## Interpretation of 6 shots into 12 channels, sent by Milko Rivera at Guyana Goldfields Inc., with Rayfract® version 3.20 :

To invert the data, start up Rayfract® via desktop icon. Select *File*|*New Profile*... . Set *File name* to RIVERAL8 and click *Save button*. Specify *Station spacing* of 10 m in *Header*|*Profile* (Fig. 1).

Unzip archive <u>riveral8.zip</u> in directory \RAY32\RIVERAL8\INPUT. Select *File*|*Import Data...* and specify *Import data type* SEG-2. Click *button Select* and select one of the .DAT files in \RAY32\RIVERAL8\INPUT (Fig. 2).

Click *button Import shots.* Specify *Shot pos.* 0.5, 1, 3, 6, 9 and 12 for shots 1 to 6. Leave *Layout start* at 1.0. Click *button Read* to import each of these shots into the profile database.

Select *File*|*Update header data*|*Update Station Coordinates...* and COORDS.COR in \RAY32\RIVERAL8\INPUT directory.

Select *File*|*Update header data*|*Update First Breaks...* and BREAKS.LST contained in \RAY32\RIVERAL8\INPUT directory.

Select *Trace*|*Shot gather*. Zoom time axis with F1. Zoom trace amplitude with CTRL+F1. Browse shots with F7/F8 (Fig. 3 and Fig. 4). Toggle trace fill mode with CTRL+F3.

Apply a *band-pass frequency filter* to better recognize the first breaks (Fig. 10).

Edit Profile			
Line ID Line type Job ID	RIVERA LINE8 Refraction spread/line	Time of Acquisition Date Time	
Instrument Client Company Observer Note		Time of Processing Date Time Units SortAs acquired Const	
Station spacing [m]     10.0000       Min. horizontal separation [%]     25       Profile start offset [m]     0.0000       Select borehole lines for WET tomography       Borehole 1 line     Select       Borehole 2 line     Select		Left handed coordinates	

Fig. 1 : Header Profile, edit profile header data

Import shots			
Import data type	SEG-2		
Input directory Select	D:\ray32\RIVERAL8\INPUT\		
Take shot record number from	DOS file name 💌		
Overwrite existing shot data-	🔲 Batch import		
Overwrite all 📀 Prompt overwriting 🔲 Limit offset			
Maximum offset imported [station nos.] 1000.0			
Default shot hole depth [m]	Default spread type		
0.00	10: 360 channels 📃 💌		
Target Sample Format	16-bit fixed point		
Turn around spread by 180 degrees during import			
Correct picks for delay time (use e.g. for .PIK files)			
Import shots	<u>C</u> ancel import		

Fig. 2 : File Import Shots ... dialog



Fig. 3 : first break picking in *Trace*|*Shot gather* (left), shot no. 2. Red crosses are picked times, blue are modeled picks. Traveltime curves in *Refractor*|*Shot breaks* (right). Grey curves are picked times, dashed blue are modeled times.



Fig. 4 : First breaks for shot no. 6, see Fig. 3





Fig. 6 : Smooth inversion, default WET settings, 20 WET iterations, wavepath width 11%





Fig. 7 : WET wavepath coverage plot. Coverage of subsurface with first break energy. WET settings as in Fig. 6 above.



Fig. 5 : initial 1D velocity model, averaged DeltatV





subsurface with first break energy. WET settings as in Fig. 8 above.

To obtain above figures :

- run Smooth invert | WET with 1D-gradient initial model, to obtain Fig. 5, 6 and 7
- select WET Tomo Interactive WET tomography ....
- set Number of WET tomography iterations to 100 •
- click button Edit grid file generation •
- set Store each nth iteration only to 20 •
- click buttons Accept parameters and Start tomography processing to obtain Fig. 8 and 9

32 30

28

- 26 - 24 - 22 - 18 - 16 - 14 - 12 - 10

- 8

Note the step-shaped basement depression at bottom of Fig. 8, after 100 WET iterations. This is not yet visible in Fig. 6 after just 20 WET iterations, due to incomplete **removal of horizontal layering artefacts of the 1D initial model** (Fig.5). We recommend using at least 24 receivers instead of just 12 receivers per spread, for more reliable interpretation. Or use <u>overlapping receiver spreads</u> for recording of shots.



Fig. 10 : band-pass frequency filtering in Trace|Shot gather, shot no. 3. Press SHIFT+Q to show band-pass dialog.

To quality-check your first breaks with the traveltime reciprocity principle, use *Trace*|Offset gather (Fig. 11). Browse common-offset sorted trace gathers with F7/F8. The common offset is displayed in the title bar, in meters. According to the reciprocity principle, seismic first break times, rays and wave paths are identical when swapping source and receiver positions, for each recorded trace. So in Fig. 11, traces with same common offset and common midpoint (station number) should have the same first break pick time, according to the laws of physics.



Fig. 11 : *Trace*|*Offset gather*, offset 60m (left). *Trace*|*Shot gather*, shot no. 4 (right). Browse traces with arrow-left and arrow-right keys. Trace attributes are displayed in status bar, at bottom of screen. Channel #12 of shot #4 (99 ms, yellow) has almost same time as channel #6 of shot #6 (100 ms, black), so these two picks regard the reciprocity principle.

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