SHELL PROCESSING SUPPORT FORMAT FOR 3D SURVEYS

AS ADOPTED BY THE SEG IN 1993
SEG TECHNICAL STANDARDS COMMITTEE

Rev 2.1

The revisions to this document allow this format to conform to the new SEGD Rev 2.1 SEG Field Tape Standards as revised Jan, 2006.

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SPS FORMAT

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INTRODUCTION

The purpose of the format is to establish a common standard for the transfer of positioning and geophysical support data from 3D field crews to seismic processing centers. The format can also be used for other types of seismic surveys.

With the growth and increased complexity of land 3D surveys there was a need to establish a robust and standard procedure for logging, during acquisition, the positioning and geophysical spread relation data in a way that reduces errors, allows the field crews to quality control the data, and hence detect and correct errors before the data was transferred to the seismic processing centers.

Quality control was carried out as the first stage in the processing centers. Experience has shown that most errors are only detected when the geophysical and coordinate information are integrated, and that often spread relation errors could not be corrected, leading to the deletion of otherwise good quality records.

Providing the processing centers with checked data in a standard format, containing all relevant field data significantly reduced the time spent by the processing centers on initial quality control and increased the quality of the end products.

Comments on Revision 2.1

Recently, advances in acquisition technology and improvements in cost efficiencies have greatly increased the volume of data, in terms of channel counts, source/receiver densities, and surface area. This increase in the shear number of elements to account for has led to a situation where both the SEGD and the SPS formats can no longer adequately reflect the positioning and geophysical spread relation data. This was partially addressed in Revision 2.0 of the SEGD format, but was not reflected in an update to the SPS. To this end, this revision (2.1) to the SPS format has been undertaken in conjunction with Revision 2.1 of the SEGD format and has been named accordingly (in the absence of a revision 2.0 of the SPS).

It is the intent of this revision to act as a stop gap measure to meet the immediate needs of the community. To that end, the original text and formats have been left unchanged unless a clear need has been seen to make changes. Modifications to the format itself have been limited to address the pressing needs of current acquisition, and to encompass the likewise limited changes made to the SEGD format in Revisions 2.0 and 2.1. Although it was agreed by the SEG Technical Standards Committee that future SEG standards would use and revisions where possible would be compatible with the EPSG Geodetic Database (now part of OGP) this minor revision will not include this standard. Adoption of the EPSG Geodetic Database compatibility has been left for the next major SEGD/SPS Rev 3 document release.

Summary of Changes to the SPS Format for Revision 2.1

The following list discusses some of the specific changes of Revision 2.1.

1) Addition of a line sequence number which will allow more than one production line per tape to be recorded as long as a unique combination of field file number and line sequence number are used per storage unit. See pages 7,13.

2) Point Record Specification table values and descriptions were modified to accommodate updated formats, defaults, justification and min/max units in keeping with SEGD Revision 2.1. Some header records will be rendered redundant or obsolete with new format, ie; H31 Line number format. See page 7.
3) Relation Record Specification table value and descriptions were modified to accommodate larger field record numbers, value changes on from and to channel items and updating formats, default values, justification and columnar entries in keeping with SEGD Revision 2.1. See page 11.
4) Geodetic datum updated to reflect WGS84 vs WGS72. See page 14.
5) Reference to UKOOA P1/84 updated to UKOOA P1/90. See page 21.
6) Appendix 1- Example of SPS Format, R, S, and X files updated to reflect changes to new Revision 2.1 format. See page 25-32.

Controlling Organization

The SPS rev 2.1 is administered by the SEG Technical Standards Committee. Any questions, corrections or problems encountered in the format should be addressed to:

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FIELD SYSTEM

The field crews must have an acquisition management system to generate the SPS format during the survey. Errors will be reduced both during recording and during the generation of the SPS format if automated procedures are introduced at survey set-up and during daily recording. Figure 1 shows the main elements of such a system; The Field Database, Topographical computations and 3D recording management are the minimum elements required to support the generation of the SPS format.

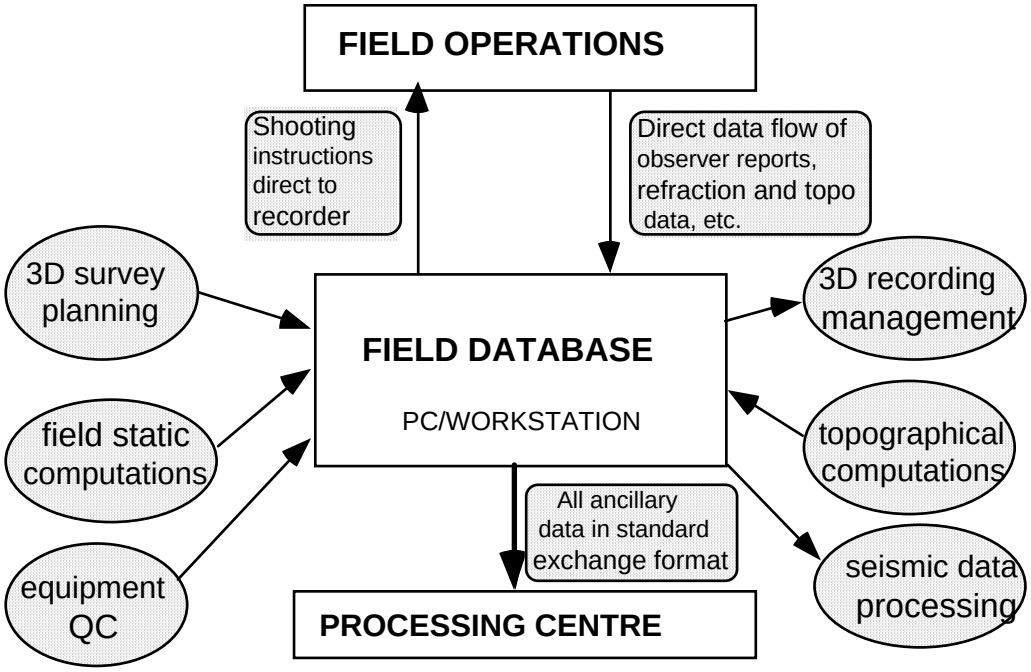

Figure 1 Field Acquisition Management System

A direct link to and from the seismic recording instrument is strongly recommended. The I/O System One, SN368 + LXU and the new MDS18X have this capability. Seismic recording systems that do not have this can be modified to provide partial automation. Figure 2 shows the preferred method of data exchange between the system and the seismic recording instrument.

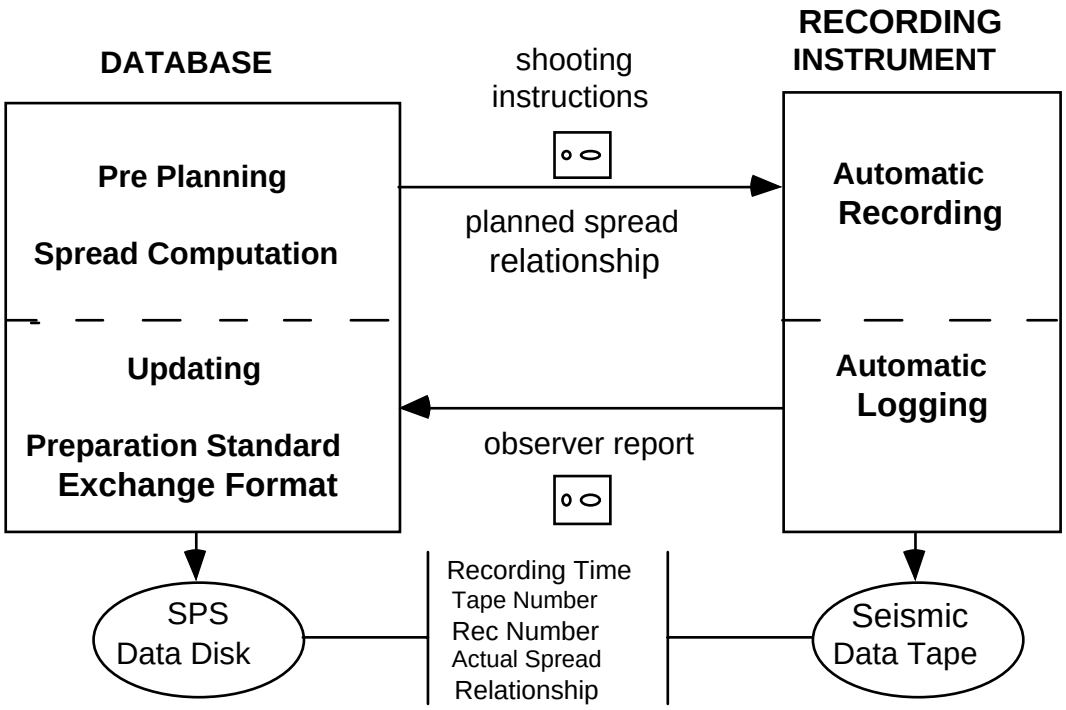

Figure 2 Automatic recording

The key information required to relate the seismic records and the corresponding positioning and geophysical support data is written in the seismic headers and in SPS.

SHELL PROCESSING SUPPORT FORMAT FOR 3D SURVEYS

Name: SPS format

GENERAL

Coordinates and elevations of geophysical lines may be determined by interpolation between observed break points in the line. The point files contains coordinates and elevations of all geophysical points (observed and interpolated) and of all permanent markers. The shotpoint and relational files are to be sorted chronologically, and the receiver file is to be sorted in ascending sequence of line, point and point index numbers.
In order to avoid ambiguities each physical position in the field (shotpoint or receiver group) must have a unique name.

Data record specification

The data set consists of three files with an optional fourth comment file, each with an identical block of header records. For magnetic tapes each file is terminated by a record containing "EOF" in col. 1-3

First file	: Receiver File.	"Point Records" with details of receiver groups or permanent markers.
Second File	: Source File.	"Point Records" with details of shotpoints (power source).
Third File	: Cross-Reference File	"Relation Records" specifying for each shotpoint its record number and the relation between recording channel numbers and receiver groups
Optional	: Comment File.	"Comments" with details of the observers report.

Data record sorting order

		Sort fields and sorting order.
Receiver File	: 'R' records.	Line name, Point number, Point index
Source File	: 'S' records.	Julian day and Time of recording shotpoint
Cross-Reference File	: 'X'records.	Sorted in the same order as the Source File.

Legacy Format for survey data on 9-track tape

Tape specifications and tape layout
Half-inch magnetic tape : IBM compatible, non-label.
Number of tracks : 9. Number of bytes per inch : 6250 (1600 is a permissible alternative).
Mode : EBCDIC coded. Record length : 80 bytes.
Block size : 1600 bytes (20 logical records). Physically separated by inter-record gap.
An "EOF" statement followed by an IBM tape mark shall be written after the end of a file and a tape shall be closed by two IBM tape marks.
In general, a tape may contain one or more files depending on the type of survey. Each file shall start with a number of 'Header Records' followed by 'Data Records' and closed by an EOF statement and an IBM tape mark.

***Legacy* Format for survey data on floppy disc**

Disc specifications and layout
Format: MS-DOS compatible ASCII files.
Record length : 80 bytes, followed by carriage return (col 81) and line feed (col 82).
3.5" or 5.25" formatted disc (any size: 360/720 Kbyte or 1.4/1.2 Mbyte). File name to relate to the project, date and sequence. To denote file type the file extension name must be prefixed with: 'S' for shotpoint records- eg- PRJX90.S01

'R' for receiver records	PRJX90.R01
'X' for relational records	PRJX90.X01
'C' for comment records	PRJX90.C01

In general, a disc may contain one or more files depending on the type of survey. Each file shall start with a number of 'Header Records' followed by 'Data Records'.

HEADER RECORD SPECIFICATION

Each file shall start with a number of header records which contain information about, and parameters controlling, all the data records which follow.

The general format for a header record shall be:

		Cols	Format
a.	Record identifier "H"	1	A1
b.	Header record type	2-3	I2
c.	Header record type modifier	4	I1
d.	Parameter description	5-32	7A4
e.	Parameter data	33-80	See below

Header records types H0 to H20 are mandatory for all surveys even if a "N/A" entry is required *("N/A" is not allowed for H18).* Header records of types H21 to H25 are mandatory as far as they are applicable to the projection used.

Requirements for projection definition include the following header records:

Transverse Mercator	: H220, H231, H232, H241, H242
UTM	: H19, H220
Stereographic	: H231, H232, H241, H242
Oblique Mercator	: H231, H232, H241, H242, H259 and H256 or H257 or H258
Lambert Conical	: H210, H220, H231, H232, H241, H242

Header record type H26 is a free format statement for any other relevant information.

Formats of parameter data fields for each of the header record types shall be:

Type	**Parameter description**	**Parameters**	
	Pos: 5-32	**Pos**	**Format**
H00	SPS format version num.	33-80	12A4
H01	Description of survey area	33-80	12A4
H02	Date of survey	33-80	12A4

H021	Post-plot date of issue	33-80	12A4
H022	Tape/disk identifier	33-80	12A4
H023	Line sequence number	33-80	I5
H03	Client	33-80	12A4
H04	Geophysical contractor	33-80	12A4
H05	Positioning contractor	33-80	12A4
H06	Pos. proc. contractor	33-80	12A4
H07	Field computer system(s)	33-80	12A4
H08	Coordinate location	33-80	12A4
H09	Offset from coord. location	33-80	12A4
H10	Clock time w.r.t. GMT	33-80	12A4
H11	Spare	33-80	12A4
H12	Geodetic datum,-spheroid	33-80	3A4,3A4,F12.3,F12.7
H13	Spare	33-80	12A4
H14	Geodetic datum parameters	33-80	3(F8.3),4(F6.3)
H15	Spare	33-80	12A4
H16	Spare	33-80	12A4
H17	Vertical datum description	33-80	12A4
H18	Projection type	33-80	12A4
H19	Projection zone	33-80	12A4
H20	Description of grid units	33-56	6A4
H201	Factor to meter	33-46	F14.8
H210	Lat. of standard parallel(s)	33-56	2(I3,I2,F6.3, A1)
H220	Long. of central meridian	33-44	I3,I2, F6.3, A1
H231	Grid origin	33-56	2(I3,I2,F6.3, A1)
H232	Grid coord. at origin	33-56	2(F11.2, A1)
H241	Scale factor	33-44	F12.10
H242	Lat., long. scale factor	33-56	2(F11.2, A1)
H256	Lat., long. initial line	33-56	4(I3,I2,F6.3, A1)
H257	Circular bearing of H256	33-44	I3, I2, F7.4
H258	Quadrant bearing of H256	33-44	A1, 2I2,F6.3, A1
H259	Angle from skew	33-44	I3,I2,F7.4
H26	Any other relevant information This record can be repeated as required.	5-80	19A4
H30	Project code and description	33-78	3A2,10A4
H31	Line number format (Obsolete)	33-80	12A4

Instrument code (I) tables

Header Records: H400-H419:code 1, H420-H439: code 2....H560-H579: code 9
Instrument code must be entered in col 33-34, for example: '1,' '2,' ... '9,'

Type	**Parameter description** **Pos: 5-32**	**Parameters** **Pos**	 **Format**
H400	Type,Model,Polarity	33-80	12A4
H401	Crew name,Comment	33-80	12A4
H402	Sample int.,Record Len.	33-80	12A4

H403	Number of channels	33-80	12A4
H404	Tape type,format,density	33-80	12A4
H405	Filter_alias Hz,dB pnt,slope	33-80	12A4
H406	Filter_notch Hz,-3dB points	33-80	12A4
H407	Filter_low Hz,dB pnt,slope	33-80	12A4
H408	Time delay FTB-SOD app Y/N	33-80	12A4
H409	Multi component recording	33-80	12A4
H410	Aux. channel 1 contents	33-80	12A4
H411	Aux. channel 2 contents	33-80	12A4
H412	Aux. channel 3 contents	33-80	12A4
H413	Aux. channel 4 contents	33-80	12A4
H414	Spare	33-80	12A4
|		|	|
H419	Spare	33-80	12A4

Receiver code (Rx) tables

Header Records: H600-H609:code 1, H610-H619:code 2....H690-H699: code 10
Receiver code must be entered in col 33-34, examples of possible codes:

G1..to.G9 for geophones H1..to.H9 for hydrophones
R1..to.R9 for multi comp. and other types
PM = Permanent marker KL = Kill or omit receiver station

Type	**Parameter description**	**Parameters**	
	Pos: 5-32	**Pos**	**Format**
H600	Type,model,polarity	33-80	12A4
H601	Damp coeff,natural freq.	33-80	12A4
H602	Nunits,len(X),width(Y)	33-80	12A4
H603	Unit spacing X,Y	33-80	12A4
H604	Spare	33-80	12A4
|		|	|
H609	Spare	33-80	12A4

For 'PM' and 'KL' use H26 records (free format description)

Source code (Sx) tables.

Header Records: H700-H719: code 1,H720-H739: code 2...H880-H899: code 10
Source code must be entered in cols 33-34, examples of possible codes:

V1..to.V9 for vibroseis E1..to.E9 for explosive
A1..to.A9 for air gun W1..to.W9 for water gun
S1..to.S9 for other types KL = Kill or omit shotpoint

Type	**Parameter description**	**Parameters**	
	Pos: 5-32	**Pos**	**Format**
H700	Type,model,polarity	33-80	12A4
H701	Size,vert. stk fold	33-80	12A4
H702	Nunits,len(X),width(Y)	33-80	12A4
H703	Unit spacing X,Y	33-80	12A4

Following records are only required if **source type= Vibroseis V1..V9**

H704	Control type	33-80	12A4
H705	Correlator,noise supp	33-80	12A4
H706	Sweep type,length	33-80	12A4
H707	Sweep freq start,end	33-80	12A4
H708	Taper,length start,end	33-80	12A4
H709	Spare	33-80	12A4
H710	Spare	33-80	12A4

Following records are only required if **source type= Explosive E1..E9**

H711	Nom. shot depth,charge len.	33-80	12A4
H712	Nom. soil,drill method	33-80	12A4
H713	Weathering thickness	33-80	12A4
H714	Spare	33-80	12A4
H715	Spare	33-80	12A4

Following records are only required if **source type = air gun A1..A9**
or = water gun W1..W9

H716	P-P bar m,prim/bubble	33-80	12A4
H717	Air pressure psi	33-80	12A4
H718	No. sub arrays,Nom depth	33-80	12A4
H719	Spare	33-80	12A4

Quality Control check records

Type	**Parameter description**	**Parameters**	
	Pos: 5-32	**Pos**	**Format**
H990	R,S,X file quality control	33-60	2A4,I4,4A4
H991	Coord. status final/prov	33-68	4A4,I4,4A4

POINT RECORD SPECIFICATION

This record type contains details at the position of the shotpoint at the time of recording or at the position of a receiver at the time of first shotpoint recorded into the receiver.

item	definition of field	cols	format	min. to max	default	just.	units
1	record identification	1-1	A1	"S" or "R"	none	n/a	
2	line name	2-11	F10.2	-999999.99 to 9999999.99	none	right	
3	point number	12-21	F10.2	-999999.99 to 9999999.99	none	right	
+		22-23			blank		blank
4	point index	24-24	I1	1 to 9	1	right	
*5	point code	25-26	A2	A#	none	Left	
6	static correction	27-30	I4	-999 to 999	blank	right	ms
7	point depth	31-34	F4.1	0 to 99.9	0	right	header defined
8	seismic datum	35-38	I4	-999 to 9999	0	right	header defined
9	uphole time	39-40	I2	0 to 99	blank	right	ms
10	water depth	41-46	F6.1	0 to 9999.9	blank	right	header defined
11	map grid easting	47-55	F9.1	none	none	right	
12	map grid northing	56-65	F10.1	none	none	right	
13	surface elevation	66-71	F6.1	-999.9 to 9999.9	none	right	header defined
14	day of year	72-74	I3	1 to 999	none	right	
15	time "hhmmss"	75-80	3I2	000000 to 235959	none	n/a	

* Example Point codes :

"PM" - permanent marker, "KL" - kill or omit point
"G1".."G9" "H1".."H9", "R1".."R9" - receiver codes
"V1".."V9" "E1".."E9", "A1".."A9","W1".."W9",
"S1".."S9". - source codes

+ For compatibility reasons cols 22-23 are left blank.

Note:
Alphanumeric (A) fields are to be left justified and
Numeric (I and F) fields are to be right justified unless specified otherwise.

RELATION RECORD SPECIFICATION

This record type is used to define the relation between the field record number and shotpoint and between recording channels and receiver groups. For each shotpoint there is at least one "Relation Record". Each of these records specifies a section of consecutively numbered channels and receiver groups. After a numbering gap or a change in line name or repositioning for the receiver groups a new "Relation Record" has to be given. Channel numbers should be in ascending order.

Fields 6,7 and 8 must be identical to fields 2,3 and 4 of the corresponding shotpoint record. While the receiver line and point numbers in fields 13,14 and 15 must be the same as used in the receiver point records.

item	definition of field	cols	format	min. to max	default	just.
1	record identification	1 – 1	A1	"X"	none	n/a
2	field tape number	2 – 7	3A2	free	none	right
3	field record number	8 - 15	I8	0 to 16777216	none	right
4	field record increment	16 - 16	I1	1 to 9	1	right
5	instrument code	17 - 17	A1	1 to 9	1	right
6	line name	18 - 27	F10.2	-999999.99 to 9999999.99	none	right
7	point number	28 - 37	F10.2	-999999.99 to 9999999.99	none	right
8	point index	38 – 38	I1	1 to 9	1	right
9	from channel	39 - 43	I5	1 to 99999	none	right
10	to channel	44 - 48	I5	1 to 99999	none	right
11	channel increment	49 - 49	I1	1 to 9	1	right
12	line name	50 - 59	F10.2	-999999.99 to 9999999.99	none	right
13	from receiver	60 - 69	F10.2	-999999.99 to 9999999.99	none	right
14	to receiver	70 - 79	F10.2	-999999.99 to 9999999.99	none	right
15	receiver index	80 -80	I1	1 to 9	1	right

Note
Alphanumeric (A) fields are to be left justified and
Numeric (I and F) fields are to be right justified unless specified otherwise.

COMMENT RECORD SPECIFICATION (Optional)

This record type is used for comments, for example to flag bad/noisy traces per record, test file details and another supplementary information normally given in the observers report.

Item	Definition of field	Cols	Format	Min.to Max.	Default	Units
1	**Record identification**	**1-1**	**A1**	"C"	None	-
2	**Comment**	**2-80**	**79A1**	Free	Blank	-

HEADER RECORD DESCRIPTION

The text in bold type face are the parameter descriptions to be entered, left justified, into positions 5-32. The text in italics are examples of parameters to be entered, left justified, into positions 33-80. Positions 33 and 34 must always contain the instrument or receiver or source code. To enable parsing of free format (12A4) parameter fields the following rule should be used "The parameters entered into positions 33-80 must be separated by a comma and the parameter string must be terminated by a semi colon. Parameter text cannot contain commas ',' or semi colons';' ".

N.B. All units of distance are in meters except the grid coordinates whose units are defined by H20 and can be converted to meters using the conversion factor defined by H201.

H00 **SPS format version num** The format version number should be in this format.
Example: SPS 2.1;

H01 **Description of survey area** The name of the country, survey area, survey type (land: L2D/L3D or Transition zone: TZ2D/TZ3D) and project number.
Example: The Netherlands,Dordrecht,L3D,0090GA;

H02 **Date of survey** The date of recording first shotpoint of survey and the last date of survey on this file. *Example: 21.05.1990,28.051990;*

H021 **Post-plot date of issue** The date when this tape or disc was issued and confirmed checked. *Example: 30.05.90;*

H022 **Tape/disk identifier** *Example: 0090GA0;*

H023 **Line sequence number** The line sequence number allows more than one production line per tape as long as a unique combination of field file number and line sequence number are used per storage unit. *Example:5;*

H03 **Client** The client's company name. *Example: NAM;*

H04 **Geophysical contractor** The company name of the main seismic contractor, and the seismic party name. *Example: Prakla Seismos,SON 1;*

H05 **Positioning contractor** The company name of contractor or sub-contractor responsible for the positioning/survey control in the field.
Example: Prakla Seismos,

H06 **Pos. proc. contractor** The company name of contractor or sub-contractor responsible for the post processing of the positioning data**.**
Example: Prakla Seismos,SON 1;

H07 **Field computer system(s)** The acquisition management system name, name of seismic recording instrument, and the method of direct transfer to/from the seismic recording instrument (if no direct transfer enter "*manual entry*").
Examples: CDB,SN368/FLUKE,FDOS discs; or None,SN368,manual entry;

H08 **Coordinate location** The description of what the coordinates refer to. *Example: centre of source pattern and centre of receiver pattern;*

H09 **Offset to coord. location** The offset from a vessel or vehicle reference position to coordinate location as defined in H08, including method of angular offset used. *Example: 170M,180DEG from vessel gyro heading;*

H10 **Clock time w.r.t. GMT** The number of hours that the local (clock) time is behind or ahead of GMT**.** *Examples:+2; or -6; or 0*;

H11 **Spare**

H12 **Geodetic datum,-spheroid** Datum name, spheroid name, semi major axis (a), inverse flattening (l/f) as used for survey.
Example: RD datum Bessel 1841 6377397.155 299.15281

H13 **Spare**

H14 **Geodetic datum parameters** Datum transformation parameters to WGS84 (dx,dy,dz,rx,ry,rz,ds) as used for survey. *Example: 595.000 11.300 478.900 0.000 0.000 0.000 0.000*

The datum transformation parameters are defined by the following model:

$$\begin{vmatrix} x \\ y \\ z \end{vmatrix}_{(2)} = \begin{vmatrix} dx \\ dy \\ dz \end{vmatrix} + |scale| * \begin{vmatrix} 1 & -rz & +ry \\ +rz & 1 & -rx \\ -ry & +rx & 1 \end{vmatrix} * \begin{vmatrix} x \\ y \\ z \end{vmatrix}_{(l)}$$

where: x,y,z are the geocentric cartesian coordinates in meters dx,dy,dz are translation parameters in meters rx,ry,rz are clockwise rotations defined in arcsecs, but converted to radians for use in the formula. Scale is [l+ds(l0E-6)], where ds is in parts per million.

For this example (l) is RD datum, (2) is WGS84 datum.

H15 **Spare**

H16 **Spare**

H17 **Vertical datum description** Name, type (i.e. equipotential, LAT or spheroidal), origin (name or lat,long) and undulation of vertical datum with respect to WGS84.
Examples: NAP, Equipotential, Amsterdam, 0; or
MSL-Syria, Equipotential, 34 degr N, 38 degr E, 23.6m;

H18 **Projection type** Type of map projection used. *Example: Transverse Mercator;*

Hl9 **Projection zone** Zone and hemisphere for UTM projections.
Example: Zone 30, North;

H20 **Description of grid units** Unit of coordinates.
Examples: Meters; or International Feet; or Indian Feet; or American Feet;

H201 **Factor to meter** The multiplication factor to convert grid units to meters. For American Feet the factor is *Examples: 0.30480061*

H210 **Lat. of standard parallel(s)** Latitude of standard parallel(s) as required for projection as per H18, in dddmmss.sss N/S. For 2 standard parallels of 5 degr N and 10 degr N.
Example: 0050000.0000100000.000N

H220 **Long. of central meridian** Longitude of central meridian as required for projection as per H18 above, in dddmmss.sss E/W. For 15 degr 30 min.
Example: 0153000.000E

H231 **Grid origin** Latitude and longitude of the grid origin in dddmmss.sss N/S dddmmss.sss E/W. For 5 degr N and 15 degr 10 min and 25 sec.
Example: 0050000.000N0151025.000E

H232 **Grid coord. at origin** Grid coordinates (Eastings and Northings) at the origin of the projection system. For false Easting of 500000 and false Northing of 0. *Example: 50000000.0E 0.00N*

H241 **Scale factor** Scale factor for defined projection.
Example: 0.9996000000

H242 **Lat., Long. scale factor** Latitude and longitude at which the scale factor (H241) is defined. *Example: 0050000.000N 151025.000E*

H256 **Lat., Long. initial line** The two points defining the initial line of projection, as latl, longl, lat2, long2. For 5 degr N, 20 degr E, 10 degr N, 30 degr E.
Example:0050000.000N0200000.000E0100000.000N0300000.000E

H257 **Circular bearing of H256** This is the true bearing to the east in the origin of the initial line of projection in dddmmss.ssss (max of 360 degrees).
Example: 1200000.0000

H258 **Quadrant bearing of H256** Quadrant bearing of the initial line of projection in N/S ddmmss.sss E/W. *Example: S300000.000E*

H259 **Angle from skew** The angle between the skew and the rectified (North oriented) grid, in dddmmsss.ssss. *Example: 0883000.0000*

H26 **Free format in positions 5-80** Any other information can be included using header records of this type.

H30 **Project code and description** A six character code, the survey area name and survey type (see H01) *Example: 0090GA,Dordrecht ,L3D;*

H31 **Line number format** (Obsolete) Specifies the internal format of the line number field in the data records. The specification shall be-
NAME1(POS1:LEN1),NAME2(POS2:LEN2),NAME3(POS3:LEN3);
Where NAMEn is the name of the sub-identifier, POSn is the first character position within the line number field and LENn is the length of the sub field.
Example: BLOCK(1:4),STRIP(5:4),LINE NUMBER(9:8);
If no sub division of the field is required then enter '*LINE NUMBER(1:16);*'

Seismic instrument header records

The user must define the set of code definitions for surveys, areas and vintages. Header record types H400-H419 are to be used to define tables for the first instrument code, and H420-H439 for the second up to H560-H579 for the ninth code. A new table must be defined, with a different code, for each instrument used or if any parameter in the table is changed.
The instrument code must always be in col 33-34, for example '1,' to '9,'

H400 **Type,Model,Polarity** The type and model name of seismic recording instrument, the unique model number of the instrument and the polarity defined as SEG or NON SEG. The definition of SEG is "A compression shall be recorded as a negative number on tape and displayed as a downward deflection on monitor records".
Example: 1,SN368+LXU,12345,SEG;

H401 **Crew name,Comment** The name of the crew and any other comments.
Example: 1,Prakla SON 1;

H402 **Sample int.,Record Length** The recording sample rate and the record length on tape.
Example: 1,2MSEC,6SEC;

H403 **Number of channels** The number of channel per record.
Example: 1,480;

H404 **Tape type,format,density** The type of tape (9track or cartridge), recording format of the data on tape and the recording density.
Example: 1,9 track,SEGD,6250;

H405 **Filter_alias Hz,dB pnt,slope** The anti alias or high cut filter setting of the recording instrument or field boxes specified in hertz, the dB level at the frequency value and the filter slope in dB per octave.
Example: 177HZ,-6DB,72 DB/OCT;

H406 **Filter_notch Hz,-3dB points** The centre frequency of the notch filter setting of the recording instrument or field boxes sepcified in hertz and the frequency values at the -3dB points.
Examples: 1,NONE; or 1,50,45,55;

H407 **Filter_low Hz,dB pnt,slope** The low cut filter setting of the recording instrument or field boxes specified in hertz, the dB level at the frequency value and the filter slope in dB per octave.
Examples: 1,NONE; or 1,8HZ,-3DB,18 DB/OCT;

H408 **Time delay,FTB-SOD app Y/N** The value of any time delay and if the delay between field time break and start of data has been applied to the seismic data recorded on tape. *Example: 1,0 Msec,not applied;*

H409 **Multi component recording** Describes the components being recorded and their recording order on consecutive channels, allowed values are'X','Y','Z'.
Examples: 1,Z; or 1,Z,X,Y;

H410 **Aux. channel 1 contents** Describes the contents of a auxilliary channel
Examples: 1,FTB; or 1,NONE;

H411 Aux. channel 2 contents
H412 Aux. channel 3 contents
H413 Aux. channel 4 contents
H414 Spare
|
H419 Spare

Seismic receiver header records

The user must define the set of code definitions for surveys, areas and vintages. Header record types H600-H609 are to be used to define tables for the first receiver code, and H610-H619 for the second up to H690-699 for the tenth code. A new table must be defined, with a different code, for each receiver type used or if any parameter in the table is changed.
The receiver code must always be in col 33-34, examples of possible codes:

G1..to.G9 for geophones	H1..to.H9 for hydrophones
R1..to.R9 for multi comp. and other types	
PM = Permanent marker	KL = Kill or omit receiver station

H600 **Type,model,polarity** The type (land geophone, marsh geophone, hydrophone), model name of seismic detector and the polarity defined as SEG or NON SE**G.** The definition of SEG is "A compression shall be recorded as a negative number on tape and displayed as a downward deflection on monitor records". *Example: G1,SM-4,1234,SEG;*

H601 **Damping coeff,natural freq.** *Example: G1,0.68,10Hz;*

H602 **Nunits,len(X),width(Y)** The number of elements in the receiver group, the in-line and the cross-line dimension of the receiver group pattern.
Example: G1,12,25M,6M;

H603 **Unit spacing X,Y** The distance between each element of the receiver group, in-line (X), and cross-line (Y). *Example: G1,4M,6M;*

H604 Spare
|
H609 Spare

Seismic source header records

The user must define the set of code definitions for surveys, areas and vintages. Header record types H700-H719 are to be used to define tables for the first source code, and H720-H739 for the second up to H880-899 for the tenth code. A new table must be defined, with a different code, for each source type used or if any parameter in the table is changed.
The source code must always be in col 33-34, examples of possible codes:

V1..to.V9 for vibroseis E1..to.E9 for explosive
A1..to.A9 for air gun W1..to.W9 for water gun
S1..to.S9 for other types. KL = Kill or omit shotpoint

H700 **Type,model,polarity** Source type (explosive,air gun etc), make or model, and the polarity defined as SEG or NON SE**G.** The definition of SEG is "A compression shall be recorded as a negative number on tape and displayed as a downward deflection on monitor records".
Examples: E1,EXPLOSIVE,SEISMOGEL 125gram,SEG; or
V1,VIBROSEIS,METRZ 22,SEG EQU;

H701 **Size,vert. stk fold** The total charge size, force or air volume of the source pattern, the vertical fold of stack or number of sweeps per VP.
Examples: E1,1000 gram,1; or V1,93 kN,1 SWEEP/VP;

H702 **Nunits,len(X),width(Y)** The number of elements in the source pattern, the in-line and the cross-line dimension of the source pattern.
Examples: E1,6,25M,0M; or V1,4 VIBS,25M,45M;

H703 **Unit spacing X,Y** The distance between each element of the source pattern, in-line (X), and cross-line (Y). *Examples: E1,5M,0; or V1,8M,15M;*

Following records are only required if source **type= Vibroseis V1..V9**

H704 **Control type** The type of control used.
Example: V1,GND FORCE PHASE&AMPL LOCK;

H705 **Correlator,noise supp** The type of correlator/stacker, and the type of noise suppression applied before summing.
Example: V1,SERCELCS-2502,NO NOISE SUPP;

H706 **Sweep type,length** The type and length of the sweep.
Example: V1,LINEAR,30 SECONDS;

H707 **Sweep freq start,end** The start and end frequency of the sweep.
Example: V1,5HZ,60HZ;

H708 **Taper,length start,end** The type of taper and the taper length (start and end).
Example: V1,COSINE,500MSEC,500MSEC;

H709 Spare

H710 Spare

Following records are only required if source **type= Explosive E1..E9**

H711 **Nom. shot depth,charge len.** The nominal shot depth, and the length of the charge. *Example: E1,15M,1M;*

H712 **Nom. soil,drill method** The nominal type of soil or near surface medium, and the method of drilling (flushing,hand auger,portable drill unit etc). *Example: E1,CLAY,PORTABLE UNITS;*

H713 **Weathering thickness** The nominal depth to the base of weathered layer. *Example: E1,8-12M;*

H714 Spare
H715 Spare

Following records are only required if source **type =** **air gun A1..A9**
water gun W1..W9

H716 **P-P bar m,prim/bubble** The Peak-peak output in bar meters, and the primary to bubble ratio measured through a 0-125Hz filter at a depth of 6 meters. *Example: A1,50,13:1;*

H717 **Air pressure psi** The nominal operating air pressure. *Example: A1,2000PSI;*

H718 **No. sub arrays,nom depth** The number of sub arrays and the nominal towing depth. *Example: A1,3,5.5M;*

H719 Spare

Quality Control check records

H990 **R,S,X file quality control** The Date and time of the Q.C. check, and the name of the person who performed the quality control of the file. *Example: 01JUN90,0930,Mr J Smith;*

H991 **Coord. status final/prov** The status of the coordinates contained in the R and S files final or provisional), the date and time of the status, the name of the surveyor responsible for the coordinate integrity. *Example: Final,01jun90,0930,Mr J. Jansen;*

POINT RECORD DESCRIPTION

2 **Line name:** Identifier for the shotpoint or receiver line. It is a numeric number with the format of F10.2. If no decimal point is provided it should be taken as implied. It can be composed of a block or strip number and a line number. The internal format of this field must be defined in the header.

3 **Point number:** Identifier for the shotpoint or receiver group number defined as the centre of the source or receiver array as staked out in the field. The value should be read as a numeric F10.2 and be right justified.

4 **Point index:** Identifier for the shotpoint or receiver index.
Shotpoint: To be 1 for original shot within the grid cell denoted by fields 2 and 3, and be incremented by 1 for each subsequent shot within the same grid cell. Exceptions: shots to be vertically stacked (unsummed vibroseis).
Receiver: To be 1 for the original positioning of a receiver group, and be incremented by 1 every time the receiver group is moved or repositioned, even when put back to any previous position.

5 **Point code:** A shotpoint or receiver code which is defined in the header by a table that describes the characteristics of the source or receiver group used at the point.

6 **Static correction:** The shotpoint or receiver static correction defined as a static time shift in Msec. that has been computed in the field to correct any seismic recording for the effects of elevation, weathering thickness, or weathering velocity at the point. The correction should be with reference to the seismic datum as defined by field 8 of this record. If no static was computed leave 'blank'.

7 **Point Depth:** The depth of the shotpoint source or receiver group. Header defined units with respect to the surface down to the top of the charge or vertical receiver array. When the surface elevation can vary with time (eg. a tidal water surface), then for shotpoints the value should be at the time of recording, and for receivers at the time of recording of the first shotpoint into that receiver. (see figures 3 and 4)

8 **Seismic datum:** Header defined units as an offset to the datum defined in header record H17. It is +ve when above datum , -ve when below datum or zero when at datum. If the seismic datum is equal to H17, enter zero. (see figures 3 and 4)

9 **Uphole Time:** Defined for a shotpoint as the vertical travel time to surface, recorded in msec and is always positive or zero. If no uphole was recorded leave 'blank' Not defined for receiver leave 'blank', unless a reverse uphole is taken then the shotpoint definition applies.

10 **Water depth**: Header defined units of the measured (or reliably determined) height of water surface above the sea bed or water bottom. In case the water depth varies in time by more than one meter (eg. tidal areas) then for shotpoints the value should be at the time of recording and for receivers at the time of recording of the first shotpoint into that receiver. The water depth value is always positive. (see figures 3 and 4)

11 **Map grid easting**: The easting for the point, in the coordinate system defined by header record H13.

12 **Map grid northing:** The northing for the point, in the coordinate system defined by header record H13. To accommodate large TM northing values for surveys straddling the equator, this field format has one more digit than UKOOA P1/90.

13 **Surface elevation:** The topographical surface with respect to the vertical datum defined by header record H17. The surface elevation is +ve when above datum , -ve when below datum or zero when at datum. When the surface elevation with respect to the datum can vary with time (eg. a tidal water surface) Then for shotpoints the value should be at the time of recording, and for receivers at the time of recording of the first shotpoint into that receiver**.** (see figures 3 and 4)

14 **Day of year:** The julian day. For shotpoints the value should be the day of recording, and for receivers the day of recording of the first shotpoint into that receiver. When the survey continues into the next year, the day should keep increasing and not be reset to zero - 1st January would then be 366 or 367.

15 **Time hhmmss:** The time taken from the clock of the master seismic recording instrument. For shotpoints the value should be the time of recording, and for receivers the time of recording of the first shotpoint into that receiver.

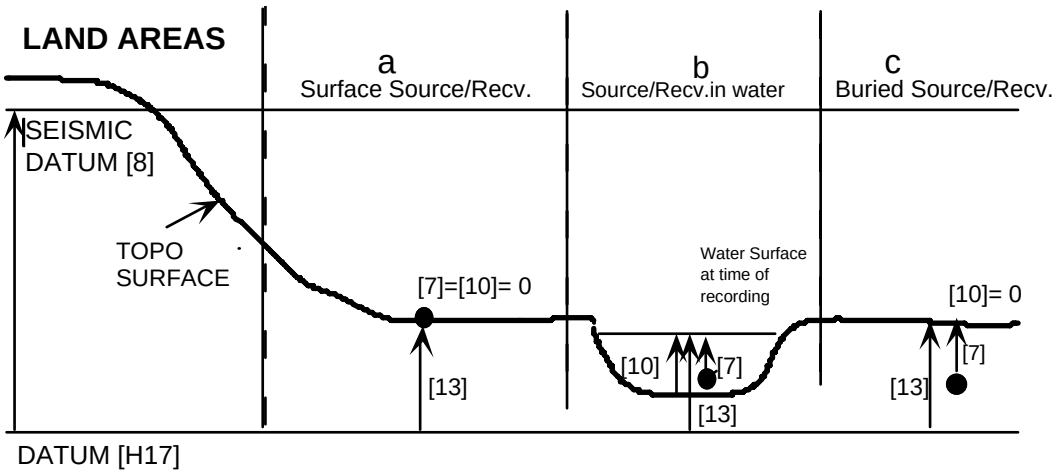

Figure 3 Land elevations

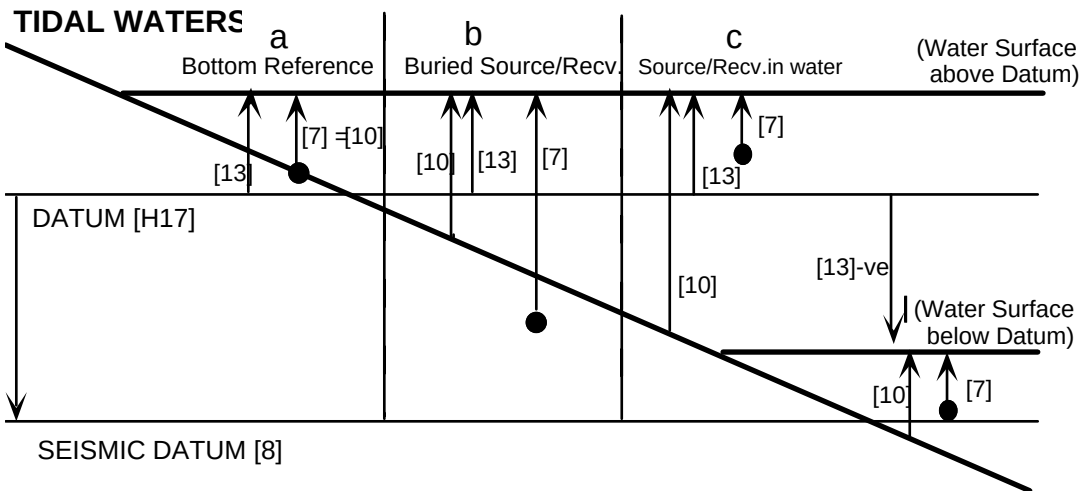

Figure 4 Tidal elevations

[7] = POINT DEPTH
[10] = WATER DEPTH at time of recording
[13] = SURFACE ELEVATION w.r.t. DATUM [H17]
[x] = Item number in POINT RECORD

RELATION RECORD DESCRIPTION

2 **Field tape number:** The identifier of the data carrier (tape) on which the seismic recording of the spread defined by this record is written. To accommodate alphanumeric tape numbers this field is defined as 3A2 and is left justified in the field.

3 **Field record number:**The number of the seismic recording given by the field instrument used to record the spread defined by this record.

4 **Field record increment:** The increment for the field record numbers, defined to allow several consecutive records which recorded the same shotpoint and spread to be defined by one 'X' record' (eg. unsummed vibroseis records).

5 **Instrument code:** Defined in the header by a table that describes the type, and settings of the instrument used to record the spread defined by this record.

6 **Line name:** Identifier for the **shotpoint** line.Must be identical to field 2 of the corresponding shotpoint record.

7 **Point number:** Identifier for the **shotpoint** number. Must be identical to field 3 of the corresponding shotpoint record.

8 **Point index:** Identifier for the **shotpoint** index. Must be identical to field 4 of the corresponding shotpoint record.

9 **From channel:** The seismic channel number as recorded in the seismic trace header corresponding to the data from the receiver group number defined by fields 12 and 13 of this record.

10 **To channel:** The seismic channel number as recorded in the seismic trace header corresponding to the data from the receiver group number defined by fields 12 and 14 of this record.

11 **Channel increment:** This field can be used for multi-component receivers when the three components (Z,X and Y) for one receiver point are recorded on three consecutive seismic channels, Then one 'X' record can define three components using a channel increment of 3. The components and their order are defined by the instrument code.

12 **Line name:** Identifier for the **receiver** line for the range of receivers defined by fields 13 and 14 of this record. The identifier must be identical to field 2 of the receiver point records that correspond to the same receiver line.

13 **From receiver:** Identifier for the **receiver** group number that corresponds to the **From channel number** defined in field 9. The identifier must be identical to field 3 of the receiver point record that corresponds to the same receiver group.

14 **To receiver:** Identifier for the **receiver** group number that corresponds to the **To channel number** defined in field 10. The identifier must be identical to field 3 of the receiver point record that corresponds to the same receiver group.

15 **Receiver index:** The receiver index value for the range of receivers defined by fields 12,13 and 14 of this record. The combination of fields 12,13,15 and 12,14,15 must correspond to the same range of receivers as defined by records in the receiver point file.

APPENDIX 1 - EXAMPLE OF SPS FORMAT

(files shown for example only-not necessarily complete)

R FILE

```
H00 SPS format version number   SPS 2.1;
H01 Description of survey area  Area A, Sparse 3-D, EXPLORATION;
H02 Date of survey              11.01.2006,21.01.2006;
H021Post/plot date of issue     22.01.2006;
H022Tape/disk identifier        B79437-B79503;
H03 Client                      SEG;
H04 Geophysical contractor      Contractor A;
H05 Positioning contractor      Contractor A;
H06 Pos. proc. contractor       Contractor A;
H07 Field computer system(s)    Sercel SN 408CMXL;
H08 Coordinate location         CENTRE OF SOURCE AND RECEIVER PATTERNS;
H09 Offset from coord. location 000M,000DEG;
H10 Clock time w.r.t. GMT       +3;
H11 Spare                       ;
H12 Geodetic datum,-spheroid    INTERNATIONAL            6378388.000 297.0000000
H13 Spare                       ;
H14 Geodetic datum parameters   -179.466-207.757 -54.446-2.598 0.287 0.843-1.000
H26 H14 are datum transformation parameters to WGS84
H15 Spare                       ;
H16 Spare                       ;
H17 Vertical datum description  MSL - mean sea level;
H18 Projection type             UTM;
H19 Projection zone             Zone 39, N;
H20 Description of grid units   METERS;
H201Factor to meter                 1.00000000
H220Long. of central meridian   0510000.000E;
H231Grid origin                 0000000.000N0510000.000E;
H232Grid coord. at origin       00500000.00E00000000.00N;
H241Scale factor                0.9996000000;
H242Lat., long. scale factor    0000000.000N0510000.000E;
H30 Project code and descriptionArea A, Sparse 3-D,3D;
H400Type,Model,Polarity         1, Sercel,SN 408CMXL,SEG;
H401Crew name,Comment           1, S-51, Chief Ob. GAO Yu;
H402Sample int.,Record Len.     1, 2msec, 6000msec;
H403Number of channels          1, 1920;
H404Tape type,format, density   1, cartridge 3590, Code 8058, 38000 bpi;
H405Filter_alias Hz,dB pnt,slope1, 200Hz,-3dB, 370.00;
H406Filter_notch Hz,-3dB points 1, NONE;
H407Filter_low Hz,dB pnt,slope  1, NONE;
H408Time delay FTB-SOD app Y/N  1, 0 MSEC, not applied;
H409Multi component recording  1, Z;
H410Aux. channel 1 contents     1, autocorrelation of true reference delayed 1s;
H411Aux. channel 2 contents     1, autocorrelation of true reference delayed 1s;
H412Aux. channel 3 contents     1, true reference;
H413Aux. channel 4 contents     1, return reference;
H414Spare                       ;
H415SPare                       ;
H416Spare                       ;
H417Spare                       ;
H26 SPS SEISMIC RECEIVER HEADER RECORDS;
H26 DESCRIPTION OF RECEIVER CODEG1 (NORMAL GEOPHONE);
H26                             ;
H600Type,model,polarity         G1, Sensor, SM-24, SEG;
H601Damp coeff,natural freq.    G1, 0.685, 10Hz;
H602Nunits,len(X),width(Y)      G1, 36, 25.00m, 55.00m;
H603Unit spacing X,Y            G1, 5m, 5m;
H604Spare                       ;
H605Spare                       ;
H606Spare                       ;
H607Spare                       ;
H26 Description G1              G1, SAND, GRAVEL PLAIN, NORMAL PATTERN;
H26 DESCRIPTION OF RECEIVER CODEG2 (COMPRESSED GEOPHONE);
H610Type,model,polarity         G2, Sensor, SM-24, SEG;
H611Damp coeff,natural freq.    G2, 0.685, 10Hz;
H612Nunits,len(X),width(Y)      G2, 36, 20.00m, 55.00m;
H613Unit spacing X,Y            G2, 5m, 5m;
H614Description G2              G2, SAND, GRAVEL PLAIN, COMPRESSED PATTERN;
H615Spare                       ;
H616Spare                       ;
```

```
H617Spare                       ;
H618Spare                       ;
H619Spare                       ;
H26 DESCRIPTION OF RECEIVER CODEG3 (BUNCHED GEOPHONE);
H620Type,model,polarity         G3, Sensor, SM-24, SEG;
H621Damp coeff,natural freq.    G3, 0.685, 10Hz;
H622Nunits,len(X),width(Y)      G3, 36, 0.00m, 25.00m;
H623Unit spacing X,Y            G3, 0m, 0m;
H624Description G3              G3, SAND, GRAVEL PLAIN, BUNCHED PATTERN;
H625Spare                       ;
H626Spare                       ;
H627Spare                       ;
H628Spare                       ;
H629Spare                       ;
H26 SPS SEISMIC SOURCE HEADER RECORDS;
H26 DESCRIPTION OF SOURCE CODE  V6 (VIBROSEIS),PARALLELOGRAM PATTERN;
H26 GRAVEL PLAIN:               ;
H800Type,model,polarity         V6, VIBROSEIS,VE432,SEG;
H801Size,vert. stk fold         V6, 70% of peak force, 1 SWEEP /VIBRATOR/VP;
H802Nunits,len(X),width(Y)      V6, 5 VIBS, 48M, 0M;
H803Unit spacing X,Y            V6, 12M, 0M;
H804Control type                V6, GNDFORCE;
H805Correlator,noise supp       V6, 408CMXL, NO NOISE SUPP;
H806Sweep type,length           V6, LINEAR UPSWEEP, 12sec;
H807Sweep freq start,end        V6, 4HZ, 84HZ;
H808Taper,length start,end      V6, COSINE, 1000MSEC, 1000MSEC;
H809Spare                       V6, All points on high side of median line;
H810Spare                       ;
H820Type,model,polarity         V7, VIBROSEIS,VE432,SEG;
H821Size,vert. stk fold         V7, 70% of peak force, 1 SWEEP /VIBRATOR/VP;
H822Nunits,len(X),width(Y)      V7, 5 VIBS, 48M, 0M;
H823Unit spacing X,Y            V7, 12M, 0M;
H824Control type                V7, GNDFORCE;
H825Correlator,noise supp       V7, 408CMXL, NO NOISE SUPP;
H826Sweep type,length           V7, LINEAR UPSWEEP, 12sec;
H827Sweep freq start,end        V7, 4HZ, 84HZ;
H828Taper,length start,end      V7, COSINE, 1000MSEC, 1000MSEC;
H829Spare                       V7, All points on low side of median line;
H830Spare                       ;
H840Type,model,polarity         V8, VIBROSEIS,VE432,SEG;
H841Size,vert. stk fold         V8, 70% of peak force, 1 SWEEP /VIBRATOR/VP;
H842Nunits,len(X),width(Y)      V8, 5 VIBS, 48M, 0M;
H843Unit spacing X,Y            V8, 12M, 0M;
H844Control type                V8, GNDFORCE;
H845Correlator,noise supp       V8, 408CMXL, NO NOISE SUPP;
H846Sweep type,length           V8, LINEAR UPSWEEP, 12sec;
H847Sweep freq start,end        V8, 4HZ, 84HZ;
H848Taper,length start,end      V8, COSINE, 1000MSEC, 1000MSEC;
H849Spare                       V8, All points on secordary source lines;
H850Spare                       ;
H26 Percentage hold down weight 70% of peak force;
H990R,S,X file quality control  22/Jan/06,0930,Party Manager;
H991Coord. status final/prov    Final,22/Jan/06,1600,Party Manager;
H26      1         2         3         4         5         6         7         8
H26 5678901234567890123456789012345678901234567890123456789012345678901234567890
R   5646.00 534450.00  1G1     0.0             238510.1 3058380.0  85.2 18213250
R   5646.00 534500.00  1G1     0.0             238540.0 3058380.0  84.3 18213250
R   5646.00 534550.00  1G1     0.0             238570.0 3058380.0  83.2 18213101
R   5646.00 534600.00  1G1     0.0             238600.0 3058380.0  82.4 18213101
R   5646.00 534650.00  1G1     0.0             238630.0 3058380.0  82.0 18212717
R   5646.00 534700.00  1G1     0.0             238660.0 3058380.0  81.9 18212717
R   5646.00 534750.00  1G1     0.0             238690.0 3058380.0  81.5 18212457
R   5646.00 534800.00  1G1     0.0             238720.0 3058380.0  81.8 18212457
R   5646.00 534850.00  1G1     0.0             238750.0 3058380.0  82.4 18212328
R   5646.00 534900.00  1G1     0.0             238780.0 3058379.9  81.4 18212328
R   5646.00 534950.00  1G1     0.0             238810.0 3058380.0  80.7 18212206
R   5646.00 535000.00  1G1     0.0             238840.0 3058380.0  79.6 18212206
R   5646.00 535050.00  1G1     0.0             238870.0 3058380.0  79.3 18212043
R   5646.00 535100.00  1G1     0.0             238900.0 3058380.0  78.9 18212043
R   5646.00 535150.00  1G1     0.0             238930.0 3058380.0  78.3 18211926
R   5646.00 535200.00  1G1     0.0             238960.0 3058380.0  77.9 18154555
R   5646.00 535250.00  1G1     0.0             238990.0 3058380.0  76.7 18154442
R   5646.00 535300.00  1G1     0.0             239020.0 3058380.0  75.9 18154442
R   5646.00 535350.00  1G1     0.0             239050.1 3058380.0  75.3 18154442
R   5646.00 535400.00  1G1     0.0             239080.0 3058380.0  75.3 18154442
R   5646.00 535450.00  1G1     0.0             239110.0 3058380.0  75.3 18154442
R   5646.00 535500.00  1G1     0.0             239140.0 3058380.0  75.4 18154442
```

```
R   5646.00 535550.00  1G1     0.0            239170.0 3058380.0  75.5 18154442
R   5646.00 535600.00  1G1     0.0            239200.0 3058380.0  75.7 18154442
R   5646.00 535650.00  1G1     0.0            239230.0 3058380.0  76.8 18154442
R   5646.00 535700.00  1G1     0.0            239260.0 3058380.0  77.7 18154442
R   5646.00 535750.00  1G1     0.0            239290.0 3058380.0  78.5 18154442
R   5646.00 535800.00  1G1     0.0            239320.0 3058380.0  78.9 18154442
R   5646.00 535850.00  1G1     0.0            239350.0 3058380.0  79.0 18154442
R   5646.00 535900.00  1G1     0.0            239380.0 3058380.0  78.9 18152739
R   5646.00 535950.00  1G1     0.0            239410.0 3058380.0  80.1 18152615
R   5646.00 536000.00  1G1     0.0            239440.0 3058380.0  78.1 18152615
R   5646.00 536050.00  1G1     0.0            239470.0 3058380.0  76.5 18151242
R   5646.00 536100.00  1G1     0.0            239500.1 3058380.0  74.6 18151242
R   5646.00 536150.00  1G1     0.0            239530.0 3058380.0  73.1 18151242
R   5646.00 536200.00  1G1     0.0            239560.0 3058380.0  72.1 18151242
R   5646.00 536250.00  1G1     0.0            239590.0 3058380.0  71.4 18151114
R   5646.00 536300.00  1G1     0.0            239620.0 3058380.0  70.5 18151114
R   5646.00 536350.00  1G1     0.0            239650.0 3058380.0  70.1 18151015
R   5646.00 536400.00  1G1     0.0            239680.0 3058380.0  68.6 18151015
R   5646.00 536450.00  1G1     0.0            239710.0 3058380.0  67.1 18144415
R   5646.00 536500.00  1G1     0.0            239740.0 3058380.0  66.3 18144415
R   5646.00 536550.00  1G1     0.0            239770.0 3058380.0  65.9 18144234
R   5646.00 536600.00  1G1     0.0            239800.0 3058380.0  65.8 18144234
R   5646.00 536650.00  1G1     0.0            239830.0 3058380.0  64.9 18144125
R   5646.00 536700.00  1G1     0.0            239860.0 3058380.0  64.8 18144125
R   5646.00 536750.00  1G1     0.0            239890.0 3058380.0  63.7 18142825
```

S FILE

```
H00 SPS format version number   SPS 2.1;
H01 Description of survey area  Area A, Sparse 3-D, EXPLORATION;
H02 Date of survey              19.01.2006,21.01.2006;
H021Post/plot date of issue     22.01.2006;
H022Tape/disk identifier        B79480;
H023Line sequence number            5;
H03 Client                      SEG;
H04 Geophysical contractor      Contractor A;
H05 Positioning contractor      Contractor A;
H06 Pos. proc. contractor       Contractor A;
H07 Field computer system(s)    Sercel SN 408CMXL;
H08 Coordinate location         CENTRE OF SOURCE AND RECEIVER PATTERNS;
H09 Offset from coord. location 000M,000DEG;
H10 Clock time w.r.t. GMT       +3;
H11 Spare                       ;
H12 Geodetic datum,-spheroid    INTERNATIONAL           6378388.000 297.0000000
H13 Spare                       ;
H14 Geodetic datum parameters   -179.466-207.757 -54.446-2.598 0.287 0.843-1.000
H26 H14 are datum transformation parameters to WGS84
H15 Spare                       ;
H16 Spare                       ;
H17 Vertical datum description  MSL - mean sea level;
H18 Projection type             UTM;
H19 Projection zone             Zone 39, N;
H20 Description of grid units   METERS;
H201Factor to meter                 1.00000000
H220Long. of central meridian   0510000.000E;
H231Grid origin                 0000000.000N0510000.000E;
H232Grid coord. at origin       00500000.00E00000000.00N;
H241Scale factor                0.9996000000;
H242Lat., long. scale factor    0000000.000N0510000.000E;
H30 Project code and description Area A, Sparse 3-D,3D;
H400Type,Model,Polarity         1, Sercel,SN 408CMXL,SEG;
H401Crew name,Comment           1, S-51, Chief Ob. GAO Yu;
H402Sample int.,Record Len.     1, 2msec, 6000msec;
H403Number of channels          1, 1920;
H404Tape type,format, density   1, cartridge 3590, Code 8058, 38000 bpi;
H405Filter_alias Hz,dB pnt,slope1, 200Hz,-3dB, 370.00;
H406Filter_notch Hz,-3dB points 1, NONE;
H407Filter_low Hz,dB pnt,slope  1, NONE;
H408Time delay FTB-SOD app Y/N  1, 0 MSEC, not applied;
H409Multi component recording  1, Z;
H410Aux. channel 1 contents     1, autocorrelation of true reference delayed 1s;
H411Aux. channel 2 contents     1, autocorrelation of true reference delayed 1s;
H412Aux. channel 3 contents     1, true reference;
H413Aux. channel 4 contents     1, return reference;
H414Spare                       ;
H415SPare                       ;
H416Spare                       ;
H417Spare                       ;
H26 SPS SEISMIC RECEIVER HEADER RECORDS;
H26 DESCRIPTION OF RECEIVER CODEG1 (NORMAL GEOPHONE);
H26                             ;
H600Type,model,polarity         G1, Sensor, SM-24, SEG;
H601Damp coeff,natural freq.    G1, 0.685, 10Hz;
H602Nunits,len(X),width(Y)      G1, 36, 25.00m, 55.00m;
H603Unit spacing X,Y            G1, 5m, 5m;
H604Spare                       ;
H605Spare                       ;
H606Spare                       ;
H607Spare                       ;
H26 Description G1              G1, SAND, GRAVEL PLAIN, NORMAL PATTERN;
H26 DESCRIPTION OF RECEIVER CODEG2 (COMPRESSED GEOPHONE);
H610Type,model,polarity         G2, Sensor, SM-24, SEG;
H611Damp coeff,natural freq.    G2, 0.685, 10Hz;
H612Nunits,len(X),width(Y)      G2, 36, 20.00m, 55.00m;
H613Unit spacing X,Y            G2, 5m, 5m;
H614Description G2              G2, SAND, GRAVEL PLAIN, COMPRESSED PATTERN;
H615Spare                       ;
H616Spare                       ;
H617Spare                       ;
H618Spare                       ;
H619Spare                       ;
H26 DESCRIPTION OF RECEIVER CODEG3 (BUNCHED GEOPHONE);
```

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H620Type,model,polarity          G3, Sensor, SM-24, SEG;
H621Damp coeff,natural freq.     G3, 0.685, 10Hz;
H622Nunits,len(X),width(Y)       G3, 36, 0.00m, 25.00m;
H623Unit spacing X,Y             G3, 0m, 0m;
H624Description G3               G3, SAND, GRAVEL PLAIN, BUNCHED PATTERN;
H625Spare                        ;
H626Spare                        ;
H627Spare                        ;
H628Spare                        ;
H629Spare                        ;
H26 SPS SEISMIC SOURCE HEADER RECORDS;
H26 DESCRIPTION OF SOURCE CODE   V6 (VIBROSEIS),PARALLELOGRAM PATTERN;
H26 GRAVEL PLAIN:                ;
H800Type,model,polarity          V6, VIBROSEIS,VE432,SEG;
H801Size,vert. stk fold          V6, 70% of peak force, 1 SWEEP /VIBRATOR/VP;
H802Nunits,len(X),width(Y)       V6, 5 VIBS, 48M, 0M;
H803Unit spacing X,Y             V6, 12M, 0M;
H804Control type                 V6, GNDFORCE;
H805Correlator,noise supp        V6, 408CMXL, NO NOISE SUPP;
H806Sweep type,length            V6, LINEAR UPSWEEP, 12sec;
H807Sweep freq start,end         V6, 4HZ, 84HZ;
H808Taper,length start,end       V6, COSINE, 1000MSEC, 1000MSEC;
H809Spare                        V6, All points on high side of median line;
H810Spare                        ;
H820Type,model,polarity          V7, VIBROSEIS,VE432,SEG;
H821Size,vert. stk fold          V7, 70% of peak force, 1 SWEEP /VIBRATOR/VP;
H822Nunits,len(X),width(Y)       V7, 5 VIBS, 48M, 0M;
H823Unit spacing X,Y             V7, 12M, 0M;
H824Control type                 V7, GNDFORCE;
H825Correlator,noise supp        V7, 408CMXL, NO NOISE SUPP;
H826Sweep type,length            V7, LINEAR UPSWEEP, 12sec;
H827Sweep freq start,end         V7, 4HZ, 84HZ;
H828Taper,length start,end       V7, COSINE, 1000MSEC, 1000MSEC;
H829Spare                        V7, All points on low side of median line;
H830Spare                        ;
H840Type,model,polarity          V8, VIBROSEIS,VE432,SEG;
H841Size,vert. stk fold          V8, 70% of peak force, 1 SWEEP /VIBRATOR/VP;
H842Nunits,len(X),width(Y)       V8, 5 VIBS, 48M, 0M;
H843Unit spacing X,Y             V8, 12M, 0M;
H844Control type                 V8, GNDFORCE;
H845Correlator,noise supp        V8, 408CMXL, NO NOISE SUPP;
H846Sweep type,length            V8, LINEAR UPSWEEP, 12sec;
H847Sweep freq start,end         V8, 4HZ, 84HZ;
H848Taper,length start,end       V8, COSINE, 1000MSEC, 1000MSEC;
H849Spare                        V8, All points on secordary source lines;
H850Spare                        ;
H26 Percentage hold down weight  70% of peak force;
H990R,S,X file quality control   22/Jan/06,0930,Party Manager;
H991Coord. status final/prov     Final,22/Jan/06,1600, Party Manager;
H26      1         2         3         4         5         6         7         8
H26 5678901234567890123456789012345678901234567890123456789012345678901234567890
S   5713.00 542525.00  2V6             0       243355.0 3060390.0  60.6019001150
S   5603.00 542425.00  1V7             0       243295.0 3057090.0  71.1019001218
S   5601.00 542525.00  1V7             0       243355.0 3057030.0  72.7019001414
S   5715.00 542525.00  2V6             0       243355.0 3060450.0  61.0019001452
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X FILE

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H00 SPS format version number   SPS 2.1;
H01 Description of survey area  Area A, Sparse 3-D, EXPLORATION;
H02 Date of survey              19.01.2006,21.01.2006;
H021Post/plot date of issue     22.01.2006;
H022Tape/disk identifier        B79480;
H023Line sequence number            5;
H03 Client                      SEG;
H04 Geophysical contractor      Contractor A;
H05 Positioning contractor      Contractor A;
H06 Pos. proc. contractor       Contractor A;
H07 Field computer system(s)    Sercel SN 408CMXL;
H08 Coordinate location         CENTRE OF SOURCE AND RECEIVER PATTERNS;
H09 Offset from coord. location 000M,000DEG;
H10 Clock time w.r.t. GMT       +3;
H11 Spare                       ;
H12 Geodetic datum,-spheroid    INTERNATIONAL           6378388.000 297.0000000
H13 Spare                       ;
H14 Geodetic datum parameters   -179.466-207.757 -54.446-2.598 0.287 0.843-1.000
H26 H14 are datum transformation parameters to WGS84
H15 Spare                       ;
H16 Spare                       ;
H17 Vertical datum description  MSL - mean sea level;
H18 Projection type             UTM;
H19 Projection zone             Zone 39, N;
H20 Description of grid units   METERS;
H201Factor to meter                 1.00000000
H220Long. of central meridian   0510000.000E;
H231Grid origin                 0000000.000N0510000.000E;
H232Grid coord. at origin       00500000.00E00000000.00N;
H241Scale factor                0.9996000000;
H242Lat., long. scale factor    0000000.000N0510000.000E;
H30 Project code and descriptionArea A, Sparse 3-D,3D;
H400Type,Model,Polarity         1, Sercel,SN 408CMXL,SEG;
H401Crew name,Comment           1, S-51, Chief Ob. GAO Yu;
H402Sample int.,Record Len.     1, 2msec, 6000msec;
H403Number of channels          1, 1920;
H404Tape type,format, density   1, cartridge 3590, Code 8058, 38000 bpi;
H405Filter_alias Hz,dB pnt,slope1, 200Hz,-3dB, 370.00;
H406Filter_notch Hz,-3dB points 1, NONE;
H407Filter_low Hz,dB pnt,slope  1, NONE;
H408Time delay FTB-SOD app Y/N  1, 0 MSEC, not applied;
H409Multi component recording   1, Z;
H410Aux. channel 1 contents     1, autocorrelation of true reference delayed 1s;
H411Aux. channel 2 contents     1, autocorrelation of true reference delayed 1s;
H412Aux. channel 3 contents     1, true reference;
H413Aux. channel 4 contents     1, return reference;
H414Spare                       ;
H415SPare                       ;
H416Spare                       ;
H417Spare                       ;
H26 SPS SEISMIC RECEIVER HEADER RECORDS;
H26 DESCRIPTION OF RECEIVER CODEG1 (NORMAL GEOPHONE);
H26                             ;
H600Type,model,polarity         G1, Sensor, SM-24, SEG;
H601Damp coeff,natural freq.    G1, 0.685, 10Hz;
H602Nunits,len(X),width(Y)      G1, 36, 25.00m, 55.00m;
H603Unit spacing X,Y            G1, 5m, 5m;
H604Spare                       ;
H605Spare                       ;
H606Spare                       ;
H607Spare                       ;
H26 Description G1              G1, SAND, GRAVEL PLAIN, NORMAL PATTERN;
H26 DESCRIPTION OF RECEIVER CODEG2 (COMPRESSED GEOPHONE);
H610Type,model,polarity         G2, Sensor, SM-24, SEG;
H611Damp coeff,natural freq.    G2, 0.685, 10Hz;
H612Nunits,len(X),width(Y)      G2, 36, 20.00m, 55.00m;
H613Unit spacing X,Y            G2, 5m, 5m;
H614Description G2              G2, SAND, GRAVEL PLAIN, COMPRESSED PATTERN;
H615Spare                       ;
H616Spare                       ;
H617Spare                       ;
H618Spare                       ;
H619Spare                       ;
```

```
H26 DESCRIPTION OF RECEIVER CODEG3 (BUNCHED GEOPHONE);
H620Type,model,polarity         G3, Sensor, SM-24, SEG;
H621Damp coeff,natural freq.    G3, 0.685, 10Hz;
H622Nunits,len(X),width(Y)      G3, 36, 0.00m, 25.00m;
H623Unit spacing X,Y            G3, 0m, 0m;
H624Description G3              G3, SAND, GRAVEL PLAIN, BUNCHED PATTERN;
H625Spare                       ;
H626Spare                       ;
H627Spare                       ;
H628Spare                       ;
H629Spare                       ;
H26 SPS SEISMIC SOURCE HEADER RECORDS;
H26 DESCRIPTION OF SOURCE CODE  V6 (VIBROSEIS),PARALLELOGRAM PATTERN;
H26 GRAVEL PLAIN:               ;
H800Type,model,polarity         V6, VIBROSEIS,VE432,SEG;
H801Size,vert. stk fold         V6, 70% of peak force, 1 SWEEP /VIBRATOR/VP;
H802Nunits,len(X),width(Y)      V6, 5 VIBS, 48M, 0M;
H803Unit spacing X,Y            V6, 12M, 0M;
H804Control type                V6, GNDFORCE;
H805Correlator,noise supp       V6, 408CMXL, NO NOISE SUPP;
H806Sweep type,length           V6, LINEAR UPSWEEP, 12sec;
H807Sweep freq start,end        V6, 4HZ, 84HZ;
H808Taper,length start,end      V6, COSINE, 1000MSEC, 1000MSEC;
H809Spare                       V6, All points on high side of median line;
H810Spare                       ;
H820Type,model,polarity         V7, VIBROSEIS,VE432,SEG;
H821Size,vert. stk fold         V7, 70% of peak force, 1 SWEEP /VIBRATOR/VP;
H822Nunits,len(X),width(Y)      V7, 5 VIBS, 48M, 0M;
H823Unit spacing X,Y            V7, 12M, 0M;
H824Control type                V7, GNDFORCE;
H825Correlator,noise supp       V7, 408CMXL, NO NOISE SUPP;
H826Sweep type,length           V7, LINEAR UPSWEEP, 12sec;
H827Sweep freq start,end        V7, 4HZ, 84HZ;
H828Taper,length start,end      V7, COSINE, 1000MSEC, 1000MSEC;
H829Spare                       V7, All points on low side of median line;
H830Spare                       ;
H840Type,model,polarity         V8, VIBROSEIS,VE432,SEG;
H841Size,vert. stk fold         V8, 70% of peak force, 1 SWEEP /VIBRATOR/VP;
H842Nunits,len(X),width(Y)      V8, 5 VIBS, 48M, 0M;
H843Unit spacing X,Y            V8, 12M, 0M;
H844Control type                V8, GNDFORCE;
H845Correlator,noise supp       V8, 408CMXL, NO NOISE SUPP;
H846Sweep type,length           V8, LINEAR UPSWEEP, 12sec;
H847Sweep freq start,end        V8, 4HZ, 84HZ;
H848Taper,length start,end      V8, COSINE, 1000MSEC, 1000MSEC;
H849Spare                       V8, All points on secordary source lines;
H850Spare                       ;
H26 Percentage hold down weight 70% of peak force;
H990R,S,X file quality control  22/Jan/06,0930,Party Manager;
H991Coord. status final/prov    Final,22/Jan/06,1600, Party Manager;
H26      1         2         3         4         5         6         7         8
H26 5678901234567890123456789012345678901234567890123456789012345678901234567890
XB79480       111   5713.00 542525.002    1  3201   5646.00 534550.00 550500.001
XB79480       111   5713.00 542525.002  321  6401   5662.00 534550.00 550500.001
XB79480       111   5713.00 542525.002  641  9601   5678.00 534550.00 550500.001
XB79480       111   5713.00 542525.002  961 12801   5694.00 534550.00 550500.001
XB79480       111   5713.00 542525.002 1281 16001   5710.00 534550.00 550500.001
XB79480       111   5713.00 542525.002 1601 19201   5726.00 534550.00 550500.001
XB79480       211   5603.00 542425.001    1  3201   5646.00 534450.00 550400.001
XB79480       211   5603.00 542425.001  321  6401   5662.00 534450.00 550400.001
XB79480       211   5603.00 542425.001  641  9601   5678.00 534450.00 550400.001
XB79480       211   5603.00 542425.001  961 12801   5694.00 534450.00 550400.001
XB79480       211   5603.00 542425.001 1281 16001   5710.00 534450.00 550400.001
XB79480       211   5603.00 542425.001 1601 19201   5726.00 534450.00 550400.001
XB79480       311   5601.00 542525.001    1  3201   5646.00 534550.00 550500.001
XB79480       311   5601.00 542525.001  321  6401   5662.00 534550.00 550500.001
XB79480       311   5601.00 542525.001  641  9601   5678.00 534550.00 550500.001
XB79480       311   5601.00 542525.001  961 12801   5694.00 534550.00 550500.001
XB79480       311   5601.00 542525.001 1281 16001   5710.00 534550.00 550500.001
XB79480       311   5601.00 542525.001 1601 19201   5726.00 534550.00 550500.001
XB79480       411   5715.00 542525.002    1  3201   5646.00 534550.00 550500.001
XB79480       411   5715.00 542525.002  321  6401   5662.00 534550.00 550500.001
XB79480       411   5715.00 542525.002  641  9601   5678.00 534550.00 550500.001
XB79480       411   5715.00 542525.002  961 12801   5694.00 534550.00 550500.001
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XB79480       311   5601.00 542525.001  321  6401   5662.00 534550.00 550500.001
XB79480       311   5601.00 542525.001  641  9601   5678.00 534550.00 550500.001
XB79480       311   5601.00 542525.001  961 12801   5694.00 534550.00 550500.001
XB79480       311   5601.00 542525.001 1281 16001   5710.00 534550.00 550500.001
XB79480       311   5601.00 542525.001 1601 19201   5726.00 534550.00 550500.001
XB79480       411   5715.00 542525.002    1  3201   5646.00 534550.00 550500.001
XB79480       411   5715.00 542525.002  321  6401   5662.00 534550.00 550500.001
XB79480       411   5715.00 542525.002  641  9601   5678.00 534550.00 550500.001
XB79480       411   5715.00 542525.002  961 12801   5694.00 534550.00 550500.001
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