ATTACHMENT V

DOWNHOLE SEISMIC VELOCITY PLOTS (REDPATH) - WHB AREA

As discussed in Section 6.2.5, this attachment presents fifteen figures, one for each borehole surveyed by Redpath Geophysics, showing plots of adjusted travel time in milliseconds versus depth below ground surface in feet. The plots also show the linear fits to the data, the slope of which gives the velocity in feet per millisecond, which is converted to feet per second. Details of the surveys and data reduction can be found in scientific notebook SN-M&O-SCI-030-V1 (Wong 2002b).

September 2002

ANL-MGR-GE-000003 REV 00



DTN: MC0111DVDWHBSC.001, MC0202WHBTMPKS.000 Figure V-1. RF#13 Downhole Travel Time Versus Depth

V-2

)

1

3 #



Figure V-2. RF#14 Downhole Travel Time Versus Depth



DTN: MO0111DVDWHBSC.001, MO0202WHBTMPKS.000

Figure V-3. RF#15 Downhole Travel Time Versus Depth

ANL-MGR-GE-000003 REV 00

September 2002

ANL-MGR-GE-000003 REV 00



Figure V-4. RF#16 Downhole Travel Time Versus Depth

V-5

September 2002

ANL-MGR-GE-000003 REV 00



7

Figure V-5. RF#18 Downhole Travel Time Versus Depth

8-٨



Figure V-6. RF#19 Downhole Travel Time Versus Depth

ANL-MGR-GE-000003 REV 00





Figure V-8. RF#21 Downhole Travel Time Versus Depth

V-9



Figure V-9. RF#22 Downhole Travel Time Versus Depth

ANL-MGR-GE-000003 REV 00



DTN: MO0111DVDWHBSC.001, MO0202WHBTMPKS.000 Figure V-10. RF#23 Downhole Travel Time Versus Depth

ANL-MGR-GE-000003 REV 00



Figure V-11. RF#24 Downhole Travel Time Versus Depth

V-12

September 2002

ANL-MGR-GE-000003 REV 00

)



.

.

Зft

DTN: MO0111DVDWHBSC.001, MO0202WHBTMPKS.000 Figure V-12. RF#25 Downhole Travel Time Versus Depth

V-13

)



DTN: MO0111DVDWHBSC.001, MO0202WHBTMPKS.000 Figure V-13. RF#26 Downhole Travel Time Versus Depth

ANL-MGR-GE-000003 REV 00



DTN: MO0111DVDWHBSC.001, MO0202WHBTMPKS.000 Figure V-14. RF#28 Downhole Travel Time Versus Depth

ANL-MGR-GE-000003 REV 00

V-15



DTN: MO0111DVDWHBSC.001, MO0202WHBTMPKS.000 Figure V-15. RF#29 Downhole Travel Time Versus Depth

ANL-MGR-GE-000003 REV 00

ATTACHMENT VI

DOWNHOLE SEISMIC VELOCITY PLOTS (GEOVISION) – WHB AREA

ANL-MGR-GE-000003 REV 00

VI-1

.....

ATTACHMENT VI

DOWNHOLE SEISMIC VELOCITY PLOTS (GEOVISION) - WHB AREA

As discussed in Section 6.2.5, this attachment presents four figures, two for each of boreholes RF#13 and #17 surveyed by GEOVision, Inc., showing plots of adjusted travel time in milliseconds versus depth below ground surface in feet. The plots also show the linear fits to the data, the slope of which gives the velocity in feet per millisecond, which is converted to feet per second. One interpretation was made by picking the first break (initial arrival) of the shear or compression wave for records at all depths, and a second interpretation was made by picking the peak of the first appearance of the shear or compression wave. GEOVision prefers the first break approach, but also provided the first peak interpretation for comparison purposes. Comparisons of Figures VI-1 and VI-2 and of Figures VI-3 and VI-4 show that the two interpretations agree very well. Details of the surveys and data reduction can be found in scientific notebook SN-M&O-SCI-025-V1 (Luebbers 2002c).



DTN: MO0110DVDBOREH.000, MO0202DWAVEATD.000

Figure VI-1. RF#13 Downhole Travel Time Versus Depth Plots (First Break Picks)

ANL-MGR-GE-000003 REV 00

VI-3



CORRECTED DOWNHOLE TRAVEL TIME (MILLISECONDS)

Figure VI-2. RF#13 Downhole Travel Time Versus Depth Plots (Peak Picks)

ANL-MGR-GE-000003 REV 00

VI-4

September 2002





VI-5

September 2002



CORRECTED DOWNHOLE TRAVEL TIME (MILLISECONDS)

Figure VI-4. RF#17 Downhole Travel Time Versus Depth Plots (Peak Picks)

September 2002

ATTACHMENT VII

SUSPENSION SEISMIC INTERVAL VELOCITY PLOTS

.

ANL-MGR-GE-000003 REV 00

ATTACHMENT VII

SUSPENSION SEISMIC INTERVAL VELOCITY PLOTS

As mentioned in Section 6.2.6.4, this attachment presents plots and tables of interpreted suspension seismic measurements as follows:

- Figures VII-1 through VII-16, plots of shear-wave interval velocity vs. depth bgs at boreholes RF#13 through RF#29, respectively.
- Figures VII-17 through VII-32, plots of compression-wave interval velocity vs. depth bgs at boreholes RF#13 through RF#29, respectively.
- Figures VII-33 through VII-48, plots of Poisson's ratio derived from interval velocity measurements vs. depth bgs at boreholes RF#13 through RF#29, respectively.
- Figures VII-49 and VII-50 plot the averaged shear-wave velocity for individual boreholes together with the median and median \pm one standard deviation for the entire data set.
- Figure VII-51 plots the averaged compression-wave velocity for individual boreholes together with the median and median \pm one standard deviation for the entire data set.
- Figure VII-52 plots the values of Poisson's ratio calculated from the averaged shearand compression-wave velocity for individual boreholes together with the median and median ± one standard deviation for the entire data set.
- Tables VII-1 and VII-2 present values of mean, median, standard deviation, and coefficient of variation and count (number of measurements in the data set) by lithostratigraphic unit for receiver-to-receiver and source-to-receiver measurements, respectively.
- Table VII-3 summarizes mean, median, standard deviation, and coefficient of variation and count by lithostratigraphic unit for the compression-wave velocity values.
- Table VII-4 summarizes mean, median, standard deviation, and coefficient of variation and count by lithostratigraphic unit for the Poisson's ratio values.

As a reminder, the 2000-1 downhole seismic survey was performed by Redpath Geophysics and the 2000-1 downhole seismic survey was performed by GEOVision.







.

NOTE: Downhole and SASW velocities are shown for comparison.

Figure VII-1. Shear-Wave Velocity (vs) from Suspension Seismic Receiver-to-Receiver Data at Borehole RF#13.

05







NOTE: Downhole and SASW velocities are shown for comparison.

Figure VII-3. Shear-Wave Velocity (vs) from Suspension Seismic Source-to-Receiver and Receiver-to-Receiver Data at Borehole RF#15.

COT

VII-5



COB





Figure VII-5. Shear-Wave Velocity (vs) from Suspension Seismic Source-to-Receiver and Receiver-to-Receiver Data at Borehole RF#17.

VII-7

009



September 2002



NOTE: Downhole and SASW velocities are shown for comparison.

Figure VII-6. Shear-Wave Velocity (vs) from Suspension Seismic Source-to-Receiver and Receiver-to-Receiver Data at Borehole RF#18.







Figure VII-7. Shear-Wave Velocity (vs) from Suspension Seismic Source-to-Receiver and Receiver-to-Receiver Data at Borehole RF#19.



VII-10

September 2002



NOTE: Downhole and SASW velocities are shown for comparison.

Figure VII-8. Shear-Wave Velocity (vs) from Suspension Seismic Source-to-Receiver and Receiver-to-Receiver Data at Borehole RF#20.

CIT





- 19

C13

NOTE: Downhole and SASW velocities are shown for comparison.

Figure VII-9. Shear-Wave Velocity (vs) from Suspension Seismic Source-to-Receiver and Receiver-to-Receiver Data at Borehole RF#21.

VII-11



NOTE: Downhole and SASW velocities are shown for comparison.

Figure VII-10. Shear-Wave Velocity (vs) from Suspension Seismic Source-to-Receiver and Receiver-to-Receiver Data at Borehole RF#22.





VII-13

NOTE: Downhole and SASW velocities are shown for comparison.

Figure VII-11. Shear-Wave Velocity (vs) from Suspension Seismic Source-to-Receiver and Receiver-to-Receiver Data at Borehole RF#23.





NOTE: Downhole and SASW velocities are shown for comparison.

Figure VII-12. Shear-Wave Velocity (vs) from Suspension Seismic Source-to-Receiver and Receiver-to-Receiver Data at Borehole RF#24.



C17

NOTE: Downhole and SASW velocities are shown for comparison.

Figure VII-13. Shear-Wave Velocity (vs) from Suspension Seismic Source-to-Receiver and Receiver-to-Receiver Data at Borehole RF#25.



September 2002





Figure VII-14. Shear-Wave Velocity (vs) from Suspension Seismic Source-to-Receiver and Receiver-to-Receiver Data at Borehole RF#26.





C19

September 2002

VII-17

September 2002



NOTE: Downhole and SASW velocities are shown for comparison.

Figure VII-16. Shear-Wave Velocity (vs) from Suspension Seismic Source-to-Receiver and Receiver-to-Receiver Data at Borehole RF#29.

		0		2	500			50	00	mp	ress	500	-Wa	ave	Vel		y, f	eet	: per	r se	con	d 150	າດດ		174	500			2000
	0			<u>م</u>		T	.	,			ı r		1				- 1 -		12,			150			L.,		1		
				l.	•	ſ,		.			: i		•	•			ł			•	•	ł ,			Fill		:	•	
		t :	*		1			•						•			1		*			; :		• •	×	0	•	•	
		Ę.			;	1.	8		÷		i :						÷							1 1 1 1 1				•	
	50		• • •						igen P aria s		• • •		·• · ···				ţ		• • • •		 ,		÷.					* * *	
		ŀ.	Ť	• •	:		0						• •			.				•		: *	i.	• •	Qa	-	ł.		
		ŀ١		•: •:		4	1	•	۲	:			а				×.	*		4	;	1			*		4	•	
		t :		1. *	•		1	• i								1			*	•		:	iliye	* 11 	•			÷	
	100	Ľ.	este Les éste		<u> </u>		. I										; 										· 	• •	
		Ŀ		· •	:		•								н. <u>Ц</u>	:		÷	•							4	e province E		
		ŀ .		• •	•	;		·	*							1 -	;	×				•		.¥: -:					
		- '	÷.	.		ţ	•	1			: !				(*	:					;	1		- -	- blai	•		* *	
	450	F :		•				1					•					÷.	•		1	1 x	×	• 1	pri		K.		
	150	[i									a di si ni		-
		ļ. ;		т с 1813							; ;											T	obt5						
		- ,		÷.			*	. 1	•		i		e			.	÷	÷			5	ı .		•	٠		ý.	• •	
		F .		•				- 0;			; i		- 3	N (*	ļ •					*	.	
	200			• • • • • • •	· • • • • • • • • • • • • • • • • • • •	* *** **	• •• •• •) ar 192 19			•••	•••••			·	****	f	• • • • • • • •		*****				Гро	m	•••	****** * **	
		ŧ:		2 81		į							* 4 1				, 1				÷	• : •		• •				😸 asi nai	
		[.									• •				L	;						¦ .		T	рср	ul			
		- .	: top			3		-			; i		i .		.	ļ ;	. 0					1						Ka	
	250		lan san sa	• · · · • • • • •												ł		- i			****			• **** *• •• •• •					••••
set		ŀ						• †		÷.	1 1		i i		ŀ	+	. 0					і т	*	· Tp	cpn	nn ·			
e, fe		Ľ		•••				ì								1						* 8 1		• •				18 18 2	
ace		Ļ.						. 1								1 :	Ì							·		<u> </u>			
F	300					- 10 10	••••	• {	•••		,								~			n		ر : سنجنسو:	pcp	<u>) </u>		• •	
d S		+ .		1		5. •	90 1	Ì		1	11					1:			*			• •	(ii)	÷		•		(r) - (r)	
n				1	•	Ŷ		•			. 1 !		•		ŀ				•			•			•		¥ :	•	
Ğ		[]		: :		÷		1		300					Ľ							* :		: T	pcr	bln	*	80 13. 19	
MO	350			 						•					1		r () Statester										***	 .	
Bel	(* .*, * .	- ·	140	•		÷¥.		•					•				*		•		•				•		7	* *	
ţ,		+ :						-			•		•	•		•			*		ł				×		- ht		
Jep		- :		e 2002	•	÷		•			: :		•				1	94 - 34	•		ar : Li		3985	90	*	•	je -	149 - 141 	
L	400	Ľ		•		*		-	•				• •				1	•			•	n s Entra -	*					4 4 6 2	
	400	Γ.		÷				.			;					Ι.		1	,	•		1 ·				•			
		Ļ,				~	* 0	.		90			ж. Ж.			;			41			к. (к.	19481		e.			100 - 100 100 - 100	
		╞ :		*:			9 i -			÷.	11		• 3			1 :		æ				r .		:	•	j.	*		
		ŀ	1	Ť		*	*	1	•	34	i 1		÷ •				\$		4					•		•	4	K R	
	450	t -		••••••••••	<u> </u>						••• •••• pee		• • • • • • •								*****		-					-1	
		[.		е • • • • • •	1.		uin Ste						1 ()	4			- 10 - 10	1982 2000			াল ব বিজ্ঞান	1 3 1 4		an in Ar				nt de Norde	
		ŀ .		Ť			:::: :**::	t.	÷	۰	: :			•			ŧ				3		×	×.			÷	÷.,	
		F :		•	•	1	19	•	6. 16	:			s	1				ł	.6	•		:					•	ì ·	
	500	-		•••••••	+		د باباد بر					-	.			+	<u></u>					1 <u></u>	<u></u>				LX ML		+
		[;	- 367 - 3	к н -		ange ange	ang ang Ang	: 1	11 - 1940) 24 5 - 19				* *			.;	т х				*			an ang T	*		98 - 1 15		Vo o
		[× 4	.	2 2				282 282	: (: ;						т. ж	inti Sat	₹ 1		-	•		ar ne			- 24 - 24	* *	-SR-
		Ļ,		•		1		. [6			4					x x						1 v	3-RR
	550			• •	. <u> </u>		•• ••			. .	: . † -	 				. :				· •	•		•••				•••	:-:	
		ŀ		• •		÷.	*				1 1		÷ (*		*	•	4		*	* *	*		X	• •	sults
		['	1.	99 		i afti e aite			*:		; ;			•			•					1			*	*	*	8 8 3 4	n Re
		Г [•]		- B.	1 2	- 3. C	19	a) (j	8 MS				at i S	- 19 <u>9</u>	10000	10 SC		- 3 1 -	1.00	<u>es 195</u>			1000	a 200	- 9 - E	n 985	19 E	. to	1.0

C21



NOTE: Although no compression wave data were available from the suspension selsmic survey, this plot is included to show the agreement between the three downhole velocity profiles.

Figure VII-17. Compression-Wave Velocity Profiles (vp) from Downhole Seismic Surveys at Borehole RF#13.

VII-19



September 2002



NOTE: Downhole velocities are shown for comparison.

Figure VII-18. Compression-Wave Velocity (vp) from Suspension Seismic Source-to-Receiver and Receiver-to-Receiver Data at Borehole RF#14.



0	0 2	500	5000	7500	10000	12500	15000	17500	2000
U							Fil		1
	- • •	••••	· · · 🙀		i •		• ‡ •	* • • •	1
	[·		Orde				· · ·		
50					·	1		Tpcrn	
	<u>k</u> · · · ·	• • •	. 046		• •		; !	1	ł
	[Con Con	5				
				: 200	! .	!	. [:
100		• • • • •	• • • •			i , ,	• ¦ • •		1
	L				51	: : : : :	1		
	- • •	· · ·		. 000	÷.				
		:	• • • •	Co Co Co		· · • •		Triandu · · ·	
150							······ +·····		
	[: .		i
		•			CHO .		. .		i
	• • • • •						. .	••• • • •	1
200		· · · · · · · · · · · ·	••••••••••••••••••••••••••••••••••••••	00		h	··••	1	• !
					1000			Thenma	j.
	- • •				i de i	0000.1			÷
	• • • • •		. , i	•• •			· • • •		÷
250		· · ·		• • • • • • • • • • • • • • • • • • •	C GO	<u>e</u>	····	Tpcpll	···•••
						, of Q			
	- • • •	• • •		•• ;	; . .	008	* •	x x	i
300		• • •				200		TpcpIn	i.
000	4		. ; .		.	Con Con	3		i
			• ;				Ξļ.		1
	• • • •	• • •	• • • •	• • • • •	i • •		• [• •		;
350		· · ·						* • • • •	!
	• * •	i	• • • •				,	· · · ·	i
		i	*	. .	• • • • •	• • • • •	• • • •	3 . x .	1
							1 1		•
400	_	· · · ·					·		
	- 14 (4) · · ·						. į		į
	• • • •		• • •	•••			• • • •	· · · · ·	i
	[: :		:
450		+ • • • • • • • •			ļ			·	
			• • •	• • •		• • • • • •		· · · ·	;
	E · · ·				• •			••• •••	•
	L			.					:
500			<u>alles</u> elligences						
	••••		• • :	• •	•• • ;	* * * !	• • • •		!
	[· · · ·		· · :						:
		: .							
550									
	• •		• • • •	• • •	· · · ·	• • • • • •	· į · ·		;
	r * * *			• • • • • •	7 19 1 9 9	* * *	· .		1

sion Maya Valacity fo

Co

C23



NOTE: Downhole velocities are shown for comparison.

Figure VII-19. Compression-Wave Velocity (vp) from Suspension Seismic Source-to-Receiver and Receiver-to-Receiver Data at Borehole RF#15.

VII-21

September 2002



C2



NOTE: Downhole velocities are shown for comparison.

Figure VII-20. Compression-Wave Velocity (vp) from Suspension Seismic Source-to-Receiver and Receiver-to-Receiver Data at Borehole RF#16.





September 2002

VII-23

Depth Below Ground Surface, feet

400

450

500

550

VII-24

September 2002

Compression-Wave Velocity, feet per second 5000 7500 10000 12500 15000

17500

Tpcpmr

Tpcpll

sion Results/RF18-RR-SR-Vp.grf

C20

20000

0 Qal 50 mbt' 100 • Tpki 1 150 • : 4 200 Tpcrh 250 6 300 A G 350 Tpcpul OB 3

G

G G

G

2500

0



NOTE: Downhole velocities are shown for comparison. No data for receiver-to-receiver.

Figure VII-22. Compression-Wave Velocity (vp) from Suspension Seismic Source-to-Receiver Data at Borehole RF#18.



C27

September 2002

VII-25

.....







٢.

not applicable due to insuficience of data points

Figure VII-25. Compression-Wave Velocity (vp) from Suspension Seismic Source-to-Receiver and Receiver-to-Receiver Data at Borehole RF#21.

VII-27





NOTE: Downhole velocities are shown for comparison.

Figure VII-26. Compression-Wave Velocity (vp) from Suspension Seismic Source-to-Receiver and Receiver-to-Receiver Data at Borehole RF#22.





Figure VII-27. Compression-Wave Velocity (vp) from Suspension Seismic Source-to-Receiver and Receiver-to-Receiver Data at Borehole RF#23.

VII-29



September 2002

NOTE: Downhole velocities are shown for comparison.

Figure VII-28. Compression-Wave Velocity (vp) from Suspension Seismic Source-to-Receiver and Receiver-to-Receiver Data at Borehole RF#24.





C33

NOTE: Downhole velocities are shown for comparison.

Figure VII-29. Compression-Wave Velocity (vp) from Suspension Seismic Source-to-Receiver and Receiver-to-Receiver Data at Borehole RF#25.

VII-31







Figure VII-31. Compression-Wave Velocity (vp) from Suspension Seismic Source-to-Receiver and Receiver-to-Receiver Data at Borehole UE-RF#28.

VII-33



No data for receiver-to-receiver.

Figure VII-32. Compression-Wave Velocity (vp) from Suspension Seismic Source-to-Receiver Data at Borehole RF#29.

C36

 \bigcirc