINT_NO	Integer Long	4	193	Energy source point number.
RECEIVERLINE_NUMBER	Integer Long	4	197	Receiver Line Number
FIELD_STATION_NUMBER	Integer Long	4	201	RXT: Ground Station Number
VOA	Integer Long	4	205	RXT: Vertical Oriantation Angle (radians/10000)
RECV_POINTINDEX	Integer Long	4	208	RXT: Receiver Point Index. 1=HY, 6=VT, 7=IN, 8=XL
SWATH NUMBER	Integer Long	4	211	RXT: Swath Number.
RAW DATA FILE STATUS	Integer Long	4	219	RXT: Raw Data File Status
HOA	Integer Long	4	221	RXT: Horizontal Orientation Angle (radians/10000)
GUN FLAG	Integer Short	2	229	RXT: Gun Flag (Odd Shots =1, Even Shots = 2)
SENSOR	Integer Long	4	234	RXT: T2M sensor type id 3=HY, 12=IL, 13=XL, 14=VT, 131=HY_Derivative
ROATION AND INVERT	Integer Long	4	240	RXT: Rotate and Invert (0=not,2=VOR applied,8=Inverted,10=VORandInvert)

11.5 Volve OBC SEGY EBCDIC Header – Example

```
C 1 CLIENT: STATOIL           COMPANY: RESERVOIR EXPLORATION TECHNOLOGY
C 2 AREA: VOLVE NORWAY BLOCK 15/9                SURVEY: ST10010
C 3 SWATH:  11                            VESSELS:M/V VIKLAND, M/V SANCO SPIRIT
C 4 RCV LINE: 1150780    RCVR RANGE: 1239-1717
C 5 DATA-SET: NAV MERGE   TRACES PER RECORD: 240 X 4   SEQ: 094-133
C 6 RECORDING FORMAT: IEEE SEG-Y          FORMAT THIS REEL: SEG-Y 3592
C 7 SAMPLE CODE: FLOATING PT              PROCESSED: 03/11/2010
C 8 ACQ. GEOM: 8 ROLL 8  INLINE SWATH     LINE PREFIX: ST10010
C 9 INSTRUMENT: VECTORSEIS OCEAN BOTTOM   RECORDING SYSTEM DELAY: 0 MS
C10 RECORDING FILTER: 1.5/6-187/260MIN PHS DESCRIPTION: HZ/DB PER OCTAVE
C11 NO OF RECEIVER LINES/SWATH: 8         RECEIVER LINE SEPARATION: 400/200M
C12 ACTIVE CABLE LENGTH: 5975M            RCVRS / RCV LINE 240 X 4
C13 NO OF SOURCES:  2                     SOURCE SEPARATION: 50M
C14 RECEIVER INTERVAL: 25M                SHOT INTERVAL: 25M, FLIP/FLOP
C15 DATUM: ED50, 31N  SPHEROID: INT. 1924 PROJECTION: UTM ZONE 31
C16 COORDINATE UNITS: METERS              MAX TIME: 10000 MS
C17 RECORDING SAMPLE RATE: 2MS            OUTPUT SAMPLE RATE: 2 MS
C18 HEADER WORD     BYTE LOCATION   HEADER WORD                BYTE LOCATION
C19 ------------    -------------   -----------                -------------
C20 HOR ORIENT ANGLE   181-182      VERT ORIENT ANGLE                183-184
C21 SWATH/PATCH NUMBER 185-186      RLINE RELAY CODE                 187-188
C22 GUN FLAG           189-190      SENSOR 1=HY,6=VT,7=IL,8=XL       191-191
C23 NOMINAL RLINE      197-200      NOMINAL SLINE                    201-204
C24 CHAN EDIT FLAG     205-205      SHOT EDIT FLAG                   206-206
C25 REV POLARITY FLAG  207-207      NAVMERGE FLAG(1=NAV ASSIGNED)    208-208
C26 NODE NUMBER(1-240) 209-210      0=NO,2=VOR,8=INV,10=BOTH,32=HY_DP 216-216
C27 SEQUENCE NUMBER    217-220      SAIL LINE NUMBER                 221-224
C28 RECEIVER LINE NO.  225-228      FIELD STATION NUMBER             229-232
C29 INLINE             233-236      CROSSLINE                        237-240
C30 PREPLOT CDP GRID: SAIL LINE AZIMUTH = 104.00/284.00 DEGREES
C31 CDP BIN CENTER ORIGIN: X-COORD. = 428020.9 Y-COORD. = 6477397.6
C32 CDP BIN INCREMENT = 25.0 METERS X 12.5 METERS  (INLINE X CROSSLINE)
C33 SENSOR: 1=HYDROPHONE(P), 6=VERTICAL(Z), 7=HORIZONTAL(X), 8=HORIZONTAL(Y)
C34 VERTICAL AND HORIZONTAL ORIENTATION SENSOR ANGLE IS IN RADIANS X 10000
C35 REVERSE POLARITY FLAG: NOT APPLIED=0, APPLIED=1
C36 TRACE EDIT FLAG: GOOD=0, BAD=1;  VECTOR ROTATION FLAG: NOT ROTATED=0
C37 PROCESSING: SPS TO HEADERS, 0MS TIME SHIFT APPLIED, HYDROPHONE DATA HAS
C38 DERIVATIVE APPLIED IN RECORDING, ACCELEROMETER DATA HAS BEEN ROTATED,
C39 WATER DEPTHS AND SOURCE/RECEIVER ELEVS. MULTIPLIED BY 10 (BYTES 41-68)
C40 X-Y COORDINATES HAVE BEEN MULTIPLIED BY 10 (BYTES 73-88)
```

11.6 SEGY Binary Header – Example

```
HEADER                           BYTE TYPE              DESCRIPTION

400 Byte SEGY Binary Header

3201 JOB_ID_NO                  : Integer Long   0 Job Identification number.  = 10010
3205 SHOTLINE_NUMBER            : Integer Long  77 Shot Line Number  = 0
3209 REEL_NUMBER                : Integer Long   2 Reel number.  = 0
3213 TRACES_PER_RECORD          : Integer Short   3 Number of data traces per record.  = 960
3215 AUXS_PER_RECORD            : Integer Short   4 Number of auxiliary traces per record.  = 0
3217 SAMPLE_RATE                : Integer Short   5 Sample rate this reel(micro-seconds).  = 2000
3219 SAMPLE_RATE_FIELD          : Integer Short   6 Field sample rate(micro-seconds)  = 2000
3221 NSAMPLES                   : Integer Short   7 No. of samples per data trace.  = 5000
3223 NSAMPLES_FIELD             : Integer Short   8 Field no. of samples per data trace.  = 5000
3225 FORMAT_CODE                : Integer Short   9 Data Format(1-Float,2-Long,3-Short,4-Fixed point).
= 5
3227 CDP_FOLD                   : Integer Short  10 CDP fold(expected).  = 0
3229 TRACE_SORT                 : Integer Short  11 Trace sort code(1-NoSort,2-CDP,3-SingleFold,4-
Stacked).  = 1
3231 VERTICAL_SUM               : Integer Short  12 Vertical sum code(1-NoSum,2-2Sum,....N = NSum).  =
1
3233 SWEEP_FREQ_START           : Integer Short  13 Sweep start freq.  = 0
3235 SWEEP_FREQ_END             : Integer Short  14 Sweep end freq.  = 0
3237 SWEEP_FREQ_LENGTH          : Integer Short  15 Sweep length(Seconds).  = 0
3239 SWEEP_TYPE                 : Integer Short  16 Sweep type(1-Linear,2-Parabolic,3-Exponential,4-
Other).  = 0
3241 SWEEP_TRACE_NO             : Integer Short  17 trace no. of sweep channel.  = 0
3243 SWEEP_TAPER_LENGTH_START : Integer Short  18 Sweep taper length(Ms) at start.  = 0
3245 SWEEP_TAPER_LENGTH_END     : Integer Short  19 Sweep taper length(Ms) at end.  = 0
3247 SWEEP_TAPER_TYPE           : Integer Short  20 Sweep taper type(1-Linear,2-CosSqr,3-Other).  = 0
3249 CORRELATED_TRACES          : Integer Short  21 Correlated traces 1 = No 2 = Yes  = 0
3251 BINARY_GAIN                : Integer Short  22 Binary gain recovered 1 = Yes 2 = No  = 0
3253 AMP_RECOVERY_METHOD        : Integer Short  23 Amplitude recovery method(1-None,2-
SphDivergence,3-AGC,4-Other)  = 1
3255 UNITS                      : Integer Short  24 Distance units 1 = Meters 2 = Feet  = 1
3257 SIGNAL_POLARITY            : Integer Short  25 Impulse signal polarity.  = 1
3259 VIBRATOR_POL_CODE          : Integer Short  26 Vibrator polarity code  = 0
```

11.7 Volve OBC SEGY Output Trace Header

```
HEADER NAME               TYPE        SIZE LOC. DESCRIPTION

240 Byte SEGY Trace Header

  1 TRACE_SEQ_NO          : Integer Long   0 Trace Seq. no. Within Line  = 1 - 11052480
  5 TRACE_SEQ_REEL        : Integer Long   1 Trace Seq. within Reel  = 5761 - 489600
  9 FIELD_RECORD_NO       : Integer Long   2 Original Field record  = 1002 - 1968
 13 CHANNEL_NO            : Integer Long   3 Trace no. Within Original Field Record.  = 1 - 960
 17 SHOT_POINT_NO         : Integer Long   4 Energy source point number.  = 1002 - 1968
 21 CMP_NO                : Integer Long   5 CMP Ensemble Number  = 52462242 - 53403678
 25 CMP_SEQ_NO            : Integer Long   6 Sequence no. within CMP.  = 0
 29 TRACE_ID_CODE         : Integer Short   7 Trace ID Code 1=seis, 2=dead trace  = 1 - 2
 31 FOLD                  : Integer Short   8 No. of vertically stacked traces->This trace.  = 0
 33 TRACE_HSTACK          : Integer Short   9 No. of horiz. stacked traces...  = 0
 35 TEST_CODE             : Integer Short  10 1-Production, 2-Test  = 1
 37 OFFSET_SH_REC         : Integer Long  11 Distance from shot to recv(May be -ve)  = 14 - 9153
 41 ELEV_REC              : Integer Long  12 Elevation of receiver group.  = -3390 - -3300
 45 ELEV_SHOT             : Integer Long  13 Surface elevation of shot  = -11 - 11
 49 DEPTH_SHOT            : Integer Long  14 Source depth below surface.  = 55 - 64
 53 ELEV_FLOATDATUM_REC   : Integer Long  15 Floating Datum elevation of receiver group.  = 0
 57 ELEV_FLOATDATUM_SHOT  : Integer Long  16 Floating Datum elevation of source.  = 0
 61 WATER_DEPTH_SHOT      : Integer Long  17 Water depth at source.  = 3250 - 3440
 65 WATER_DEPTH_REC       : Integer Long  18 Water depth at receiver group.  = 3300 - 3390
 69 ELEV_DEPTH_SCALER     : Integer Short  19 Scalar to be applied to all elevations and depths.  = -
10
 71 COORD_SCALER          : Integer Short  20 Scalar to be applied to all coordinates.  = -10
 73 XSHOT                 : Integer Long  21 Shot X Coordinate  = 4033892 - 4134500
 77 YSHOT                 : Integer Long  22 Shot Y Coordinate  = 71232647 - 71334944
 81 XREC                  : Integer Long  23 Receiver group X Coordinate  = 4063171 - 4105064
 85 YREC                  : Integer Long  24 Receiver group Y Coordinate  = 71262864 - 71305472
 89 UNITS                 : Integer Short  25 1-Length (meters or feet), 2-Lat/long  = 1
 91 VELOCITY_WEATHER      : Integer Short  26 Weathering Velocity  = 0
 93 VELOCITY_SUBWEATHER   : Integer Short  27 Sub-Weathering velocity(Replacement Velocity).  = 0
 95 UPHOLE_SHOT           : Integer Short  28 Uphole time at source.  = 0
 97 UPHOLE_REC            : Integer Short  29 Uphole time at receiver group.  = 0
 99 STATIC_SRC            : Integer Short  30 Source static correction.  = 0
101 STATIC_REC            : Integer Short  31 Receiver group static correction.  = 0
103 STATIC_TOTAL          : Integer Short  32 Total static applied.  = 0
```

```
105 LAG_TIME_A             : Integer Short  33 Time in ms.  = 0
109 DELAY_TIME             : Integer Short  35 Delay recording time(Ms).  = 0
111 MUTE_TIME_START        : Integer Short  36 Mute time start.  = 0
113 MUTE_TIME_END          : Integer Short  37 Mute time end.  = 0
115 NSAMPLES               : Integer Short  38 Number of samples for this trace.  = 5000
117 SAMPLERATE             : Integer Short  39 Sample interval in microseconds for this trace.  = 2000
119 GAIN_TYPE              : Integer Short  40 Gain type of field instruments 1-Fixed/2-Binary/3-
Float/4-..Optional  = 1
121 GAIN_CONSTANT          : Integer Short  41 Instrument gain constant (preamp K gain)  = 0 - 18
123 GAIN_INITIAL           : Integer Short  42 Instrument early or initial gain(dB).  = 0
141 ALIAS_FILTER_FREQ      : Integer Short  51 Alias filter frequency, if used.  = 187
143 ALIAS_FILTER_SLOPE     : Integer Short  52 Alias filter slope.  = 260
145 NOTCH_FILTER_FREQ      : Integer Short  53 Notch filter frequency  = 0
147 NOTCH_FILTER_SLOPE     : Integer Short  54 Notch filter slope  = 0
149 LOWCUT_FREQ            : Integer Short  55 Low cut frequency, if used.  = 1
151 HIGHCUT_FREQ           : Integer Short  56 High cut frequency, if used.  = 0
153 LOWCUT_SLOPE           : Integer Short  57 Low cut slope.  = 6
155 HIGHCUT_SLOPE          : Integer Short  58 High cut slope.  = 0
157 DATARECORDED_YEAR      : Integer Short  59 Year data recorded.  = 2010
159 DATARECORDED_DAY       : Integer Short  60 Day of year data recorded.  = 247 - 252
161 DATARECORDED_HOUR      : Integer Short  61 Hour of day(24 Hour clock).  = 0 - 23
163 DATARECORDED_MINUTE    : Integer Short  62 Minute of hour data recorded.  = 0 - 59
165 DATARECORDED_SECOND    : Integer Short  63 Second of Minute data recorded.  = 0 - 59
167 TIME_BASIS_CODE        : Integer Short  64 Time basis code: 1=local, 2=GMT, 3=other.  = 2
181 VWUSER_2               : Integer Short 1001 UDV02: RXT Horizontal Orientation Angle
(Radians*10000)  = 0
183 VWUSER_3               : Integer Short 1002 UDV03: RXT vertical orientation angle (Radians*10000)
= 0 - 31390
185 VWUSER_5               : Integer Short 1004 UDV05: RXT patch or swath number  = 17 - 22
187 VWUSER_6               : Integer Short 1005 UDV06: RXT cable relay code  = 0
189 VWUSER_7               : Integer Short 1006 UDV07: RXT flag to indicate port or starboard gun  = 1
- 2
191 VWUSER_26              : One(1) Byte 1025 UDV26: RXT sensor 1=HY(P), 6=VT(Z), 7=IL(X), 8=XL(Y)  =
1 - 8
193 VWUSER_9               : Integer Long 1008 UDV09: RXT Old Channel Number in case of renumbering  =
0
197 VWUSER_12              : Integer Long 1011 UDV12: RXT Nominal Rline Number  = 5294
201 VWUSER_13              : Integer Long 1012 UDV13: RXT Nominal Sline Number  = 52020 - 53860
205 VWUSER_14              : One(1) Byte 1013 UDV14: RXT channel edit flag  = 0 - 1
206 VWUSER_15              : One(1) Byte 1014 UDV15: RXT shot edit flag  = 0 - 1
207 VWUSER_16              : One(1) Byte 1015 UDV16: RXT reverse chan edit flag  = -1 - 1
208 VWUSER_23              : One(1) Byte 1022 UDV23: RXT 0 if no nav, 1 if nav has been assigned  = 1
209 VWUSER_25              : Integer Short 1024 UDV25: RXT module or node number (0-240)  = 1 - 240
213 VWUSER_28              : One(1) Byte 1027 UDV28: RXT physical buoy number  = 4
214 BUCKET_NUMBER          : One(1) Byte 1028 UDV29: RXT Bucket Number (0= not implemented)  = 30 -
111
215 VWUSER_30              : One(1) Byte 1029 UDV30: RXT physical cable number  = 4
216 VWUSER_34              : One(1) Byte 1033 UDV34: RXT data mod flag
(0=not,2=VORapplied,8=inverted,10=both,32=hyd dP mode)  = 0 - 32
217 VWUSER_27              : Integer Long 1026 UDV27: RXT acquisition sequence number  = 221 - 275
221 SHOTLINE_NUMBER        : Integer Long  77 Shot Line Number  = 17152020 - 22153860
225 RECEIVERLINE_NUMBER    : Integer Long  78 Receiver Line Number.  = 2052940
229 FIELD_STATION_NUMBER   : Integer Long  70 Field Station Number  = 1241 - 1719
233 INLINE                 : Integer Long  71 In-Line or LINE of data trace.  = 5246 - 5340
237 CROSSLINE              : Integer Long  72 Cross-Line, TRACE of data trace.  = 2242 - 3686
```

11.8 Example Acquisition Log

ACQUISITION LOG

Vessel	Sanco Spirit and Vikland
Client	Statoil
Area	Volve, Norway, 4D OBS
Project	ST10010
Job #	ST10010

Date	28-Oct-10
Swath	swath11
Line	530640120
Sail Line	53064
Seq #	0120
Dir (°)	105°
Type	RESHOOT
Status	COMPLETE

Rx LINE	1152540		1152380									
Nodes	240	1	240	1								
Channels	960	1	960	1								
Stations	1717	1239	1239	1717								
Stations required for coverage given below												
Nodes	240	1	240	1								
Channels	960	1	960	1								
Stations	1717	1239	1239	1717								
Shot Poi	1834	1592	1592	1834								
# Channe	960		960									
Lay Dir (°	284°		104°									
Buoy	6		8									
Cable	4		2									
Bucket	072		105									

Rx LINE												
Nodes												
Channels												
Stations												
Stations required for coverage given below												
Nodes												
Channels												
Stations												
Shot Poi												
# Channe												
Lay Dir (°												
Buoy												
Cable												
Bucket												

Hydrophone data output to tape in units of µBar/sec. Accelerometer data output to tape in units of nm/sec/sec

Channel statistics			
Rx Line #	Cable	# Bad	% Bad
1152540	4		
1152380	2		
Total Live Channels		1920	
Dead Channels		4	
Instrument Failures		0	
Environmental		0	
VOR Failure		4	

Shot statistics	
Total SP	122
PDR	0
NDR	0
Misfire	0
Autofire	0
Delta	1
Timing	0
Parity	0
Other	0
Gap	
Total # Bad SP	1
Total % Bad SP	0.82

Line statistics	FPSP	LPSP	Units
Time	22:28	22:53	UTC
Shotpoint	1592	1834	
Vessel Speed	3.8	3.9	Knots
Water Depth	89.6	99.7	Meters
Sea State	2.5	2.5	Meters
Winds	SW 22	SW 22	Knots
HY RMS noise	N/A	10.0	dB
Array 1 Volume	3990	3990	Cu.In
Array 2 Volume	3990	3990	Cu.In
Array Pressure	2053	2041	P.S.I.
Atmospheric Pressure	1010.0	1010.0	mBar
Crossline Distance	-9.3	1.0	Meters
Heading	122°	122°	Degrees
Course Made Good	099°	099°	Degrees

Line Naming Convention		
SAIL LINE - ZZZZI	PP - SWATH	D - LAY NUMBER
RECEIVER LINE - PPZZZZD		Z - LINE NUMBER
		I - SHOT ATTEMPT

For multiple NTBP SP Ranges separate the different ranges with an "&". Ex. 24123-24152 & 15663-15699

Line Events and Remarks (Do not use commas in the Acquisition Log remarks)	Cable	RL	NTBP Shots
Picking up noise from the Spirit while shooting from SP to SP. No reshoot is required.			
Average Noise Level for the sequence is µBars.			
Pressure sensor on array #6 intermittent			
Delta error gun 4:4 at SP1714			
Cable 2 recorded setup with GS 1243-1721. Changed manually to 1239-1717.			

Recording parameters	
Record length (sec)	10
Precursor (µs)	0
Sample interval (ms)	2
Hydrophone Source	Sensor
Hydrophone Impulse	Off
Hydrophone Data mode	Diff
Trace attribute type	Peak
Low cut filter (Hz)	0
Anti alias filter phase type	Minimum
Offset removal filter	Dynamic
Hydrophone Gain	6
Hydrophone Sensitivity	High

Party Chief
Bob Schram
Instrument Tech on Duty
1200-0000 Calum, Jonas, Chris
0000-1200 Lars, Adam
Quality Control Phase
1200-0000 Dave, Atanas
0000-1200 Chamam, Taylor
FINAL

Acquisition Geometry			
Rx line spacing (m)	400	Station spacing (m)	25
Station increment	2		
Sail line spacing (m)	100	Shot spacing (m)	25
Shot increment	2		

Source Parameters	
Number of Sources	2
Sources Separation (m)	50
Depth (m)	6
Volume (cu. in.)	3990
Pressure (psi)	2000
Sub-Arrays/Strings	6

Figure 72. Example overview sheet, Acquisition log for sequence 0120.

Vessel	Sanco Spirit and Vikland
Client	Statoil
System	Input/Output VSO System 2/4
Area	Volve, Norway, 4D OBS
Project	ST10010

Line Name	**530640120**	**Seq #:**	**120**
Receiver line	**1152540**	**1152380**	
Buoy	6	8	
Cable	4	2	
Bucket	72	105	
Number of Channels	960	960	

Time	File Name	SP	CODE	CODE DESCRIPTION	
	0	1548	SOL	START OF LINE	Start of Line
	0	1548	NDRB8	NDR BUOY 8	Shot not recorded for B8
22:23	2010301222330	1550	NR	NOISE RECORD	No Gundata found for Shot 1550
22:28	**2010301222802**	**1592**	**FPSP**	**FIRST PRODUCTION SHOTPOINT**	**First Production Shot Point**
22:28	**2010301222802**	**1592**		**FIRST REQUIRED SP**	**First required SP for RL1152540 RL1152380**
22:41	2010301224107	1714	DE	DELTA ERROR	1 Delta Errors in shot.
22:53	**2010301225357**	**1834**	**LPSP**	**LAST PRODUCTION SHOTPOINT**	**Last Production Shot Point**
22:53	**2010301225357**	**1834**		**LAST REQUIRED SP**	**Last required SP for RL1152540 RL1152380**
22:54	2010301225411	1836	NR	NOISE RECORD	No Gundata found for Shot 1836
22:54	2010301225411	1836	EOL	END OF LINE	End of Line

Figure 73. Example Line log Sheet, Acquisition log Sequence 0120.

Online & Offline Channel QC			
Nominal Rx Line #	Station	CODE	
5222	1315	N	NOISY
5222	1563	W	WEAK
5254	1673	D	DEAD
5254	1683	V	VOR ERROR

Figure 74. Example Bad Channel Listing, Acquisition log, sequence 0120.

11.10 Navmerged SEGY Tape Listing

TAPE	RLINE	SEQ		Chans	DATE OUTPUT	ORIGINAL SHIPMENT	
		MIN	MAX		DD-MMM-YY	NUMBER	DATE
C40194	**1252700**	0004	0077	960	17-Oct-2010	VIKS10-024	20/10/2010
C40195	**1252860**	0006	0093	960	17-Oct-2010	VIKS10-024	20/10/2010
C40196	**1253020**	0008	0093	960	17-Oct-2010	VIKS10-024	20/10/2010
C40197	**1253180**	0013	0090	960	17-Oct-2010	VIKS10-024	20/10/2010
C40198	**1253340**	0024	0090	960	17-Oct-2010	VIKS10-024	20/10/2010
C40199	**1253500**	0041	0090	960	17-Oct-2010	VIKS10-024	20/10/2010
C40200	**1253660**	0047	0093	960	17-Oct-2010	VIKS10-024	20/10/2010
C40201	**1253980**	0051	0093	960	17-Oct-2010	VIKS10-024	20/10/2010
C40203	**1150780**	0094	0133	960	04-Nov-2010	VIKS10-027	08/11/2010
C40204	**1151100**	0098	0146	960	04-Nov-2010	VIKS10-027	08/11/2010
C40205	**1151420**	0101	0157	960	07-Nov-2010	VIKS10-027	08/11/2010
C40206	**1151740**	0107	0164	960	07-Nov-2010	VIKS10-027	08/11/2010
C40207	**1152060**	0126	0164	960	07-Nov-2010	VIKS10-027	08/11/2010
C40208	**1152220**	0119	0164	960	07-Nov-2010	VIKS10-027	08/11/2010
C40209	**1152380**	0115	0164	960	07-Nov-2010	VIKS10-027	08/11/2010
C40210	**1152540**	0113	0164	960	07-Nov-2010	VIKS10-027	08/11/2010
C45014	**1150780-1253980**	0004	0164	960	07-Nov-2010	VIKS10-027	08/11/2010

Table 11. Final Navmerged SEGY Tape List

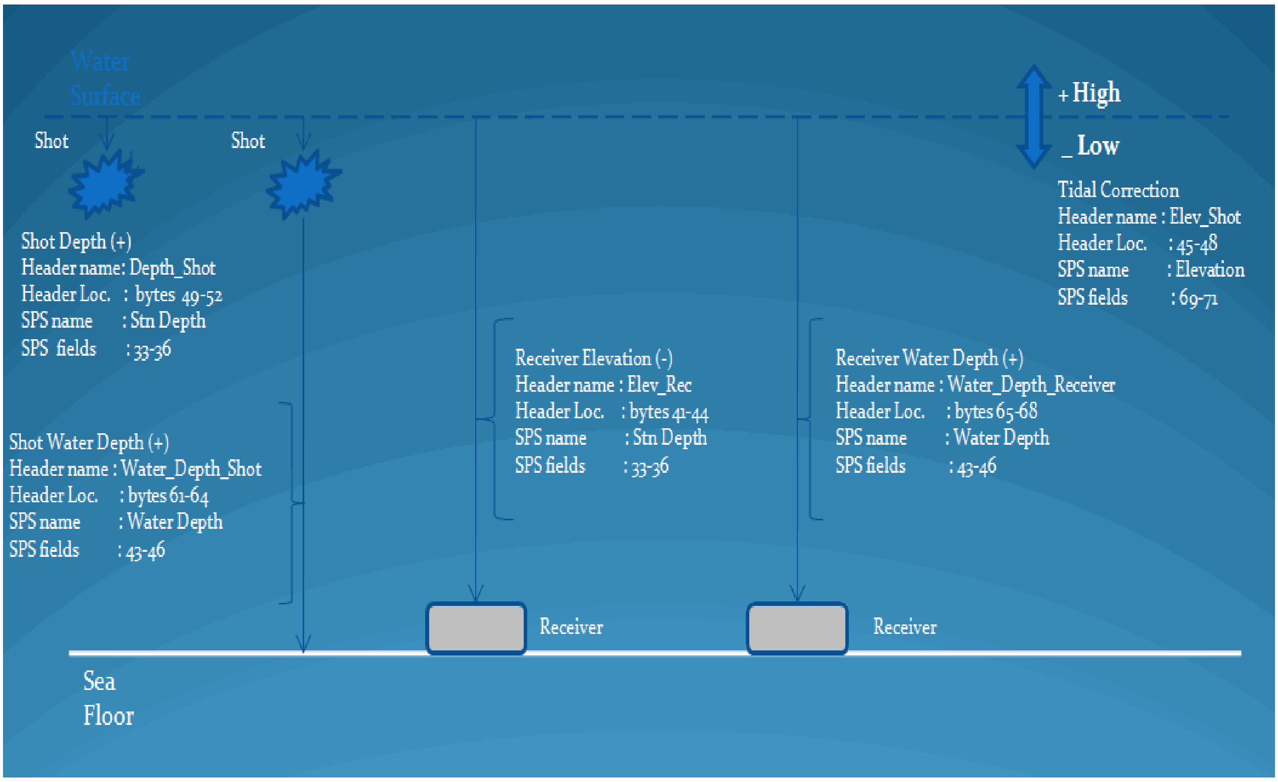
11.11 Deliverables List

Deliverable	Frequency	Fomat	Media
Final Acquisition Log	Acquisition Sequcnce	MS Excel	USB
Online RMS Noise Display HY Component	Acquisition Sequcnce	jpeg	USB
Online RMS Noise Display X Component	Acquisition Sequcnce	jpeg	USB
Online RMS Noise Display Y Component	Acquisition Sequcnce	jpeg	USB
Online RMS Noise Display Z Component	Acquisition Sequcnce	jpeg	USB
RMS Noise Spatial Display HY (median)	Per Block and Accumulative	jpeg	USB
Near Field Data Package	Acquisition Sequcnce	SEGY	USB
NF Shot Stack - port/strd amp comparison	Acquisition Sequcnce	jpeg	USB
Receiver Gather F-X Analysis	3 Gathers per Receiver line (P, Z, X, Y)	jpeg	USB

Source Gather F-X Analysis	3 Gathers per Receiver line (P, Z, X, Y)	jpeg	USB
Cable Movement QC	Per Cable Lay	jpeg	USB
Receiver Edits	Per Receiver Line / Block	txt	USB
Shot Edits	Per Receiver Line / Block	txt	USB
Polarity Reversal File	Per Receiver Line/Block	txt	USB
Reciever Prediction Using FBP	Per Cable Lay	jpeg	USB
Reciever Prediction Using FBP	Per Cable Lay	txt	USB
Receiver FBP	Per Cable Lay	txt	USB
Receiver Position QC: Quadrant Stack	Per Cable Lay	jpeg	USB
Receiver Postion QC: Wather Depth LMO	Per Cable Lay	jpeg	USB
Brute Stack HY Pressure Component	Per Receiver Line/Block	SEGY Disk File	USB
Brute Stack VT Velocity Component	Per Receiver Line/Block	SEGY Disk File	USB
Brute Stack HY+VT Summation	Per Receiver Line/Block	SEGY Disk File	USB
Converted wave Brute Stack X Component	Per Receiver Line/Block	SEGY Disk File	USB
Brute Stack P, V, P+V	Per Receiver Line/Block	jpeg	USB
Converted wave Brute Stack X Component	Per Receiver Line/Block	jpeg	USB
Post Plot SEGY Shot Positions	Lay Segment & Accumulative	jpeg	USB
Post Plot SEGY Receiver Positions	Lay Segment & Accumulative	jpeg	USB
Post Plot SEGY Water Depth at Receiver	Lay Segment & Accumulative	jpeg	USB
Post Plot SEGY Water Depth at Shot	Lay Segment & Accumulative	jpeg	USB
Fold	Lay Segment & Accumulative	jpeg	USB
Low Fold Cube HY Component SEGY Cube	Per Block & Accumulative	SEGY	USB
Low Fold Cube Fold Display	Per Block & Accumulative	jpeg	USB
Nav Merged Data Tape Copy 1	Per Receiver Line/Block	SEGY	3592E05
Nav Merged Data Tape Copy 2	Per Receiver Line/Block	SEGY	3592E05
Tap Log	Per Data Shipment	MS Excel	USB

Table 12. Client Deliverables

11.12 Water Depths and Tidal Corrections Diagram (header specifications)



11.13 Source SPS File, Header Example

```
H00 SPS format version num.     SPS001,01.10.90;
H01 Description of survey area  Norway, Block 15/9,RXT10010;
H02 Date of survey              26/09/2010, 25/10/2010;
H022Tape/disk identifier        ST10010_RL115078;
H03 Client                      STATOIL;
H04 Geophysical contractor      RXT AS,Crew 4;
H05 Positioning contractor      VERIPOS Subsea7  C-NAV C&C Technologies Inc;
H06 Pos. proc. contractor       RXT AS-Crew 4;
H07 Field computer system(s)    Concept Systems Ltd.,GATOR INS V10.12.3,none;
H08 Coordinate location         Centre of source and of receiver pattern;
H09 Offset to coord. location   -/-;
H10 Clock time w.r.t. GMT       0;
H11 Spare                       ;
H12 Geodetic datum and spheroid ED50 International 1924 6378388.000 297.000;
H13 Spare                       H14 is Datum shift from WGS84 to Survey Datum;
H14 Geodetic datum parameters   90.365 101.130 123.384 -0.333 -0.077 -0.894 ;
H15 Geodetic datum param cont.   -1.994 ;
H16 Spare                       ;
H17 Vertical datum description  MSL, Equipotential,,;
H18 Projection type             UTM North;
H19 Projection zone             Zone 31N;
H20 Description of grid units   Metres;
H201Factor to metre             1.00000000;
H220Long. of central meridian   0030000.000E;
H241Scale factor                0.9996000000;
H30 Project code and descriptionRXT10010, Volve Norway, 4D OBC;
H26 Source line number prefix   ST10010;
H31 Line number format          SW(1:2),LINENUMBER(4:4),SEQ(9:4);
H26 Receiver line number prefix ST10010;
H31 Line number format          SW(1:2),LINENUMBER(3:4),LAY(7:1);
H400Type,Model,Polarity         1,VECTORSEIS OCEAN 24bit,VSO GATOR,SEG;
H401Crew name,Comment           1,RXT Crew 4;
H402Sample int.,Record Length   1,2MSEC,10SEC;
H403Number of channels          1,960;
H404Tape type,format,density    1,Bucket-3592,SEG-Y IBM EBCDIC Reel Hdr;
H405Filter_alias Hz,dB pnt,slope1,187HZ,3DB,186 DB/OCT;
H406Filter_notch Hz,-3db points 1,NONE;
H407Filter_low Hz,dB pnt,slope  1,1.5HZ,-3DB,6 DB/OCT;
H408Time delay,FTB-SOD app Y/N  1,10 MSEC,not applied;
H409Multi component recording   1,P,X,Y,Z;
H410Aux. channel 1 contents     1,N/A;
H411Aux. channel 2 contents     1,N/A;
H412Aux. channel 3 contents     1,N/A;
H413Aux. channel 4 contents     1,N/A;
H26
H26 Hydrophone (numbered 1)
H600Type,model,polarity         H1,IO,IO VectorSeis,SEG;
H601Damping coeff,natural freq. H1,N/A,N/A;
H602Nunits,len(X),width(Y)      H1,1,0.00M,0.00M;
H603Unit spacing X,Y            H1,0.0M,0.00M;
H26
H26 Vertical Accelerometer (numbered 6)
H610Type,model,polarity         R6,SVSM-MARINE,I/O VectorSeis,SEG;
H611Damping coeff,natural freq. R6,N/A,N/A;
H612Nunits,len(X),width(Y)      R6,1,0.00M,0.00M;
H613Unit spacing X,Y            R6,0.0M,0.00M;
H26
H26 Inline Accelerometer (numbered 7)
H620Type,model,polarity         R7,SVSM-MARINE,I/O VectorSeis,SEG;
H621Damping coeff,natural freq. R7,N/A,N/A;
H622Nunits,len(X),width(Y)      R7,1,0.00M,0.00M;
H623Unit spacing X,Y            R7,0.0M,0.00M;
H26
H26 Crossline Accelerometer (numbered 8)
H630Type,model,polarity         R8,SVSM-MARINE,I/O VectorSeis,SEG;
H631Damping coeff,natural freq. R8,N/A,N/A;
H632Nunits,len(X),width(Y)      R8,1,0.00M,0.00M;
H633Unit spacing X,Y            R8,0.0M,0.00M;
H26
H700Type,model,polarity         A1,SERCEL G-GUN,150/250,SEG;
H701Size,vert. stk fold         A1,3990 CUBIC IN,1;
H702Nunits,len(X),width(Y)      A1,36,15.0M,15.0M;
H703Unit spacing X,Y            A1,varies,7.5M;
H716P-P bar m,prim/bubble       A1,110.0,20.6;
H717Air pressure                A1,2000 PSI;
H718No. sub arrays,nom depth    A1,3,6M;
H719Spare
H26
H720Type,model,polarity         A2,SERCEL G-GUN,150/250,SEG;
H721Size,vert. stk fold         A2,3990 CUBIC IN,1;
H722Nunits,len(X),width(Y)      A2,36,15.0M,15.0M;
H723Unit spacing X,Y            A2,varies,7.5M;
```

```
H736P-P bar m,prim/bubble       A2,110.0,20.6;
H737Air pressure                A2,2000 PSI;
H738No. sub arrays,nom depth    A2,3,6M;
H739Spare
H26
H990R,S,X file quality control  03/11/2010, 19:03:22,RXT Navigation;
H991Coord. status final/prov    Final, 03/11/2010, 19:03:22,RXT Navigation;
H26
H26 The instrument code is always 1;
H26 Column 13 in the Relation file is used for sensor type;
H26
H26 Water Depth is Draft Corrected;
H26 Water Depth is corrected for sound velocity;
H26 Surface elevation value in Columns 66-71 of R files is entered as zero;
H26 because the tidal correction is included in the Point depth and surface;
H26 elevation;
H26 Surface elevation value in Columns 66-71 of S files is not applied to the;
H26 water depth in cols 43-46;
H26
H26 Due to SPS format limitations the FFID in X file is from columns 7-11
H26
H26
H26 Number of lines included for ST10010_RL115078 is 22
H26                                       111501000094
H26                                       111502600095
H26                                       111500200096
H26                                       111501800097
H26                                       111503400098
H26                                       111504200099
H26                                       111505000100
H26                                       111505800101
H26                                       111509000102
H26                                       111506600103
H26                                       111508200104
H26                                       111505810105
H26                                       111507400106
H26                                       111509800107
H26                                       111510600108
H26                                       111509810109
H26                                       111511400127
H26                                       111512210128
H26                                       111513000129
H26                                       111513800130
H26                                       111515400131
H26                                       111514610133
H26
H26 5678901234567890123456789012345678901234567890123456789012345678901234567890
H26      1         2         3         4         5         6         7         8
H26
S111501000094        10001A1     6.2    0   0106 428057.2 6477488.5  -0.2287103941
S111501000094        10021A2     6.3    0   0106 428094.6 6477530.8  -0.2287103952
```

11.14 Receiver SPS File, Header Example

```
H00 SPS format version num.      SPS001,01.10.90;
H01 Description of survey area   Norway, Block 15/9,RXT10010;
H02 Date of survey               26/09/2010, 25/10/2010;
H022Tape/disk identifier         ST10010_RL115078;
H03 Client                       STATOIL;
H04 Geophysical contractor       RXT AS,Crew 4;
H05 Positioning contractor       VERIPOS Subsea7  C-NAV C&C Technologies Inc;
H06 Pos. proc. contractor        RXT AS-Crew 4;
H07 Field computer system(s)     Concept Systems Ltd.,GATOR INS V10.12.3,none;
H08 Coordinate location          Centre of source and of receiver pattern;
H09 Offset to coord. location    -/-;
H10 Clock time w.r.t. GMT        0;
H11 Spare                        ;
H12 Geodetic datum and spheroid ED50 International 1924 6378388.000 297.000;
H13 Spare                        H14 is Datum shift from WGS84 to Survey Datum;
H14 Geodetic datum parameters    90.365 101.130 123.384 -0.333 -0.077 -0.894 ;
H15 Geodetic datum param cont.    -1.994 ;
H16 Spare                        ;
H17 Vertical datum description   MSL, Equipotential,,;
H18 Projection type              UTM North;
H19 Projection zone              Zone 31N;
H20 Description of grid units    Metres;
H201Factor to metre              1.00000000;
H220Long. of central meridian    0030000.000E;
H241Scale factor                 0.9996000000;
H30 Project code and descriptionRXT10010, Volve Norway, 4D OBC;
H26 Source line number prefix    ST10010;
H31 Line number format           SW(1:2),LINENUMBER(4:4),SEQ(9:4);
H26 Receiver line number prefix ST10010;
H31 Line number format           SW(1:2),LINENUMBER(3:4),LAY(7:1);
H400Type,Model,Polarity          1,VECTORSEIS OCEAN 24bit,VSO GATOR,SEG;
H401Crew name,Comment            1,RXT Crew 4;
H402Sample int.,Record Length    1,2MSEC,10SEC;
H403Number of channels           1,960;
H404Tape type,format,density     1,Bucket-3592,SEG-Y IBM EBCDIC Reel Hdr;
H405Filter_alias Hz,dB pnt,slope1,187HZ,3DB,186 DB/OCT;
H406Filter_notch Hz,-3db points 1,NONE;
H407Filter_low Hz,dB pnt,slope   1,1.5HZ,-3DB,6 DB/OCT;
H408Time delay,FTB-SOD app Y/N   1,10 MSEC,not applied;
H409Multi component recording    1,P,X,Y,Z;
H410Aux. channel 1 contents      1,N/A;
H411Aux. channel 2 contents      1,N/A;
H412Aux. channel 3 contents      1,N/A;
H413Aux. channel 4 contents      1,N/A;
H26
H26 Hydrophone (numbered 1)
H600Type,model,polarity          H1,IO,IO VectorSeis,SEG;
H601Damping coeff,natural freq. H1,N/A,N/A;
H602Nunits,len(X),width(Y)       H1,1,0.00M,0.00M;
H603Unit spacing X,Y             H1,0.0M,0.00M;
H26
H26 Vertical Accelerometer (numbered 6)
H610Type,model,polarity          R6,SVSM-MARINE,I/O VectorSeis,SEG;
H611Damping coeff,natural freq. R6,N/A,N/A;
H612Nunits,len(X),width(Y)       R6,1,0.00M,0.00M;
H613Unit spacing X,Y             R6,0.0M,0.00M;
H26
H26 Inline Accelerometer (numbered 7)
H620Type,model,polarity          R7,SVSM-MARINE,I/O VectorSeis,SEG;
H621Damping coeff,natural freq. R7,N/A,N/A;
H622Nunits,len(X),width(Y)       R7,1,0.00M,0.00M;
H623Unit spacing X,Y             R7,0.0M,0.00M;
H26
H26 Crossline Accelerometer (numbered 8)
H630Type,model,polarity          R8,SVSM-MARINE,I/O VectorSeis,SEG;
H631Damping coeff,natural freq. R8,N/A,N/A;
H632Nunits,len(X),width(Y)       R8,1,0.00M,0.00M;
H633Unit spacing X,Y             R8,0.0M,0.00M;
H26
H700Type,model,polarity          A1,SERCEL G-GUN,150/250,SEG;
H701Size,vert. stk fold          A1,3990 CUBIC IN,1;
H702Nunits,len(X),width(Y)       A1,36,15.0M,15.0M;
```

```
H703Unit spacing X,Y            A1,varies,7.5M;
H716P-P bar m,prim/bubble       A1,110.0,20.6;
H717Air pressure                A1,2000 PSI;
H718No. sub arrays,nom depth    A1,3,6M;
H719Spare
H26
H720Type,model,polarity         A2,SERCEL G-GUN,150/250,SEG;
H721Size,vert. stk fold         A2,3990 CUBIC IN,1;
H722Nunits,len(X),width(Y)      A2,36,15.0M,15.0M;
H723Unit spacing X,Y            A2,varies,7.5M;
H736P-P bar m,prim/bubble       A2,110.0,20.6;
H737Air pressure                A2,2000 PSI;
H738No. sub arrays,nom depth    A2,3,6M;
H739Spare
H26
H990R,S,X file quality control  03/11/2010, 19:03:22,RXT Navigation;
H991Coord. status final/prov    Final, 03/11/2010, 19:03:22,RXT Navigation;
H26
H26 The instrument code is always 1;
H26 Column 13 in the Relation file is used for sensor type;
H26
H26 Water Depth is Draft Corrected;
H26 Water Depth is corrected for sound velocity;
H26 Surface elevation value in Columns 66-71 of R files is entered as zero;
H26 because the tidal correction is included in the Point depth and surface;
H26 elevation;
H26 Surface elevation value in Columns 66-71 of S files is not applied to the;
H26 water depth in cols 43-46;
H26
H26 Due to SPS format limitations the FFID in X file is from columns 7-11
H26
H26
R1150780             12391H1    0101      0101 431164.0 6477612.8   0.0123456789
R1150780             12391R6    0101      0101 431164.0 6477612.8   0.0123456789
```

11.15 Relational SPS File, Header Example

```
H00 SPS format version num.     SPS001,01.10.90;
H01 Description of survey area  Norway, Block 15/9,RXT10010;
H02 Date of survey              26/09/2010, 25/10/2010;
H022Tape/disk identifier        ST10010_RL115078;
H03 Client                      STATOIL;
H04 Geophysical contractor      RXT AS,Crew 4;
H05 Positioning contractor      VERIPOS Subsea7  C-NAV C&C Technologies Inc;
H06 Pos. proc. contractor       RXT AS-Crew 4;
H07 Field computer system(s)    Concept Systems Ltd.,GATOR INS V10.12.3,none;
H08 Coordinate location         Centre of source and of receiver pattern;
H09 Offset to coord. location   -/-;
H10 Clock time w.r.t. GMT       0;
H11 Spare                       ;
H12 Geodetic datum and spheroid ED50 International 1924 6378388.000 297.000;
H13 Spare                       H14 is Datum shift from WGS84 to Survey Datum;
H14 Geodetic datum parameters   90.365 101.130 123.384 -0.333 -0.077 -0.894 ;
H15 Geodetic datum param cont.   -1.994 ;
H16 Spare                       ;
H17 Vertical datum description  MSL, Equipotential,,;
H18 Projection type             UTM North;
H19 Projection zone             Zone 31N;
H20 Description of grid units   Metres;
H201Factor to metre             1.00000000;
H220Long. of central meridian   0030000.000E;
H241Scale factor                0.9996000000;
H30 Project code and descriptionRXT10010, Volve Norway, 4D OBC;
H26 Source line number prefix   ST10010;
H31 Line number format          SW(1:2),LINENUMBER(4:4),SEQ(9:4);
H26 Receiver line number prefix ST10010;
H31 Line number format          SW(1:2),LINENUMBER(3:4),LAY(7:1);
H400Type,Model,Polarity         1,VECTORSEIS OCEAN 24bit,VSO GATOR,SEG;
H401Crew name,Comment           1,RXT Crew 4;
H402Sample int.,Record Length   1,2MSEC,10SEC;
H403Number of channels          1,960;
H404Tape type,format,density    1,Bucket-3592,SEG-Y IBM EBCDIC Reel Hdr;
H405Filter_alias Hz,dB pnt,slope1,187HZ,3DB,186 DB/OCT;
H406Filter_notch Hz,-3db points 1,NONE;
H407Filter_low Hz,dB pnt,slope  1,1.5HZ,-3DB,6 DB/OCT;
H408Time delay,FTB-SOD app Y/N  1,10 MSEC,not applied;
H409Multi component recording   1,P,X,Y,Z;
H410Aux. channel 1 contents     1,N/A;
H411Aux. channel 2 contents     1,N/A;
H412Aux. channel 3 contents     1,N/A;
H413Aux. channel 4 contents     1,N/A;
H26
H26 Hydrophone (numbered 1)
H600Type,model,polarity         H1,IO,IO VectorSeis,SEG;
H601Damping coeff,natural freq. H1,N/A,N/A;
H602Nunits,len(X),width(Y)      H1,1,0.00M,0.00M;
H603Unit spacing X,Y            H1,0.0M,0.00M;
H26
H26 Vertical Accelerometer (numbered 6)
H610Type,model,polarity         R6,SVSM-MARINE,I/O VectorSeis,SEG;
H611Damping coeff,natural freq. R6,N/A,N/A;
H612Nunits,len(X),width(Y)      R6,1,0.00M,0.00M;
H613Unit spacing X,Y            R6,0.0M,0.00M;
H26
H26 Inline Accelerometer (numbered 7)
H620Type,model,polarity         R7,SVSM-MARINE,I/O VectorSeis,SEG;
H621Damping coeff,natural freq. R7,N/A,N/A;
H622Nunits,len(X),width(Y)      R7,1,0.00M,0.00M;
H623Unit spacing X,Y            R7,0.0M,0.00M;
H26
H26 Crossline Accelerometer (numbered 8)
H630Type,model,polarity         R8,SVSM-MARINE,I/O VectorSeis,SEG;
H631Damping coeff,natural freq. R8,N/A,N/A;
H632Nunits,len(X),width(Y)      R8,1,0.00M,0.00M;
H633Unit spacing X,Y            R8,0.0M,0.00M;
H26
H700Type,model,polarity         A1,SERCEL G-GUN,150/250,SEG;
H701Size,vert. stk fold         A1,3990 CUBIC IN,1;
H702Nunits,len(X),width(Y)      A1,36,15.0M,15.0M;
```

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H703Unit spacing X,Y           A1,varies,7.5M;
H716P-P bar m,prim/bubble      A1,110.0,20.6;
H717Air pressure               A1,2000 PSI;
H718No. sub arrays,nom depth   A1,3,6M;
H719Spare
H26
H720Type,model,polarity        A2,SERCEL G-GUN,150/250,SEG;
H721Size,vert. stk fold        A2,3990 CUBIC IN,1;
H722Nunits,len(X),width(Y)     A2,36,15.0M,15.0M;
H723Unit spacing X,Y           A2,varies,7.5M;
H736P-P bar m,prim/bubble      A2,110.0,20.6;
H737Air pressure               A2,2000 PSI;
H738No. sub arrays,nom depth   A2,3,6M;
H739Spare
H26
H990R,S,X file quality control  03/11/2010, 19:03:22,RXT Navigation;
H991Coord. status final/prov    Final, 03/11/2010, 19:03:22,RXT Navigation;
H26
H26 The instrument code is always 1;
H26 Column 13 in the Relation file is used for sensor type;
H26
H26 Water Depth is Draft Corrected;
H26 Water Depth is corrected for sound velocity;
H26 Surface elevation value in Columns 66-71 of R files is entered as zero;
H26 because the tidal correction is included in the Point depth and surface;
H26 elevation;
H26 Surface elevation value in Columns 66-71 of S files is not applied to the;
H26 water depth in cols 43-46;
H26
H26 Due to SPS format limitations the FFID in X file is from columns 7-11
H26
H26
H26 Number of lines included for ST10010_RL115078 is 22
H26                                         111501000094
H26                                         111502600095
H26                                         111500200096
H26                                         111501800097
H26                                         111503400098
H26                                         111504200099
H26                                         111505000100
H26                                         111505800101
H26                                         111509000102
H26                                         111506600103
H26                                         111508200104
H26                                         111505810105
H26                                         111507400106
H26                                         111509800107
H26                                         111510600108
H26                                         111509810109
H26                                         111511400127
H26                                         111512210128
H26                                         111513000129
H26                                         111513800130
H26                                         111515400131
H26                                         111514610133
H26
H26 5678901234567890123456789012345678901234567890123456789012345678901234567890
H26      1         2         3         4         5         6         7         8
H26
X      100021111501000094        10001    1 95741150780             1239    17171
X      100026111501000094        10001    2 95841150780             1239    17171
```

11.16 Summary of Noise Affected Lines

Sequence	Affected Shots		Affected G/S		Affected Cables	Total Affected G/S	RMS µB	% Affected Shots in Sequence	% Affected G/S	Cause
0004	1958	1854	1717	1597	0001	0060	35µB	11.04%	1.04%	VIKLAND
0004	1958	1860	1717	1239	0001	0240		10.42%	100.00%	Seismic Interference
0008	1724	1738	1717	1829	0001	0060	35µB	1.67%	1.04%	VIKLAND
0023	1466	1000	1239	1717	ALL	0960	25µB	71.56%	16.67%	
0034	1666	1958	1239	1717	ALL	1200	30µB	45.94%	20.83%	Rig
0036	1356	1534	1239	1717	ALL	480	50µB	100.00%	8.33%	Tanker
0037	1734	1382	1239	1717	ALL	720	50µB	100.00%	12.50%	Tanker
0038	1392	1628	1239	1717	ALL	960	50µB	100.00%	16.67%	Tanker
0040	1954	1320	1239	1717	ALL	240	50µB	100.00%	4.17%	Tanker
0041	1320	1958	1239	1717	ALL	240	50µB	100.00%	4.17%	Tanker
0046	1000	1318	1239	1717	ALL	1440	30µB	100.00%	25.00%	Sea Explorer
0047	1000	1958	1239	1717	ALL	1680	30µB	100.00%	29.17%	Sea Explorer
0048	1498	1958	1239	1717	ALL	1440	30µB	100.00%	25.00%	Sea Explorer
0049	1468	1690	1239	1717	ALL	1440	30µB	100.00%	25.00%	Sea Explorer
0050	1810	1958	1239	1717	ALL	1680	30µB	100.00%	29.17%	Sea Explorer
0051								0.00%	0.00%	
0054	1000	1808	1239	1717	ALL	1800	60µB	100.00%	31.25%	Geo Coral??
0055	1834	1758	1239	1717	ALL	1920	50µB	100.00%	33.33%	Geo Coral??
0056	1704	1320	1239	1717	ALL	1920	45µB	88.13%	33.33%	Geo Coral??
0057	1320	1958	1239	1717	ALL	1920	45µB	100.00%	33.33%	Geo Coral??
0058	1320	1958	1804	1717	ALL	1680	45µB	410.26%	29.17%	
0059	1596	1194	1194	1717	ALL	1680	45µB	100.00%	29.17%	
0061	1958	1000	1239	1717	ALL	1680	50µB	100.00%	29.17%	Geo Coral??
0064	1958	1414	1414	1717	ALL	1920	45µB	100.00%	33.33%	
0065	1318	1000	1000	1717	ALL	1920	50µB	100.00%	33.33%	
0068	1318	1312	1239	1717	ALL	1920	50µB	2.50%	33.33%	
0069	1000	1456	1239	1717	ALL	1920	50µB	100.00%	33.33%	
0070	1412	1000	1239	1717	ALL	1920	45µB	100.00%	33.33%	
0071	1000	1028	1239	1717	ALL	1440	30µB	100.00%	25.00%	
0072	1148	1192	1239	1717	ALL	1200	30µB	100.00%	20.83%	
0073	1230	1160	1239	1717	ALL	1680	30µB	100.00%	29.17%	
0075	1000	1500	1239	1717	ALL	1680	45µB	100.00%	29.17%	
0076	1560	1646	1239	1717	ALL	1680	60µB	100.00%	29.17%	
0077	1844	1958	1239	1717	ALL	1200	45µB	100.00%	20.83%	
0078	1804	1780	1239	1717	ALL	1680	55µB	8.55%	29.17%	
0079	1188	1126	1239	1717	ALL	1680	50µB	100.00%	29.17%	
0080	1000	1084	1239	1717	ALL	1680	40µB	8.96%	29.17%	

0082	1624	1000	1239	1717	ALL	720	40µB	100.00%	12.50%	
0083	1820	1958	1239	1717	ALL	1200	40µB	14.58%	100.00%	Sea Explorer
0084	1000	1958	1239	1717	ALL	960	40µB	100.00%	16.67%	
0085	1000	1958	1239	1717	ALL	960	50µB	100.00%	16.67%	
0086	1958	1562	1239	1717	ALL	720	60µB	41.46%	12.50%	
0087	1000	1512	1239	1717	ALL	1440	40µB	53.54%	25.00%	
0089	1200	1958	1239	1717	ALL	1440	40µB	79.17%	25.00%	
0097	1000	1958	1239	1717	ALL	960	40µB	100.00%	16.67%	Rig
0098	1000	1180	1239	1717	ALL	1920	40µB	18.96%	33.33%	Rig
0138	1000	1958	1239	1717	7	1680	25µB	100.00%	29.17%	Tanker
0145	1320	1800	1477	1521	7	23	125µB	75.31%	1.37%	Abbas supply vessel
0164	1552	1958	1239	1717	5	1200	35µB	100.00%	100.00%	Ocean Pearl?

Table 13. Noise Log