

Government of Ulaanbaatar City,  
Emergency Management Department of the Capital City  
Japan International Cooperation Agency (JICA)

Mongolia  
The Project for Strengthening the Capacity  
of Seismic Disaster Risk Management  
in Ulaanbaatar City  
Final Report

Volume-4     Databook

October 2013

Asian Disaster Reduction Center, Urban Disaster Research Institute  
Tokyo Electric Power Services Co., Ltd.

Mongolia  
The Project for Strengthening the Capacity of Seismic Disaster  
Risk Management in Ulaanbaatar City

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# Mongolia

## The Project for Strengthening the Capacity of Seismic Disaster Risk Management in Ulaanbaatar City

### Final Report Volume-4 Databook

#### Abbreviations

ADB	Asian Development Bank
ADRC	Asian Disaster Reduction Center
ALACGaC	Agency of Land Affairs, Construction, Geodecy and Cartography
ASTER	Advanced Spaceborne Thermal Emission and Reflection Radiometer, Global Digital Elevation Model
CA	Capacity Assessment
CBS	Cellphone Broadcast System
CP	Counterpart
DF/R	Draft Final Report
EMDC	The Emergency Management Department of the Capital City
EOST	la Ecole et Observatoire des Sciences de la Terre
F/R	Final Report
GDP	Gross Domestic Product
GIS	Geographic Information System
GTZ	Deutsche Gesellschaft fur Technische Zusammenarbeit
HFA	Hyogo Framework for Action
HRW	Human Rights Watch
IC/R	Inception Report
ISC	International Seismological Centre
JCC	Joint Coordination Committee
JICA	Japan International Cooperation Agency
M	Japan Meteorological Agency (JMA) magnitudes
MI	Richter magnitudes
Ms	Surface magnitudes
Mw	Moment magnitudes
M/M	Minutes of Meetings
MHFC	Mongolian Housing Finance Corporation
MRTCUD	Ministry of Roads, Transport, Construction and Urban Development
MSK	Medvedev-Sponheuer-Karnik intensity scale
MUST	Mongolian University of Science and Technology
NEMA	National Emergency Management Agency
NGIC	Mongolian National Geo-information Center
NGO	Non-Governmental Organization
PGA	Peak Ground Acceleration
PR/R	Progress Report
R/D	Record of Discussions
RC	Reinforced Concrete
RCAG	Research Center of Astronomy and Geophysics of Mongolian Academy of Sciences

SC	Steering Committee
UB	Ulaanbaatar
UBMPS	The Study on City Master Plan and Urban Development Program of Ulaanbaatar City
UN	United Nations
UNDP	United Nations Development Programme
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
UN-HABITAT	United Nations Human Settlements Programme
USD	United States Dollar
USGS	United States Geological Survey
WB	World Bank
WG	Working Group
WMO	World Meteorological Organization

## **Table of Contents**

Chapter 1 Result of Ground Survey .....	1-1
1.1 Information of Survey Points .....	1-1
1.2 Survey Method .....	1-2
1.3 Survey Data .....	1-3
1.3.1 Summary of boring survey results.....	1-3
1.3.2 Boring Logging .....	1-4
1.3.3 Grain Size Test .....	1-14
1.3.4 PS Logging .....	1-30
1.3.5 Surface Wave Exploration .....	1-41
1.3.6 Microtremor Measurement.....	1-141
Chapter 2 Implementation Process and Results of Seismic Hazard Assessment and Seismic Risk Assessment .....	2-1
2.1 Information of selected bridges for static and dynamic analysis.....	2-1
2.1.1 Survey of Existing Structure .....	2-1
2.2 Inventory of Transportation and Lifeline Structures .....	2-6
2.3 Model of Bridge Pier.....	2-23
Chapter 3 Disaster Awareness Survey .....	3-1
3.1 Questionnaire of Disaster Awareness of Ulaanbaatar City Citizens – Ger Area .....	3-1
3.1.1 Questionnaire of Disaster Awareness of Ulaanbaatar City Citizens – Ger Area .....	3-1
3.1.2 Questionnaire of Disaster Awareness of Ulaanbaatar City Citizens- Apartment Area .....	3-6
3.2 Result of Survey .....	3-12
Chapter 4 Minutes of Meeting.....	4-1



Chapter 1 Result of Ground Survey  
1.1 Information of Survey Points

Point ID	Alt	Label	Easting	Northing	Latitude(N. °)	Longitude(E. °)	Type of Survey				Date of completion								
							Boring	PS Logging	Cyclic test	Microtremor	Boring		PS Logging		Surface wave	Microtremor			
											Depth	Laboratory test	Depth	Date			Date	Date	
Dankharsel	BI	1	BI_Bo_01	882561.000	3282195.000	47.307493	100.432488	×	×	×	×	30			2012/8/9	30	2012/8/11	2012/8/25	2012/8/26
		2	BI_02	882802.432	3282662.441	47.310850	100.434913	×	×	×	×	30						2012/8/26	2012/8/26
		3	BI_03	882284.000	3281290.000	47.309451	100.462302	×	×	×	×	30			2012/8/8	30	2012/8/7	2012/8/22	2012/8/26
Bajamir	BR	4	BR_01	300745.000	5200705.000	47.608951	105.333011	×	×	×	×	30			2012/8/11	30	2012/8/13	2012/8/27	2012/8/27
		5	BR_02	310340.000	5302391.000	47.572779	105.375503	×	×	×	×	30			2012/8/14	30	2012/8/15	2012/8/27	2012/8/27
		6	BR_Bo_00	756171.000	5304300.000	47.647716	105.344059	×	×	×	×	30						2012/8/21	2012/8/27
Naako	NI	7	NI_01	669975.000	3994884.000	47.798957	107.255913	×	×	×	×	30			2012/8/3	30	2012/8/4	2012/8/25	2012/8/28
		8	NI_02	601041.000	3292772.000	47.663389	105.281384	×	×	×	×	30			2012/8/1	30	2012/8/3	2012/8/28	2012/8/28
		9	NI_03	870161.429	3290542.912	47.622824	105.255832	×	×	×	×	30						2012/8/22	2012/8/28
Uaimbaator	UB	10	UB_01	828818.918	5304381.281	47.604331	105.723677	×	×	×	×	30						2012/8/12	2012/8/17
		11	UB_02	810815.120	5304593.185	47.584874	105.747185	×	×	×	×	30						2012/8/13	2012/8/18
		12	UB_03	800689.000	5306510.244	47.580602	105.745500	×	×	×	×	30						2012/8/12	2012/8/17
		13	UB_04	836678.213	5306588.135	47.611875	105.748076	×	×	×	×	30						2012/8/9	2012/8/18
		14	UB_05	833070.854	5308125.185	47.612836	105.780821	×	×	×	×	30						2012/8/9	2012/8/18
		15	UB_06	831106.577	5306482.226	47.607854	105.780841	×	×	×	×	30						2012/8/12	2012/8/17
		16	UB_07	852983.880	5305005.503	47.634985	105.763801	×	×	×	×	30						2012/8/13	2012/8/18
		17	UB_08	835362.740	5303002.033	47.609752	105.810069	×	×	×	×	30						2012/8/14	2012/8/18
		18	UB_09	835326.425	5304959.714	47.603893	105.810022	×	×	×	×	30						2012/8/14	2012/8/18
		19	UB_10	835385.730	5308183.701	47.612500	105.811553	×	×	×	×	30						2012/8/15	2012/8/14
		20	UB_11	835402.108	5308917.390	47.624654	105.812544	×	×	×	×	30						2012/8/15	2012/8/15
		21	UB_12	835362.740	5311020.081	47.638273	105.812493	×	×	×	×	30						2012/8/14	2012/8/14
		22	UB_13	838324.190	5312600.885	47.662402	105.812512	×	×	×	×	30						2012/8/14	2012/8/14
		23	UB_14	838273.254	5310590.189	47.657311	105.857492	×	×	×	×	30						2012/8/15	2012/8/15
		24	UB_15	839235.802	5309009.792	47.610751	105.871623	×	×	×	×	30						2012/8/15	2012/8/15
		25	UB_16	850206.652	5306521.011	47.607111	105.849133	×	×	×	×	30						2012/8/15	2012/8/15
		26	UB_17	838211.510	5304314.452	47.632876	105.848956	×	×	×	×	30						2012/8/16	2012/8/16
		27	UB_18	841081.707	5308749.487	47.611977	105.888196	×	×	×	×	30						2012/8/15	2012/8/16
		28	UB_19	841101.742	5308181.011	47.626142	105.888808	×	×	×	×	30						2012/8/15	2012/8/16
		29	UB_20	840728.389	5315907.468	47.678570	105.828195	×	×	×	×	30						2012/8/17	2012/8/17
		30	UB_21	843668.661	5314043.313	47.664115	105.824685	×	×	×	×	30						2012/8/17	2012/8/17
		31	UB_22	843590.825	5312541.184	47.658976	105.823109	×	×	×	×	30						2012/8/15	2012/8/17
		32	UB_23	843635.230	5311093.187	47.673947	105.822153	×	×	×	×	30						2012/8/23	2012/8/22
		33	UB_24	843621.340	5309650.859	47.624133	105.820435	×	×	×	×	30						2012/8/23	2012/8/23
		34	UB_25	843590.825	5306579.918	47.606471	105.821123	×	×	×	×	30						2012/8/16	2012/8/16
		35	UB_26	846375.000	5311498.000	47.680496	105.862429	×	×	×	×	30						2012/8/23	2012/8/23
		36	UB_27	848836.620	5305370.850	47.699690	105.890470	×	×	×	×	30						2012/8/24	2012/8/21
		37	UB_28	849815.917	5308167.807	47.670128	105.852746	×	×	×	×	30						2012/8/22	2012/8/21
		38	UB_29	848165.650	5309515.729	47.621616	105.863685	×	×	×	×	30						2012/8/24	2012/8/20
		39	UB_30	848221.440	5308144.227	47.608804	105.863582	×	×	×	×	30						2012/8/24	2012/8/22
40	UB_31	848213.658	5306648.845	47.608030	105.863958	×	×	×	×	30						2012/8/24	2012/8/21		
41	UB_32	850235.123	5306660.485	47.604683	105.839951	×	×	×	×	30						2012/8/24	2012/8/21		
42	UB_33	850195.750	5305282.655	47.610710	105.810028	×	×	×	×	30						2012/8/24	2012/8/22		
43	UB_34	852242.853	5308283.822	47.608075	105.833718	×	×	×	×	30						2012/8/28	2012/8/20		
44	UB_35	852242.853	5308089.833	47.604529	105.832809	×	×	×	×	30						2012/8/16	2012/8/18		
45	UB_36	854132.550	5308455.802	47.632911	105.862025	×	×	×	×	30						2012/8/11	2012/8/13		
46	UB_37	854132.550	5308146.837	47.628132	105.862853	×	×	×	×	30						2012/8/24	2012/8/23		
47	UB_Bo_00	825858.000	5306405.000	47.627237	105.810416	×	×	×	×	30				2012/6/22	25	2012/6/25	2012/8/25	2012/8/27	
48	UB_Bo_01	876275.000	5309520.000	47.624254	105.850080	×	×	×	×	30				2012/6/22	10	2012/6/24	2012/8/25	2012/8/25	
49	UB_Bo_02	841145.000	5305474.000	47.609514	105.838872	×	×	×	×	30				2012/6/25	20	2012/8/29	2012/8/28	2012/8/27	
50	UB_Bo_04	843500.000	5308112.000	47.610332	105.820481	×	×	×	×	30				2012/6/28	28	2012/8/6	2012/8/26	2012/8/27	
Total							10	10	30	50									

## 1.2 Survey Method

Items	Method, Standard	Used Instruments	Remarks
Boring	Rotary method	UGB-1VS type with 4500 powers. The diameter of casing is 146~168 mm and the boring is 89 mm.	
SPT	JIS-A-1219:2001	63.5±0.5kg drive hammer	
Soil Test	JIS-A-1204	Sieve, buoy	
PS Logging	JGS-1122-2003	Seismographs: Recording machine made by Kawasaki Geological Engineering 1 set 6ch	Record length: 55 sec
		Borehole receiver: BHP Model-3315 , 3 components (28Hz) , geophone type	Sampling rate : 0.25msec
		Surface receiver: Geophones 3 components (28Hz)	
		Source: Hammer	
Surface Wave Exploration		Seismograph: Strataview, 1 set 60ch	Record length: 16sec (vibrator; 1sec listening) , 1sec (hammer)
		Receiver: Geophone L-22D , 12 units	Sampling rate: 1msec
		Source: Electromagnetic Vibrator (0.5 kN) & Hammer	
Microtremor Measurement		Seismographs: KTX-316BT	Record length : 40 minutes (In some cases additional 20 minutes)
		Geophones: L-4C , 3 components	Sampling rate: 1msec

Ref: JICA Project Team



### 1.3 Survey Data

#### 1.3.1 Summary of boring survey results

No.	Depth (GL- m)	Main soil	N value	Groundwater level (GL- m)
UB_B O_01	0.0-0.2	Topsoil	—	6.0
	0.2-16.5	Gravel with sand and cobble	32	
	16.5-30.0	Gravel with sand, cobble and clay	50	
UB_B O_02	0.0-0.2	Topsoil	—	4.7
	0.2-4.0	Poorly graded gravel with clay, sand and cobble	34	
	4.0-30.0	Sandy gravel with clay and cobble. Within depth 15.4-16.5m, gravel with clay.	50	
UB_B O_03	0.0-0.2	Topsoil	—	8.0
	0.2-7.0	Poorly graded gravel with clay, sand and cobble	38	
	7.0-13.1	Mainly of poorly graded gravel, bedded clay, sand and cobble	35	
	13.1-16.0	Mainly of gravel, bedded sand and cobble	38	
	16.0-30.0	Poorly graded gravel with clay, sand and cobble	50	
UB_B O_04	0.0-1.6	Topsoil, clayey gravel	24	3.2
	1.6-9.5	Poorly graded gravel with clay, sand and cobble	48	
	9.5-24.5	Mainly composed of gravel, bedded sand and cobble	50	
	24.5-30.0	Clayey sand with gravel	50	
NH_01	0.0-0.5	Topsoil	—	0.0
	0.5-8.4	Clayey sand with gravel	29	
	8.4-30	Lean clay, include thins bed of sandy clay	49	
NH_02	0.0-0.2	Topsoil	—	2.8
	0.2-30	Sandy clay, lean clay. From depth 5.2m is permafrost.	41	
BI_01	0.0-0.4	Topsoil	—	14.5
	0.4-5.2	Sand with gravel	21	
	5.2-30.0	Clayey gravel with sand	36	
BI_03	0.0-0.4	Topsoil	-	21.1
	0.4~5.0	Sand and clay	32	
	5.0~30.0	Clay with sand and gravel	41	
BR_01	0.0-0.3	Topsoil	—	11.2
	0.3-18.0	Clayey sand with gravel	34	
	18.0-30.0	Sandy lean clay with gravel	44	
BR_02	0.0-1.1	Topsoil	24	3.5
	1.1-9.8	Sand with clay and gravel	33	
	9.8-17.2	Clayey sand with gravel	44	
	17.2-30	Sandy clay with gravel	47	

Ref: JICA Project Team

1.3.2 Boring Logging

Soil Trade LLC

LOG OF BOREHOLE -UB\_BO\_01

and Standard Penetration Test

CLIENT: MON MAP LLC  
 PROJECT NAME: Strengthening the capacity of seismic disaster risk management  
 LOCATION: Power Plant  
 HOLE DIA: 89 mm  
 COORDS: E: 106 49 3.63  
 N: 47 53 47.78  
 DEPTH: 30.0 m  
 GROUND WATER LEVEL: 3.4 m  
 Drill rig: UGB-IVS & Power 4500  
 Driller: Soil Trade LLC  
 Date: 06-15.Aug.2012  
 Logged: D.Duurenjargal

Depth, m	Started depth, m	Ended depth, m	Thickness of stratum	Soil/ Rock Material Description		Standart Penetration Test					Depth, m	Symbol
				Graphic log	Description of Soil	Depth, m	Number Blows N	Number of every 15 cm				
							15cm	30cm	45cm			
	0.0	0.2	0.2		Top soil, brownish brown							
2					Poorly graded GRAVEL with sand, trace cobbles - Yellowish brown, moist condition, alluvium-proluvium deposit	2	18/30	2	8	10		
4				4		15/30	5	6	9			
6				6		18/30	3	9	9			
8				8		20/30	4	9	11			
10				10		25/30	8	13	12			
12				12		35/30	12	20	15			
14				14		28/30	9	10	18			
16				16		32/30	8	18	14			
18				18		36/30	11	10	26			
20				20		38/30	15	19	19			
22				22		37/30	11	18	19			
24				24		41/30	13	20	21			
26				26		44/30	14	23	21			
28				28		48/30	12	24	24			
30	16.5	30.0	14.5		Poorly graded GRAVEL with sand and clay, trace cobbles - Yellowish brown, wet condition, alluvium proluvium deposit	30	41/30	16	19	22		
				32		41/30	17	18	23			
				34		43/30	15	21	22			
				36		51/30	16	23	28			
				38		54/30	15	24	30			
				40		48/30	11	28	20			
				42		51/30	10	19	32			
				44		52/30	18	21	31			
				46		55/30	20	25	30			
				48		58/30	23	29	29			
				50	56/30	18	31	25				
				52	58/30	19	24	34				
				54	57/30	20	26	31				
				56	54/30	22	24	30				
				58	59/30	21	30	29				

Soil Trade LLC

LOG OF BOREHOLE -UB\_BO\_02  
and Standard Penetration Test

CLIENT: MON MAP LLC  
PROJECT NAME: Strengthening the capacity of seismic disaster risk management  
LOCATION: Songino-Khairhan district  
HOLE DIA: 89 mm  
COORDS: E: 106 51 1.20 N: 47 55 26.72  
DEPTH: 30.0 m  
Ground water level: (m-unknown)  
Sheet: 1 of 1  
Drill rig: UGB-1VS & Power 4500  
Driller: Soil Trade LLC  
Date: 06.Aug.30.Jun.2012  
Logged: D.Duurenjargal

Depth, m	Started depth, m	Ended depth, m	Thickness of stratum	Soil/ Rock Material Description		Standart Penetration Test						Depth, m	Symbol						
				Graphic log	Symbol	Description of Soil	Depth, m	Number Blow, N	Number of every 15 cm					0	10	20	30	40	50
									15cm	30cm	45cm								
	0.0	0.2	0.2			Top soil, brownish brown													
2					GP	Poorly Graded GRAVEL with clay & sand, trace cobbles - brownish grey to yellowish brown, well rounded to rounded, medium dense to very dense. Alluvium-Proluvium deposits.	12/30	5	6	6									
4	0.2	4.0	3.8		GP-GC	Poorly Graded GRAVEL with clay & sand, trace cobbles - brownish grey to yellowish brown, well rounded to rounded, medium dense to very dense. Proluvium deposits.	52/30	6	12	20									
6					GP-GC	Poorly Graded GRAVEL with clay & sand, trace cobbles - brownish grey to yellowish brown, well rounded to rounded, medium dense to very dense. Proluvium deposits.	59/30	9	18	41									
8					GP-GC	Poorly Graded GRAVEL with clay & sand, trace cobbles - brownish grey to yellowish brown, well rounded to rounded, medium dense to very dense. Proluvium deposits.	52/30	11	20	32									
10					GP-GC	Poorly Graded GRAVEL with clay & sand, trace cobbles - brownish grey to yellowish brown, well rounded to rounded, medium dense to very dense. Proluvium deposits.	46/30	8	12	34									
12					GP-GC	Poorly Graded GRAVEL with clay & sand, trace cobbles - brownish grey to yellowish brown, well rounded to rounded, medium dense to very dense. Proluvium deposits.	52/30	10	18	34									
14					GP-GC	Poorly Graded GRAVEL with clay & sand, trace cobbles - brownish grey to yellowish brown, well rounded to rounded, medium dense to very dense. Proluvium deposits.	48/30	6	16	32									
16	4.0	15.4	11.4		GP-GC	Poorly Graded GRAVEL with clay & sand, trace cobbles - brownish grey to yellowish brown, well rounded to rounded, medium dense to very dense. Proluvium deposits.	52/30	15	21	31									
18					GP-GC	Poorly Graded GRAVEL with clay & sand, trace cobbles - brownish grey to yellowish brown, well rounded to rounded, medium dense to very dense. Proluvium deposits.	53/30	14	20	33									
20					GP-GC	Poorly Graded GRAVEL with clay & sand, trace cobbles - brownish grey to yellowish brown, well rounded to rounded, medium dense to very dense. Proluvium deposits.	53/30	13	19	34									
22					GP-GC	Poorly Graded GRAVEL with clay & sand, trace cobbles - brownish grey to yellowish brown, well rounded to rounded, medium dense to very dense. Proluvium deposits.	55/30	11	20	35									
24					GP-GC	Poorly Graded GRAVEL with clay & sand, trace cobbles - brownish grey to yellowish brown, well rounded to rounded, medium dense to very dense. Proluvium deposits.	54/30	8	12	42									
26					GP-GC	Poorly Graded GRAVEL with clay & sand, trace cobbles - brownish grey to yellowish brown, well rounded to rounded, medium dense to very dense. Proluvium deposits.	56/30	7	18	38									
28					GP-GC	Poorly Graded GRAVEL with clay & sand, trace cobbles - brownish grey to yellowish brown, well rounded to rounded, medium dense to very dense. Proluvium deposits.	58/30	10	22	36									
30	15.4	30.0	14.6		GP-GC	Poorly Graded GRAVEL with clay & sand, trace cobbles - brownish grey to yellowish brown, well rounded to rounded, medium dense to very dense. Proluvium deposits.	68/30	16	68	25									
							57/30	7	17	40									
							59/30	11	26	33									
							59/30	18	24	35									
							58/30	17	19	39									
							56/30	14	28	28									
							48/30	7	17	31									
							55/30	11	12	43									
							49/30	12	16	33									
							47/30	6	20	27									
							50/30	9	29	21									
							51/30	18	31	20									
							51/30	14	28	23									
							54/30	13	32	22									
							56/30	16	27	29									

Soil Trade LLC

LOG OF BOREHOLE -UB\_BO\_03  
and Standard Penetration Test

CLIENT: MON MAP LLC  
PROJECT NAME: Strengthening the capacity of seismic disaster risk management  
LOCATION: Han-Uul district  
HOLE DIA: 89 mm

COORDS: E: 106 53 18.50  
N: 47 53 46.07

DEPTH: 30.0 m  
Ground water level: 2.9 m

Sheet: 1 of 1  
Drill rig: UGB-1VS & Power 4500  
Driller: Soil Trade LLC  
Date: 19-23.Aug.2012  
Logged: D.Duurenjargal

Depth, m	Started depth, m	Ended depth, m	Thickness of stratum	Soil/ Rock Material Description		Standard Penetration Test					Depth, m	Symbol	
				Graphic log	Symbol	Description of Soil	Depth, m	Number Blows N	Number of every 15 cm				
									15cm	30cm			45cm
0.0	0.2	0.2				Top soil, brownish brown.							
2						Poorly Graded GRAVEL with clay & sand, trace cobbles - brownish grey to yellowish brown, well rounded to rounded, medium dense to very dense. Alluvium-Proluvium deposits.							
4						Poorly Graded GRAVEL with clay & sand, trace cobbles - brownish grey to yellowish brown, well rounded to rounded, medium dense to very dense. Alluvium-Proluvium deposits.							
6						Poorly Graded GRAVEL with clay & sand, trace cobbles - brownish grey to yellowish brown, well rounded to rounded, medium dense to very dense. Alluvium-Proluvium deposits.							
8						Clayey GRAVEL with sand, trace cobbles-brownish grey to yellowish brown, slightly moist to wet, Upper & Modern Quaternary aged, Alluvium-Proluvium deposits.							
10						Poorly Graded GRAVEL with clay & sand, trace cobbles - brownish grey to yellowish brown, well rounded to rounded, medium dense to very dense. Alluvium-Proluvium deposits.							
12						Poorly Graded GRAVEL with clay & sand, trace cobbles - brownish grey to yellowish brown, well rounded to rounded, medium dense to very dense. Alluvium-Proluvium deposits.							
14						Poorly Graded GRAVEL with clay & sand, trace cobbles - brownish grey to yellowish brown, well rounded to rounded, medium dense to very dense. Alluvium-Proluvium deposits.							
16						Poorly Graded GRAVEL with clay & sand, trace cobbles - brownish grey to yellowish brown, well rounded to rounded, medium dense to very dense. Alluvium-Proluvium deposits.							
18						Poorly Graded GRAVEL with clay & sand, trace cobbles - brownish grey to yellowish brown, well rounded to rounded, medium dense to very dense. Alluvium-Proluvium deposits.							
20						Poorly Graded GRAVEL with clay & sand, trace cobbles - brownish grey to yellowish brown, well rounded to rounded, medium dense to very dense. Alluvium-Proluvium deposits.							
22						Poorly Graded GRAVEL with clay & sand, trace cobbles - brownish grey to yellowish brown, well rounded to rounded, medium dense to very dense. Alluvium-Proluvium deposits.							
24						Poorly Graded GRAVEL with clay & sand, trace cobbles - brownish grey to yellowish brown, well rounded to rounded, medium dense to very dense. Alluvium-Proluvium deposits.							
26						Poorly Graded GRAVEL with clay & sand, trace cobbles - brownish grey to yellowish brown, well rounded to rounded, medium dense to very dense. Alluvium-Proluvium deposits.							
28						Poorly Graded GRAVEL with clay & sand, trace cobbles - brownish grey to yellowish brown, well rounded to rounded, medium dense to very dense. Alluvium-Proluvium deposits.							
30						Poorly Graded GRAVEL with clay & sand, trace cobbles - brownish grey to yellowish brown, well rounded to rounded, medium dense to very dense. Alluvium-Proluvium deposits.							

Soil Trade LLC

LOG OF BOREHOLE -UB\_BO\_04  
and Standard Penetration Test

CLIENT: MON MAP LLC  
PROJECT NAME: Strengthening the capacity of seismic disaster risk management  
LOCATION: 1-st Sukhbaatar district  
HOLE DIA: 89 mm

COORDS: E: 106 55 15.41  
N: 47 34 37.78

DEPTH: 30.0 m  
Ground water level: 5.2 m

Sheet: 1 of 1  
Drill rig: UGB-1VS & Power 4500  
Driller: Soil Trade LLC  
Date: 15-19.Aug.2012  
Logged: D.Duurenjargal

Depth, m	Started depth, m	Ended depth, m	Thickness of stratum	Soil/ Rock Material Description		Standart Penetration Test					Depth, m	Symbol							
				Graphic log	Symbol	Description of Soil	Depth, m	Number Blows N	Number of every 15 cm				0	10	20	30	40	50	
									15cm	30cm									45cm
0	0.0	1.6	1.6	[Graphic log symbol: 1 QIV]	1 QIV	Ebankment soil - Poorly graded GRAVEL with sand - Dark brown, Brownish grey medium dense.	0	dry, loose to	1	9	14								
2			23/30																
2				[Graphic log symbol: GP]	GP	Poorly Graded GRAVEL with clay & sand, trace cobbles - brownish grey to yellowish brown, well rounded to rounded, medium dense to very dense, alluvium-Proluvium deposits.	2	24/30	6	11	13								
4			32/30				8	14	18										
4			41/30				10	20	21										
6			48/30				9	26	22										
6			54/30				8	26	28										
8			55/30				12	26	29										
8			54/30				20	25	29										
10	1.6	0.5	7.0				55/30	27	27	28									
10							57/30	19	23	34									
12							56/30	19	24	32									
12				54/30	20	20	34												
14				58/30	13	28	30												
14				53/30	16	28	25												
16				55/30	18	28	25												
16				56/30	14	27	29												
18				58/30	21	29	29												
18				56/30	27	29	27												
20				59/30	24	29	30												
20				55/30	15	29	26												
22				57/30	23	26	31												
22				53/30	19	30	25												
24				58/30	22	28	30												
24	9.5	24.5	15.0	56/30	20	28	28												
24				54/30	21	26	28												
26				59/30	26	28	31												
26				62/30	28	30	32												
28				65/30	29	32	33												
28				67/30	31	31	36												
30	24.5	30.0	5.5	68/30	27	35	33												

Soil Trade LLC

## LOG OF BOREHOLE - NH\_01 and Standard Penetration Test

CLIENT: MON MAP LLC	COORDS: E: 669923 N: 5294884	Sheet: 1 of 1
PROJECT NAME: Strengthening the capacity of seismic disaster risk management	DEPTH: 30.0 m	Drill rig: Power 4500
LOCATION: Nalaib district	Ground water level: nu-knowu	Driller: Soil Trade LLC
HOLE DIA: 89 mm		Date: 12-15.Sep.2012
		Logged: D.Duurenjargal

Depth, m	Soil/ Rock Material Description				Standart Penetration Test					Depth, m	Symbol				
	Started depth, m	Ended depth, m	Thickness of stratum	Graphic log	Symbol	Description of Soil	Depth, m	Number Blows N	Number of every 15 cm						
									15cm			30cm	45cm	60cm	
0.0	0.5	0.5				Top soil-Clayey SAND, with vegetation roots: brown	19/30	10	9	10					
2					SC	Clayey SAND with gravel- yellowish brown, stiff consistency. Deluvium - Proluvium deposits	20/30	11	10	10					
4							22/30	12	9	13					
6							26/30	14	17	9					
8	0.5	8.4	7.9				31/30	10	12	19					
10							33/30	10	12	21					
12							36/30	16	16	20					
14							42/30	20	22	20					
16							40/30	21	17	23					
18							46/30	20	23	23					
20							44/30	19	21	23					
22							47/30	23	23	24					
24							49/30	21	20	29					
26							46/30	23	23	25					
28							48/30	22	23	25					
30	8.4	30.0	21.6				47/30	22	27	20					
							48/30	21	19	29					
							46/30	27	23	23					
							49/30	24	21	28					
							50/30	23	26	24					
							52/30	23	24	28					
							48/30	19	26	22					
							50/30	22	26	24					
							52/30	23	29	23					
							54/30	24	23	31					
							50/30	26	27	23					
							52/30	26	30	22					
							53/30	23	32	21					
							51/30	28	25	26					
							52/30	26	22	30					

Soil Trade LLC

LOG OF BOREHOLE - NH\_02  
and Standard Penetration Test

CLIENT: MON MAP LLC  
PROJECT NAME: Strengthening the capacity of seismic disaster risk management  
LOCATION: Nalaih district  
HOLE DIA: 89 mm

COORDS: E: 671047  
N: 5292772  
DEPTH: 30.0 m  
Ground water level: unknown

Sheet: 1 of 1  
Drill rig: Power 4500  
Driller: Soil Trade LLC  
Date: 09-12.Sep.2012  
Logged: D.Duurenjargal

Soil/ Rock Material Description				Standart Penetration Test														
Depth, m	Started depth, m	Ended depth, m	Thickness of stratum	Graphic log	Symbol	Description of Soil	Depth, m	Number Blows, N	Number of every 15 cm			Penetration depth, cm					Depth, m	Symbol
									15cm	30cm	45cm	10	20	30	40	50		
0.0	0.0	0.3	0.3	0.3		Top soil-Clayey SAND, with vegetation roots, brown	0.3	8	8	9	10							
2							2	10	10	11	11							
4							4	11	9	13								
6							6	13	14	14								
8							8	14	16	16								
10							10	16	15	13								
12							12	12	23	19								
14					CL	Lean Clay- Dark grey, stiff consistency, starts 5.2 permafrost zone. Prolivium deposit	14	21	22	22								
16							16	19	26	22								
18							18	23	23	28								
20							20	20	26	28								
22							22	26	23	30								
24							24	20	21	29								
26							26	23	26	32								
28							28	20	23	23								
30							30	21	20	22								
								21	19	21								
								18	19	24								
								23	17	25								
								23	25	21								
								20	22	23								
								21	21	26								
								23	22	24								
								26	23	25								
								24	25	24								
								28	23	24								
								19	26	18								
								21	18	28								

Soil Trade LLC

LOG OF BOREHOLE - BI\_01  
and Standard Penetration Test

CLIENT: MON MAP LLC  
PROJECT NAME: Strengthening the capacity of seismic disaster risk management  
LOCATION: Baga hangai district  
HOLE DIA: 89 mm

COORDS: E: 683561  
N: 5252195  
DEPTH: 30.0 m  
Ground water level: (m-known)

Sheet: 1 of 1  
Drill rig: Power 4500  
Driller: Soil Trade LLC  
Date: 27-31. Aug. 2012  
Logged: D. Duurenjargal

Depth, m	Started depth, m	Ended depth, m	Thickness of stratum	Soil/ Rock Material Description		Standart Penetration Test					Depth, m	Symbol	
				Graphic log	Symbol	Description of Soil	Depth, m	Number Blows N	Number of every 15 cm				
									15cm	30cm			45cm
0.0	0.4	0.4	0.4			Top soil, brownish brown.	16/30	6	7	9			
2				GP		Sand with GRAVEL-Yellowish brown, stiff consistency, Proluvium deposits.	19/30	8	9	10			
4							22/30	9	10	12			
6	0.4	5.2	4.8				24/30	11	12	12			
8				GC		Clayey GRAVEL with sand-yellowish brown, slightly moist to wet, Upper & Modern Quaternary aged, Proluvium deposits.	25/30	10	14	14			
10							28/30	12	14	14			
12							32/30	14	15	17			
14							36/30	15	17	19			
16							34/30	10	16	18			
18							33/30	16	17	16			
20							35/30	14	18	17			
22							36/30	15	18	18			
24							38/30	13	18	20			
26							34/30	14	15	19			
28							33/30	15	16	17			
30	5.2	30.0	24.8				38/30	18	17	21			
							37/30	17	19	18			
							39/30	20	19	20			
							37/30	16	20	17			
							40/30	15	20	20			
							38/30	16	18	20			
							36/30	19	17	19			
							37/30	15	29	18			
							34/30	16	17	17			
							36/30	15	17	19			
							35/30	16	18	17			
							37/30	18	18	19			
							39/30	16	17	22			
							42/30	18	21	21			
							44/30	16	21	23			





Soil Trade LLC

LOG OF BOREHOLE - BR\_01  
and Standard Penetration Test

CLIENT: MON MAP LLC  
PROJECT NAME: Strengthening the capacity of seismic disaster risk management  
LOCATION: Baga nuur district  
HOLE DIA: 89 mm

COORDS: E: 300745  
N: 5290705

DEPTH: 30.0 m  
Ground water level: (m-unknown)

Sheet: 1 of 1  
Drill rig: Power 4500  
Driller: Soil Trade LLC  
Date: 01-04.Sep.2012  
Logged: D.Duurenjargal

Depth, m	Started depth, m	Ended depth, m	Thickness of stratum	Soil/ Rock Material Description			Standart Penetration Test					Depth, m	Symbol						
				Graphic log	Symbol	Description of Soil	Depth, m	Number Blows N	Number of every 15 cm					10	20	30	40	50	
									15cm	30cm	45cm								
0.0	0.3	0.3				Top soil-Clayey SAND, with vegetation roots. brown	18/30	8	8	10									
2						Clayey SAND with gravel- yellowish brown, stiff consistency. Prohivium deposits SC	20/30	9	11	9									
4							23/30	13	11	12									
6							26/30	11	12	14									
8							28/30	12	15	13									
10							31/30	10	16	15									
12							33/30	12	17	16									
14							36/30	14	17	19									
16							38/30	15	17	21									
18	0.3	18.0	17.7				39/30	17	18	21									
20							40/30	17	19	21									
22							42/30	18	22	20									
24							40/30	16	20	20									
26							41/30	18	21	22									
28							41/30	17	20	21									
30						38/30	18	19	19										
						36/30	18	17	19										
						37/30	19	20	17										
						38/30	15	18	20										
						40/30	18	19	21										
						39/30	14	18	21										
						43/30	19	21	22										
						44/30	20	21	23										
						46/30	23	22	24										
						47/30	19	24	23										
						48/30	22	24	24										
						46/30	23	22	24										
						45/30	16	24	21										
						44/30	16	24	20										
						42/30	18	23	19										



### 1.3.3 Grain Size Test

#### (1) Grain Size Test Datasheet

No.	Hole no.	Depth (m)	Particle size, %															Particle Analysis, (%)			Atterberg Limits			Cu	Cc	Soil type	Soil name MNS-ASTM D2487	
			75	50	37.5	25	19	12.5	6.5	4.75	2.00	0.850	0.425	0.250	0.106	0.075	<0.075	%	Gravel	Sand	Silt/Clay	LL	PL					PI
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
1	UB Bo 01	1.0-1.5	0.0	10.8	16.0	8.0	6.5	5.4	6.5	9.0	11.4	8.7	4.4	3.8	3.8	0.8	4.9	100.0	62.2	32.9	4.9	Nonplastic					GP	Poorly graded GRAVEL with sand
2	UB Bo 01	2.0-2.2	0.0	0.0	4.8	16.7	10.6	10.3	21.3	20.0	9.8	2.5	0.6	0.4	0.8	0.6	1.6	100.0	83.7	14.7	1.6	Nonplastic					GP	Poorly graded GRAVEL with sand
3	UB Bo 01	3.0	0.0	0.0	5.5	7.4	12.5	14.0	19.8	23.4	10.0	3.2	1.6	1.2	0.7	0.4	2.3	100.0	80.6	17.1	2.3	Nonplastic					GP	Poorly graded GRAVEL with sand
4	UB Bo 01	4.0	0.0	6.5	12.5	16.0	9.5	7.6	18.6	8.6	7.9	4.0	2.4	1.0	0.6	1.3	3.5	100.0	79.3	17.2	3.5	Nonplastic					GP	Poorly graded GRAVEL with sand
5	UB Bo 01	5.0	0.0	5.3	7.7	17.0	6.0	7.3	11.2	17.1	14.2	6.7	1.3	0.7	1.8	0.8	2.9	100.0	71.6	25.5	2.9	Nonplastic					GP	Poorly graded GRAVEL with sand
6	UB Bo 01	6.0	0.0	0.0	11.2	8.6	7.2	9.8	15.0	21.6	7.0	11.2	2.5	1.8	0.8	0.5	2.8	100.0	73.4	23.8	2.8	Nonplastic					GP	Poorly graded GRAVEL with sand
7	UB Bo 01	7.0	0.0	4.6	9.3	10.2	7.5	11.0	13.5	16.8	9.4	5.9	5.3	1.9	1.2	0.8	4.6	100.0	72.9	22.5	4.6	Nonplastic					GP	Poorly graded GRAVEL with sand
8	UB Bo 01	8.0-8.3	0.0	10.4	12.8	12.7	7.8	15.8	4.8	7.9	7.3	5.5	3.4	4.4	2.1	0.4	4.7	100.0	72.2	23.1	4.7	Nonplastic					GP	Poorly graded GRAVEL with sand
9	UB Bo 01	10.0	0.0	5.6	7.8	16.5	9.4	21.5	13.0	4.0	6.2	5.9	2.8	1.9	1.9	0.3	3.2	100.0	77.8	19.0	3.2	Nonplastic					GP	Poorly graded GRAVEL with sand
10	UB Bo 01	11	0.0	7.8	13.6	16.8	6.5	18.2	10.4	5.4	3.5	8.1	5.4	1.6	0.5	0.2	2.0	100.0	78.7	19.3	2.0	Nonplastic					GP	Poorly graded GRAVEL with sand
11	UB Bo 01	12.0-12.5	0.0	5.4	8.2	23.7	7.2	7.6	9.9	8.0	5.6	4.0	4.0	5.3	3.6	0.8	6.7	100.0	70.0	23.3	4.8	Nonplastic					GP	Poorly graded GRAVEL with sand
12	UB Bo 01	14.0	0.0	0.0	7.2	14.6	9.0	10.3	8.8	13.4	13.0	8.6	3.7	4.7	2.6	0.2	3.9	100.0	63.3	32.8	3.9	Nonplastic					GP	Poorly graded GRAVEL with sand
13	UB Bo 01	15.8-16.0	0.0	4.0	9.9	7.4	5.6	7.5	6.3	10.7	23.1	10.8	4.1	4.9	2.5	0.3	2.9	100.0	51.2	45.9	2.9	Nonplastic					GP	Poorly graded GRAVEL with sand
14	UB Bo 01	18.2	0.0	0.0	22.6	7.2	1.2	6.7	4.8	10.1	11.7	8.3	4.5	4.8	5.5	0.7	11.9	100.0	52.6	35.5	11.9	20.5	13.6	6.9			GP-GC	Poorly graded GRAVEL with sand and clay
15	UB Bo 01	20.0	0.0	2.3	10.1	12.1	4.3	6.0	6.0	11.0	12.9	10.4	7.2	5.3	4.2	0.5	7.7	100.0	51.8	40.5	7.7	22.3	15	7.3			GP-GC	Poorly graded GRAVEL with sand and clay
16	UB Bo 01	23.4-24.0	0.0	0.0	16.8	9.8	5.3	8.9	7.5	7.0	8.4	4.2	7.8	5.2	6.0	2.6	10.5	100.0	53.3	34.2	10.5	22.7	15.2	7.5			GP-GC	Poorly graded GRAVEL with sand and clay
17	UB Bo 01	25.0	0.0	17.7	14.9	6.9	3.5	5.4	4.0	8.0	8.5	8.1	4.3	3.2	3.8	0.7	11.0	100.0	60.4	28.6	11.0	22.3	15.3	7			GP-GC	Poorly graded GRAVEL with sand and clay
18	UB Bo 01	29.5-30.0	12.6	13.2	12.1	12.1	5.1	3.4	5.6	8.1	7.6	6.3	2.8	1.9	2.4	0.4	6.4	100.0	72.2	21.4	6.4	24.5	17.3	7.2			GP-GC	Poorly graded GRAVEL with sand and clay

No.	Hole no.	Depth (m)	Particle size, %															Particle Analysis, (%)			Atterberg Limits			Cu	Cc	Soil type	Soil name MNS-ASTM D2487	
			75	50	37.5	25	19	12.5	6.5	4.75	2.00	0.850	0.425	0.250	0.106	0.075	<0.075	%	Gravel	Sand	Silt/Clay	LL	PL					PI
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
1	UB Bo 02	1.0-1.2	0.0	7.6	12.5	21.3	10.3	6.2	7.8	11.0	6.2	5.3	3.5	2.7	1.8	0.6	3.2	100.0	76.7	20.1	3.2	Nonplastic					GP	Poorly graded GRAVEL with sand
2	UB Bo 02	2.0	0.0	1.5	4.8	13.0	15.5	21.6	10.2	15.5	5.6	4.3	2.7	1.6	1.0	0.4	2.3	100.0	82.1	15.6	2.3	Nonplastic					GP	Poorly graded GRAVEL with sand
3	UB Bo 02	3.0	0.0	0.0	2.6	8.2	8.9	13.2	19.0	25.4	8.6	3.2	1.6	1.2	2.5	1.3	4.3	100.0	77.3	18.4	4.3	Nonplastic					GP	Poorly graded GRAVEL with sand
4	UB Bo 02	3.8-4.0	0.0	7.2	12.5	16.0	9.5	7.6	20.9	8.6	5.6	3.6	2.4	0.8	1.4	1.0	2.9	100.0	82.3	14.8	2.9	Nonplastic					GP	Poorly graded GRAVEL with sand
5	UB Bo 02	5.0	0.0	0.0	0.0	6.5	13.1	9.8	13.0	20.4	11.1	6.0	3.8	2.5	3.2	2.5	7.9	100.0	62.8	29.3	7.9	23.4	13.8	7.6			GP-GC	Poorly graded GRAVEL with sand and clay
6	UB Bo 02	6.8-7.0	0.0	0.0	4.8	13.6	7.6	10.2	7.9	15.4	8.6	4.3	3.2	3.2	5.0	3.7	10.5	100.0	59.5	30.0	10.5	21.7	13.8	7.9			GP-GC	Poorly graded GRAVEL with sand and clay
7	UB Bo 02	11.0	0.0	0.0	2.3	10.2	7.5	9.5	11.3	16.8	5.0	6.1	4.0	8.7	6.1	4.3	8.2	100.0	57.6	34.2	8.2	24.2	16.1	8.1			GP-GC	Poorly graded GRAVEL with sand and clay
8	UB Bo 02	14.8-15.0	0.0	0.0	7.8	11.0	9.2	12.3	4.8	6.5	5.2	4.0	6.7	10.2	5.8	5.9	10.6	100.0	51.6	37.8	10.6	22.0	14.3	7.7			GP-GC	Poorly graded GRAVEL with sand and clay

No.	Hole no.	Depth (m)	Particle size, %															Particle Analysis, (%)			Atterberg Limits			Cu	Cc	Soil type	Soil name MNS-ASTM D2487	
			75	50	37.5	25	19	9.5	4.75	2	0.6	0.425	0.25	0.15	0.075	<0.075	%	Gravel	Sand	Silt/Clay	LL	PL	PI					
1	UB Bo 03	1.0			4.2	12.0	10.8	25.5	9.5	2.9	4.9	4.3	7.9	6.5	1.8	4.8	100.0	62.0	33.3	4.8	Nonplastic						GP	Poorly graded GRAVEL with sand
2	UB Bo 03	2.0-2.3		7.6	4.6	6.3	9.3	14.0	12.1	13.4	9.0	7.8	4.7	4.8	1.5	4.9	100.0	53.9	41.2	4.9	Nonplastic						GP	Poorly graded GRAVEL with sand
3	UB Bo 03	3.0		6.5	5.0	7.8	10.3	13.8	15.0	12.1	8.7	10.0	3.8	2.3	0.8	3.9	100.0	58.4	37.7	3.9	Nonplastic						GP	Poorly graded GRAVEL with sand
4	UB Bo 03	4.0-4.5				11.3	4.9	20.9	14.9	12.8	9.5	10.1	8.5	4.0	0.5	3.5	100.0	51.1	45.4	3.5	Nonplastic						GP	Poorly graded GRAVEL with sand
5	UB Bo 03	6.8-7.0			11.1	8.6	7.0	19.1	13.3	11.3	10.9	5.2	4.4	3.5	0.6	4.9	100.0	59.3	35.8	4.9	Nonplastic						GP	Poorly graded GRAVEL with sand
6	UB Bo 03	10.0-10.5	0.0	13.2	8.3	13.3	3.7	11.1	13.2	14.0	9.2	1.7	1.1	1.8	1.3	8.1	100.0	62.8	29.1	8.1	24	15.1	8.9				GP-GC	Poorly graded GRAVEL with sand and clay
7	UB Bo 03	12.0		8.7	10.3	15.2	5.8	10.8	14.0	101.0	8.2	5.0	0.9	2.5	0.9	7.6	100.0	64.8	27.6	7.6	23.8	16.2	7.6				GP-GC	Poorly graded GRAVEL with sand and clay
8	UB Bo 03	14.5-15.0		6.5	10.2	6.8	12.0	7.8	6.8	4.6	5.0	4.3	7.0	6.2	4.5	18.3	100.0	50.1	31.6	18.3	26.5	16.5	10				GC	Clayey GRAVEL with sand
9	UB Bo 03	16.0-16.2			4.8	7.3	9.2	15.4	13.7	12.1	7.4	5.4	5.9	6.7	1.4	10.9	100.0	50.3	38.8	10.9	23.8	16.8	7.0				GP-GC	Poorly graded GRAVEL with sand and clay
10	UB Bo 03	20.0-20.4			4.8	15.1	10.6	16.9	11.4	11.0	8.2	4.1	2.9	4.2	1.0	9.9	100.0	58.9	31.3	9.9	23.2	15.3	7.9				GP-GC	Poorly graded GRAVEL with sand and clay
11	UB Bo 03	26.0		2.8	5.6	13.8	9.2	12.7	10.8	14.4	7.6	5.1	3.1	2.8	1.6	10.5	100.0	54.9	34.6	10.5	23.2	15.3	7.9				GP-GC	Poorly graded GRAVEL with sand and clay
12	UB Bo 03	29.0	0.0	0.0	13.8	4.8	8.2	23.5	14.5	10.6	3.8	1.2	0.8	2.0	1.6	11.2	100.0	66.8	22.0	11.2	25.3	18.0	7.3				GP-GC	Poorly graded GRAVEL with sand and clay

No.	Hole no.	Depth (m)	Particle size, %															Particle Analysis, (%)			Atterberg Limits			Cu	Cc	Soil type	Soil name MNS-ASTM D2487		
			75	50	37.5	25	19	9.5	4.75	2	0.85	0.425	0.25	0.106	0.075	0.075	<0.075	%	Gravel	Sand	Silt/Clay	LL	PL					PI	
1	UB Bo 04	1.0	0.0	0.0	1.7	9.6	9.6	13.4	23.3	38.2	1.0	0.7	0.5	0.7	0.1		2.2	100.0	56.6	41.2	2.2	Nonplastic						GP	Poorly graded GRAVEL with sand
2	UB Bo 04	2.0	0.0	2.8	8.0	8.4	13.8	9.8	26.8	12.0	5.8	4.2	2.6	9.8	1.2		3.8	100.0	69.6	26.6	3.8	Nonplastic						GP	Poorly graded GRAVEL with sand
3	UB Bo 04	2.7-3.2	0.0	17.1	16.8	5.6	9.5	14.2	7.4	7.0	5.1	2.9	3.3	4.4	0.5		4.2	100.0	70.6	25.2	4.2	Nonplastic						GP	Poorly graded GRAVEL with sand
4	UB Bo 04	4.0-4.5	0.0	0.0	40.1	17.2	10.2	8.6	4.8	7.7	4.2	1.9	0.9	1.1	0.2		3.1	100.0	80.9	16.0	3.1	Nonplastic						GP	Poorly graded GRAVEL with sand
5	UB Bo 04	5.0	0.0	13.8	21.4	17.2	11.3	7.5	9.0	6.8	5.0	2.1	1.0	1.3	0.7		2.9	100.0	80.2	16.9	2.9	Nonplastic						GP	Poorly graded GRAVEL with sand
6	UB Bo 04	6.0	0.0	15.3	16.8	21.4	8.6	5.3	10.3	5.6	4.8	3.5	2.5	1.9	0.0		3.0	100.0	77.7	19.3	3.0	Nonplastic						GP	Poorly graded GRAVEL with sand
7	UB Bo 04	7.0	5.6	9.5	11.3	18.3	20.4	6.3	7.8	9.0	5.1	1.4	2.6	0.8	1.1		2.6	100.0	77.4	20.0	2.6	Nonplastic						GP	Poorly graded GRAVEL with sand
8	UB Bo 04	8.0	0.0	15.4	9.8	23.4	11.4	7.5	9.1	4.6	6.2	2.6	3.4	1.8	0.8		4.0	100.0	76.6	19.4	4.0	Nonplastic						GP	Poorly graded GRAVEL with sand
9	UB Bo 04	8.8-9.2	0.0	0.0	4.8	16.7	10.6	31.6	20.0	9.8	2.5	0.6	0.4	0.8	0.6		1.6	100.0	83.7	14.7	1.6	Nonplastic						GP	Poorly graded GRAVEL with sand
10	UB Bo 04	10	0.0	0.0	0.0	3.3	6.6	20.6	19.1	15.9	8.1	2.2	1.8	4.1	2.9		15.4	100.0	49.6	35.0	15.4	28.5	19.8	8.7				GC	Clayey SAND with gravel
11	UB Bo 04	14.0-14.2	0.0	0.0	21.4	6.7	4.7	11.5	9.6	11.4	6.5	4.0	3.0	4.6	0.9		13.7	100.0	53.9	30.4	15.7	21.1	13.2	7.9				GC	Clayey SAND with gravel
12	UB Bo 04	21.5-22.0	0.0	19.6	15.2	11.4	3.2	8.9	6.7	7.5	3.9	2.3	2.1	3.2	0.7		13.3	100.0	67.0	19.7	13.3	22.4	13.6	8.8				GC	Clayey SAND with gravel
13	UB Bo 04	23.8	0.0	0.0	6.9	10.5	13.6	8.4	12.0	5.7	3.2	4.9	5.5	6.9	4.5		17.9	100.0	51.4	30.7	17.9	36.3	22.8	13.5				GC	Clayey SAND with gravel
14	UB Bo 04	25.0-25.3	0.0	0.0	0.0	0.0	0.0	0.0	9.2	1.5	4.9	12.0	22.4	16.0	15.6		27.4	100.0	6.0	72.4	27.4	27	17.5	9.5				SC	Clayey SAND
15	UB Bo 04	29.6-30.0	0.0	0.0	0.0	8.8	2.8	14.9	14.3	14.3	13.5	6.3	4.3	4.9	0.6		15.3	100.0	40.8	43.4	15.3	22.8	15.2	7.6				SC	Clayey SAND with gravel

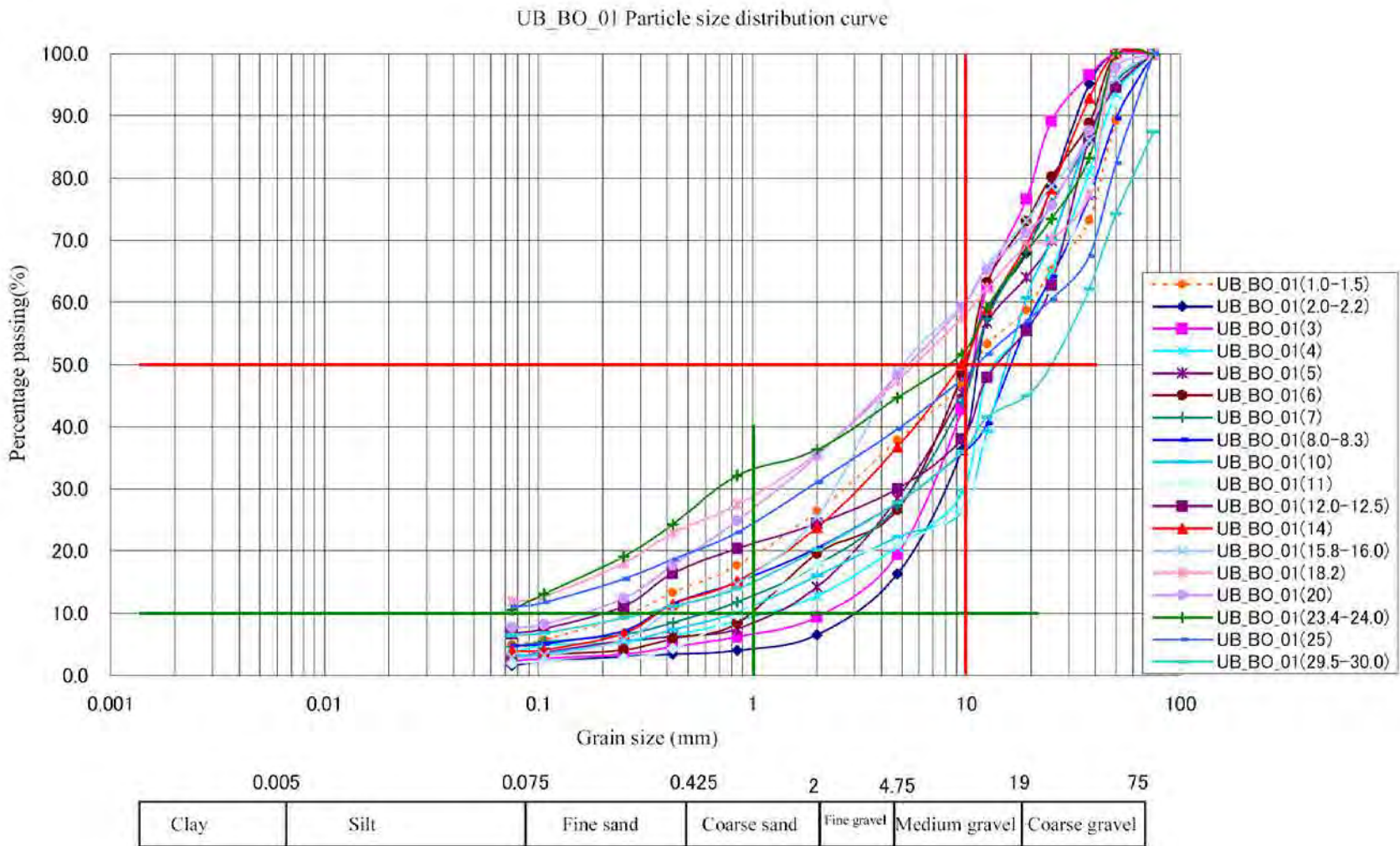
No.	Bore no.	Depth (m)	Particle size, %															Particle Analysis, (%)			Atterberg Limits			Cu	Cc	Soil type	Soil name MNS-ASTM D2487		
			75	50	37.5	25	19	9.5	4.75	7	0.85	0.425	0.25	0.106	0.075	0.075	<0.075	%	Gravel	Sand	Silt/Clay	LL	PL					PI	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	
1	NH 01	1.0						3.4	1.0	2.0	5.8	2.0	3.4	34.5	7.4		40.5	100.0	4.4	55.1	40.5	27.8	15.4	12.4				SC	Clayey SAND
2	NH 01	2.0						18.4	10.0	21.4	10.3	5.4	4.0	6.2	1.8		19.5	100.0	28.4	52.1	19.5	23.8	13.4	10.4				SC	Clayey SAND with gravel
3	NH 01	3.0						20.9	11.6	19.8	11.3	6.7	5.8	8.0	1.6		14.3	100.0	32.5	53.2	14.3	25.6	14.2	11.4				SC	Clayey SAND with gravel
4	NH 01	4.0							0.5	2.9	4.5	2.4	3.8	34.5	4.7		46.9	100.0	0.3	52.8	46.9	26.8	15.5	11.3				SC	Clayey SAND
5	NH 01	5.0					0.4	3.6	19.6	35.4	3.8	1.0	0.6	3.0	3.5		29.1	100.0	23.6	47.3	29.1	28.9	19.7	9.1				SC	Clayey SAND with gravel
6	NH 01	6.0					10.5	9.4	8.5	12.0	9.0	5.5	4.3	7.6	4.1		29.3	100.0	28.2	42.5	29.3	22.5	15.2	7.3				SC	Clayey SAND with gravel
7	NH 01	7.0					0.0	2.9	1.6	7.0	12.9	6.2	4.8	12.2	8.7		43.7	100.0	4.5	51.8	43.7	27.0	19.9	7.1				SC	Clayey SAND
8	NH 01	8.0					1.7	8.7	7.2	11.2	9.0	6.2	6.5	9.1	2.0		38.4	100.0	17.6	44.0	38.4	24.4	14.2	10.2				SC	Clayey SAND with gravel
9	NH 01	9.0							0.1	0.2	0.1	0.4	1.8	1.3	4.1		92.0	100.0	0.1	7.9	92.0	34.6	18.9	15.7				CL	Lean CLAY
10	NH 01	10.0							3.5	2.0	7.8	3.0	2.9	1.0	0.8		79.0	100.0	3.5	17.5	79.0	36.8	21.4	15.4				CL	Lean CLAY
11	NH 01	12.0							1.0	0.5	0.5	2.4	3.0	1.3			91.3	100.0	0.0	8.7	91.3	36.5	18.5	18.0				CL	Lean CLAY
12	NH 01	15.0							1.0	0.5	0.5	2.4	3.0	1.3			91.3	100.0	0.0	8.7	91.3	39.8	20.3	19.5				CL	Lean CLAY
13	NH 01	18.0							0.1	1.0	0.3	0.2	0.1	2.7			95.6	100.0	0.0	4.4	95.6	37.8	19.8	18.0				CL	Lean CLAY
14	NH 01	24.0							6.7	0.04	0.04	0.1	0.1	0.1			92.9	100.0	0.0	7.1	92.9	36.5	14.8	21.7				CL	Sandy lean CLAY
15	NH 01	29.0							6.2	8.2	0.1	0.1	0.1	0.1	0.04		85.2	100.0	6.2	8.6	85.2	42.1	21.6	20.5				CL	Sandy lean CLAY
16	NH 02	1.0							1.1	0.1	0.3	1.0	20.4	18.0			58.5	100.0	0.0	41.5	58.5	38.2	19.8	18.4				CL	Lean CLAY with sand
17	NH 02	2.0							0.1	2.2	0.1	0.8	18.4	15.0			63.4	100.0	0.0	36.6	63.4	37.8	18.6	19.2				CL	Sandy lean CLAY
18	NH 02	3.0									0.5	1.0	16.0	11.0			71.5	100.0	0.0	28.5	71.5	42.1	25.0	19.1				CL	Lean CLAY with sand
19	NH 02	4.0									1.5	3.0	5.3	11.0	9.8		69.4	100.0	0.0	30.6	69.4	39.8	19.8	20.0				CL	Sandy lean CLAY
20	NH 02	5.0							0.5	2.0	1.8	4.3	9.8	7.0			74.6	100.0	0.0	25.4	74.6	37.2	17.6	19.6				CL	Lean CLAY with sand
21	NH 02	6.0							1.0	2.3	1.5	2.3	5.6	16.3	9.1		61.9	100.0	1.0	37.1	61.9	41.0	21.5	19.5				CL	Sandy lean CLAY
22	NH 02	8.0							3.7	0.7	0.9	1.7	25.2	14.3			53.5	100.0	0.0	46.5	53.5	39.8	22.3	17.5				CL	Sandy lean CLAY
23	NH 02	12.0							1.3	2.4	1.1	0.4	1.2	16.8	20.0		56.8	100.0	1.3	41.9	56.8	41.3	16.8	24.5				CL	Lean CLAY with sand
24	NH 02	17.0							1.2	2.9	1.2	0.7	1.0	16.8	6.5		69.7		1.2	29.1	69.7	36.8	18.2	18.6				CL	Lean CLAY with sand
25	NH 02	20.0							1.1	1.5	0.3	0.3	12.5	8.5			75.6		0.0	24.4	75.6	43.5	21.4	22.1				CL	Lean CLAY with sand
26	NH 02	25.0								1.3	2.7	4.0	2.6	6.0			83.4	100.0	0.0	16.6	83.4	38.0	18.8	19.2				CL	Lean CLAY with sand
27	NH 02	29.0							2.4	2.0	4.0	3.2	5.1	7.0			76.3	100.0	0.0	23.7	76.3	41.0	21.3	19.7				CL	Lean CLAY with sand

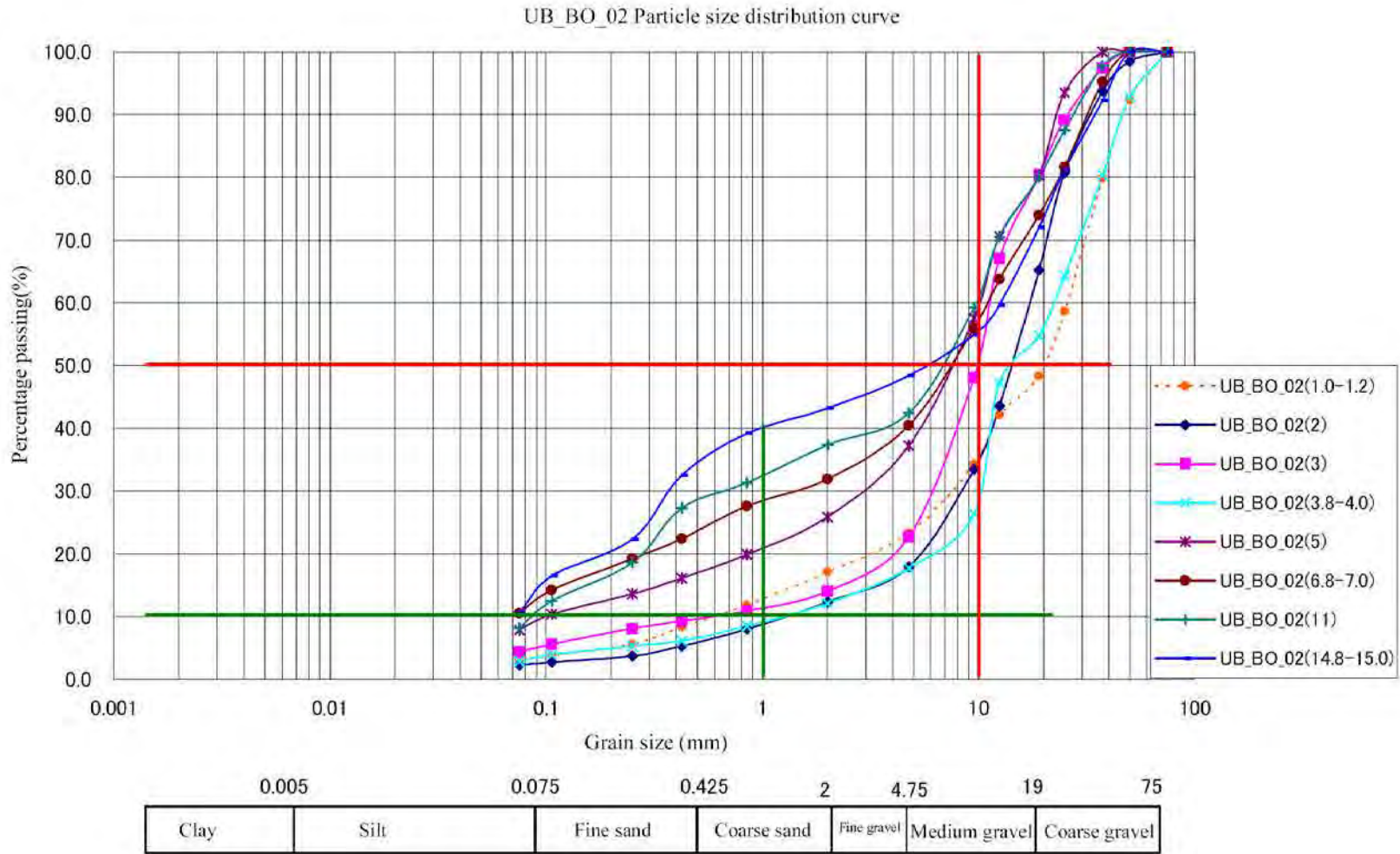


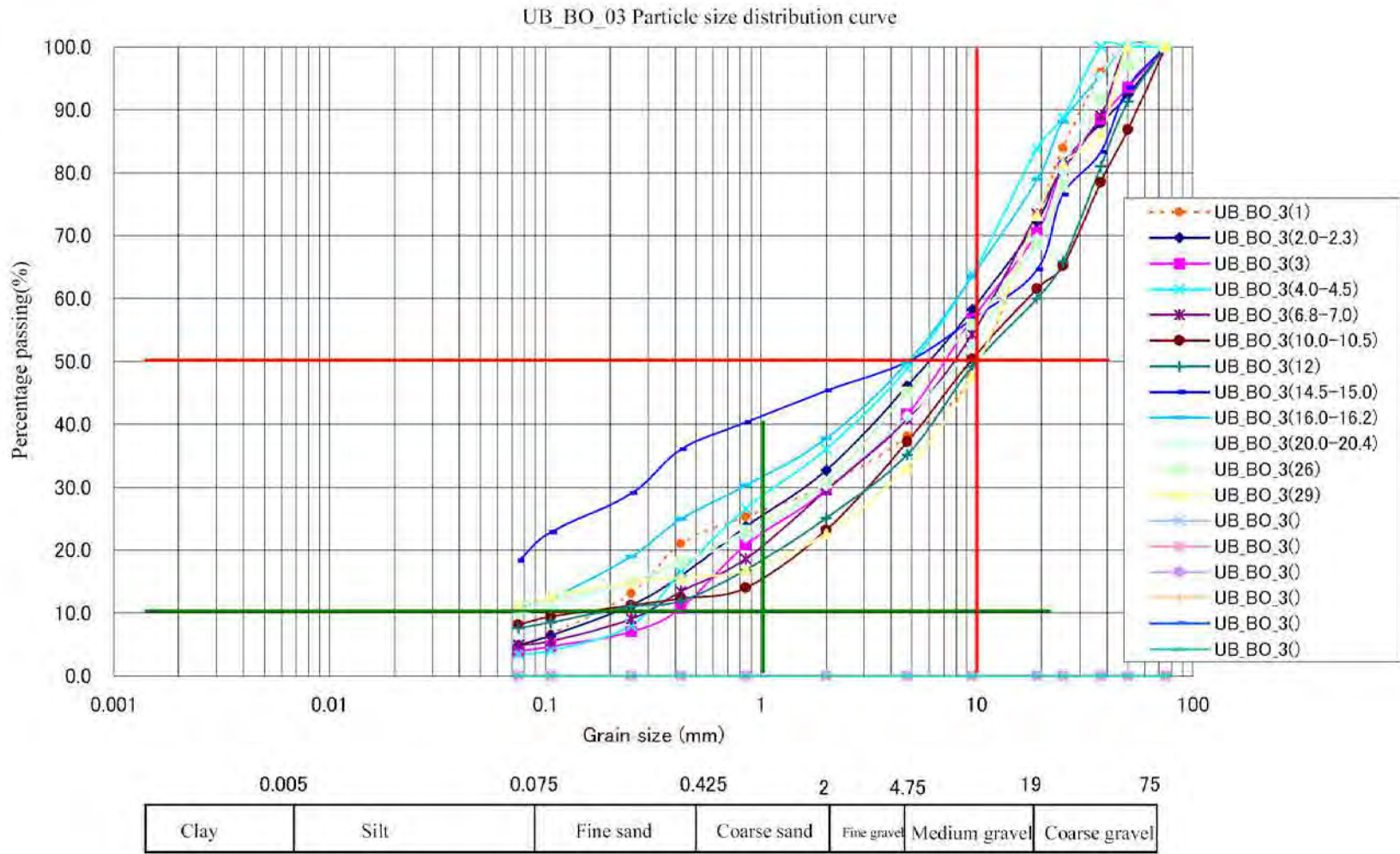


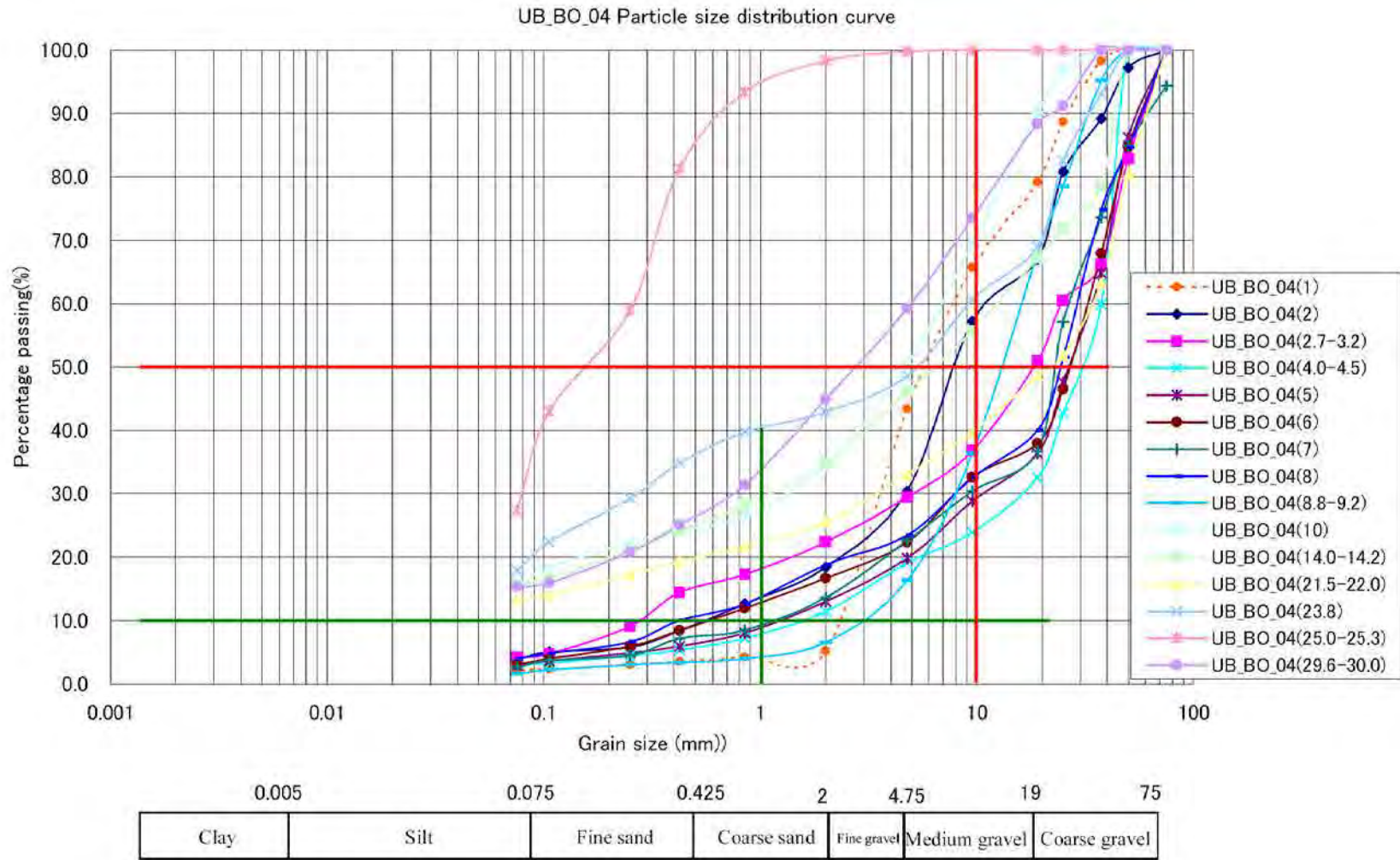


(2) Grain Size Accumulation Curves

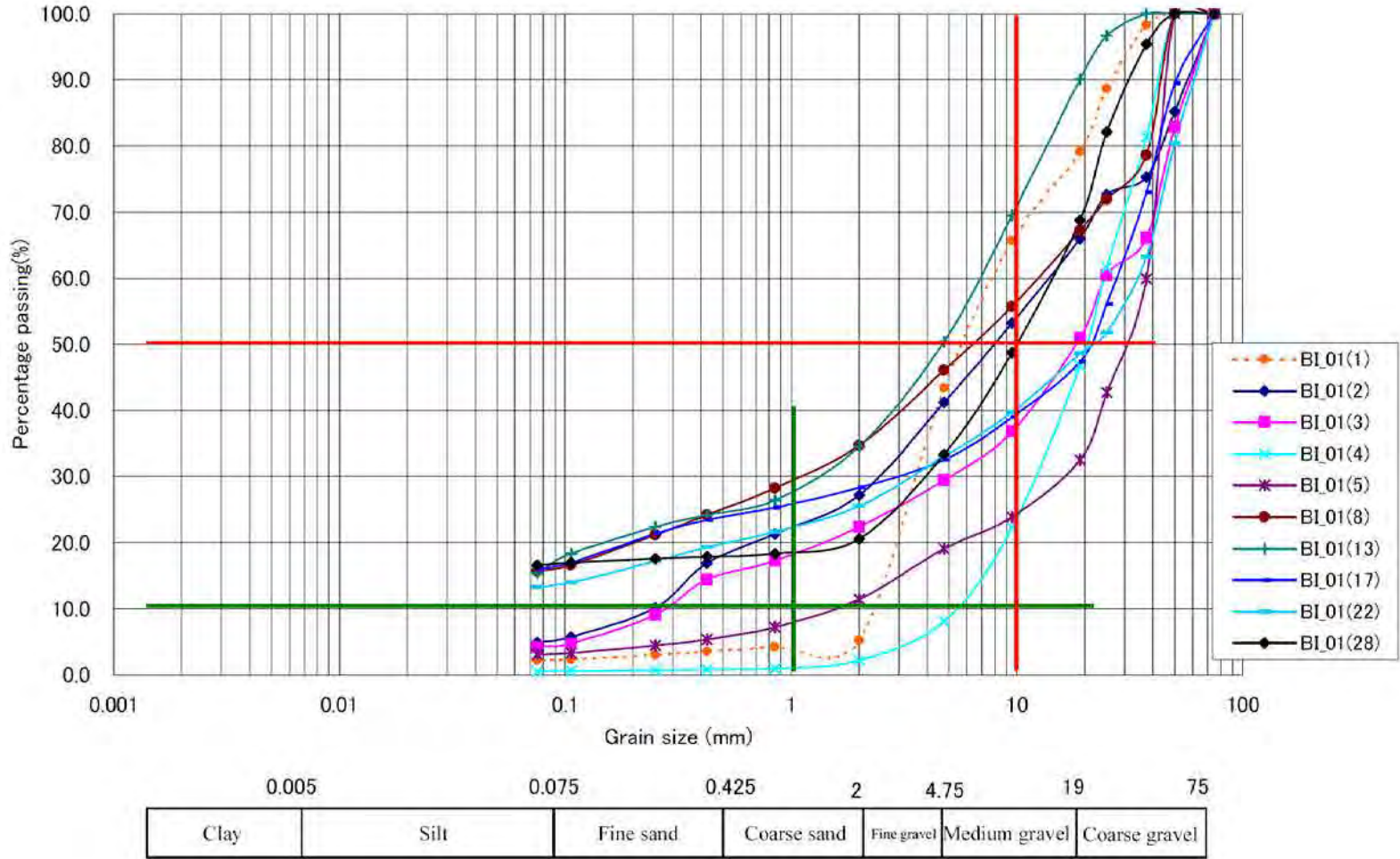


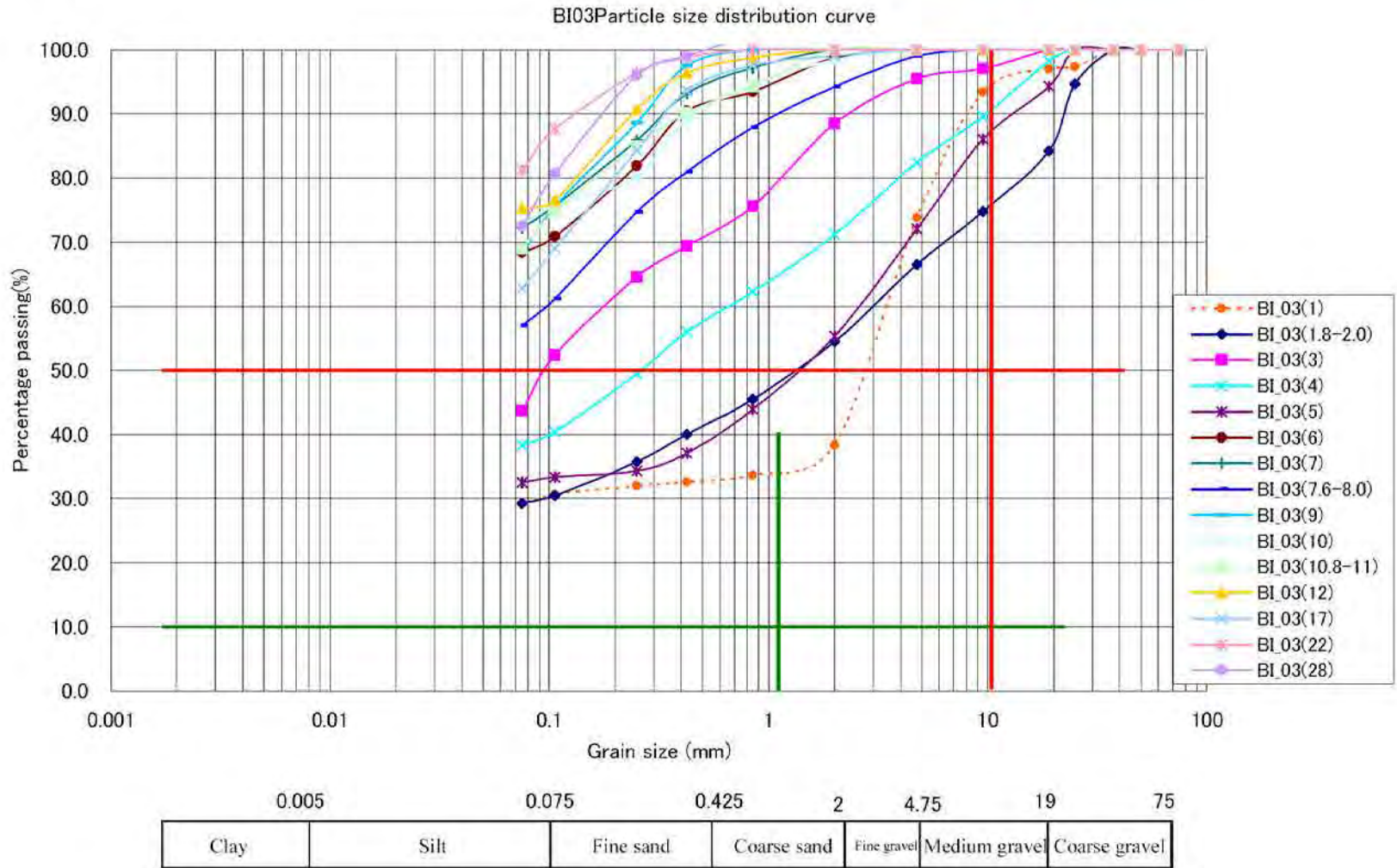


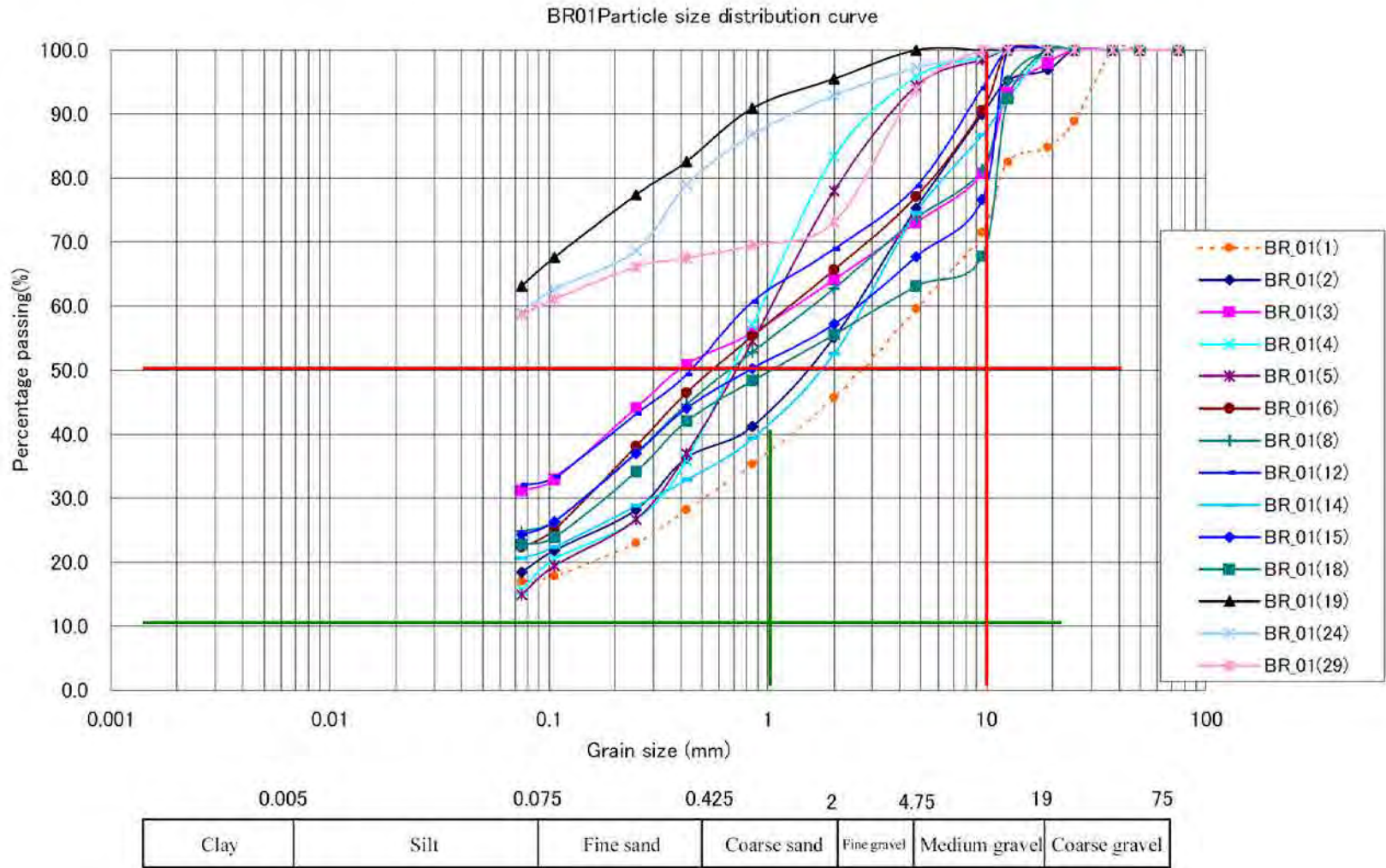




BI01Particle size distribution curve

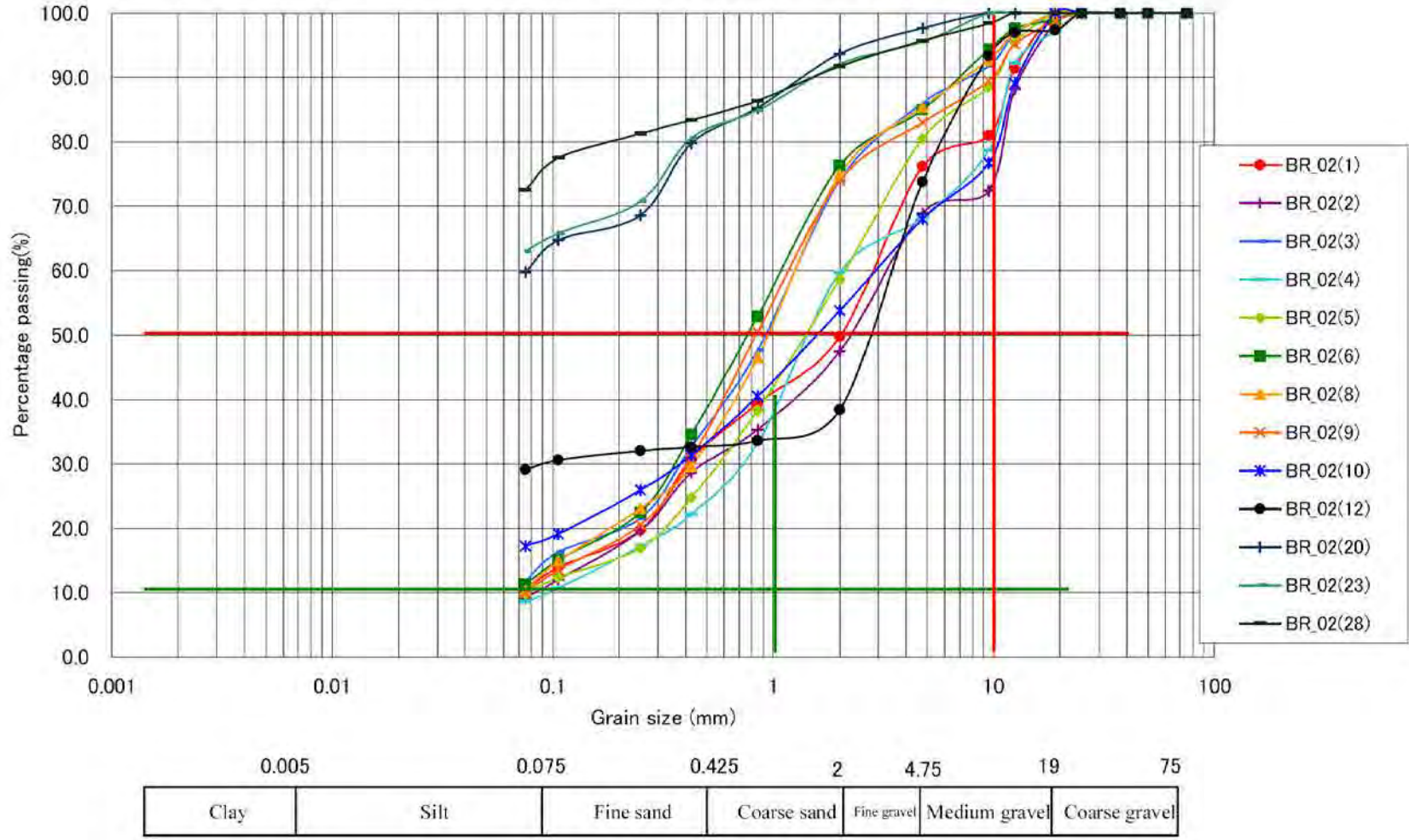


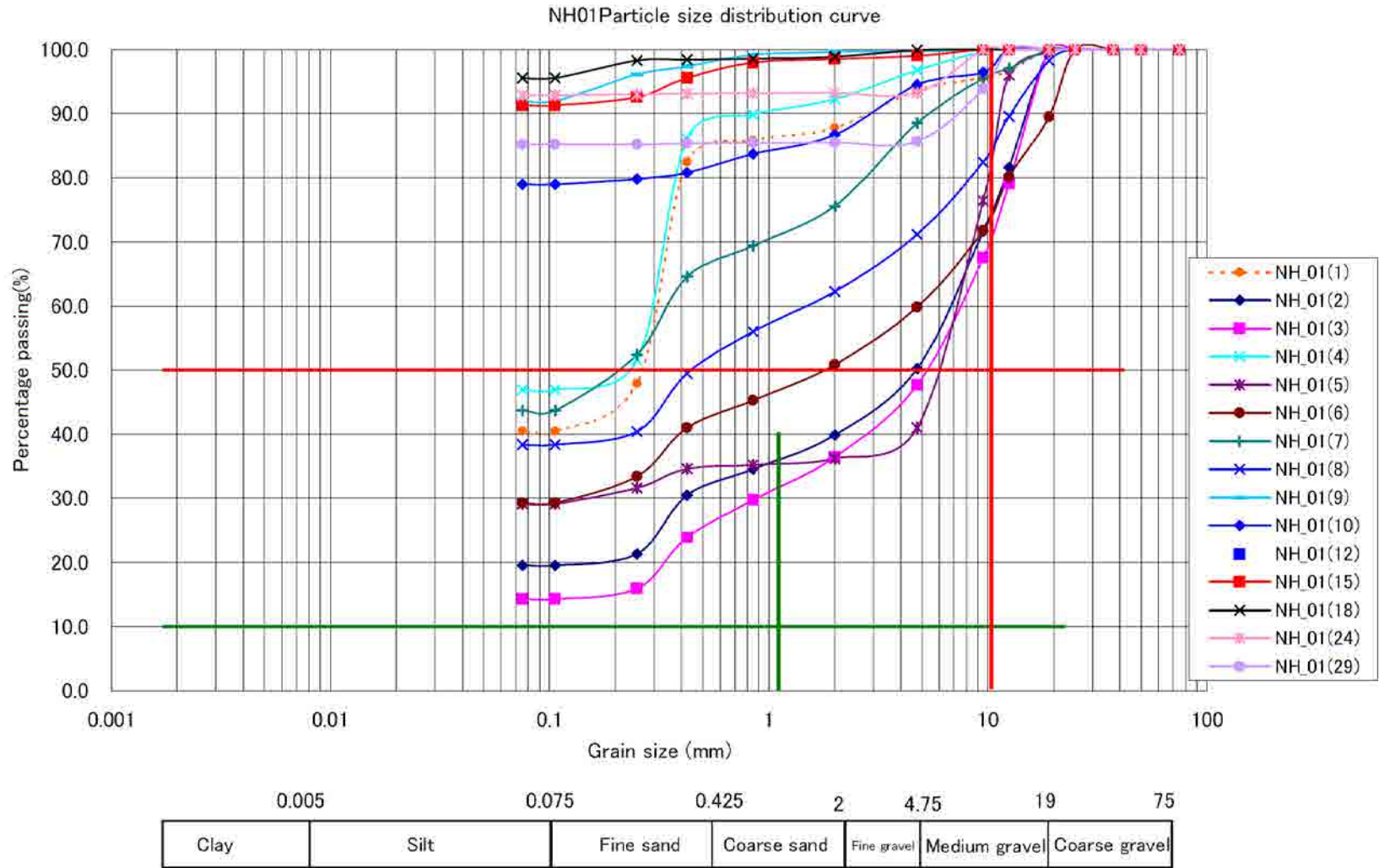


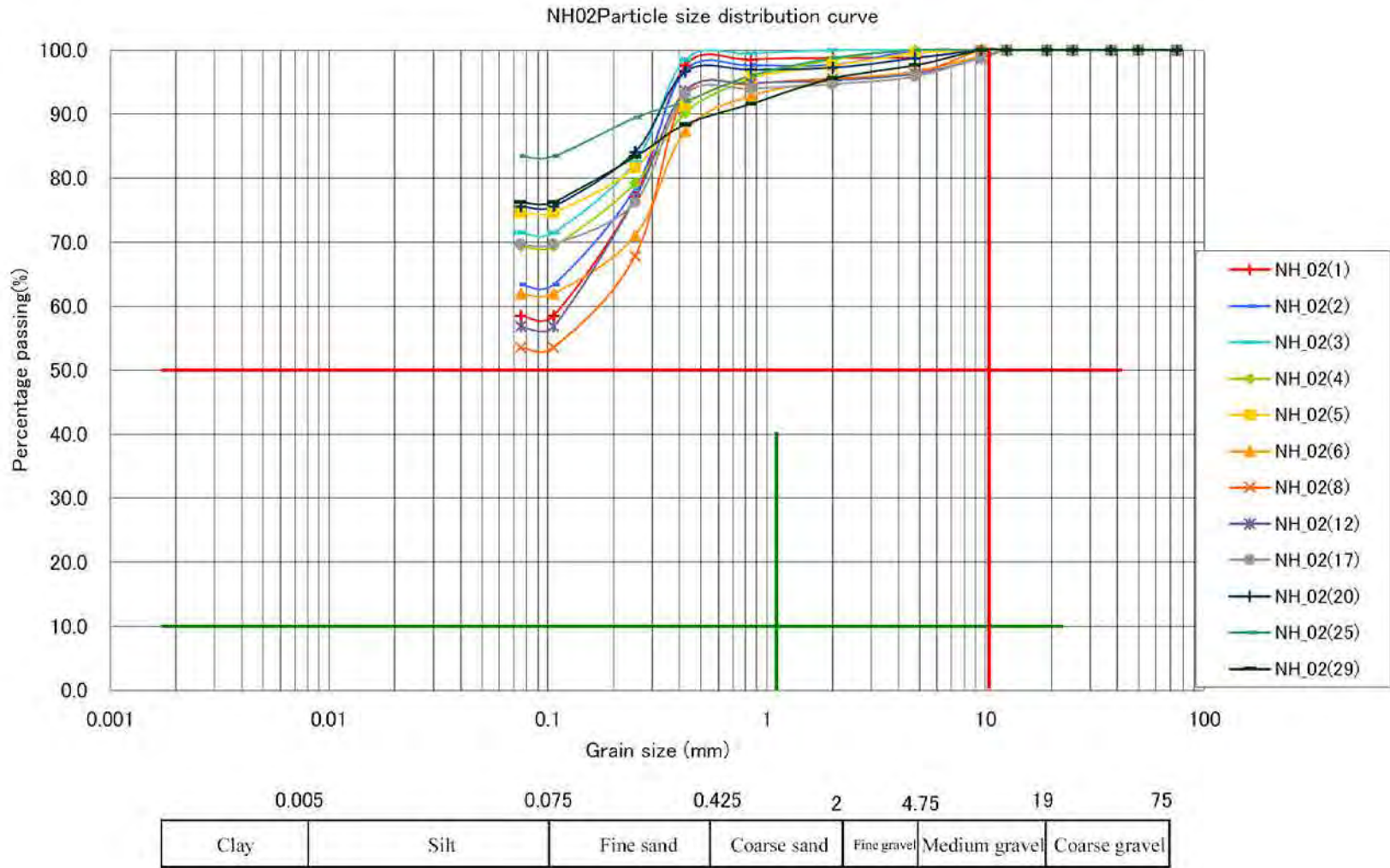




BR02Particle size distribution curve





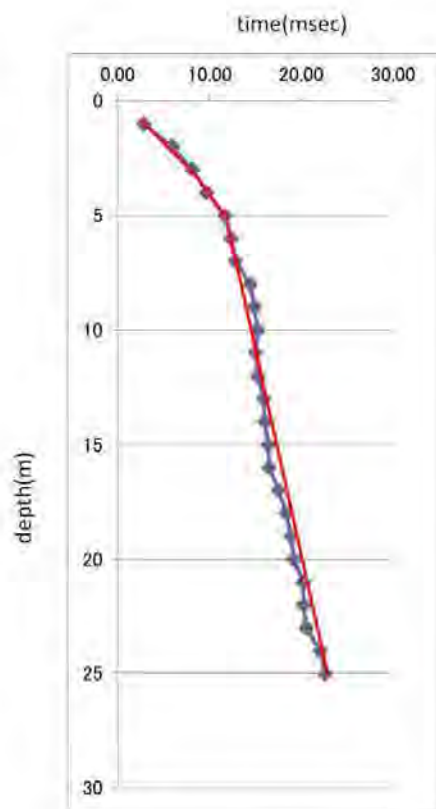


### 1.3.4 PS Logging

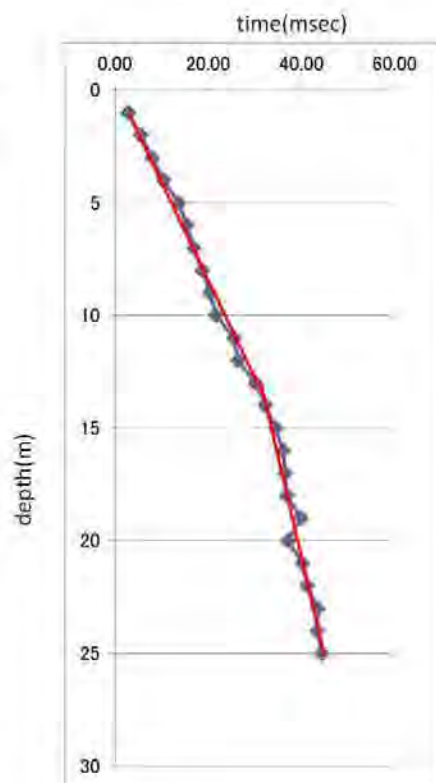
#### (1) PS Logging

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P-wave						
offset(m)	5			correction		Provisional
depth	time			value	depth	Vp
(m)	(msec)	cal1	cal2	(msec)	(m)	(m/sec)
1	14.5	14.50	5.10	<b>2.84</b>	1	380
2	16	32.00	5.39	<b>5.94</b>	2	
3	15.75	47.25	5.83	<b>8.10</b>	3	
4	15.5	62.00	6.40	<b>9.68</b>	4	561
5	16.5	82.50	7.07	<b>11.67</b>	5	
6	16	96.00	7.81	<b>12.29</b>	6	1837
7	15.75	110.25	8.60	<b>12.82</b>	7	
8	17	136.00	9.43	<b>14.42</b>	8	
9	17	153.00	10.30	<b>14.86</b>	9	
10	17	170.00	11.18	<b>15.21</b>	10	
11	16.5	181.50	12.08	<b>15.02</b>	11	
12	16.5	198.00	13.00	<b>15.23</b>	12	
13	17	221.00	13.93	<b>15.87</b>	13	
14	17	238.00	14.87	<b>16.01</b>	14	
15	17.25	258.75	15.81	<b>16.36</b>	15	
16	17.25	276.00	16.76	<b>16.46</b>	16	
17	18.25	310.25	17.72	<b>17.51</b>	17	
18	19	342.00	18.68	<b>18.31</b>	18	
19	19.5	370.50	19.65	<b>18.86</b>	19	
20	19.75	395.00	20.62	<b>19.16</b>	20	
21	20.75	435.75	21.59	<b>20.19</b>	21	
22	20.75	456.50	22.56	<b>20.23</b>	22	
23	21	483.00	23.54	<b>20.52</b>	23	
24	22.5	540.00	24.52	<b>22.03</b>	24	
25	23	575.00	25.50	<b>22.55</b>	25	



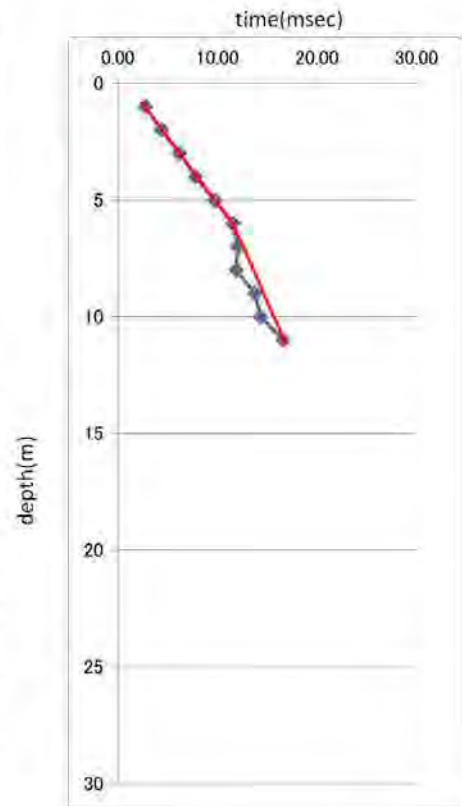
S-wave						
offset(m)	5			correction		Provisional
depth	time			value	depth	Vs
(m)	(msec)	cal1	cal2	(msec)	(m)	(m/sec)
1	14.25	14.25	5.10	<b>2.79</b>	1	439
2	14.75	29.50	5.39	<b>5.48</b>	2	
3	15.5	46.50	5.83	<b>7.97</b>	3	
4	16.5	66.00	6.40	<b>10.31</b>	4	
5	19.25	96.25	7.07	<b>13.61</b>	5	
6	20	120.00	7.81	<b>15.36</b>	6	
7	20.75	145.25	8.60	<b>16.88</b>	7	
8	22	176.00	9.43	<b>18.66</b>	8	
9	23.25	209.25	10.30	<b>20.32</b>	9	
10	24.25	242.50	11.18	<b>21.69</b>	10	
11	28	308.00	12.08	<b>25.49</b>	11	841
12	28.5	342.00	13.00	<b>26.31</b>	12	
13	32.25	419.25	13.93	<b>30.10</b>	13	
14	34.25	479.50	14.87	<b>32.25</b>	14	
15	36.25	543.75	15.81	<b>34.39</b>	15	
16	37.75	604.00	16.76	<b>36.03</b>	16	
17	38	646.00	17.72	<b>36.46</b>	17	
18	38.25	688.50	18.68	<b>36.85</b>	18	
19	41.25	783.75	19.65	<b>39.89</b>	19	
20	38.25	765.00	20.62	<b>37.11</b>	20	
21	41.25	866.25	21.59	<b>40.13</b>	21	
22	42.25	929.50	22.56	<b>41.20</b>	22	
23	44.5	1023.50	23.54	<b>43.48</b>	23	
24	44.24	1061.76	24.52	<b>43.31</b>	24	
25	45.25	1131.25	25.50	<b>44.37</b>	25	



UB\_BO\_02\_P&S

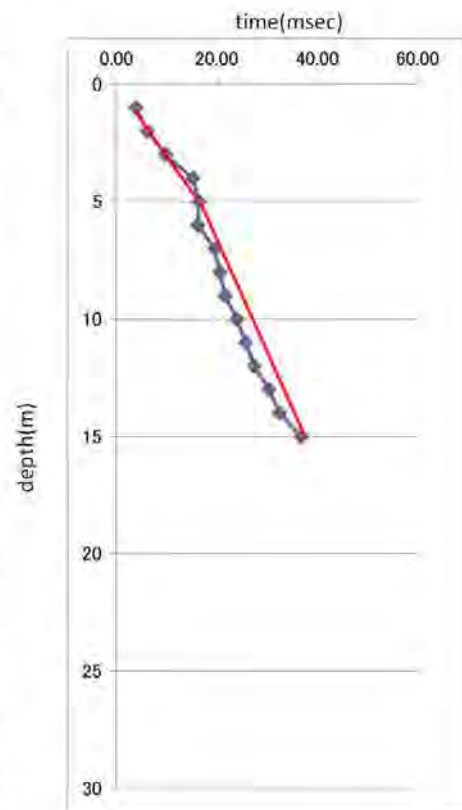
P-wave

offset(m)	5			correction		Provisional
depth	time			value	depth	Vp
(m)	(msec)	cal1	cal2	(msec)	(m)	(m/sec)
1	14	14.00	5.10	<b>2.75</b>	1	570
2	11.75	23.50	5.39	<b>4.36</b>	2	
3	12	36.00	5.83	<b>6.17</b>	3	
4	12.5	50.00	6.40	<b>7.81</b>	4	
5	13.75	68.75	7.07	<b>9.72</b>	5	
6	15	90.00	7.81	<b>11.52</b>	6	982
7	14.75	103.25	8.60	<b>12.00</b>	7	
8	14	112.00	9.43	<b>11.87</b>	8	
9	15.75	141.75	10.30	<b>13.77</b>	9	
10	16	160.00	11.18	<b>14.31</b>	10	
11	18.25	200.75	12.08	<b>16.61</b>	11	
12		0.00	13.00		12	
13		0.00	13.93		13	
14		0.00	14.87		14	
15		0.00	15.81		15	
16		0.00	16.76		16	
17		0.00	17.72		17	
18		0.00	18.68		18	
19		0.00	19.65		19	
20		0.00	20.62		20	
21		0.00	21.59		21	
22		0.00	22.56		22	
23		0.00	23.54		23	
24		0.00	24.52		24	
25		0.00	25.50		25	
26		0.00	26.48		26	
27		0.00	27.46		27	
28		0.00	28.44		28	
29		0.00	29.43		29	
30		0.00	30.41		30	



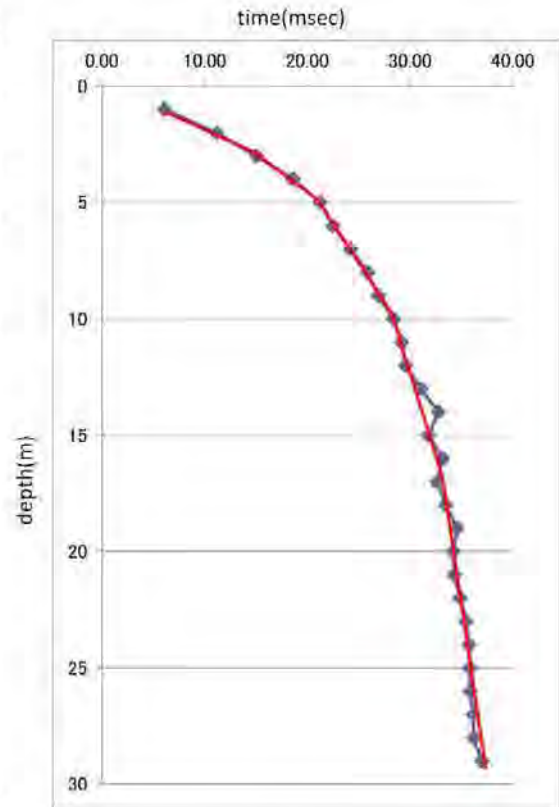
S-wave

offset(m)	5			correction		Provisional
depth	time			value	depth	Vs
(m)	(msec)	cal1	cal2	(msec)	(m)	(m/sec)
1	19.75	19.75	5.10	<b>3.87</b>	1	318
2	16.5	33.00	5.39	<b>6.13</b>	2	
3	19	57.00	5.83	<b>9.78</b>	3	
4	24.25	97.00	6.40	<b>15.15</b>	4	
5	23.25	116.25	7.07	<b>16.44</b>	5	
6	21	126.00	7.81	<b>16.13</b>	6	492
7	24	168.00	8.60	<b>19.53</b>	7	
8	24.25	194.00	9.43	<b>20.56</b>	8	
9	24.75	222.75	10.30	<b>21.64</b>	9	
10	26.75	267.50	11.18	<b>23.93</b>	10	
11	28.25	310.75	12.08	<b>25.72</b>	11	
12	29.75	357.00	13.00	<b>27.46</b>	12	
13	32.5	422.50	13.93	<b>30.33</b>	13	
14	34.5	483.00	14.87	<b>32.49</b>	14	
15	38.75	581.25	15.81	<b>36.76</b>	15	
16		0.00	16.76		16	
17		0.00	17.72		17	
18		0.00	18.68		18	
19		0.00	19.65		19	
20		0.00	20.62		20	
21		0.00	21.59		21	
22		0.00	22.56		22	
23		0.00	23.54		23	
24		0.00	24.52		24	
25		0.00	25.50		25	
26		0.00	26.48		26	
27		0.00	27.46		27	
28		0.00	28.44		28	
29		0.00	29.43		29	
30		0.00	30.41		30	

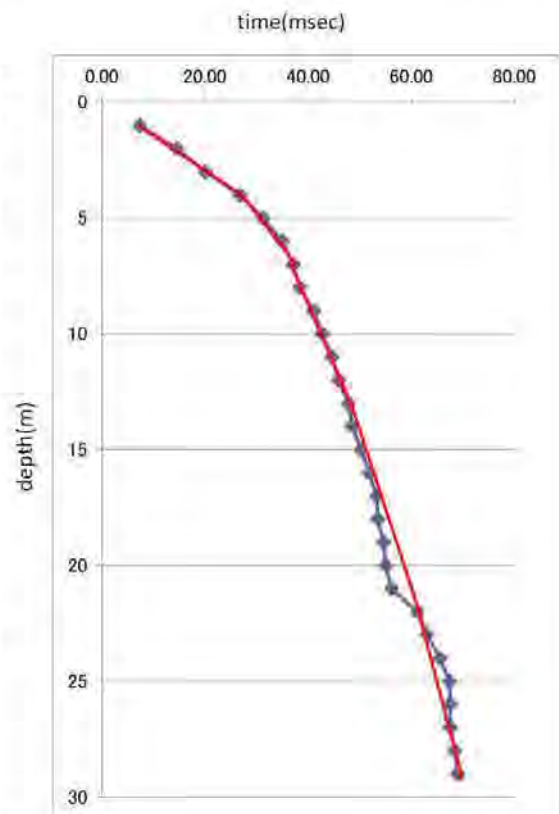


UB\_BO\_03\_P&S

P-wave						
offset(m)	5			correction		Provisional
depth	time			value	depth	Vp
(m)	(msec)	cal1	cal2	(msec)	(m)	(m/sec)
1	31	31.00	5.10	<b>6.08</b>	1	223
2	30	60.00	5.39	<b>11.14</b>	2	
3	29.25	87.75	5.83	<b>15.05</b>	3	
4	29.75	119.00	6.40	<b>18.58</b>	4	324
5	30	150.00	7.07	<b>21.21</b>	5	
6	29.25	175.50	7.81	<b>22.47</b>	6	696
7	29.75	208.25	8.60	<b>24.21</b>	7	
8	30.5	244.00	9.43	<b>25.86</b>	8	
9	30.75	276.75	10.30	<b>26.88</b>	9	
10	31.75	317.50	11.18	<b>28.40</b>	10	1659
11	32	352.00	12.08	<b>29.13</b>	11	
12	32	384.00	13.00	<b>29.54</b>	12	
13	33.25	432.25	13.93	<b>31.03</b>	13	
14	34.75	486.50	14.87	<b>32.73</b>	14	2767
15	33.5	502.50	15.81	<b>31.78</b>	15	
16	34.75	556.00	16.76	<b>33.17</b>	16	
17	34	578.00	17.72	<b>32.62</b>	17	
18	34.75	625.50	18.68	<b>33.48</b>	18	2767
19	35.75	679.25	19.65	<b>34.57</b>	19	
20	35.25	705.00	20.62	<b>34.20</b>	20	
21	35.25	740.25	21.59	<b>34.29</b>	21	
22	35.75	786.50	22.56	<b>34.86</b>	22	
23	36.25	833.75	23.54	<b>35.42</b>	23	
24	36.5	876.00	24.52	<b>35.73</b>	24	
25	36.5	912.50	25.50	<b>35.79</b>	25	
26	36.5	949.00	26.48	<b>35.84</b>	26	
27	36.75	992.25	27.46	<b>36.14</b>	27	
28	36.75	1029.00	28.44	<b>36.18</b>	28	
29	37.5	1087.50	29.43	<b>36.95</b>	29	



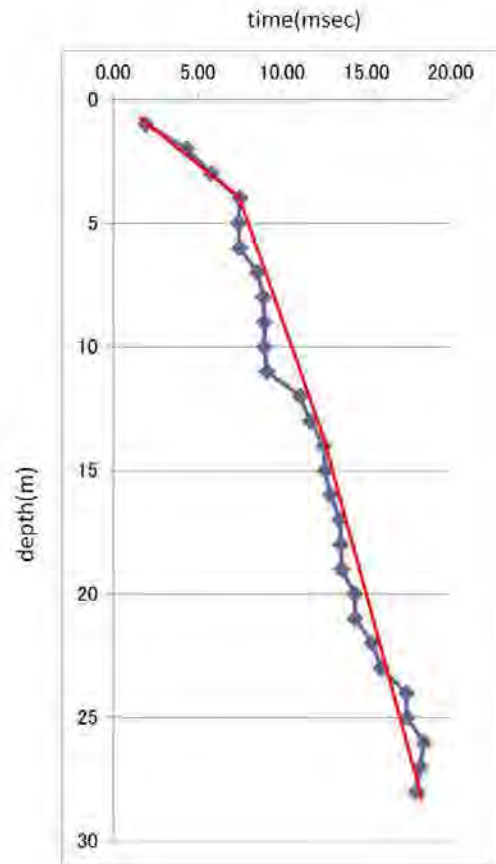
S-wave						
offset(m)	5			correction		Provisional
depth	time			value	depth	Vs
(m)	(msec)	cal1	cal2	(msec)	(m)	(m/sec)
1	37.25	37.25	5.10	<b>7.31</b>	1	155
2	39	78.00	5.39	<b>14.48</b>	2	
3	39	117.00	5.83	<b>20.07</b>	3	
4	42.75	171.00	6.40	<b>26.71</b>	4	291
5	44.25	221.25	7.07	<b>31.29</b>	5	
6	45.5	273.00	7.81	<b>34.95</b>	6	555
7	45.5	318.50	8.60	<b>37.02</b>	7	
8	45.25	362.00	9.43	<b>38.37</b>	8	
9	47	423.00	10.30	<b>41.09</b>	9	
10	47.75	477.50	11.18	<b>42.71</b>	10	674
11	49	539.00	12.08	<b>44.61</b>	11	
12	49.75	597.00	13.00	<b>45.92</b>	12	
13	51.25	666.25	13.93	<b>47.83</b>	13	
14	51.5	721.00	14.87	<b>48.50</b>	14	898
15	53	795.00	15.81	<b>50.28</b>	15	
16	54.25	868.00	16.76	<b>51.78</b>	16	
17	55.5	943.50	17.72	<b>53.24</b>	17	
18	55.5	999.00	18.68	<b>53.48</b>	18	898
19	56.5	1073.50	19.65	<b>54.64</b>	19	
20	56.75	1135.00	20.62	<b>55.06</b>	20	
21	57.75	1212.75	21.59	<b>56.18</b>	21	
22	62.75	1380.50	22.56	<b>61.19</b>	22	
23	64.5	1483.50	23.54	<b>63.03</b>	23	
24	67	1608.00	24.52	<b>65.59</b>	24	
25	68.75	1718.75	25.50	<b>67.41</b>	25	
26	68.75	1787.50	26.48	<b>67.51</b>	26	
27	68.75	1856.25	27.46	<b>67.60</b>	27	
28	69.5	1946.00	28.44	<b>68.42</b>	28	
29	70	2030.00	29.43	<b>68.98</b>	29	



UB\_BO\_04\_P&S

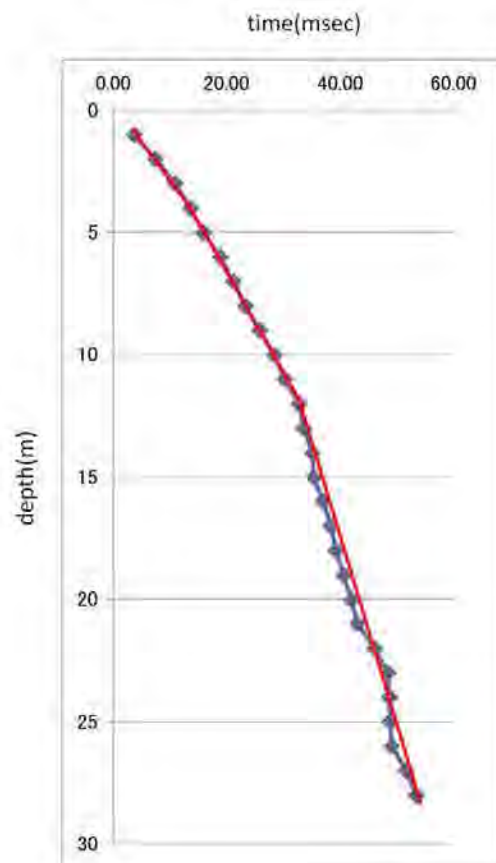
P-wave

offset(m)	5			correction	Provisional
depth	time			value	depth
(m)	(msec)	cal1	cal2	(msec)	(m)
1	9.75	9.75	5.10	1.91	1
2	11.75	23.50	5.39	4.36	2
3	11.25	33.75	5.83	5.79	3
4	12.00	48.00	6.40	7.50	4
5	10.50	52.50	7.07	7.42	5
6	9.75	58.50	7.81	7.49	6
7	10.50	73.50	8.60	8.54	7
8	10.50	84.00	9.43	8.90	8
9	10.25	92.25	10.30	8.96	9
10	10.00	100.00	11.18	8.94	10
11	10.00	110.00	12.08	9.10	11
12	12.00	144.00	13.00	11.08	12
13	12.50	162.50	13.93	11.67	13
14	13.25	185.50	14.87	12.48	14
15	13.25	198.75	15.81	12.57	15
16	13.50	216.00	16.76	12.89	16
17	14.00	238.00	17.72	13.43	17
18	14.00	252.00	18.68	13.49	18
19	14.00	266.00	19.65	13.54	19
20	14.75	295.00	20.62	14.31	20
21	14.75	309.75	21.59	14.35	21
22	15.75	346.50	22.56	15.36	22
23	16.25	373.75	23.54	15.88	23
24	17.75	426.00	24.52	17.38	24
25	17.75	443.75	25.50	17.41	25
26	18.75	487.50	26.48	18.41	26
27	18.50	499.50	27.46	18.19	27
28	18.25	511.00	28.44	17.97	28



S-wave

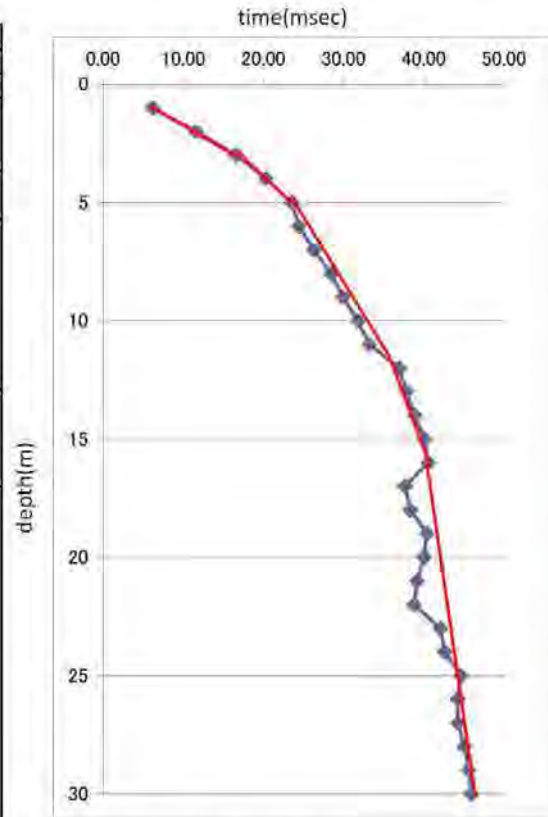
offset(m)	5			correction	Provisional
depth	time			value	depth
(m)	(msec)	cal1	cal2	(msec)	(m)
1	19.00	19.00	5.10	3.73	1
2	20.00	40.00	5.39	7.43	2
3	21.25	63.75	5.83	10.93	3
4	21.75	87.00	6.40	13.59	4
5	22.50	112.50	7.07	15.91	5
6	24.50	147.00	7.81	18.82	6
7	26.00	182.00	8.60	21.16	7
8	27.50	220.00	9.43	23.32	8
9	29.50	265.50	10.30	25.79	9
10	31.75	317.50	11.18	28.40	10
11	33.25	365.75	12.08	30.27	11
12	35.50	426.00	13.00	32.77	12
13	36.00	468.00	13.93	33.60	13
14	37.25	521.50	14.87	35.08	14
15	37.25	558.75	15.81	35.34	15
16	38.75	620.00	16.76	36.99	16
17	40.00	680.00	17.72	38.37	17
18	40.75	733.50	18.68	39.26	18
19	42.00	798.00	19.65	40.62	19
20	43.25	865.00	20.62	41.96	20
21	44.25	929.25	21.59	43.05	21
22	47.25	1039.50	22.56	46.08	22
23	49.50	1138.50	23.54	48.37	23
24	49.75	1194.00	24.52	48.70	24
25	49.75	1243.75	25.50	48.78	25
26	50.00	1300.00	26.48	49.10	26
27	52.50	1417.50	27.46	51.62	27
28	54.25	1519.00	28.44	53.41	28



NH\_01\_P&S

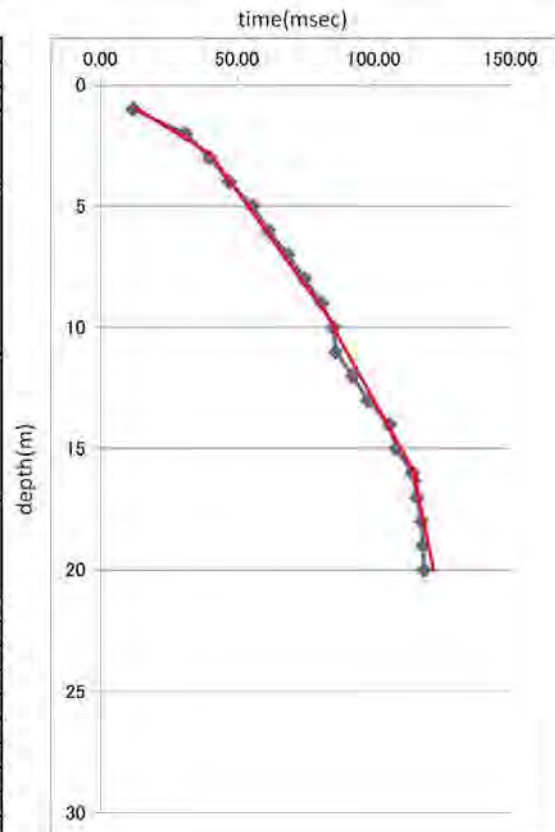
P-wave

offset(m)	5			correction		Provisional
depth	time			value	depth	Vp
(m)	(msec)	cal1	cal2	(msec)	(m)	(m/sec)
1	31.25	31.25	5.10	<b>6.13</b>	1	191
2	31.25	62.50	5.39	<b>11.61</b>	2	
3	32.25	96.75	5.83	<b>16.59</b>	3	
4	32.5	130.00	6.40	<b>20.30</b>	4	256
5	33.25	166.25	7.07	<b>23.51</b>	5	
6	31.75	190.50	7.81	<b>24.39</b>	6	522
7	32.25	225.75	8.60	<b>26.24</b>	7	
8	33.5	268.00	9.43	<b>28.41</b>	8	
9	34.25	308.25	10.30	<b>29.94</b>	9	
10	35.5	355.00	11.18	<b>31.75</b>	10	
11	36.5	401.50	12.08	<b>33.23</b>	11	1098
12	40	480.00	13.00	<b>36.92</b>	12	
13	40.5	526.50	13.93	<b>37.80</b>	13	
14	41.25	577.50	14.87	<b>38.85</b>	14	
15	42.25	633.75	15.81	<b>40.08</b>	15	
16	42.5	680.00	16.76	<b>40.57</b>	16	2641
17	39.25	667.25	17.72	<b>37.66</b>	17	
18	39.75	715.50	18.68	<b>38.30</b>	18	
19	41.75	793.25	19.65	<b>40.38</b>	19	
20	41.25	825.00	20.62	<b>40.02</b>	20	
21	40.25	845.25	21.59	<b>39.16</b>	21	
22	39.75	874.50	22.56	<b>38.76</b>	22	
23	43	989.00	23.54	<b>42.02</b>	23	
24	43.5	1044.00	24.52	<b>42.59</b>	24	
25	45.5	1137.50	25.50	<b>44.62</b>	25	
26	45	1170.00	26.48	<b>44.19</b>	26	
27	45	1215.00	27.46	<b>44.25</b>	27	
28	45.75	1281.00	28.44	<b>45.04</b>	28	
29	46.25	1341.25	29.43	<b>45.58</b>	29	
30	46.50	1395.00	30.41	<b>45.87</b>	30	



S-wave

offset(m)	5			correction		Provisional
depth	time			value	depth	Vs
(m)	(msec)	cal1	cal2	(msec)	(m)	(m/sec)
1	61.25	61.25	5.10	<b>12.01</b>	1	72
2	83.75	167.50	5.39	<b>31.10</b>	2	
3	77.5	232.50	5.83	<b>39.87</b>	3	
4	75.25	301.00	6.40	<b>47.01</b>	4	154
5	78.75	393.75	7.07	<b>55.68</b>	5	
6	80	480.00	7.81	<b>61.46</b>	6	
7	84.25	589.75	8.60	<b>68.56</b>	7	
8	88	704.00	9.43	<b>74.62</b>	8	
9	92.75	834.75	10.30	<b>81.08</b>	9	208
10	95.25	952.50	11.18	<b>85.19</b>	10	
11	94.5	1039.50	12.08	<b>86.03</b>	11	
12	100	1200.00	13.00	<b>92.31</b>	12	
13	104.75	1361.75	13.93	<b>97.77</b>	13	
14	112.25	1571.50	14.87	<b>105.71</b>	14	931
15	114	1710.00	15.81	<b>108.15</b>	15	
16	119.5	1912.00	16.76	<b>114.06</b>	16	
17	120.75	2052.75	17.72	<b>115.84</b>	17	
18	121.75	2191.50	18.68	<b>117.31</b>	18	
19	122	2318.00	19.65	<b>117.98</b>	19	
20	122	2440.00	20.62	<b>118.36</b>	20	
21		0.00	21.59		21	
22		0.00	22.56		22	
23		0.00	23.54		23	
24		0.00	24.52		24	
25		0.00	25.50		25	
26		0.00	26.48		26	
27		0.00	27.46		27	
28		0.00	28.44		28	
29		0.00	29.43		29	
30		0.00	30.41		30	

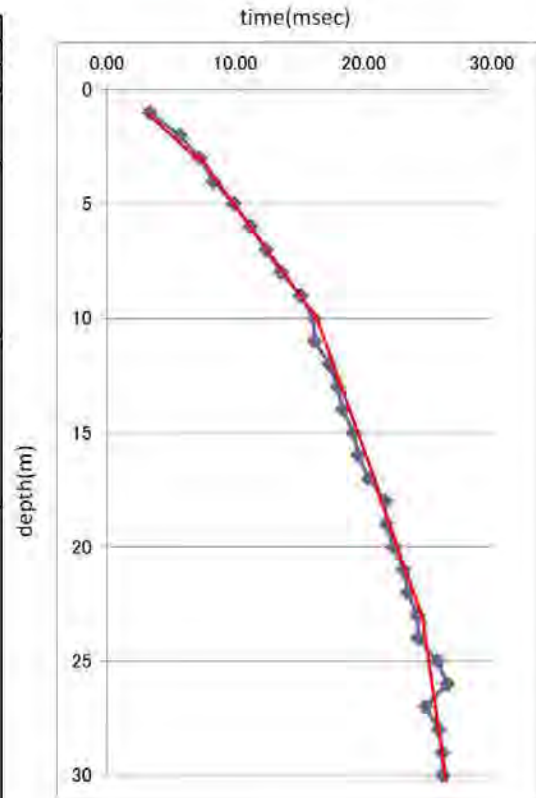




NH\_02\_P&S

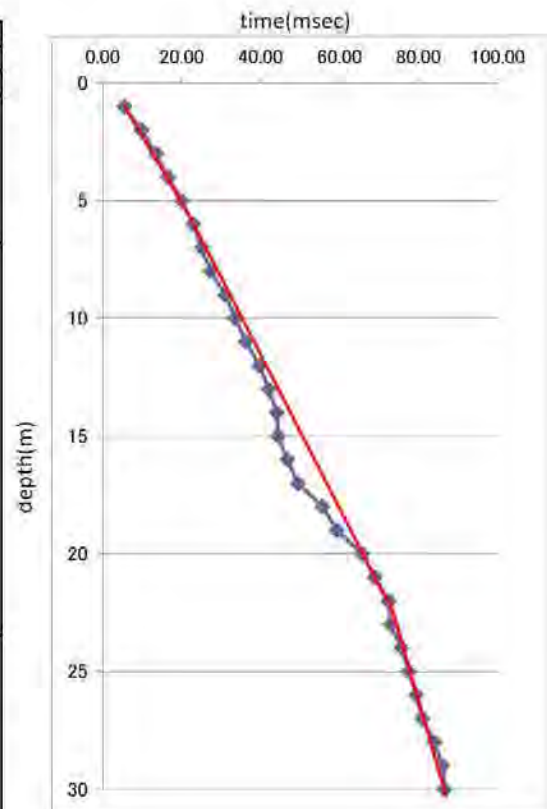
P-wave

offset(m)	5			correction		Provisional
depth	time			value	depth	V <sub>p</sub>
(m)	(msec)	cal1	cal2	(msec)	(m)	(m/sec)
1	17	17.00	5.10	3.33	1	517
2	15.25	30.50	5.39	5.66	2	
3	14	42.00	5.83	7.20	3	
4	13.25	53.00	6.40	8.28	4	787
5	14	70.00	7.07	9.90	5	
6	14.5	87.00	7.81	11.14	6	
7	15.25	106.75	8.60	12.41	7	
8	16	128.00	9.43	13.57	8	1633
9	17.25	155.25	10.30	15.08	9	
10	18	180.00	11.18	16.10	10	
11	17.75	195.25	12.08	16.16	11	2260
12	18.75	225.00	13.00	17.31	12	
13	19.25	250.25	13.93	17.97	13	
14	19.5	273.00	14.87	18.36	14	
15	20.25	303.75	15.81	19.21	15	
16	20.5	328.00	16.76	19.57	16	
17	21.25	361.25	17.72	20.39	17	
18	22.5	405.00	18.68	21.68	18	
19	22.5	427.50	19.65	21.76	19	
20	23	460.00	20.62	22.31	20	
21	23.75	498.75	21.59	23.10	21	
22	24	528.00	22.56	23.40	22	
23	24.75	569.25	23.54	24.19	23	
24	24.75	594.00	24.52	24.23	24	
25	26.25	656.25	25.50	25.74	25	
26	27	702.00	26.48	26.51	26	
27	25.25	681.75	27.46	24.83	27	
28	26.25	735.00	28.44	25.84	28	
29	26.50	768.50	29.43	26.11	29	
30	26.50	795.00	30.41	26.14	30	



S-wave

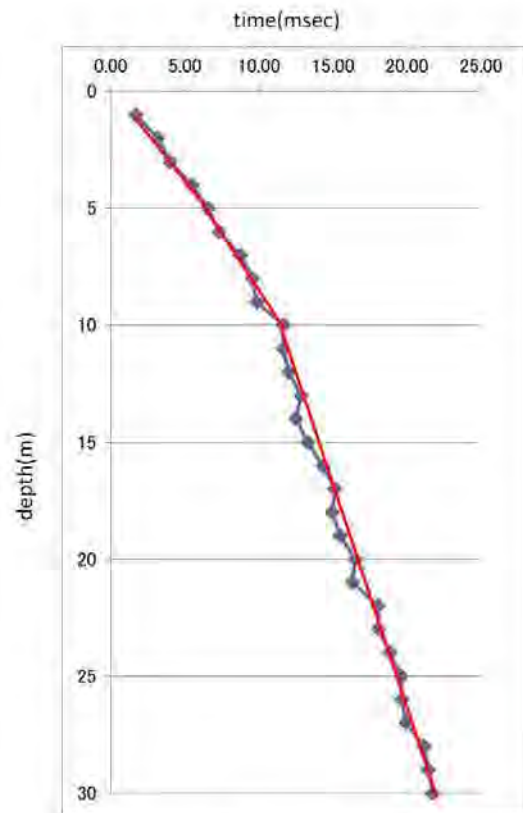
offset(m)	5			correction		Provisional
depth	time			value	depth	V <sub>s</sub>
(m)	(msec)	cal1	cal2	(msec)	(m)	(m/sec)
1	27.75	27.75	5.10	5.44	1	287
2	26.5	53.00	5.39	9.84	2	
3	26.25	78.75	5.83	13.51	3	
4	26.5	106.00	6.40	16.55	4	323
5	28.25	141.25	7.07	19.98	5	
6	29.75	178.50	7.81	22.85	6	
7	30.75	215.25	8.60	25.02	7	
8	32.25	258.00	9.43	27.35	8	565
9	35.5	319.50	10.30	31.03	9	
10	37.5	375.00	11.18	33.54	10	
11	39.75	437.25	12.08	36.19	11	
12	43	516.00	13.00	39.69	12	
13	45	585.00	13.93	42.00	13	
14	46.75	654.50	14.87	44.03	14	
15	46.75	701.25	15.81	44.35	15	
16	49	784.00	16.76	46.77	16	
17	51.5	875.50	17.72	49.41	17	
18	57.75	1039.50	18.68	55.64	18	
19	61.25	1163.75	19.65	59.23	19	
20	67.75	1355.00	20.62	65.73	20	
21	70.75	1485.75	21.59	68.83	21	
22	74.25	1633.50	22.56	72.40	22	
23	74.5	1713.50	23.54	72.80	23	
24	77.25	1854.00	24.52	75.63	24	
25	79	1975.00	25.50	77.47	25	
26	80.75	2099.50	26.48	79.30	26	
27	82.25	2220.75	27.46	80.87	27	
28	85.25	2387.00	28.44	83.92	28	
29	87.25	2530.25	29.43	85.98	29	
30	87.75	2632.50	30.41	86.56	30	



Bl\_01\_P&S

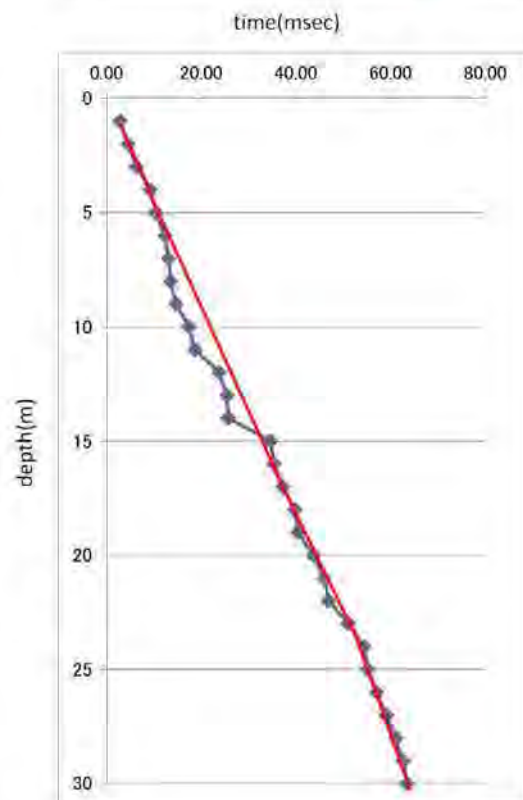
P-wave

offset(m)	5			correction	Provisional
depth	time			value	depth
(m)	(msec)	cal1	cal2	(msec)	(m)
1	8.5	8.50	5.10	1.67	1
2	8.5	17.00	5.39	3.16	2
3	7.75	23.25	5.83	3.99	3
4	8.75	35.00	6.40	5.47	4
5	9.25	46.25	7.07	6.54	5
6	9.5	57.00	7.81	7.30	6
7	10.75	75.25	8.60	8.75	7
8	11.25	90.00	9.43	9.54	8
9	11.25	101.25	10.30	9.83	9
10	13	130.00	11.18	11.63	10
11	12.75	140.25	12.08	11.61	11
12	13	156.00	13.00	12.00	12
13	13.75	178.75	13.93	12.83	13
14	13.25	185.50	14.87	12.48	14
15	14	210.00	15.81	13.28	15
16	15	240.00	16.76	14.32	16
17	15.75	267.75	17.72	15.11	17
18	15.5	279.00	18.68	14.93	18
19	16	304.00	19.65	15.47	19
20	17	340.00	20.62	16.49	20
21	16.75	351.75	21.59	16.29	21
22	18.5	407.00	22.56	18.04	22
23	18.5	425.50	23.54	18.08	23
24	19.25	462.00	24.52	18.85	24
25	20	500.00	25.50	19.61	25
26	20	520.00	26.48	19.64	26
27	20.25	546.75	27.46	19.91	27
28	21.5	602.00	28.44	21.17	28
29	21.75	630.75	29.43	21.43	29
30	22	660.00	30.41	21.70	30



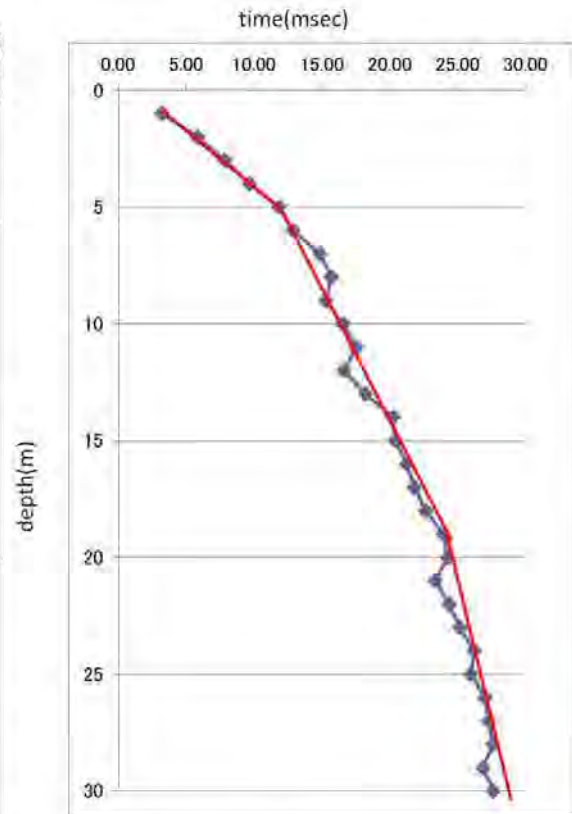
S-wave

offset(m)	5			correction	Provisional
depth	time			value	depth
(m)	(msec)	cal1	cal2	(msec)	(m)
1	14.50	14.50	5.10	2.84	1
2	12.25	24.50	5.39	4.55	2
3	12.25	36.75	5.83	6.30	3
4	14.75	59.00	6.40	9.21	4
5	14.75	73.75	7.07	10.43	5
6	16.00	96.00	7.81	12.29	6
7	16.00	112.00	8.60	13.02	7
8	16.00	128.00	9.43	13.57	8
9	16.75	150.75	10.30	14.64	9
10	19.50	195.00	11.18	17.44	10
11	20.50	225.50	12.08	18.66	11
12	25.75	309.00	13.00	23.77	12
13	27.25	354.25	13.93	25.43	13
14	27.25	381.50	14.87	25.66	14
15	36.50	547.50	15.81	34.63	15
16	37.00	592.00	16.76	35.32	16
17	38.75	658.75	17.72	37.18	17
18	41.25	742.50	18.68	39.75	18
19	41.75	793.25	19.65	40.38	19
20	45.00	900.00	20.62	43.66	20
21	47.25	992.25	21.59	45.97	21
22	48.00	1056.00	22.56	46.81	22
23	52.25	1201.75	23.54	51.06	23
24	55.50	1332.00	24.52	54.33	24
25	56.25	1406.25	25.50	55.16	25
26	58.00	1508.00	26.48	56.96	26
27	60.00	1620.00	27.46	59.00	27
28	62.00	1736.00	28.44	61.03	28
29	63.50	1841.50	29.43	62.58	29
30	64.25	1927.50	30.41	63.38	30

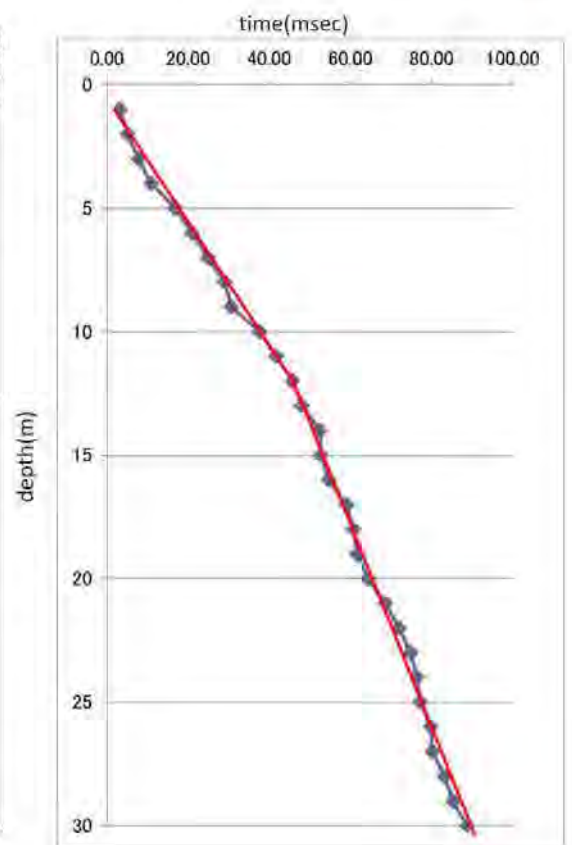


BI.03.P&S

P-wave						
offset(m)	5			correction		Provisional
depth	time			value	depth	Vp
(m)	(msec)	cal1	cal2	(msec)	(m)	(m/sec)
1	16.5	16.50	5.10	3.24	1	465
2	15.75	31.50	5.39	5.85	2	
3	15.25	45.75	5.83	7.85	3	
4	15.50	62.00	6.40	9.68	4	
5	16.75	83.75	7.07	11.84	5	
6	16.75	100.50	7.81	12.87	6	
7	18.25	127.75	8.60	14.85	7	1158
8	18.50	148.00	9.43	15.69	8	
9	17.50	157.50	10.30	15.30	9	
10	18.50	185.00	11.18	16.55	10	
11	19.25	211.75	12.08	17.52	11	
12	18.00	216.00	13.00	16.62	12	
13	19.50	253.50	13.93	18.20	13	
14	21.50	301.00	14.87	20.25	14	
15	21.50	322.50	15.81	20.40	15	
16	22.25	356.00	16.76	21.24	16	
17	22.75	386.75	17.72	21.83	17	2417
18	23.50	423.00	18.68	22.64	18	
19	24.75	470.25	19.65	23.94	19	
20	25.00	500.00	20.62	24.25	20	
21	24.00	504.00	21.59	23.35	21	
22	25.00	550.00	22.56	24.38	22	
23	25.75	592.25	23.54	25.16	23	
24	26.75	642.00	24.52	26.19	24	
25	26.50	662.50	25.50	25.99	25	
26	27.50	715.00	26.48	27.01	26	
27	27.75	749.25	27.46	27.29	27	
28	28.00	784.00	28.44	27.56	28	
29	27.25	790.25	29.43	26.85	29	
30	28.00	840.00	30.41	27.62	30	



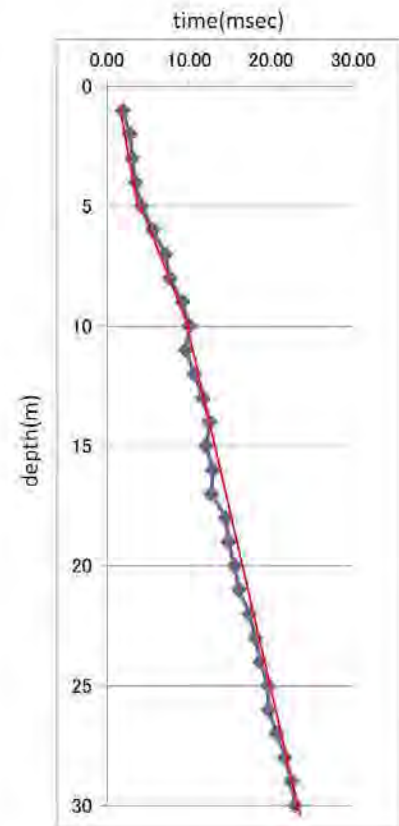
S-wave						
offset(m)	5			correction		Provisional
depth	time			value	depth	Vs
(m)	(msec)	cal1	cal2	(msec)	(m)	(m/sec)
1	16.25	16.25	5.10	3.19	1	259
2	13.75	27.50	5.39	5.11	2	
3	15	45.00	5.83	7.72	3	
4	17.25	69.00	6.40	10.78	4	
5	23.75	118.75	7.07	16.79	5	
6	27.25	163.50	7.81	20.93	6	
7	30.5	213.50	8.60	24.82	7	
8	34.25	274.00	9.43	29.04	8	
9	35	315.00	10.30	30.60	9	
10	42	420.00	11.18	37.57	10	
11	45.75	503.25	12.08	41.65	11	418
12	49.5	594.00	13.00	45.69	12	
13	51.5	669.50	13.93	48.07	13	
14	55.75	780.50	14.87	52.50	14	
15	55.5	832.50	15.81	52.65	15	
16	57.25	916.00	16.76	54.64	16	
17	61.5	1045.50	17.72	59.00	17	
18	63	1134.00	18.68	60.70	18	
19	63.75	1211.25	19.65	61.65	19	
20	66.25	1325.00	20.62	64.27	20	
21	70.5	1480.50	21.59	68.58	21	
22	73.75	1622.50	22.56	71.92	22	
23	76.5	1759.50	23.54	74.75	23	
24	78	1872.00	24.52	76.36	24	
25	78.75	1968.75	25.50	77.22	25	
26	81.25	2112.50	26.48	79.79	26	
27	81.5	2200.50	27.46	80.14	27	
28	84.5	2366.00	28.44	83.18	28	
29	86.5	2508.50	29.43	85.24	29	
30	90	2700.00	30.41	88.78	30	



BR01\_P&S

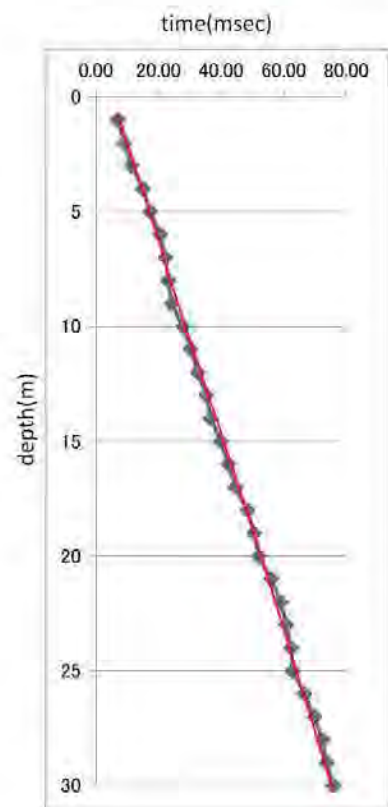
P-wave

offset(m)	5			correction		Provisional
depth	time			value	depth	Vp
(m)	(msec)	cal1	cal2	(msec)	(m)	(m/sec)
1	9.75	10	5.10	1.91	1	1104
2	7.50	15	5.39	2.79	2	
3	6.00	18	5.83	3.09	3	
4	5.50	22	6.40	3.44	4	
5	6.00	30	7.07	4.24	5	
6	7.25	44	7.81	5.57	6	
7	8.75	61	8.60	7.12	7	
8	9.00	72	9.43	7.63	8	
9	10.50	95	10.30	9.18	9	
10	11.25	113	11.18	10.08	10	
11	10.50	116	12.08	9.56	11	1554
12	11.50	138	13.00	10.62	12	
13	12.50	163	13.93	11.67	13	
14	13.25	186	14.87	12.48	14	
15	12.75	191	15.81	12.10	15	
16	13.50	216	16.76	12.89	16	
17	13.25	225	17.72	12.71	17	
18	15.00	270	18.68	14.45	18	
19	15.25	290	19.65	14.75	19	
20	16.00	320	20.62	15.52	20	
21	16.50	347	21.59	16.05	21	
22	17.75	391	22.56	17.31	22	
23	18.50	426	23.54	18.08	23	
24	19.00	456	24.52	18.60	24	
25	20.00	500	25.50	19.61	25	
26	20.00	520	26.48	19.64	26	
27	21.00	567	27.46	20.65	27	
28	22.00	616	28.44	21.66	28	
29	22.75	660	29.43	22.42	29	
30	23.25	698	30.41	22.93	30	



S-wave

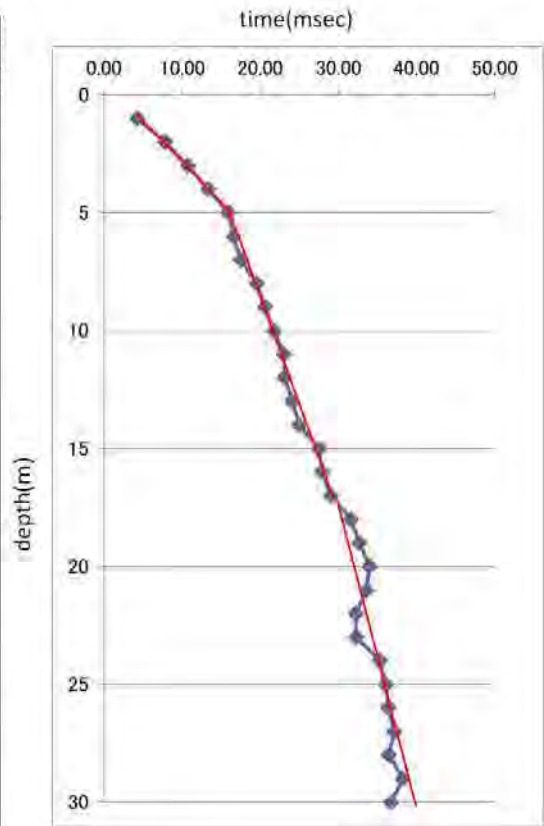
offset(m)	5			correction		Provisional
depth	time			value	depth	Vs
(m)	(msec)	cal1	cal2	(msec)	(m)	(m/sec)
1	35	35	5.10	6.86	1	392
2	24.25	49	5.39	9.01	2	
3	22	66	5.83	11.32	3	
4	24	96	6.40	14.99	4	
5	24.5	123	7.07	17.32	5	
6	26.75	161	7.81	20.55	6	
7	27.25	191	8.60	22.17	7	
8	27.25	218	9.43	23.11	8	419
9	27.75	250	10.30	24.26	9	
10	31	310	11.18	27.73	10	
11	33.25	366	12.08	30.27	11	
12	35.25	423	13.00	32.54	12	
13	37.75	491	13.93	35.23	13	
14	39	546	14.87	36.73	14	
15	42	630	15.81	39.84	15	436
16	44.25	708	16.76	42.24	16	
17	46.5	791	17.72	44.61	17	
18	50.25	905	18.68	48.42	18	
19	52.25	993	19.65	50.53	19	
20	53.5	1070	20.62	51.90	20	
21	57.5	1208	21.59	55.94	21	
22	60.5	1331	22.56	59.00	22	
23	62.25	1432	23.54	60.83	23	
24	63.75	1530	24.52	62.41	24	
25	64	1600	25.50	62.76	25	
26	67.75	1762	26.48	66.53	26	
27	71	1917	27.46	69.81	27	
28	73.5	2058	28.44	72.36	28	
29	74.75	2168	29.43	73.66	29	
30	77	2310	30.41	75.95	30	



BR.02.P&S

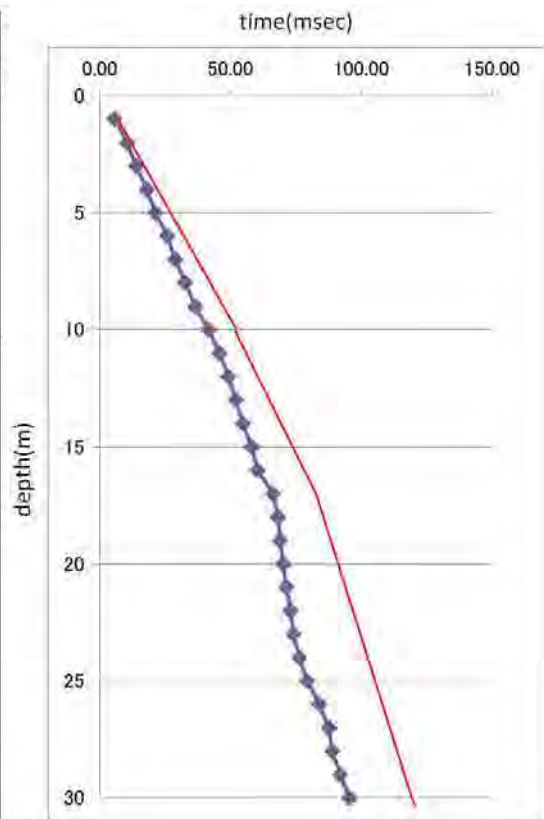
P-wave

offset(m)	5			correction	Provisional
depth	time			value	depth
(m)	(msec)	cal1	cal2	(msec)	(m)
1	21.50	21.50	5.10	<b>4.22</b>	1
2	21.00	42.00	5.39	<b>7.80</b>	2
3	20.75	62.25	5.83	<b>10.68</b>	3
4	21.25	85.00	6.40	<b>13.27</b>	4
5	22.50	112.50	7.07	<b>15.91</b>	5
6	21.50	129.00	7.81	<b>16.52</b>	6
7	21.50	150.50	8.60	<b>17.50</b>	7
8	23.00	184.00	9.43	<b>19.50</b>	8
9	23.50	211.50	10.30	<b>20.54</b>	9
10	24.25	242.50	11.18	<b>21.69</b>	10
11	25.25	277.75	12.08	<b>22.99</b>	11
12	25.00	300.00	13.00	<b>23.08</b>	12
13	25.75	334.75	13.93	<b>24.03</b>	13
14	26.50	371.00	14.87	<b>24.96</b>	14
15	29.00	435.00	15.81	<b>27.51</b>	15
16	29.25	468.00	16.76	<b>27.92</b>	16
17	30.25	514.25	17.72	<b>29.02</b>	17
18	32.75	589.50	18.68	<b>31.56</b>	18
19	33.75	641.25	19.65	<b>32.64</b>	19
20	35.00	700.00	20.62	<b>33.95</b>	20
21	34.50	724.50	21.59	<b>33.56</b>	21
22	33.00	726.00	22.56	<b>32.18</b>	22
23	33.00	759.00	23.54	<b>32.25</b>	23
24	36.00	864.00	24.52	<b>35.24</b>	24
25	36.75	918.75	25.50	<b>36.04</b>	25
26	37.00	962.00	26.48	<b>36.33</b>	26
27	37.75	1019.25	27.46	<b>37.12</b>	27
28	37.00	1036.00	28.44	<b>36.42</b>	28
29	38.75	1123.75	29.43	<b>38.19</b>	29
30	37.25	1117.50	30.41	<b>36.74</b>	30



S-wave

offset(m)	5			correction	Provisional
depth	time			value	depth
(m)	(msec)	cal1	cal2	(msec)	(m)
1	28.75	28.75	5.10	<b>5.64</b>	1
2	27.75	55.50	5.39	<b>10.31</b>	2
3	27	81.00	5.83	<b>13.89</b>	3
4	28.75	115.00	6.40	<b>17.96</b>	4
5	30	150.00	7.07	<b>21.21</b>	5
6	33.5	201.00	7.81	<b>25.74</b>	6
7	35.5	248.50	8.60	<b>28.89</b>	7
8	38.5	308.00	9.43	<b>32.65</b>	8
9	41.75	375.75	10.30	<b>36.50</b>	9
10	46.5	465.00	11.18	<b>41.59</b>	10
11	50.25	552.75	12.08	<b>45.75</b>	11
12	53.25	639.00	13.00	<b>49.15</b>	12
13	55.75	724.75	13.93	<b>52.03</b>	13
14	58	812.00	14.87	<b>54.62</b>	14
15	61.25	918.75	15.81	<b>58.11</b>	15
16	63.25	1012.00	16.76	<b>60.37</b>	16
17	69	1173.00	17.72	<b>66.20</b>	17
18	70.75	1273.50	18.68	<b>68.17</b>	18
19	71.25	1353.75	19.65	<b>68.90</b>	19
20	72.25	1445.00	20.62	<b>70.09</b>	20
21	73.25	1538.25	21.59	<b>71.26</b>	21
22	74.75	1644.50	22.56	<b>72.89</b>	22
23	75.75	1742.25	23.54	<b>74.02</b>	23
24	78	1872.00	24.52	<b>76.36</b>	24
25	80.75	2018.75	25.50	<b>79.18</b>	25
26	85.5	2223.00	26.48	<b>83.96</b>	26
27	89	2403.00	27.46	<b>87.51</b>	27
28	90.25	2527.00	28.44	<b>88.84</b>	28
29	93.25	2704.25	29.43	<b>91.89</b>	29
30	96.75	2902.50	30.41	<b>95.43</b>	30

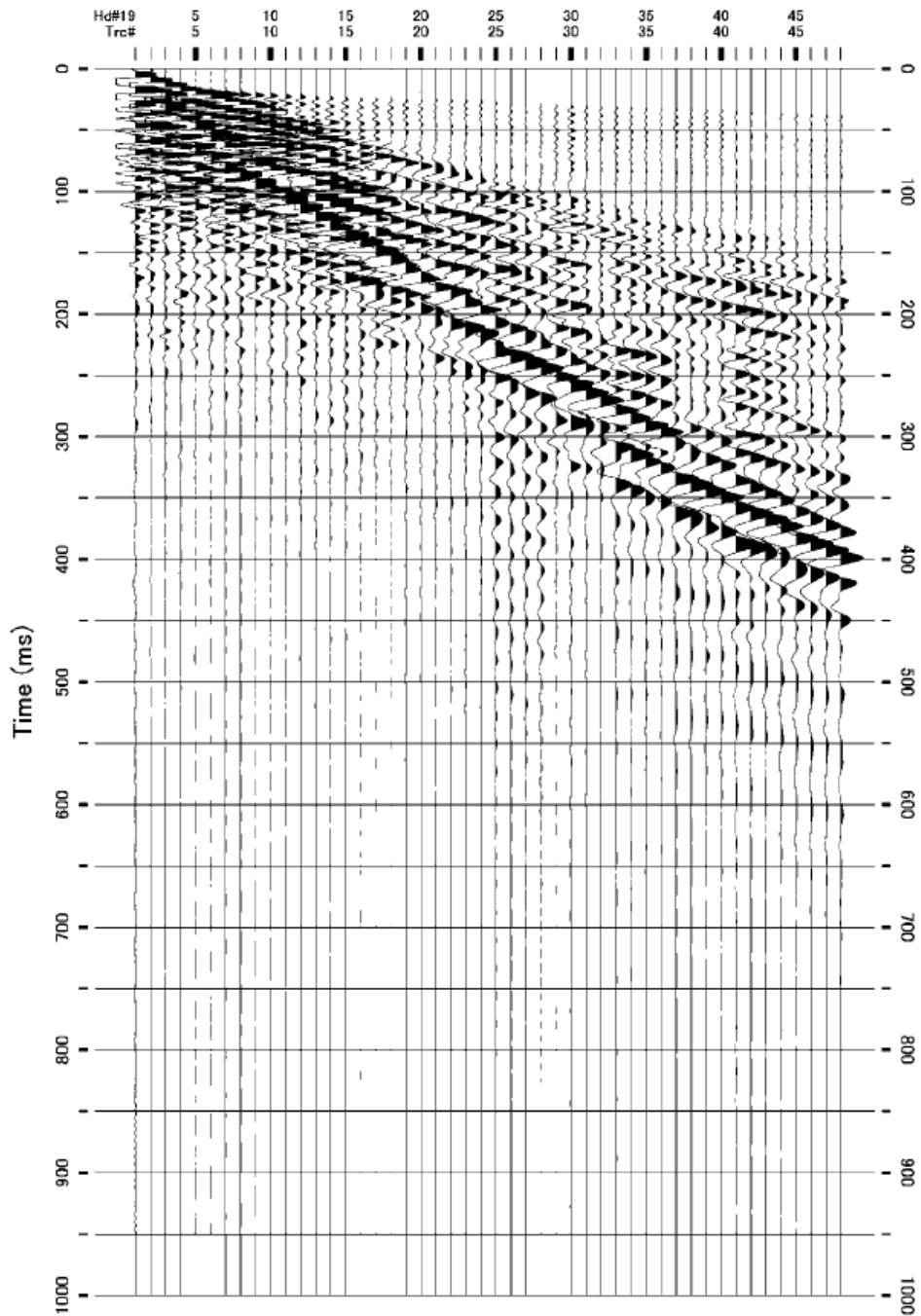


(2) Summary of S Wave Velocity

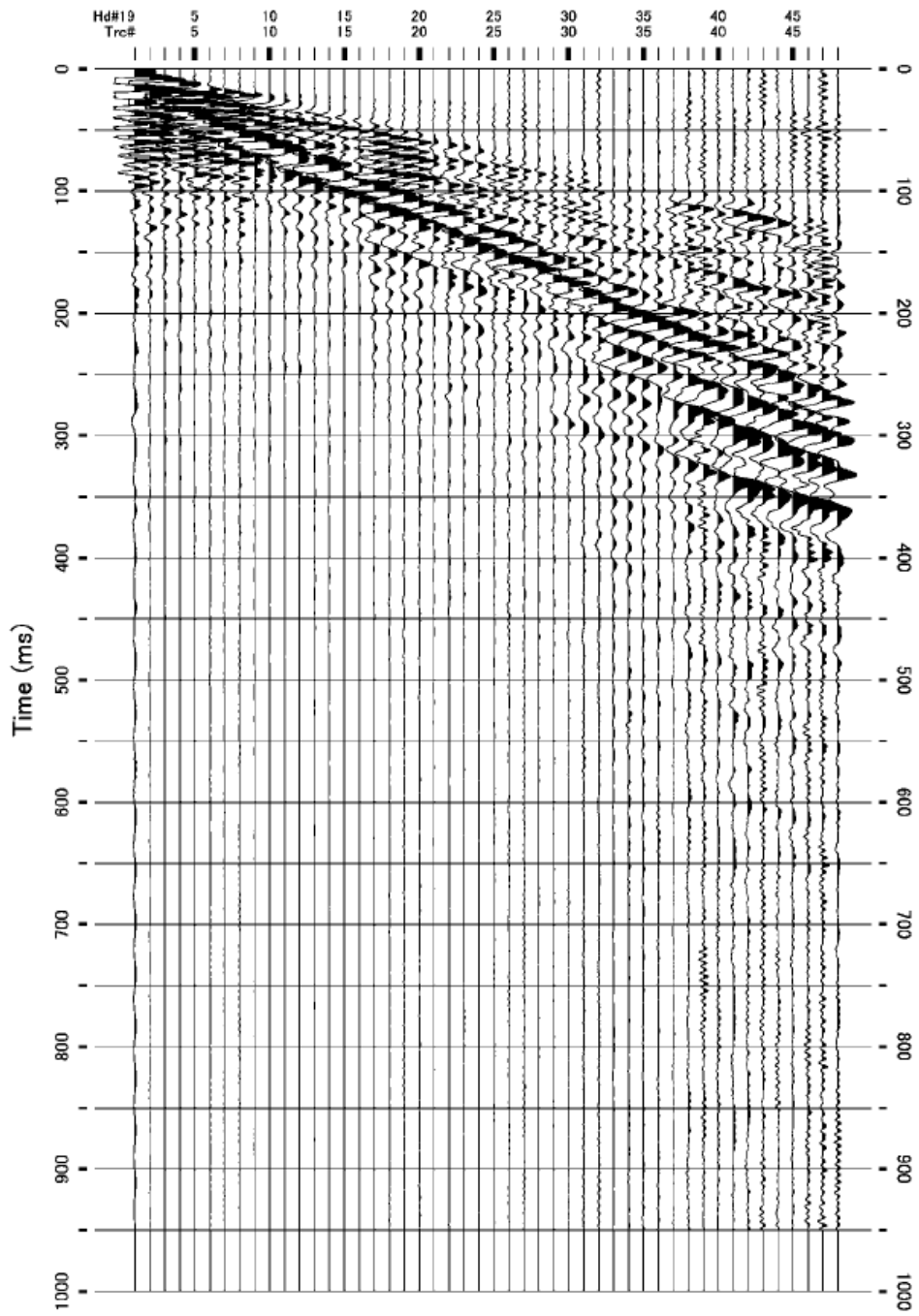
No.	Depth (GL- m)	S wave velocity (m/s)	Main soil	Mean N value
UB_BO_01	0.0-13.0	439	Sand and cobble mixed gravel	29
	13.0-25.0	841	Gravel with sand, cobble and clay	49
UB_BO_02	0.0-5.0	318	Clay, sand and cobble-mixed gravel	39
	5.0-15.0	492	Sandy gravel	50
UB_BO_03	0.0-4.0	155	Clay, sand and cobble-mixed gravel	39
	4.0-7.0	291	Clay, sand and cobble-mixed gravel	38
	7.0-13.0	555	Sand and cobble-mixed gravel	35
	13.0-22.0	674	Clay, sand and cobble-mixed gravel	42
	22.0-30.0	898	Clay, sand and cobble-mixed gravel	50
UB_BO_04	0.0-4.0	304	Clay, sand and cobble-mixed gravel	26
	4.0-12.0	417	Clay, sand and cobble-mixed gravel	50
	12.0-28.0	775	Gravel-mixed clayey sand	50
NH_01	0.0-3.0	72	Gravel-mixed clayey sand	20
	3.0-10.0	154	Gravel-mixed clayey sand	33
	10.0-16.0	208	Clay	47
	16.0-20.0	931	Clay	48
NH_02	0.0-6.0	287	Sandy clay	22
	6.0-22.0	323	Sandy clay	44
	22.0-30.0	565	Sandy clay	46
BI_01	0.0-4.0	471	Gravel-mixed sand	19
	4.0-14.0	442	Sand-mixed clayey gravel	36
	14.0-30.0	522	Sand-mixed clayey gravel	37
BI_03	0.0-12.0	259	Sand and clay	34
	12.0-30.0	418	Sand and gravel-mixed clay	41
BR_01	0.0-7.0	392	Clayey sand	24
	7.0-18.0	419	Clayey sand	39
	18.0-30.0	436	Gravel-mixed sandy clay	43
BR_02	0.0-10.0	250	Clay and gravel-mixed sand	34
	10.0-17.0	284	Clay and gravel-mixed sand	37
	17.0-30.0	445	Sandy clay	42

### 1.3.5 Surface Wave Exploration

#### (1) Wave Form Record

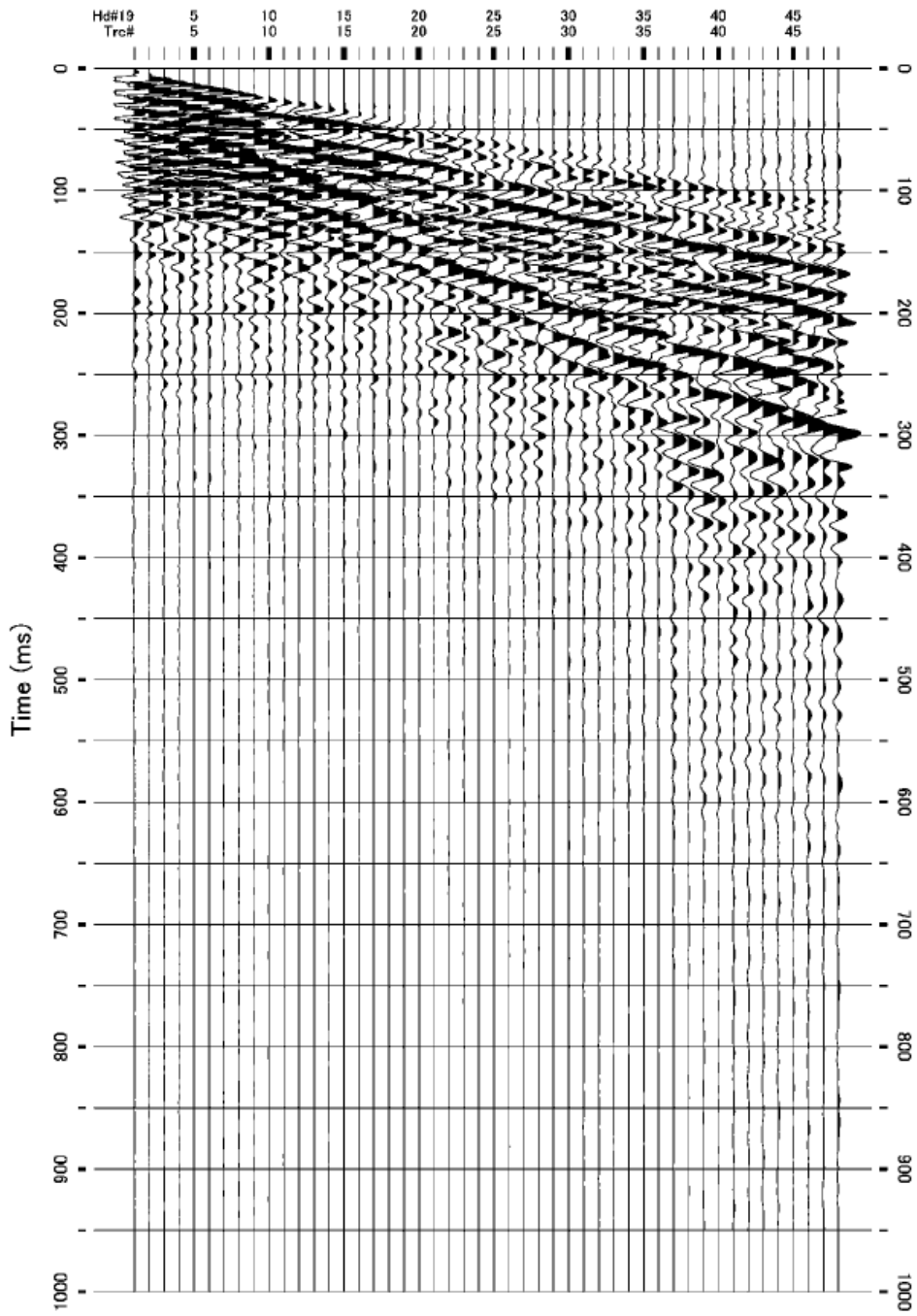


Field data (Surface wave shot record) : UB\_01

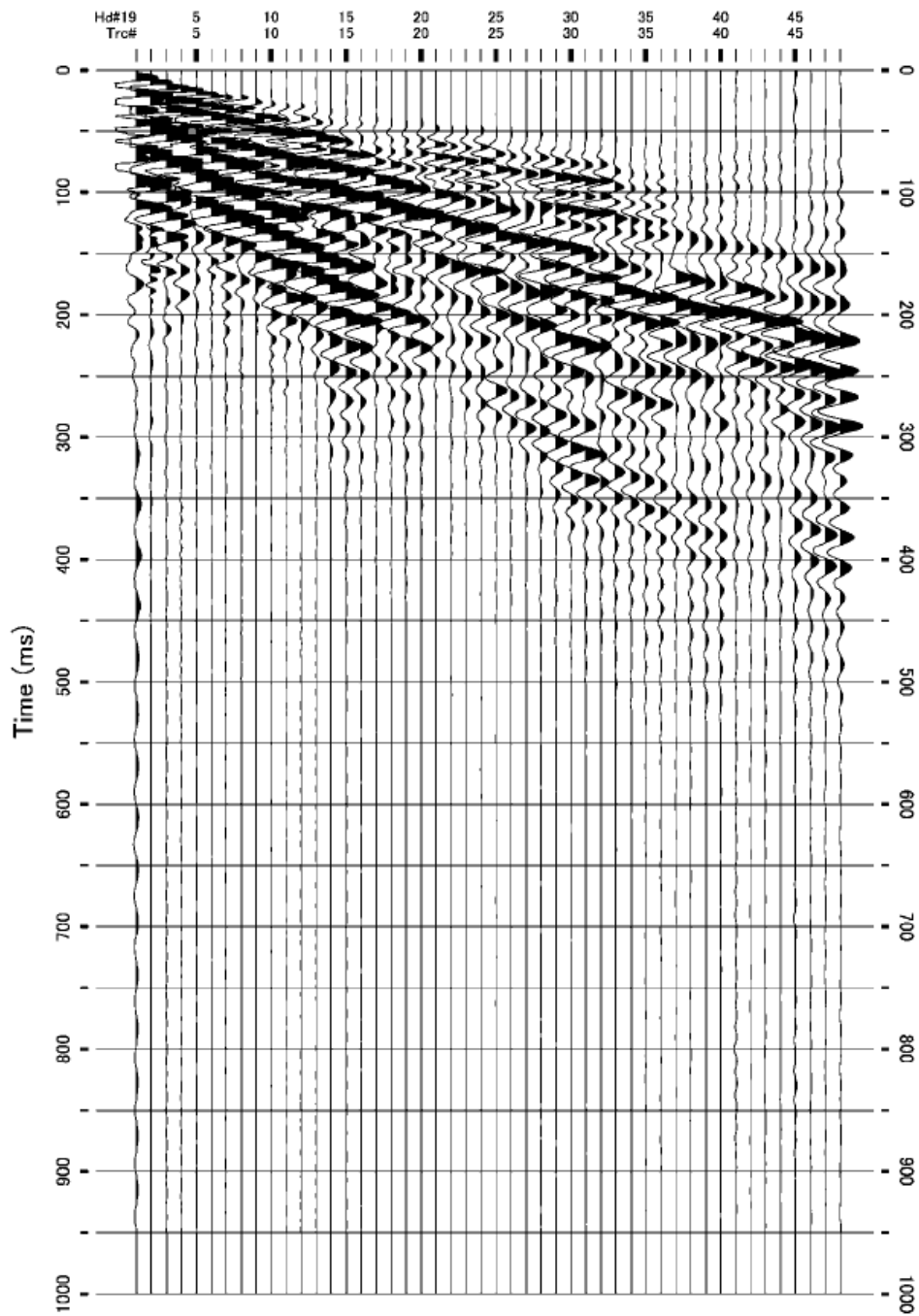


Field data (Surface wave shot record) : UB\_02

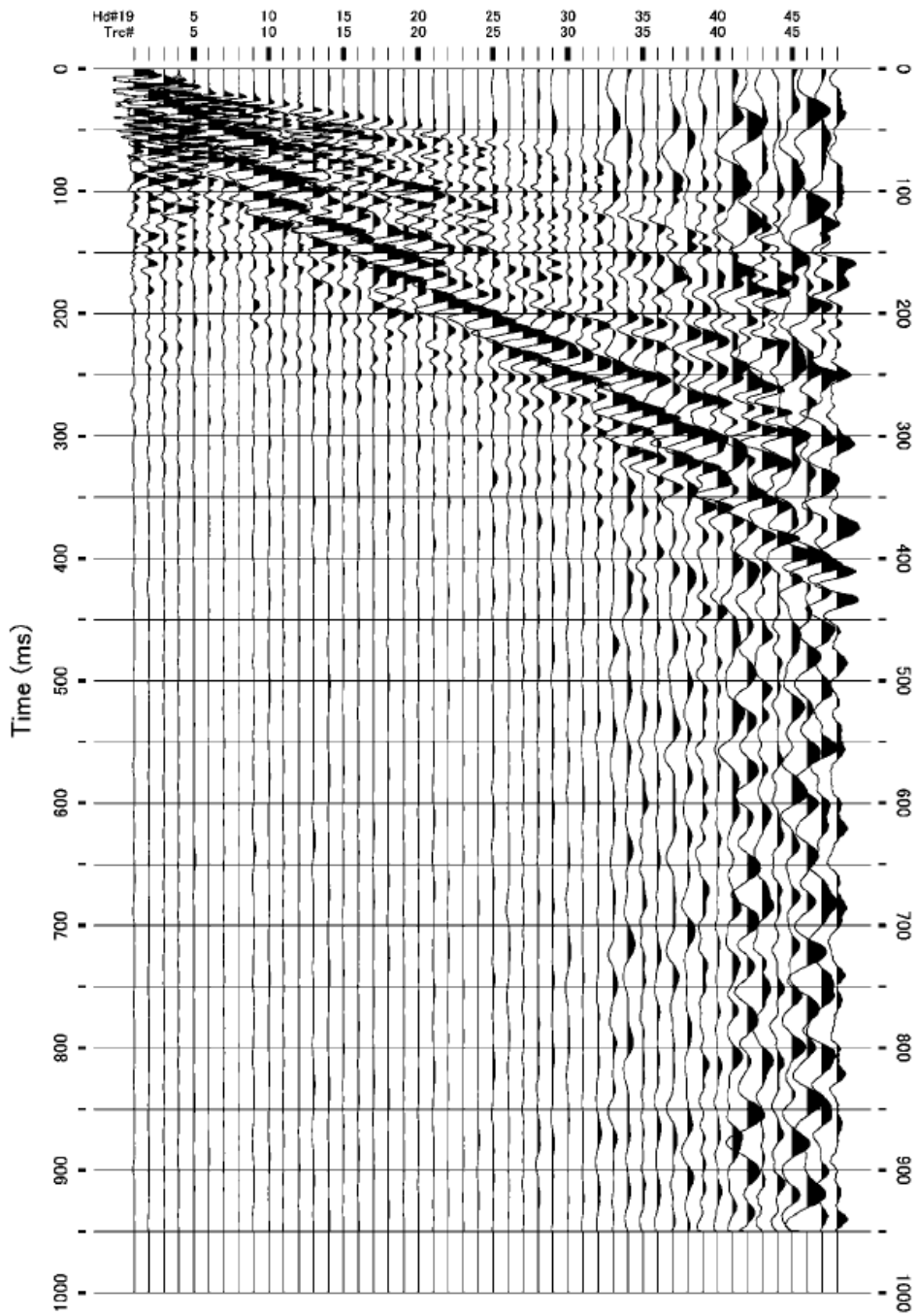




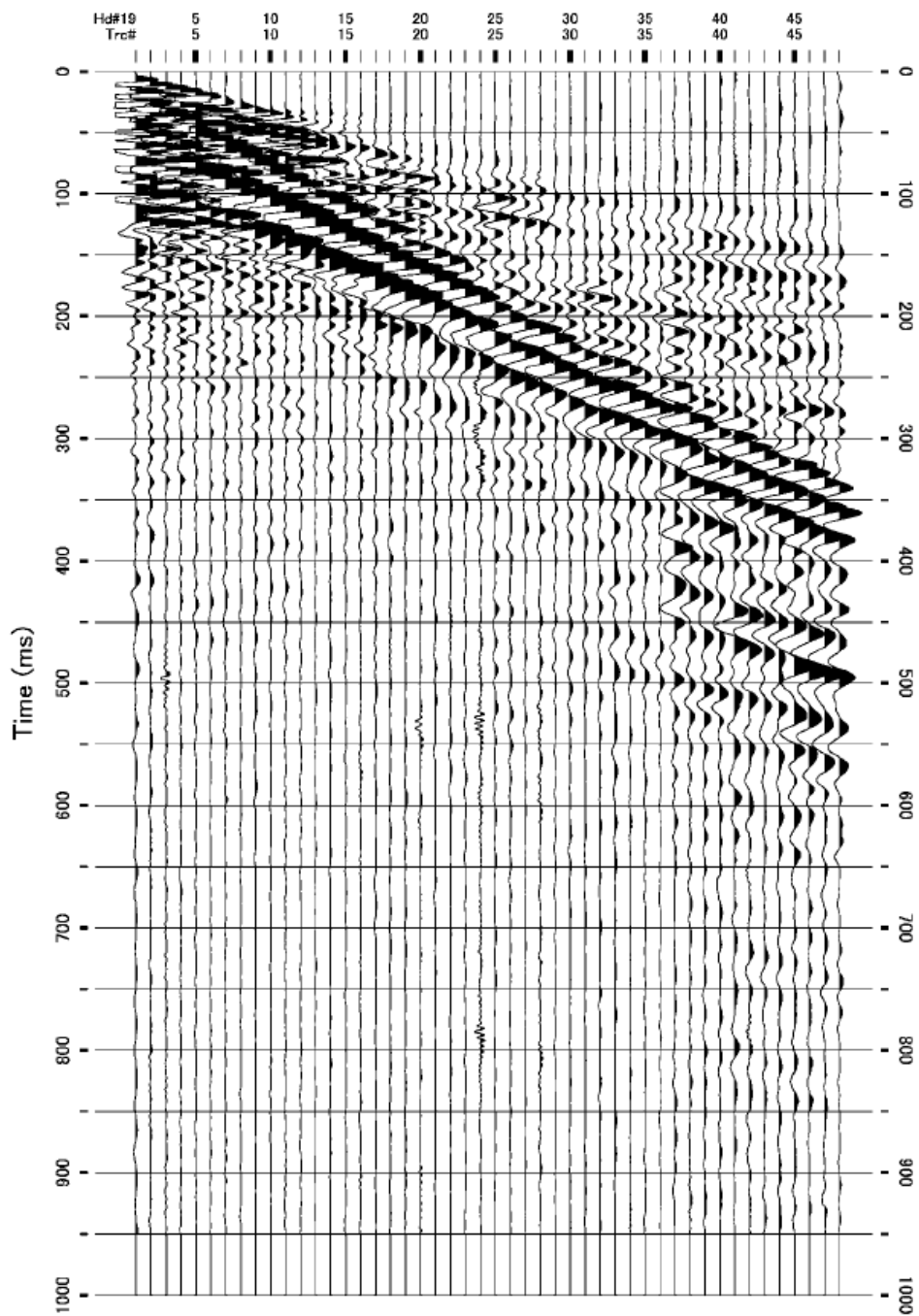
Field data (Surface wave shot record) : UB\_03



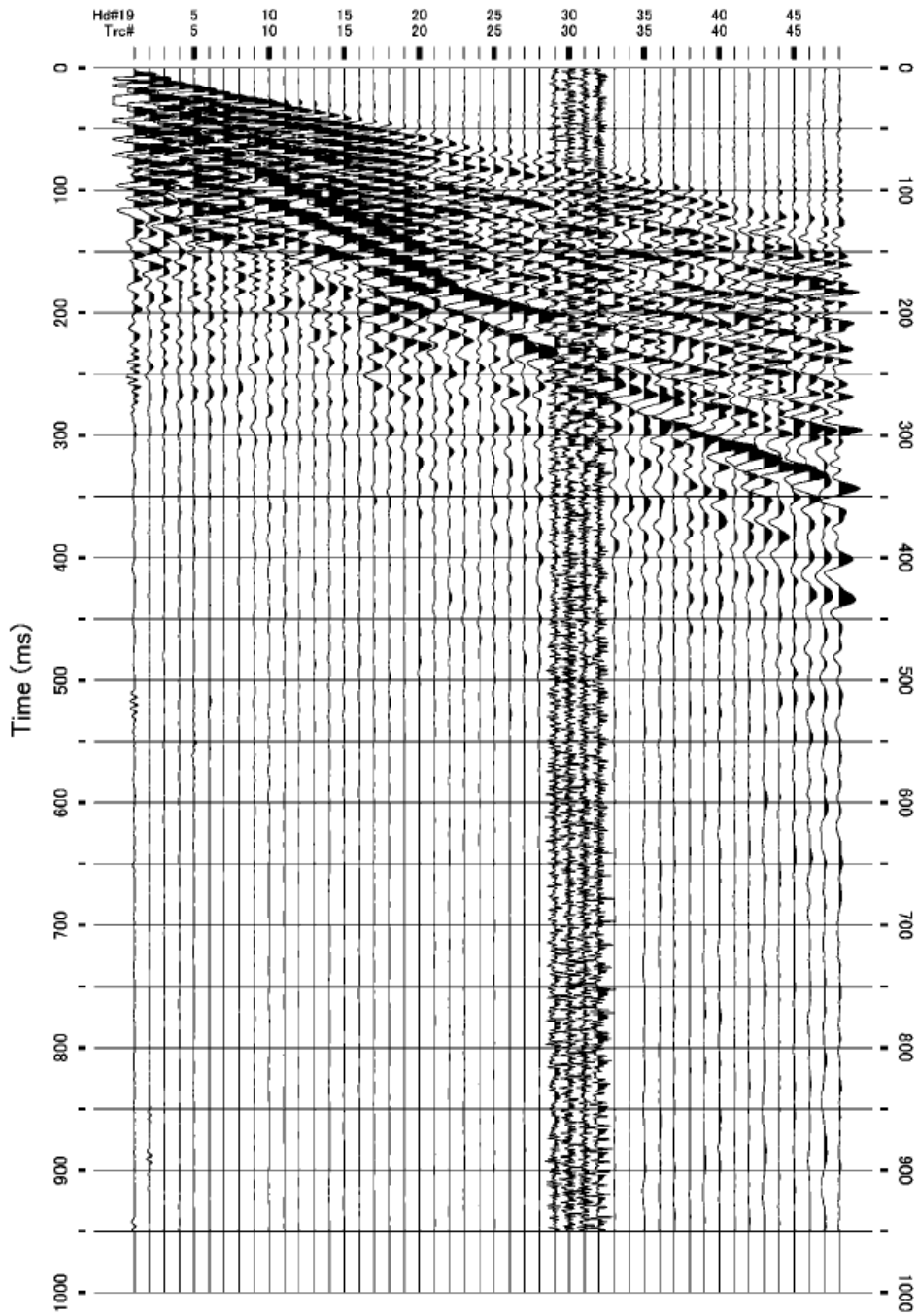
Field data (Surface wave shot record) : UB\_04



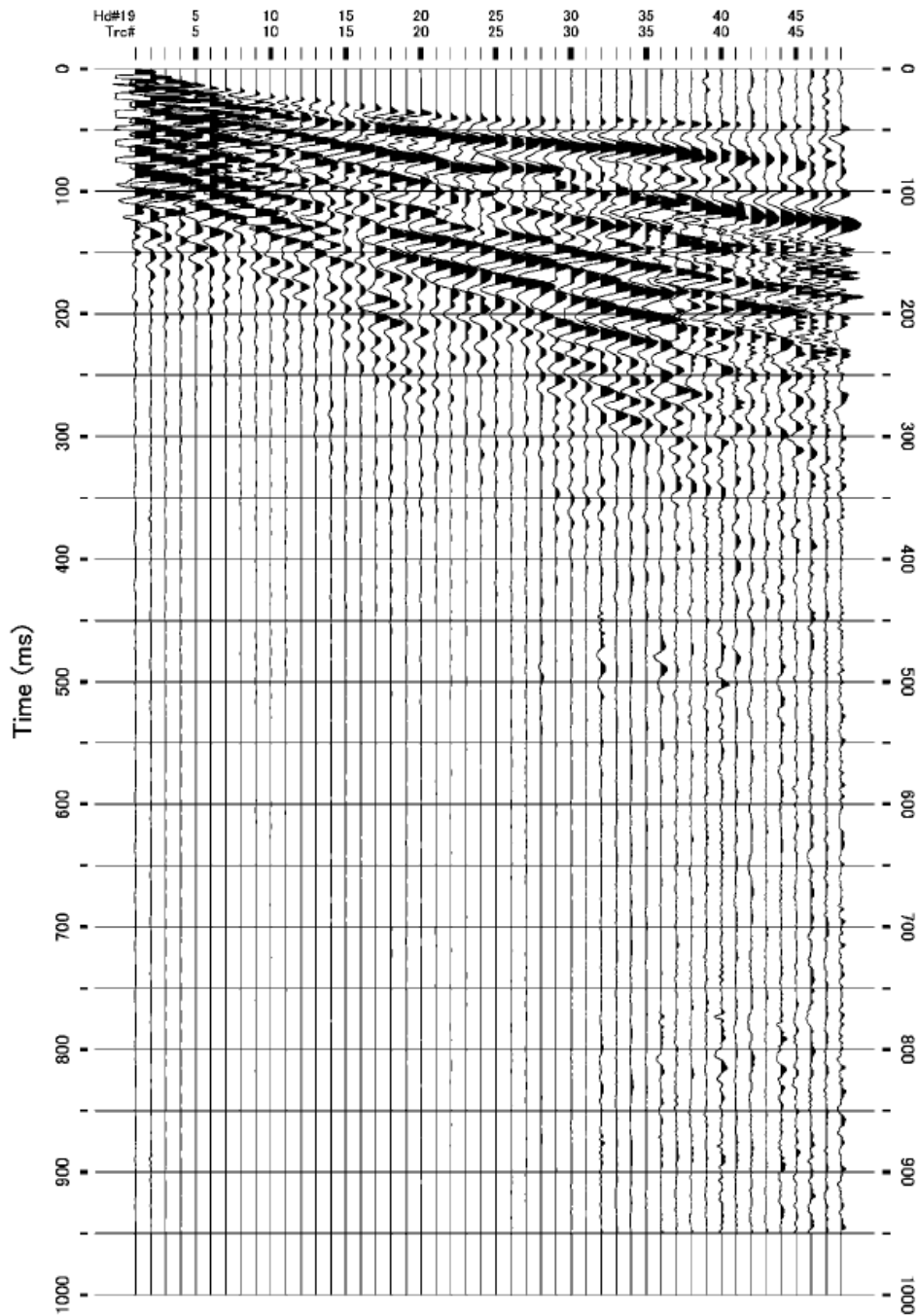
Field data (Surface wave shot record) : UB\_05



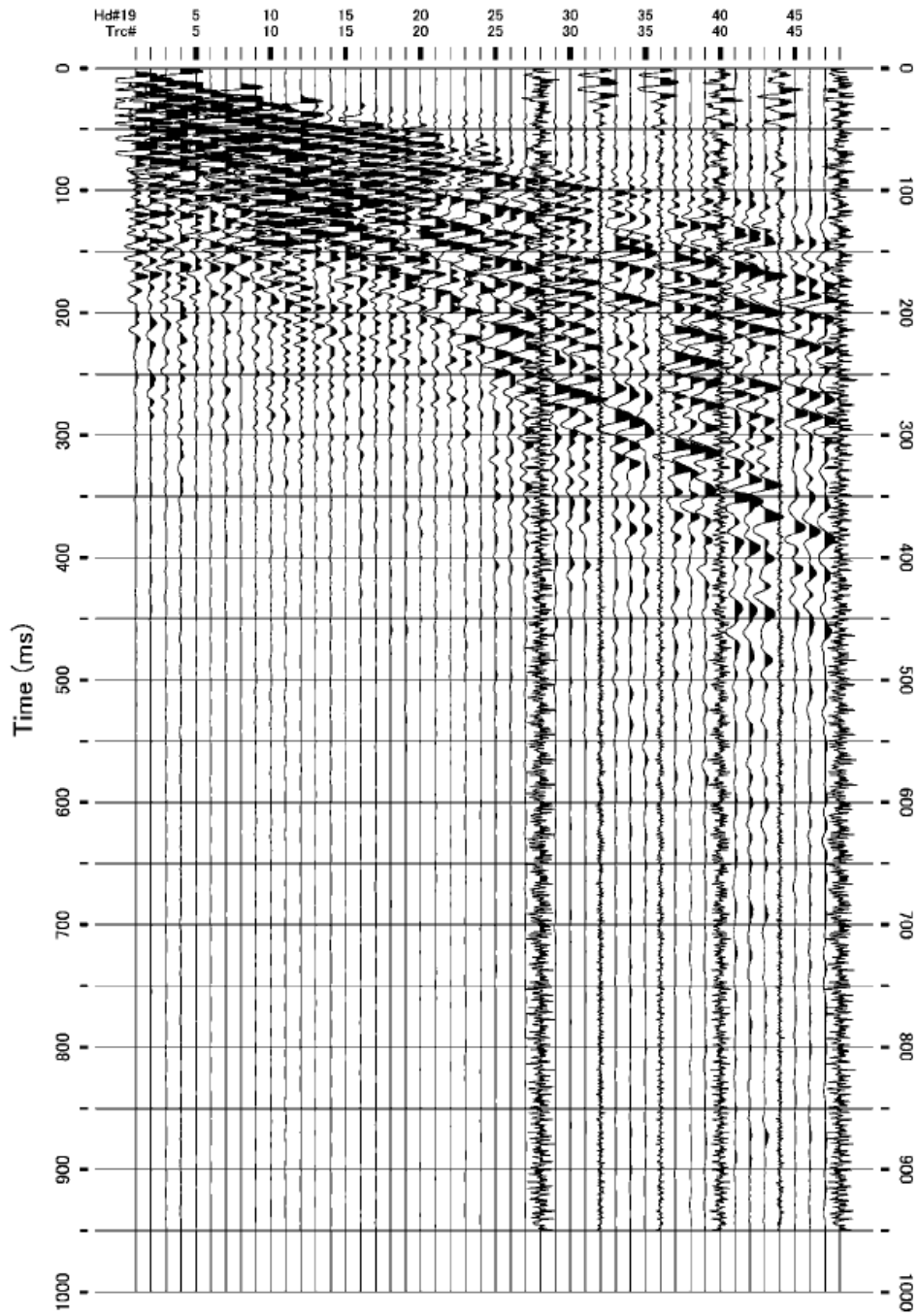
Field data (Surface wave shot record) : UB\_06



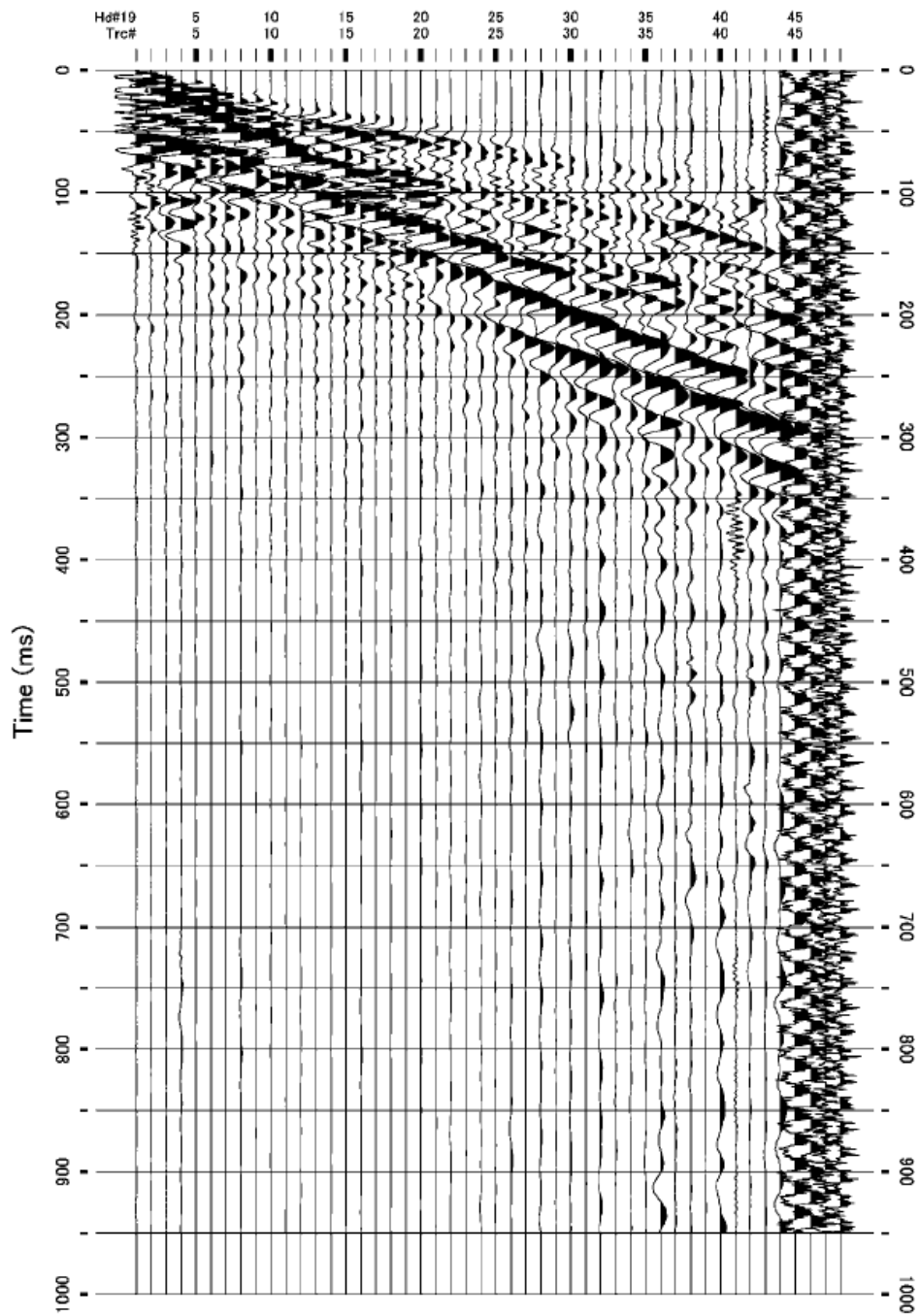
Field data (Surface wave shot record) : UB\_07



Field data (Surface wave shot record) : UB\_08

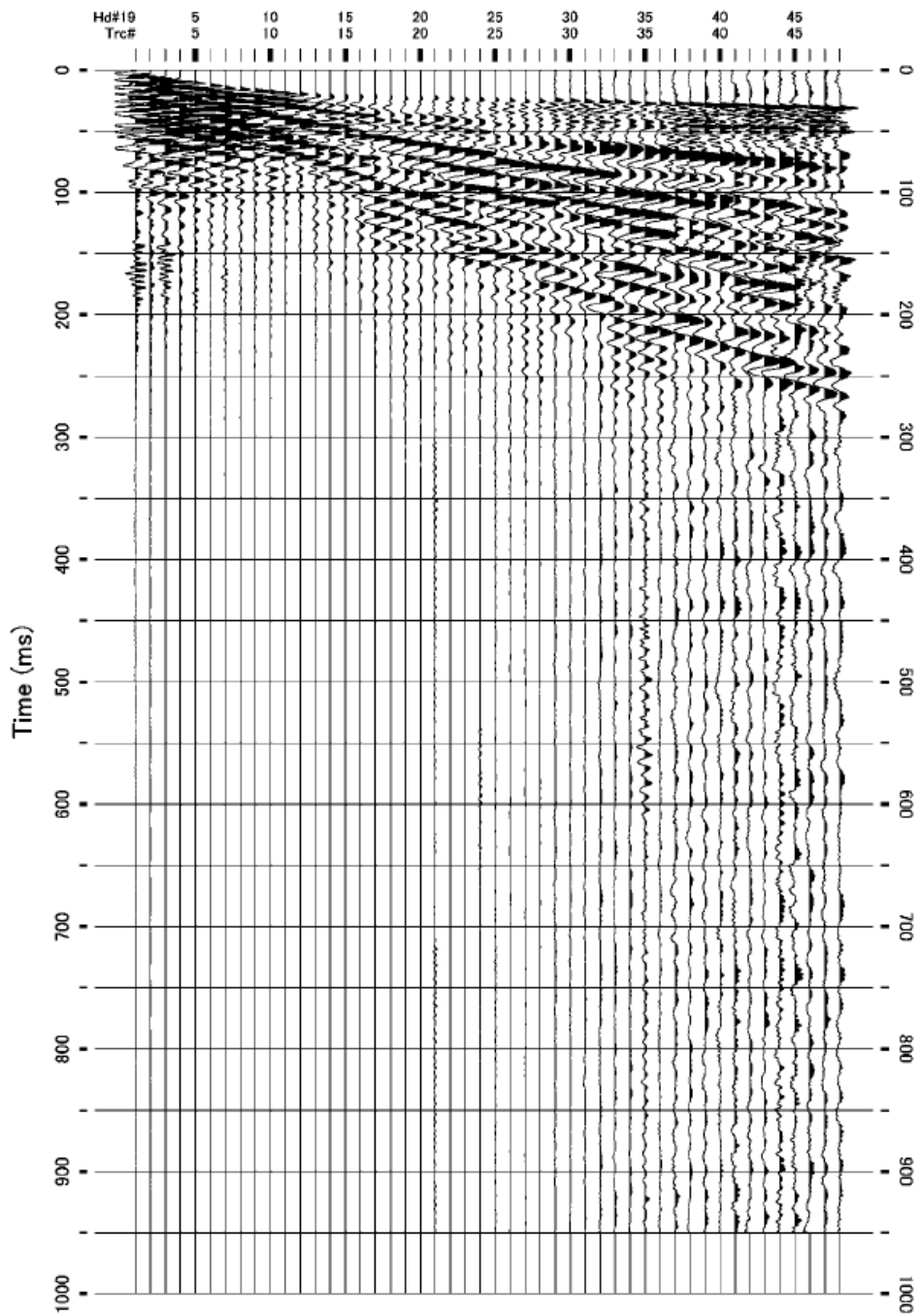


Field data (Surface wave shot record) : UB\_09

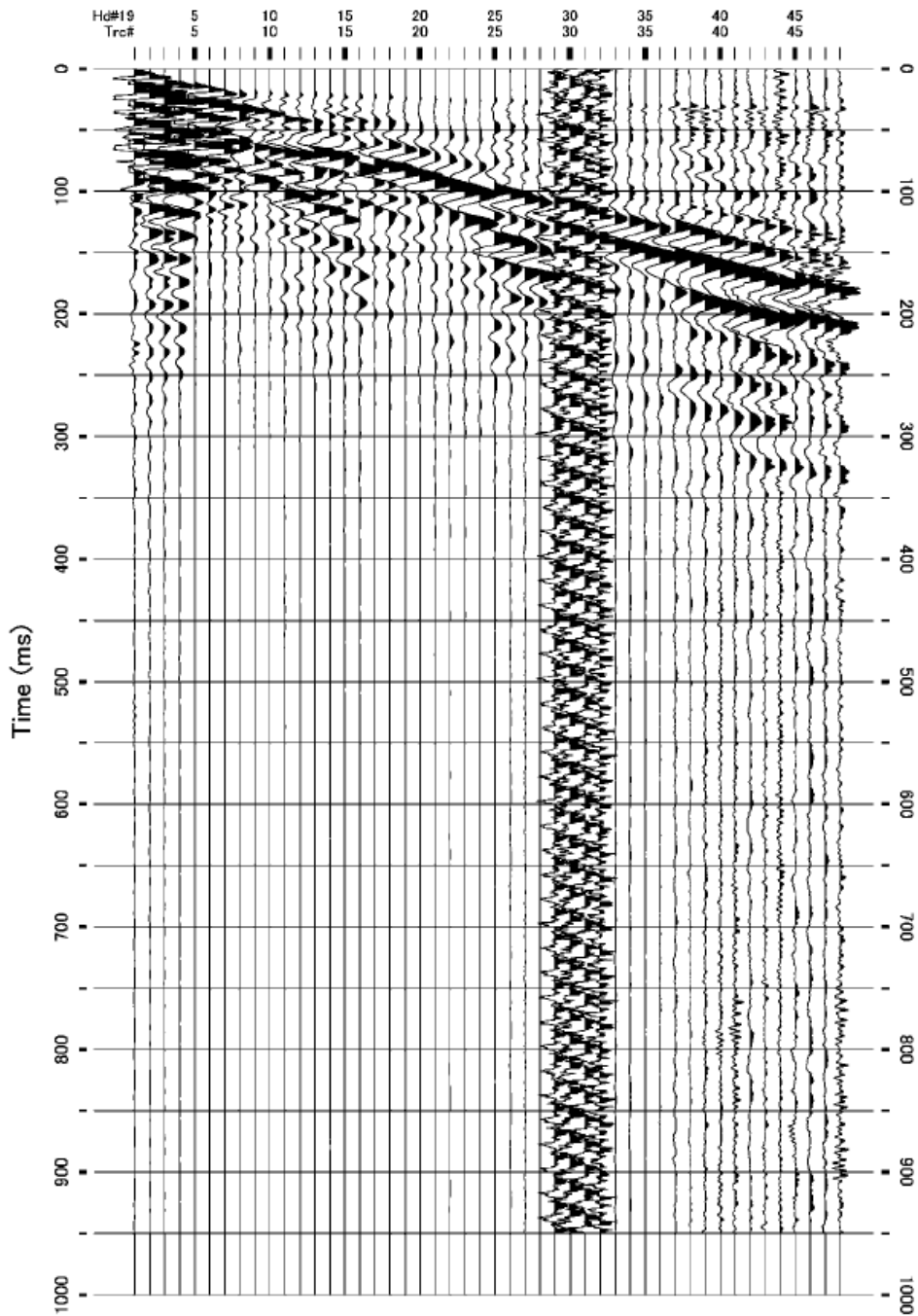


Field data (Surface wave shot record) : UB\_10

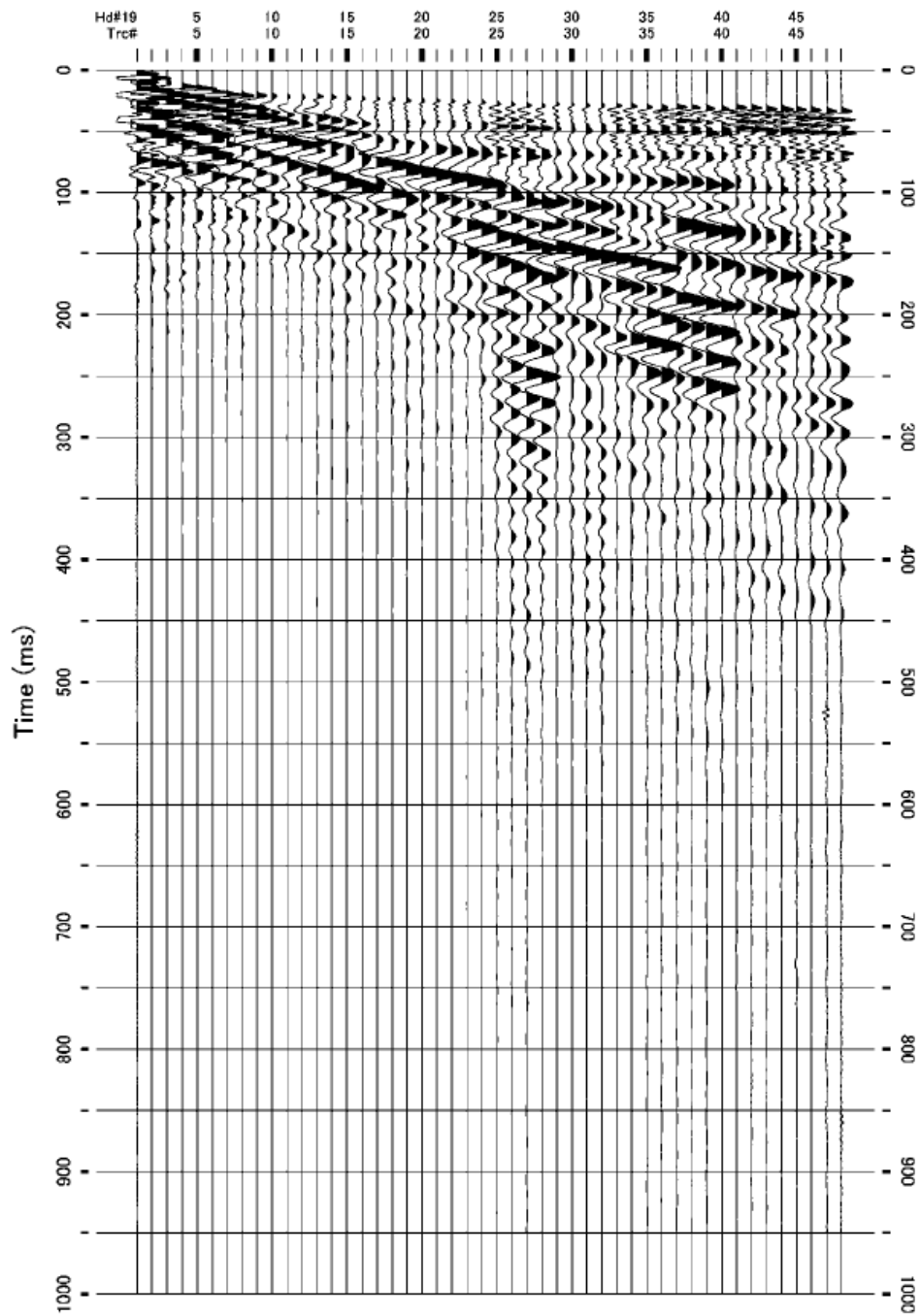




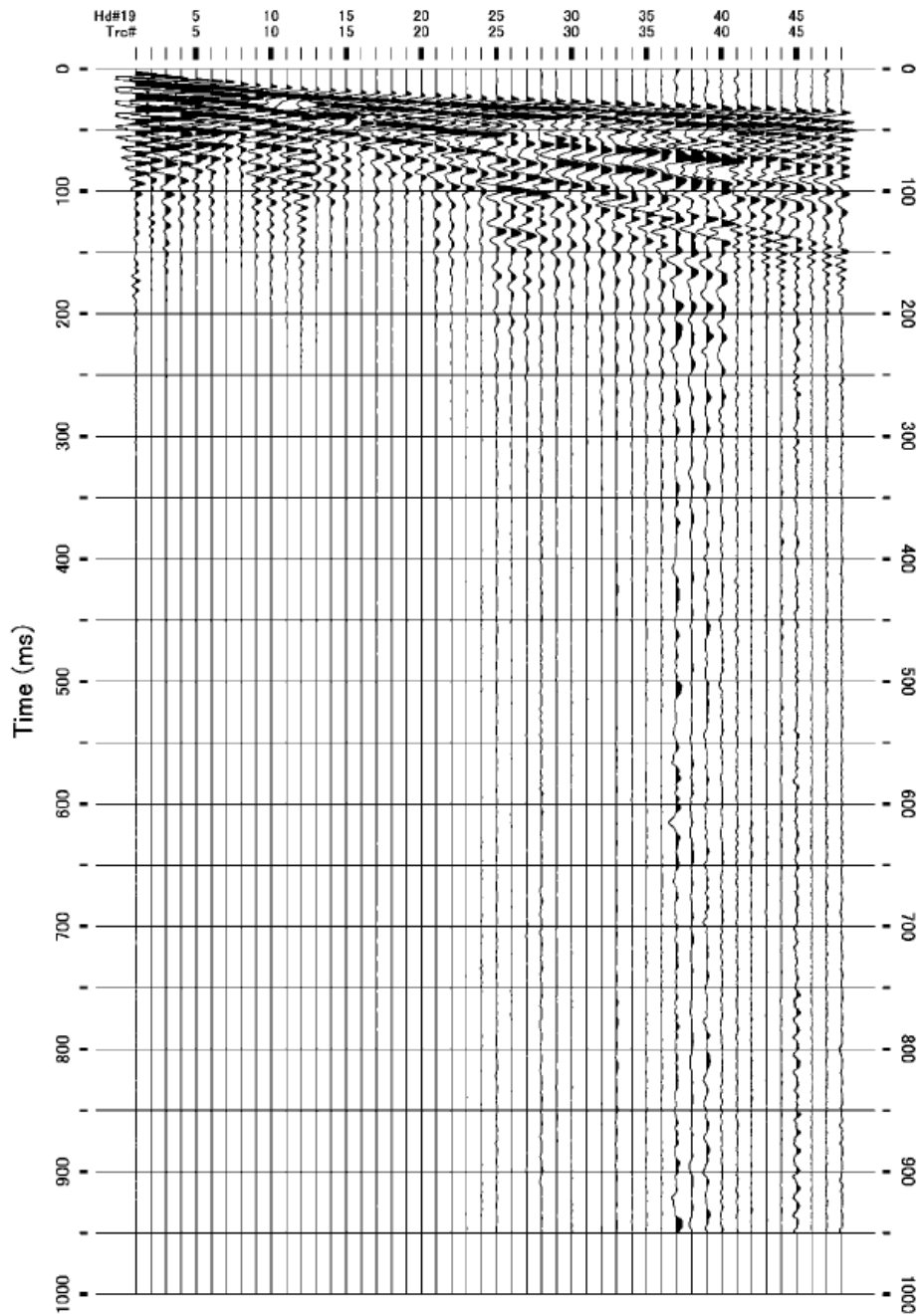
Field data (Surface wave shot record) : UB\_11



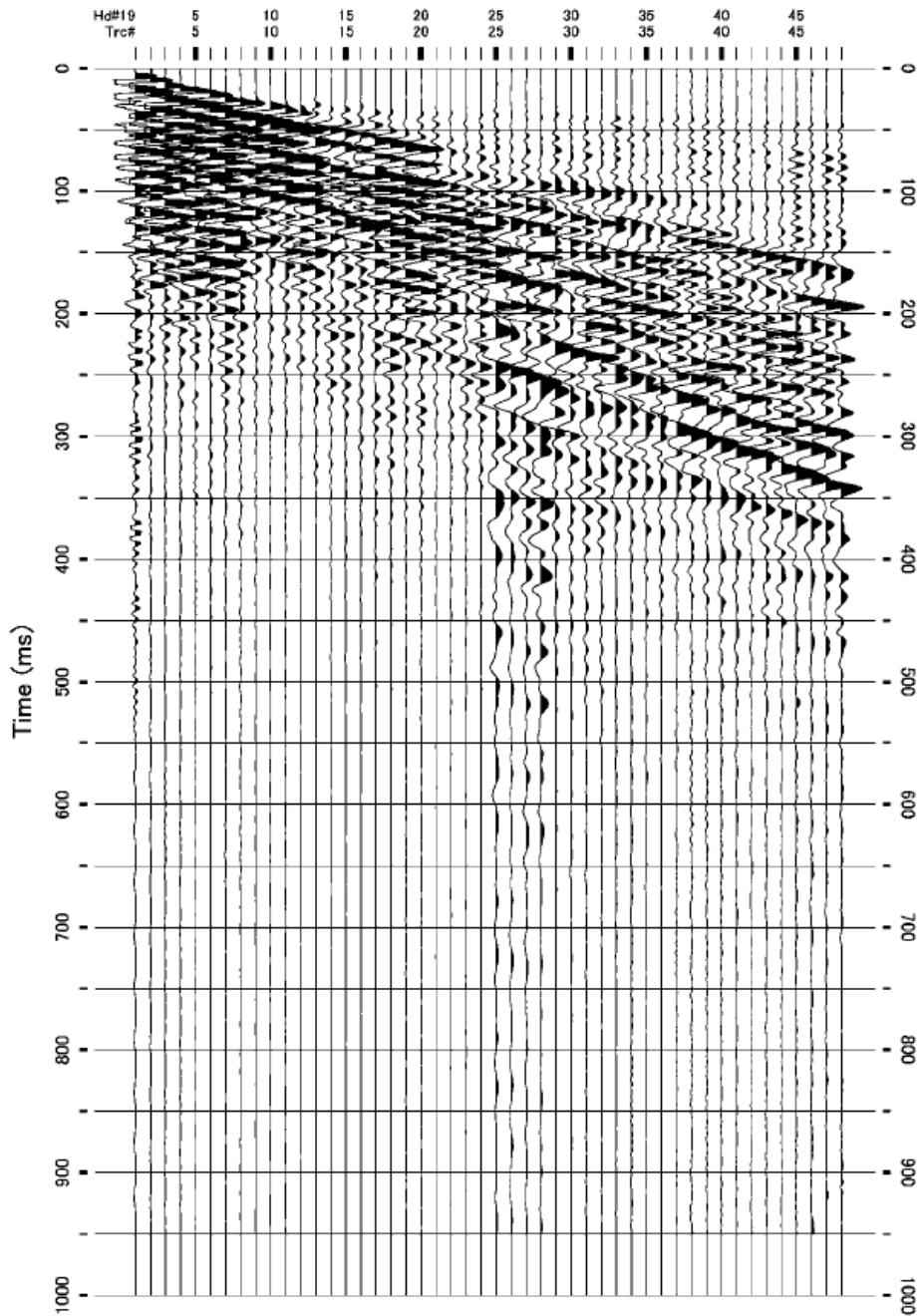
Field data (Surface wave shot record) : UB\_12



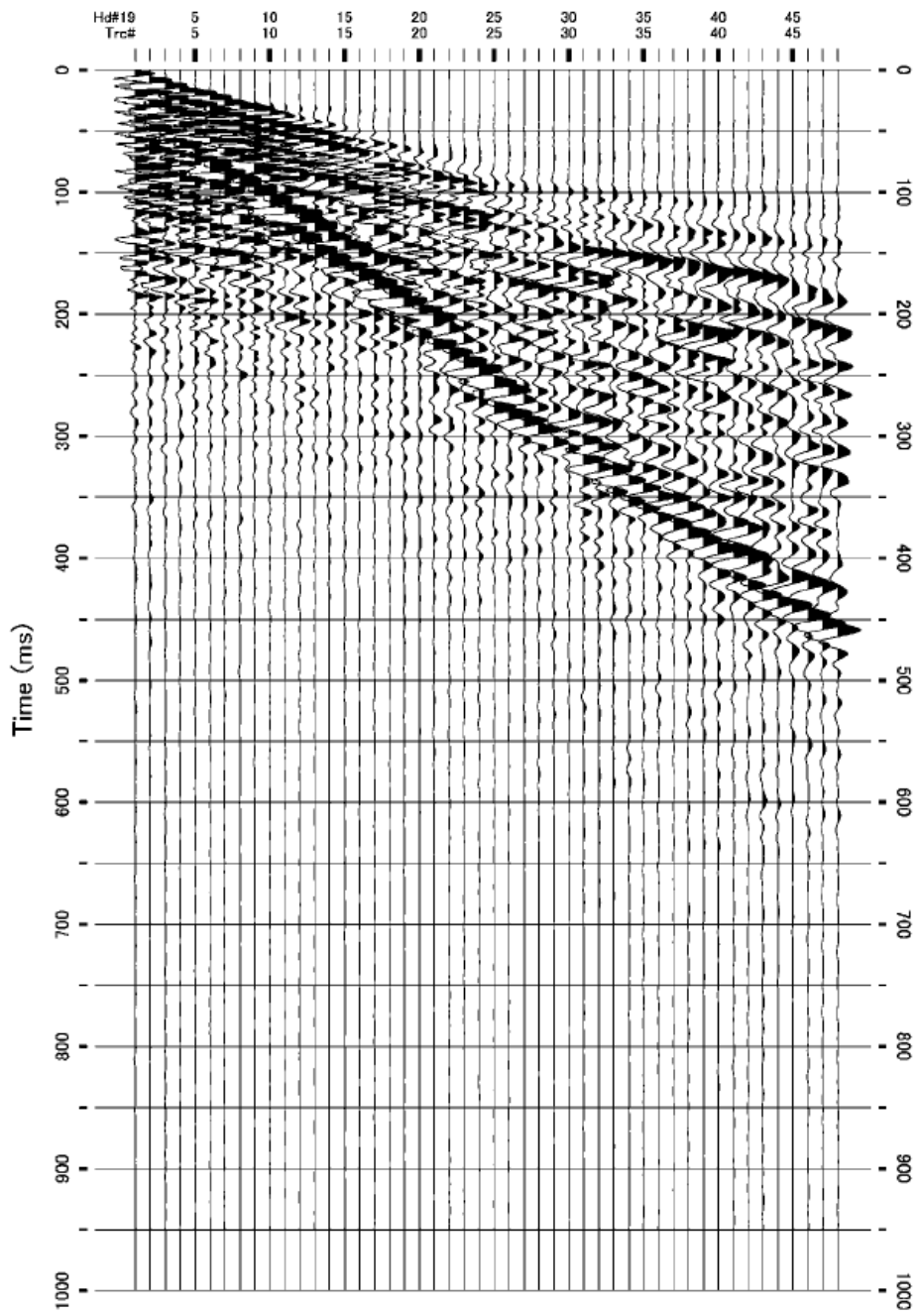
Field data (Surface wave shot record) : UB\_13



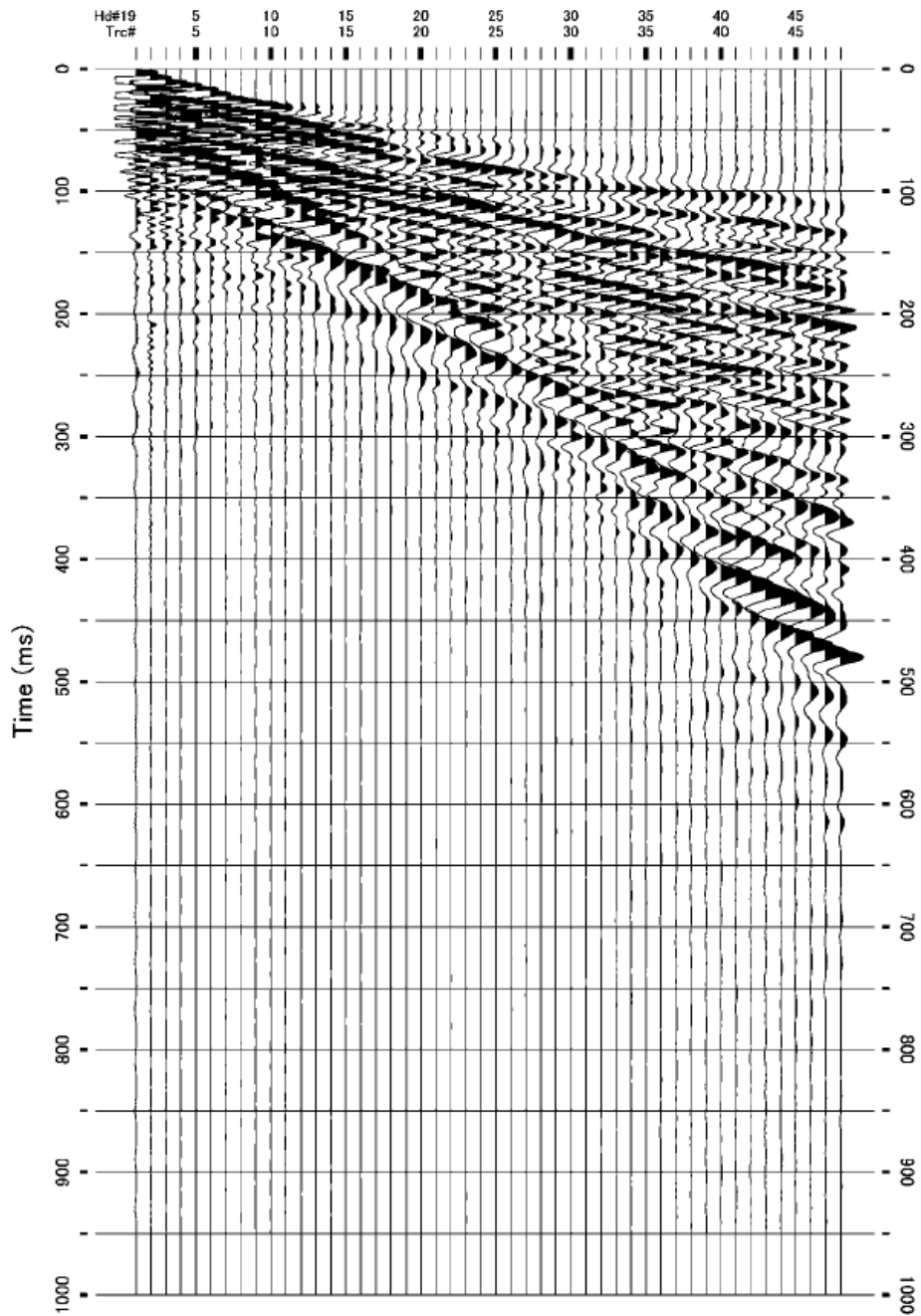
Field data (Surface wave shot record) : UB\_14



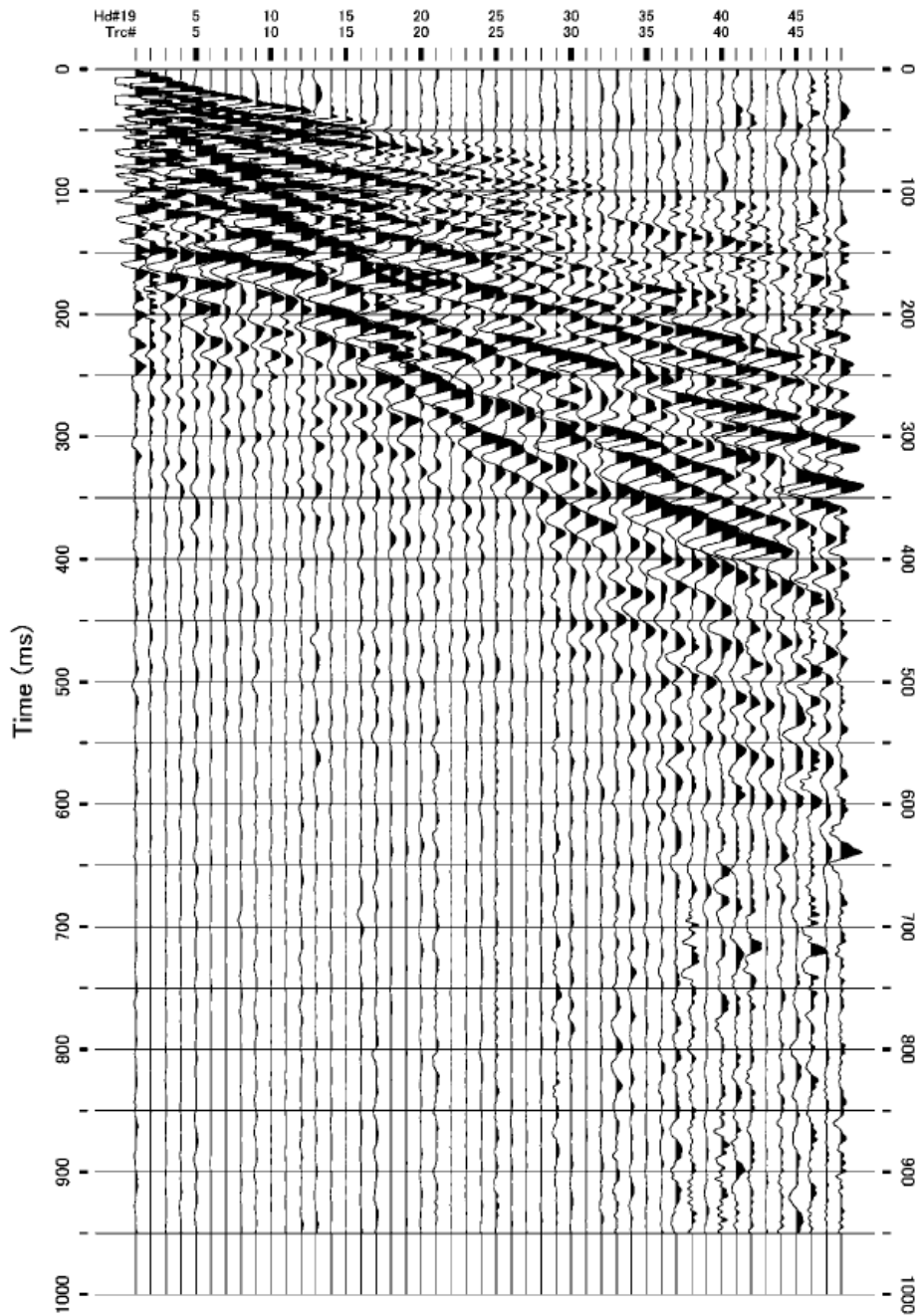
Field data (Surface wave shot record) : UB\_15



Field data (Surface wave shot record) : UB\_16

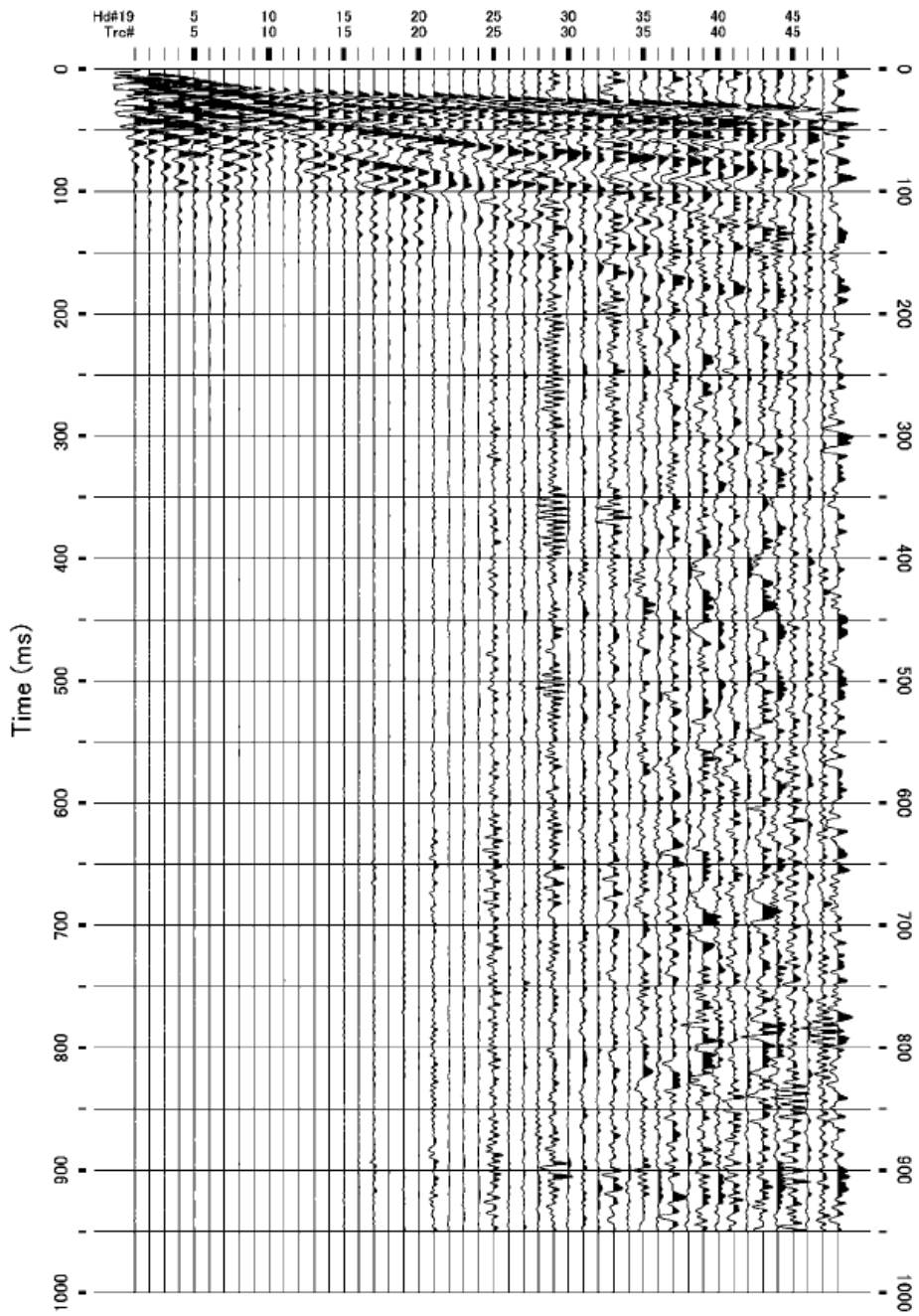


Field data (Surface wave shot record) : UB\_17

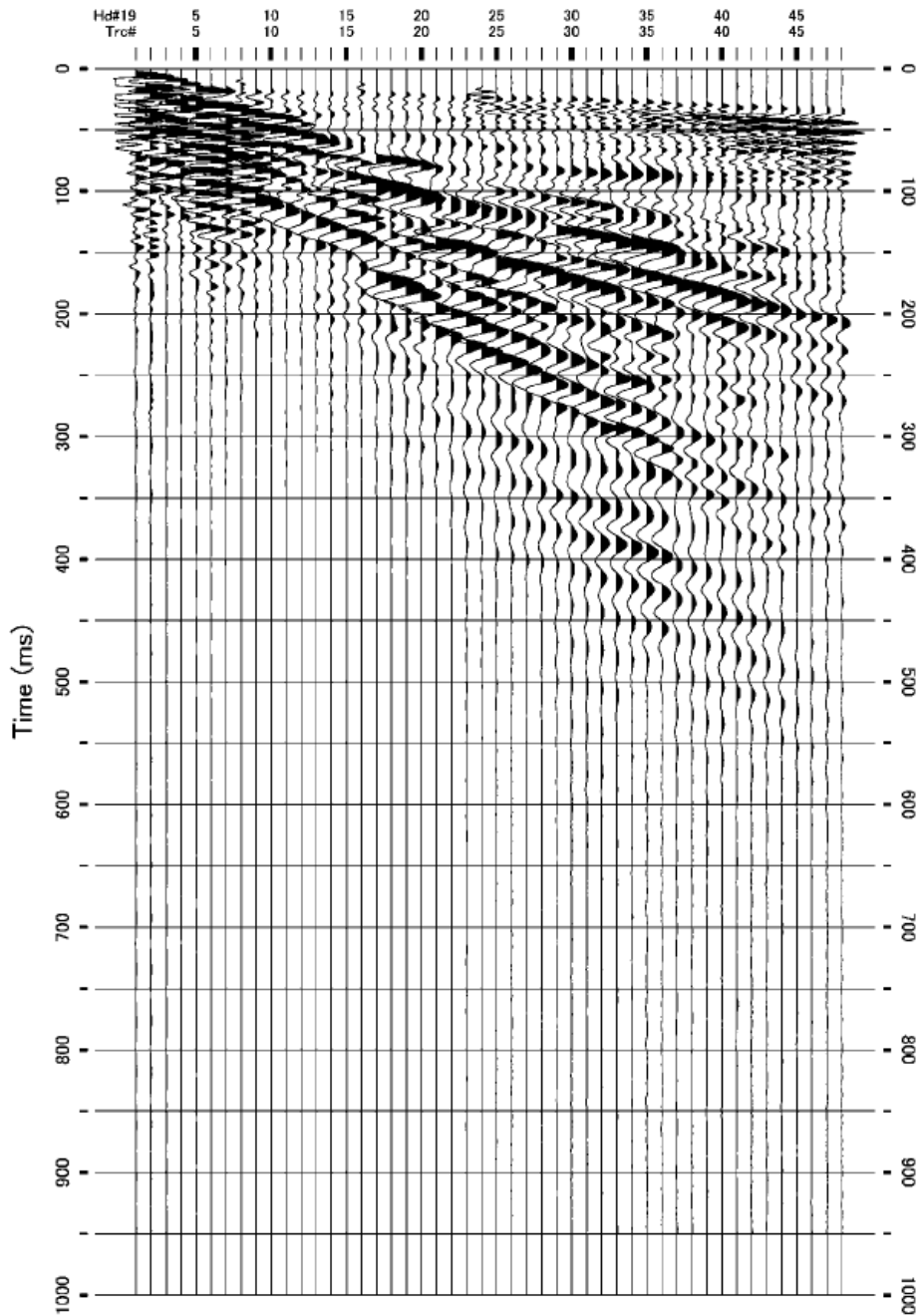


Field data (Surface wave shot record) : UB\_18

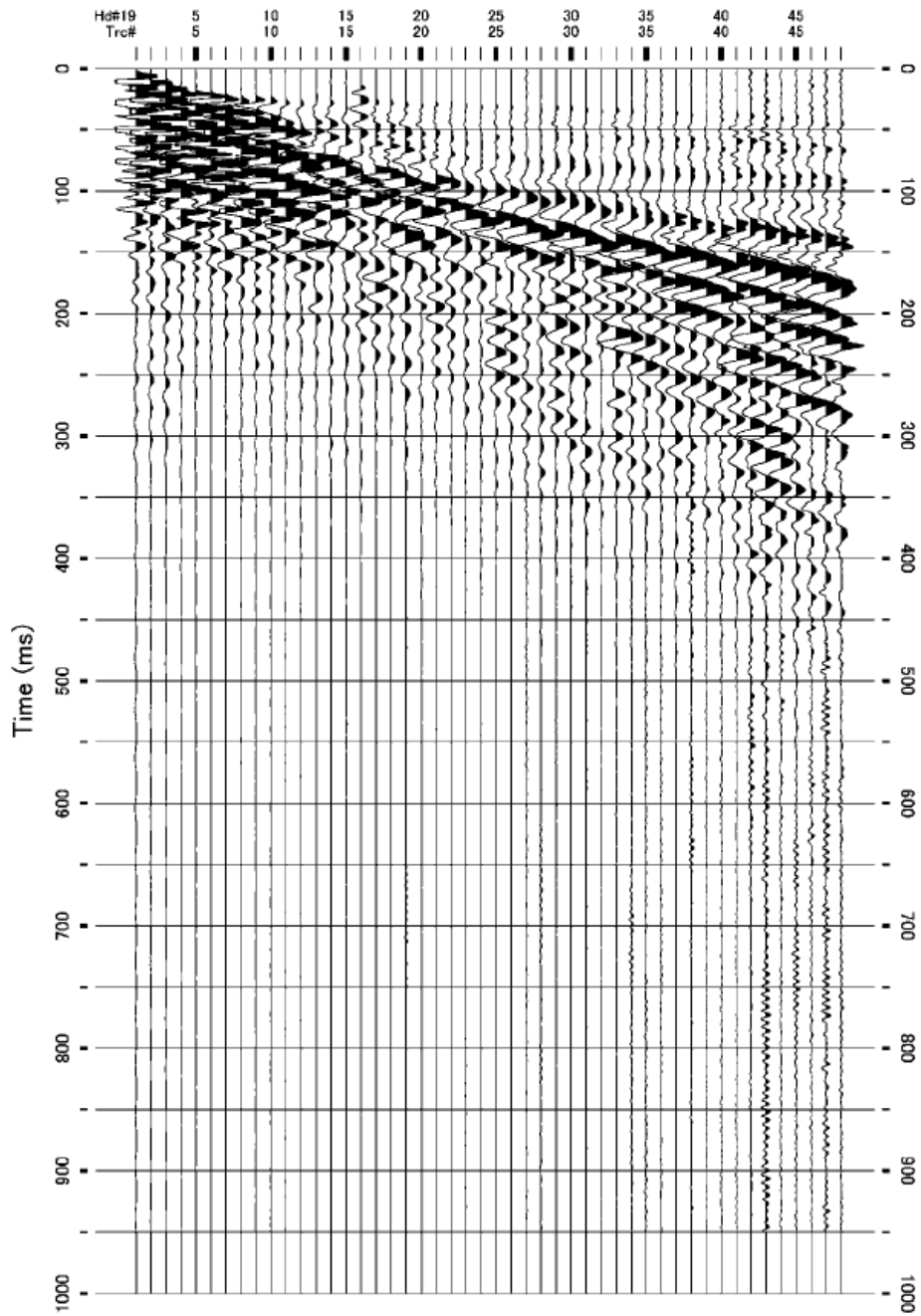




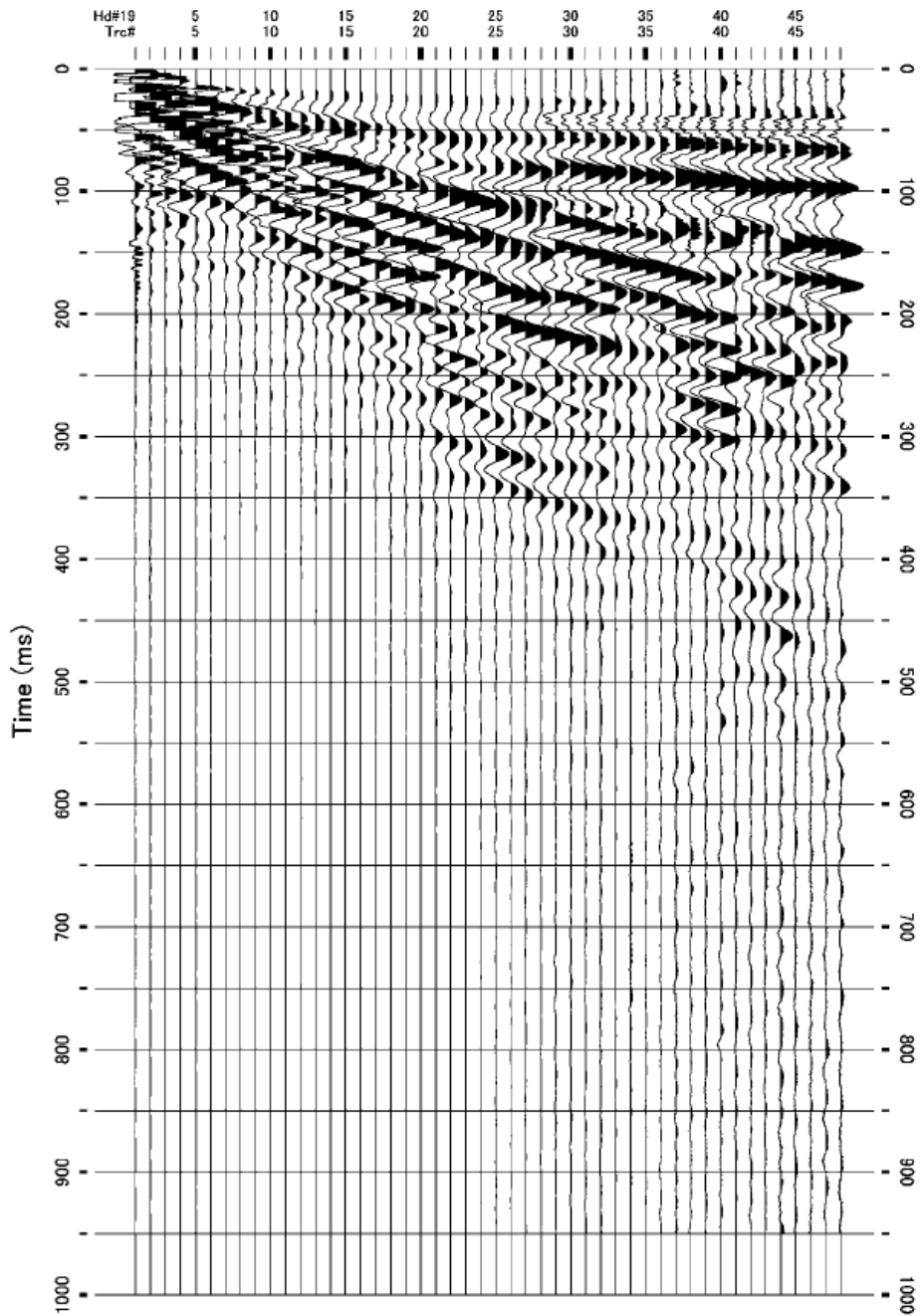
Field data (Surface wave shot record) : UB\_19



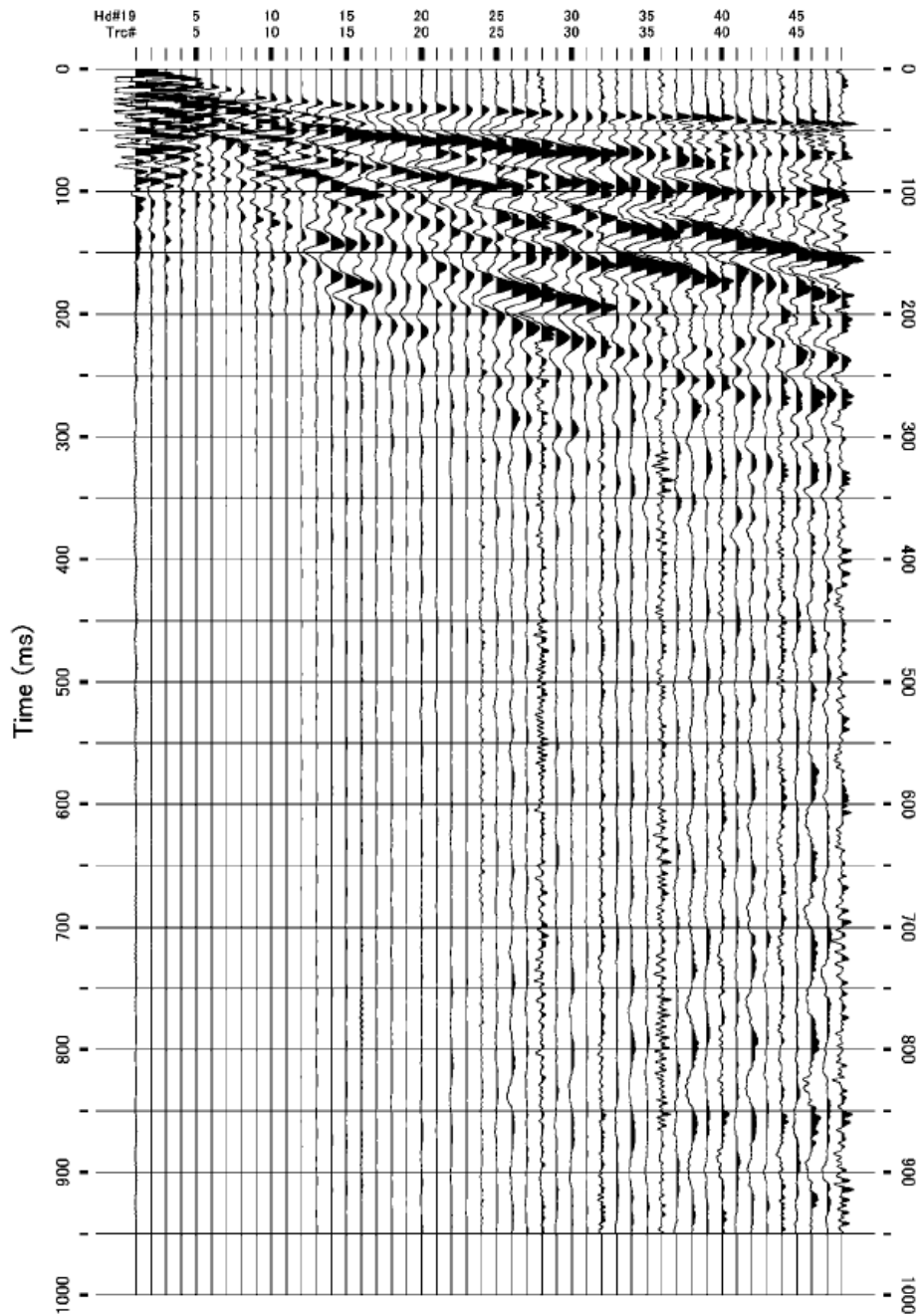
Field data (Surface wave shot record) : UB\_20



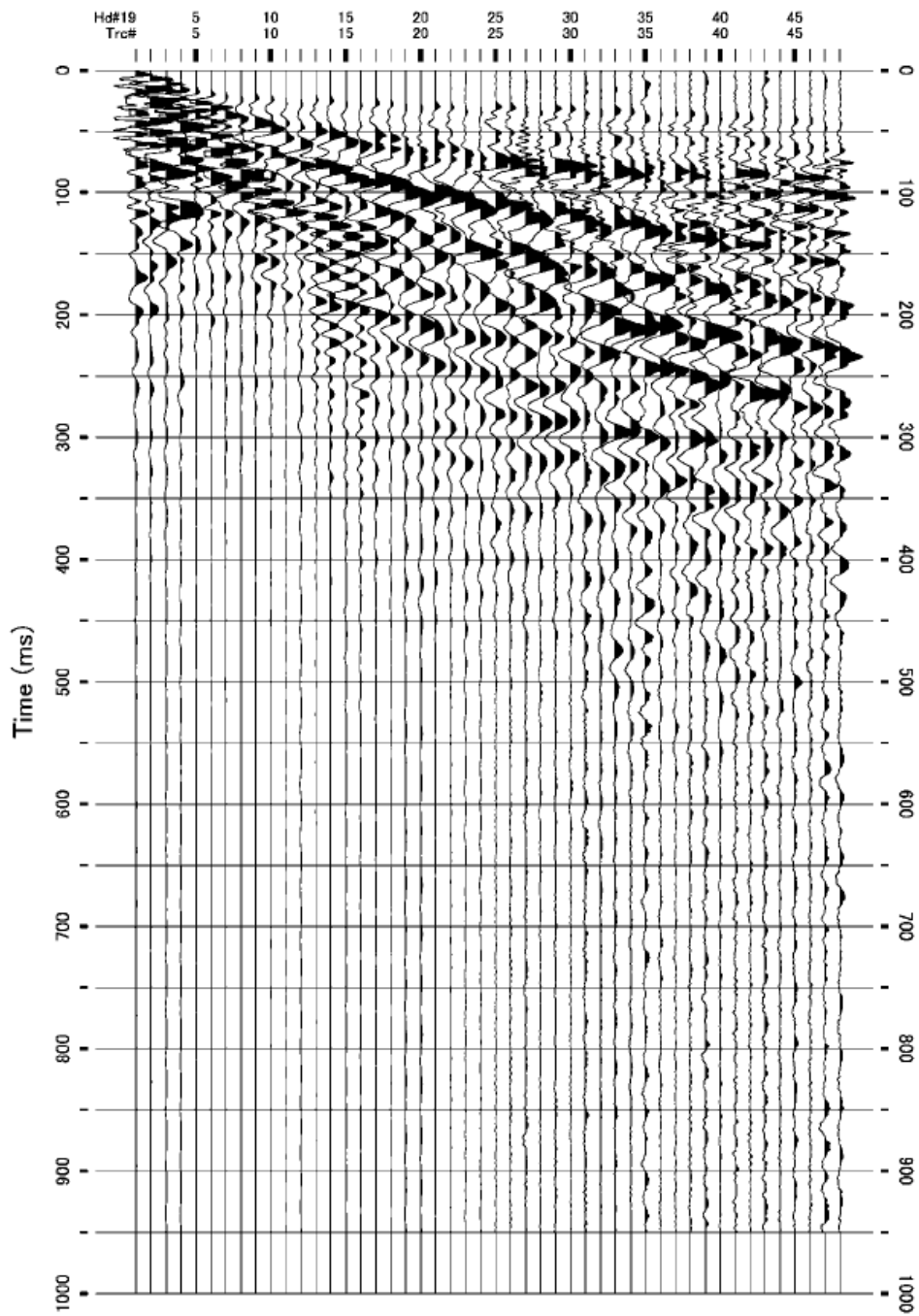
Field data (Surface wave shot record) : UB\_21



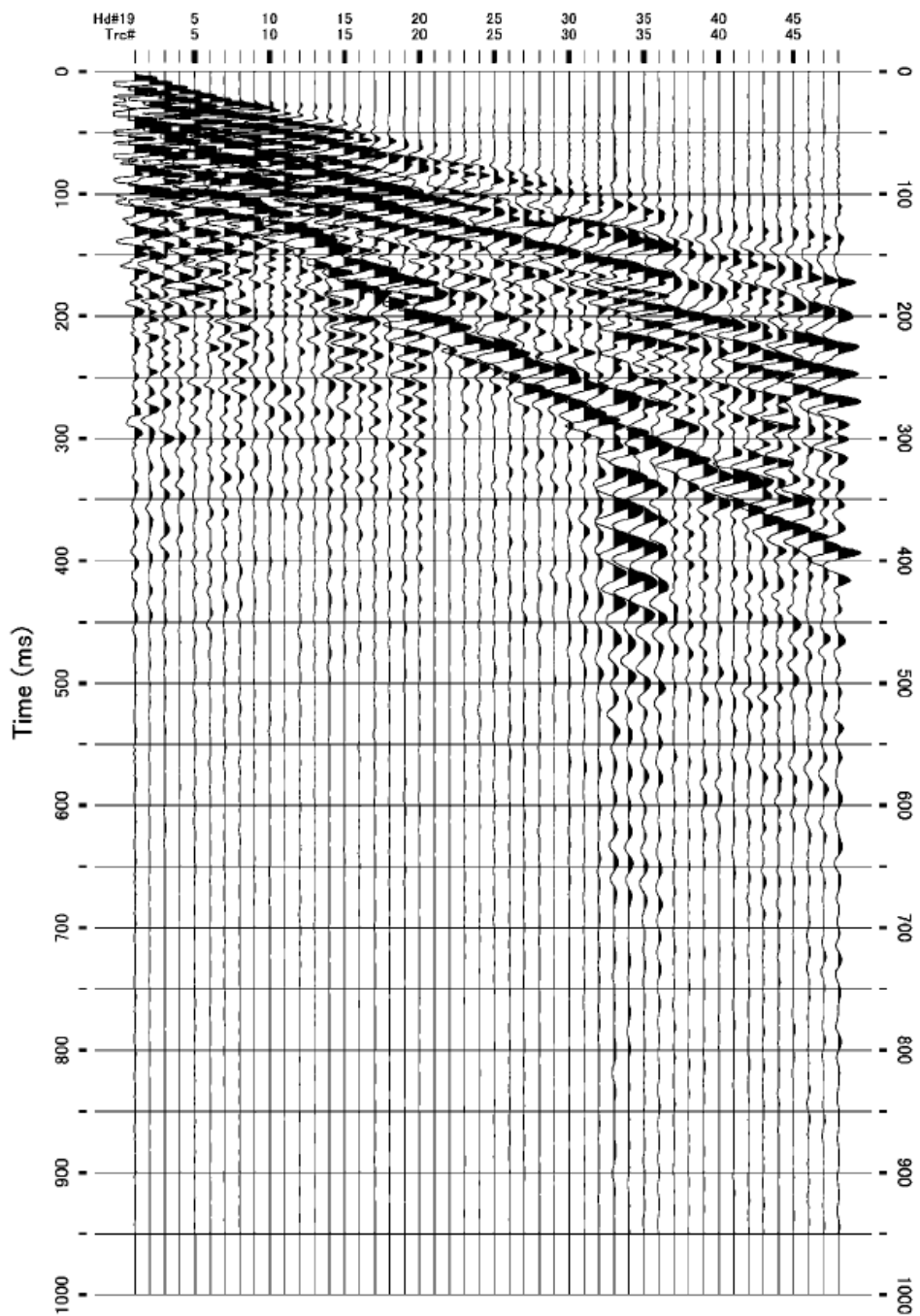
Field data (Surface wave shot record) : UB\_22



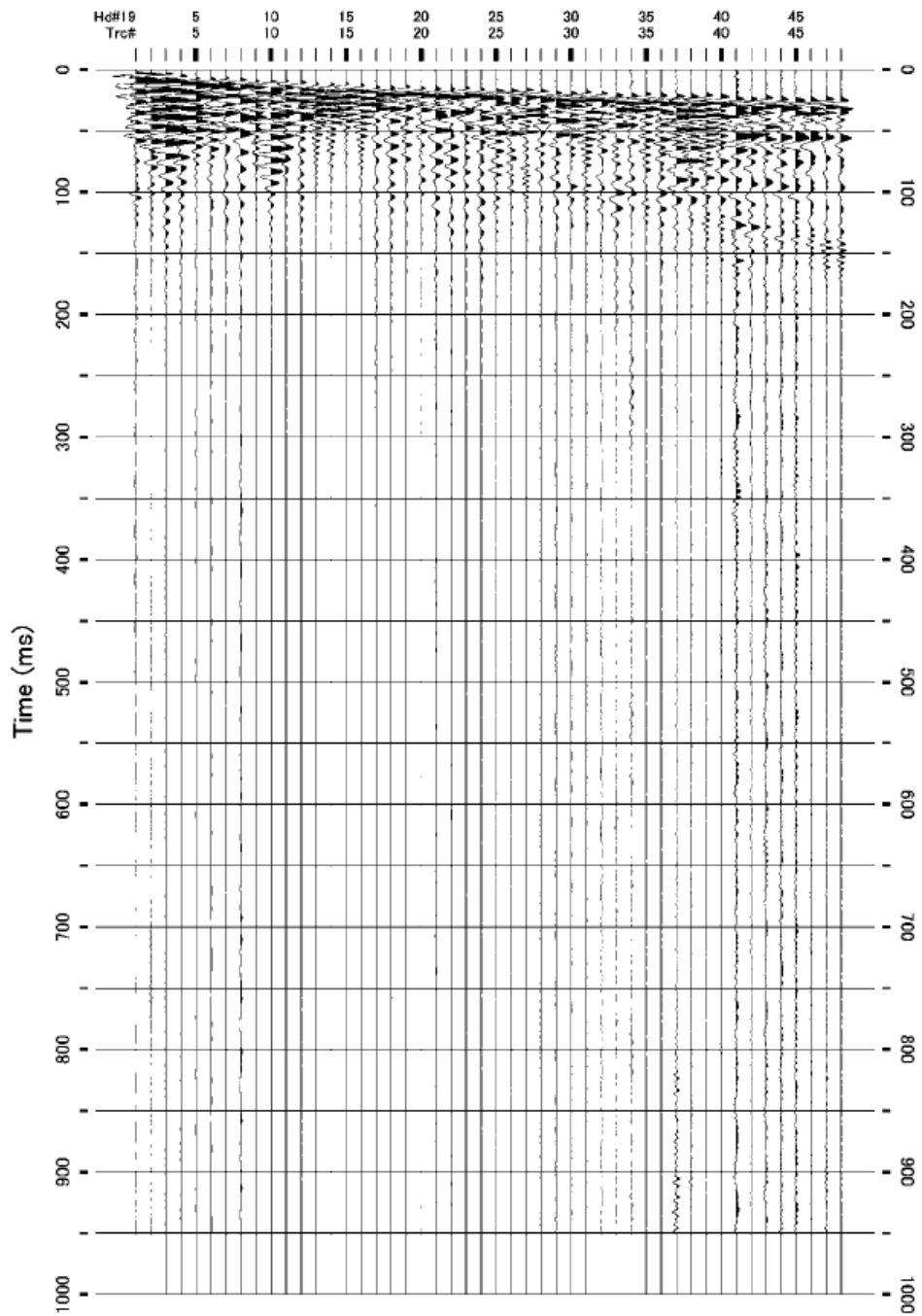
Field data (Surface wave shot record) : UB\_23



Field data (Surface wave shot record) : UB\_24

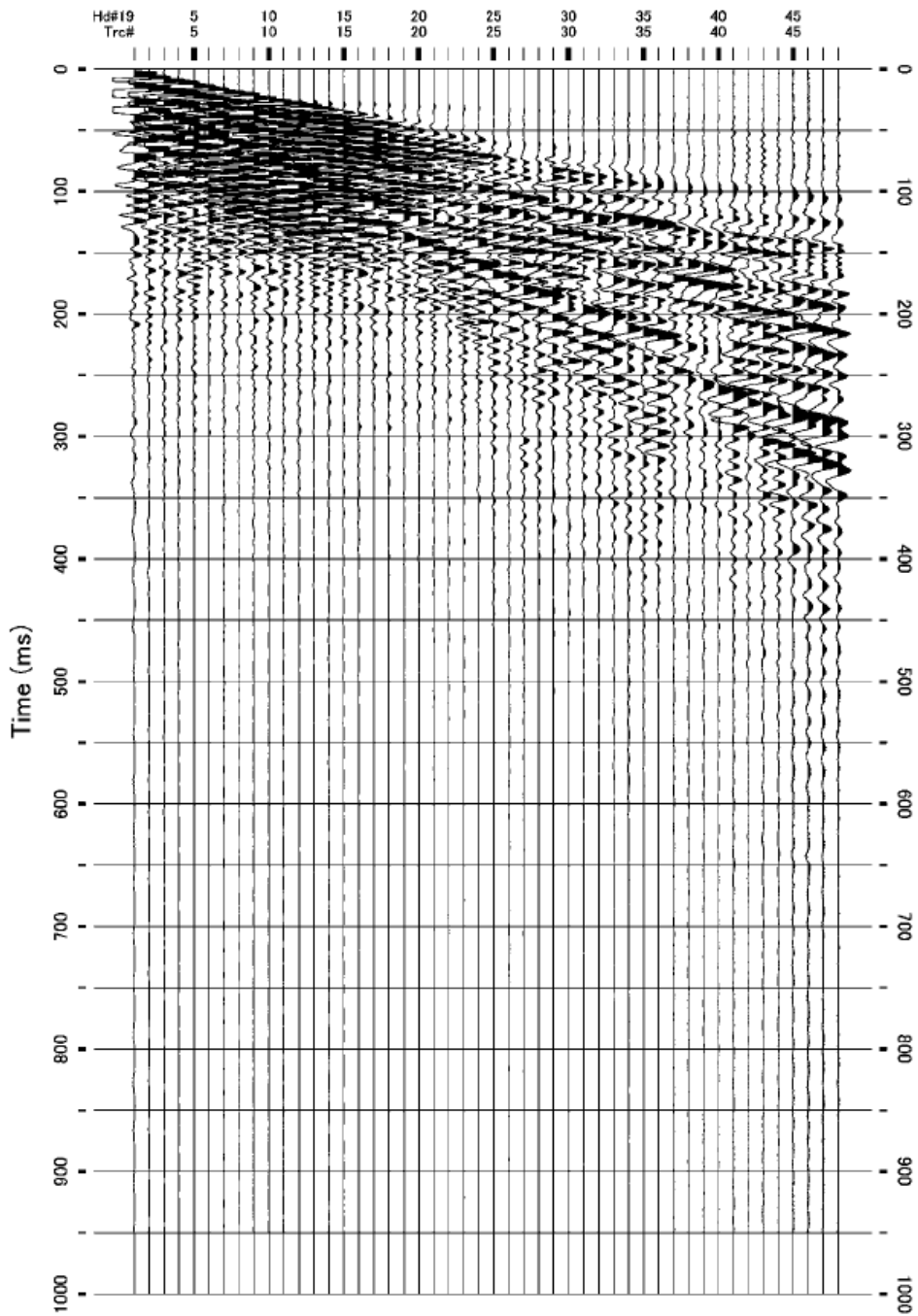


Field data (Surface wave shot record) : UB\_25

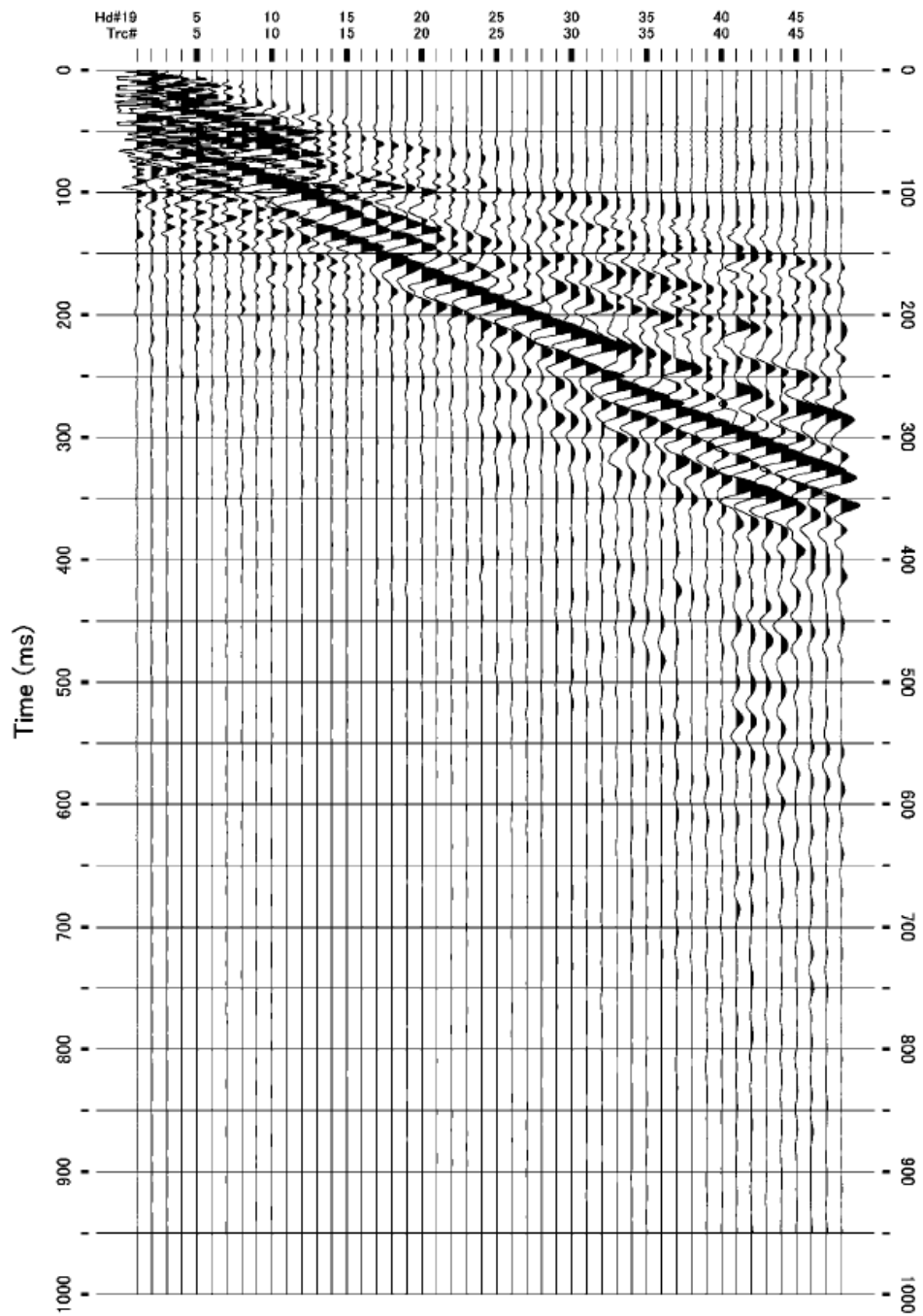


Field data (Surface wave shot record) : UB\_26

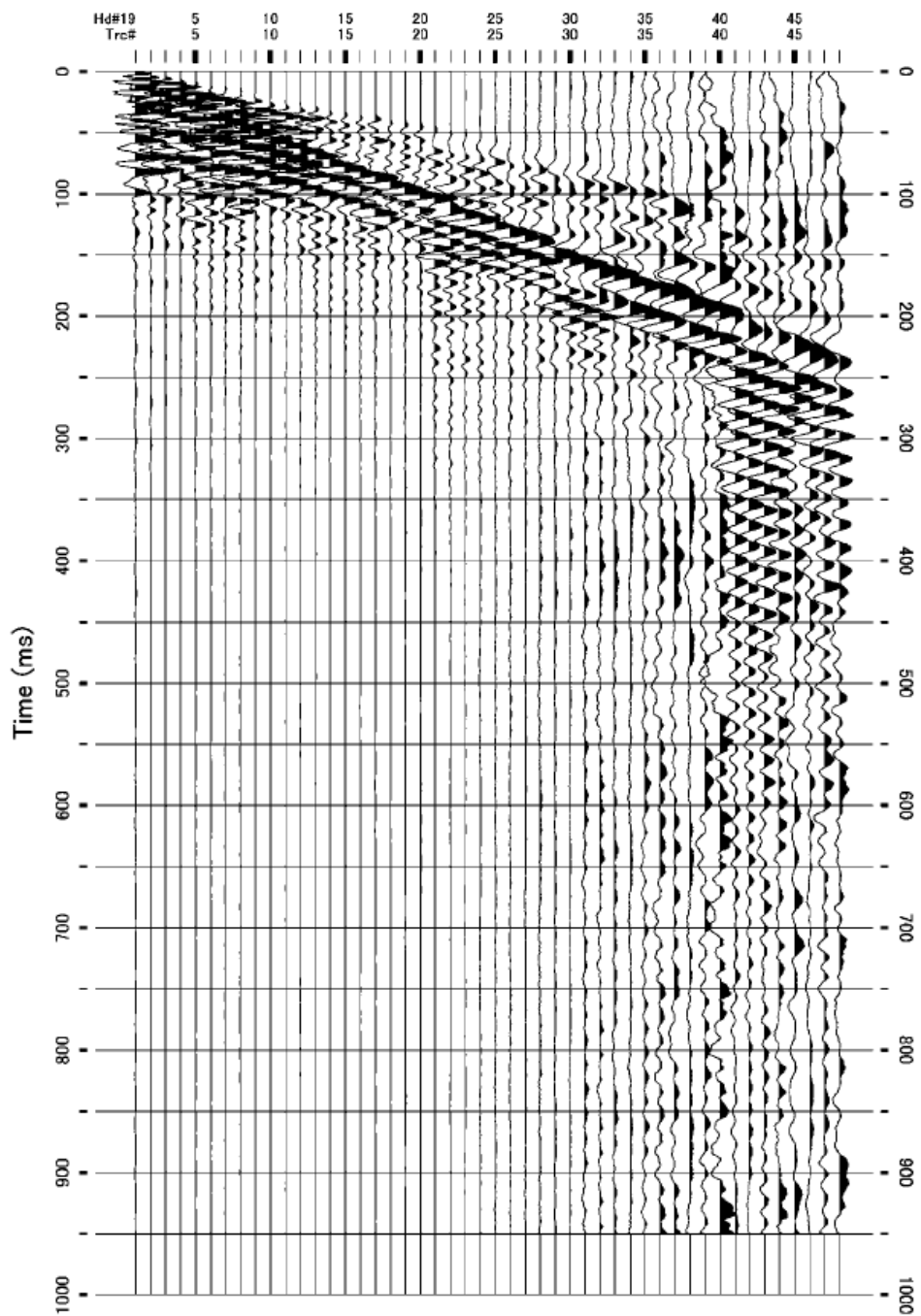




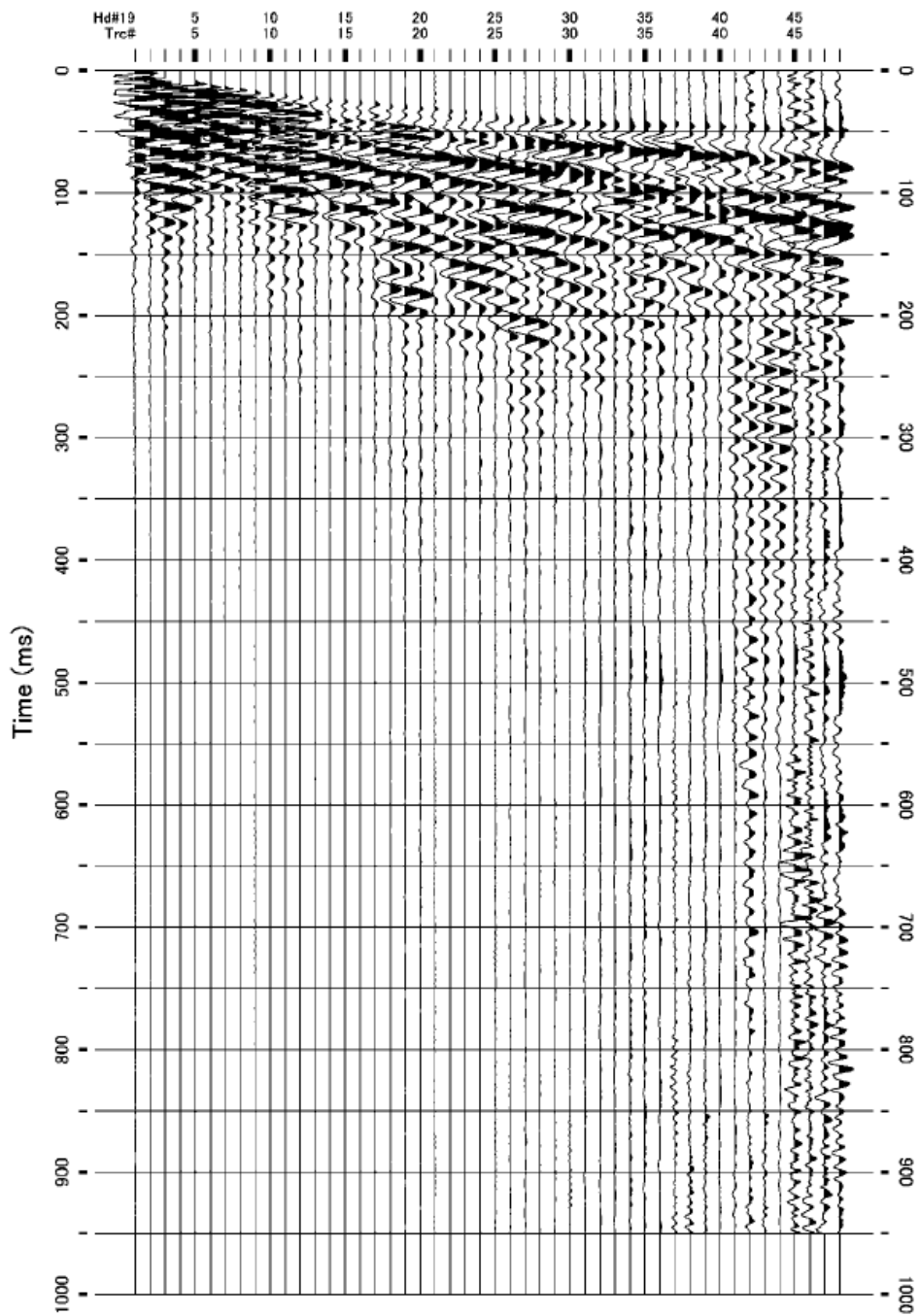
Field data (Surface wave shot record) : UB\_27



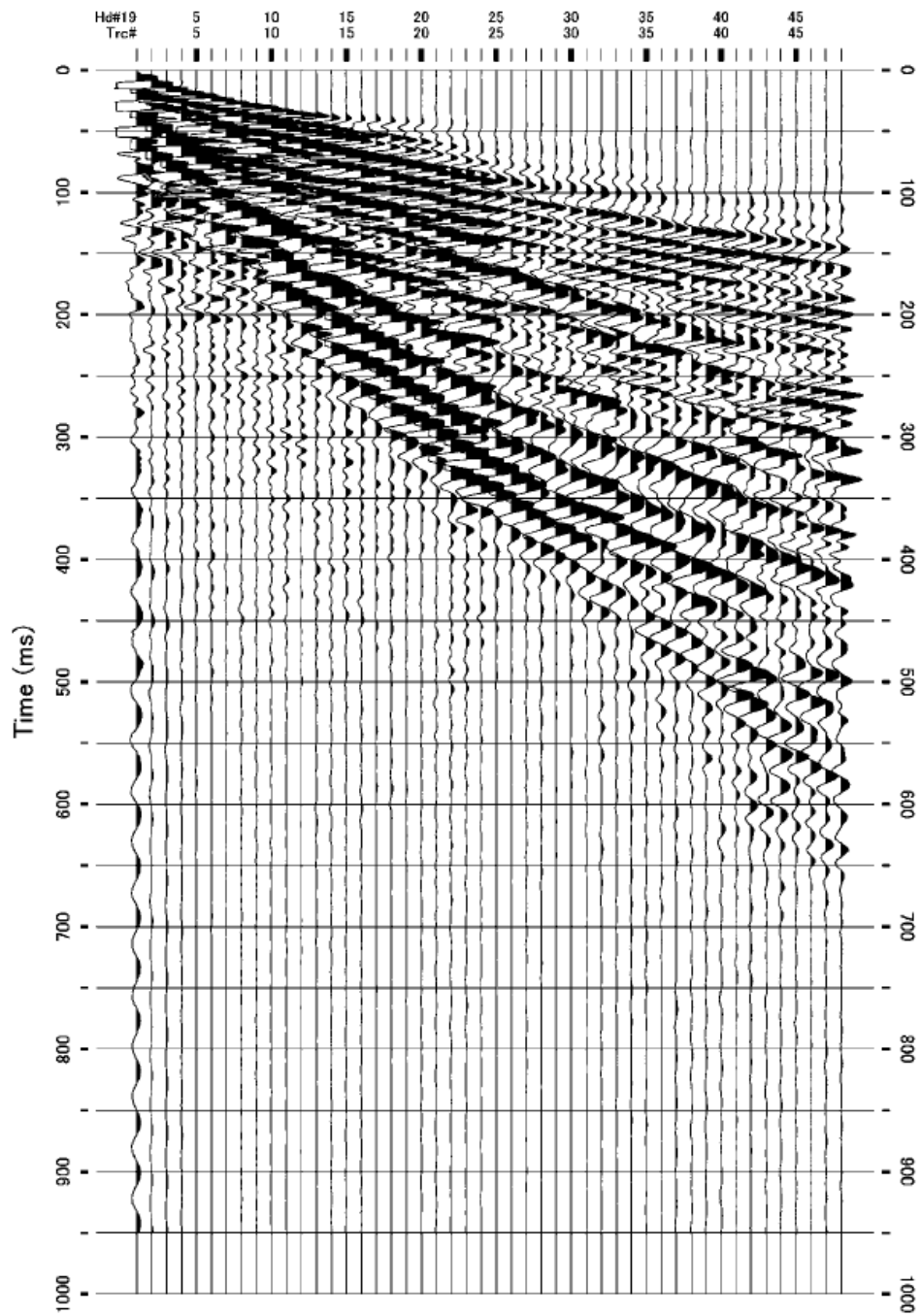
Field data (Surface wave shot record) : UB\_28



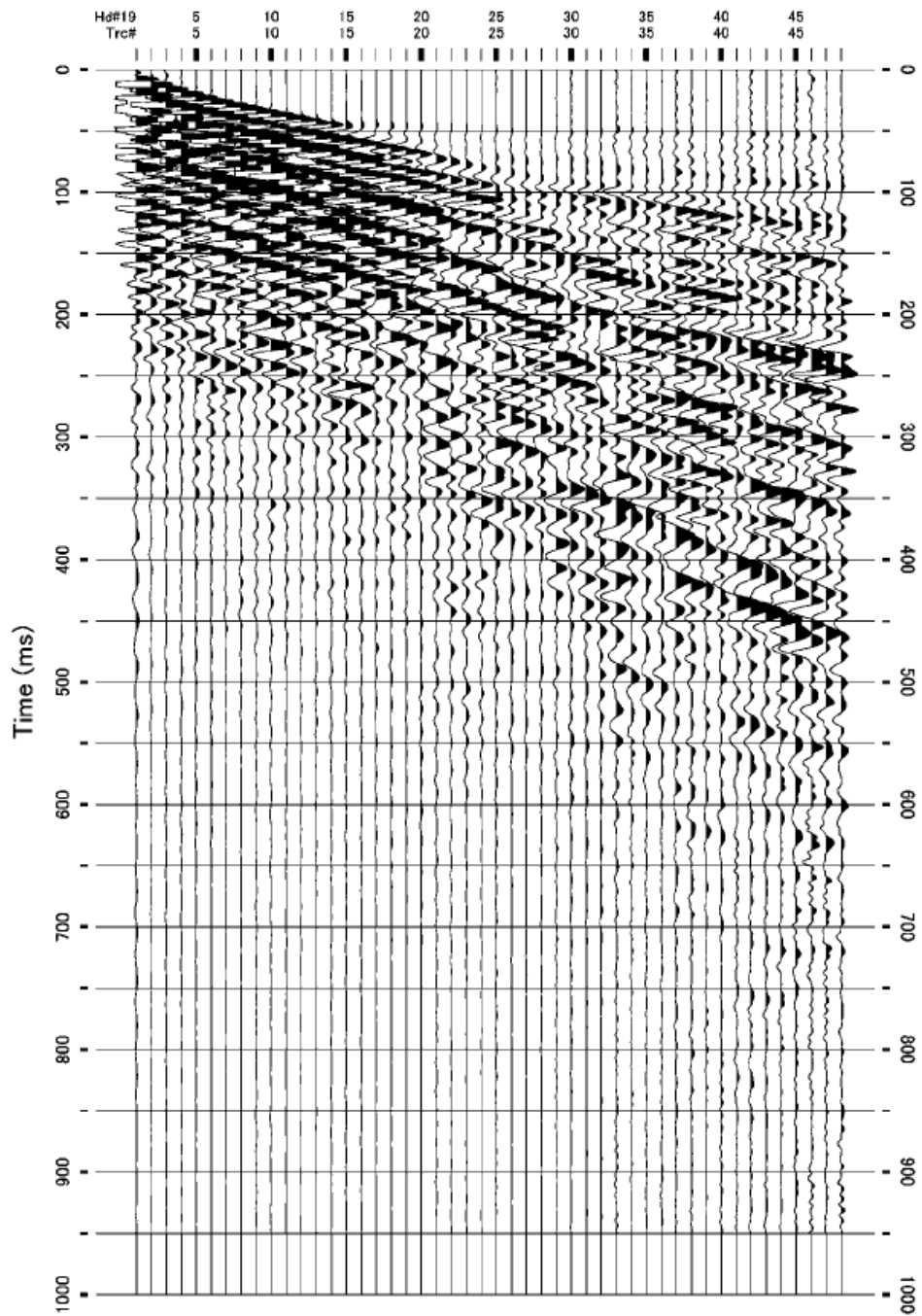
Field data (Surface wave shot record) : UB\_29



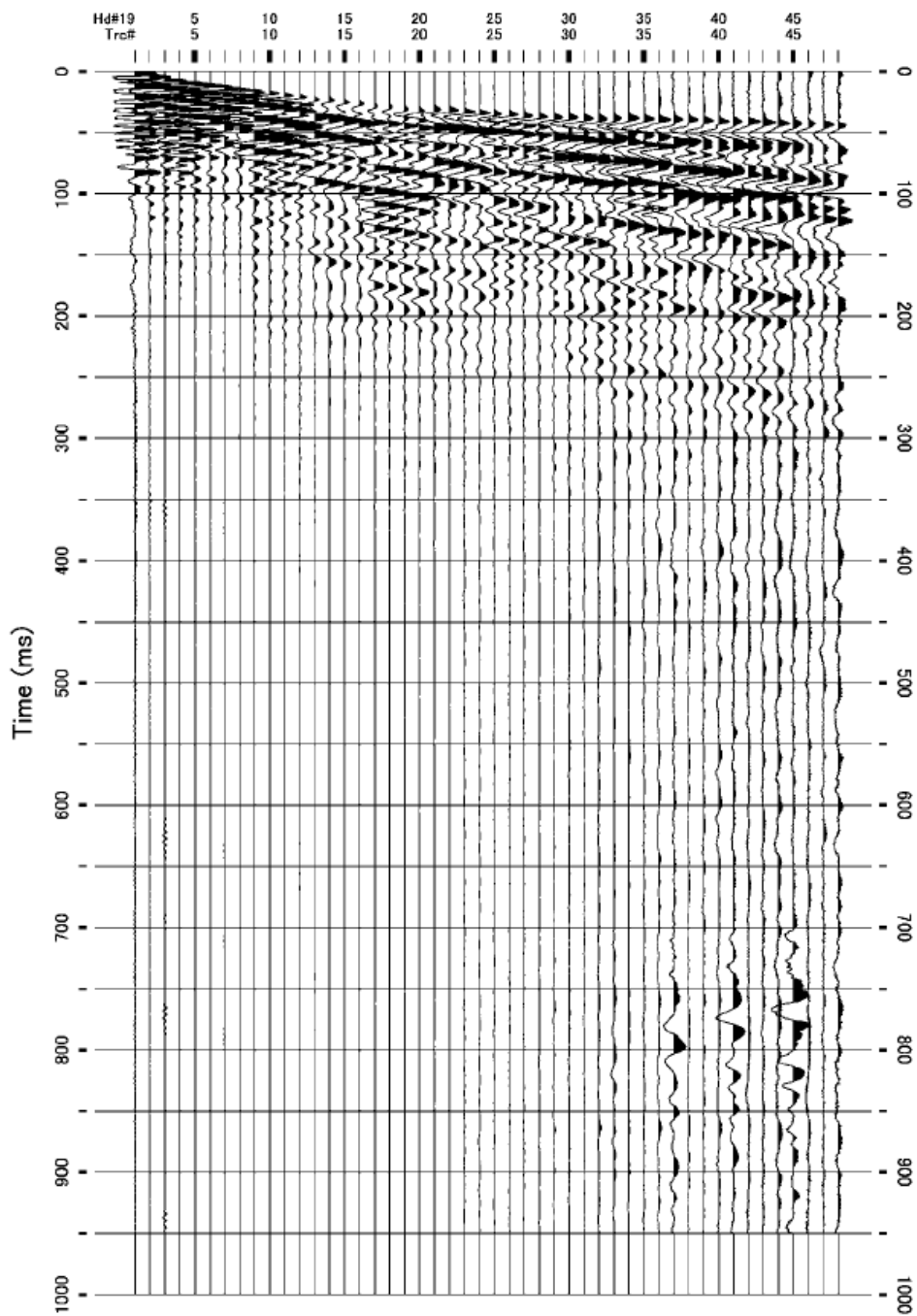
Field data (Surface wave shot record) : UB\_30



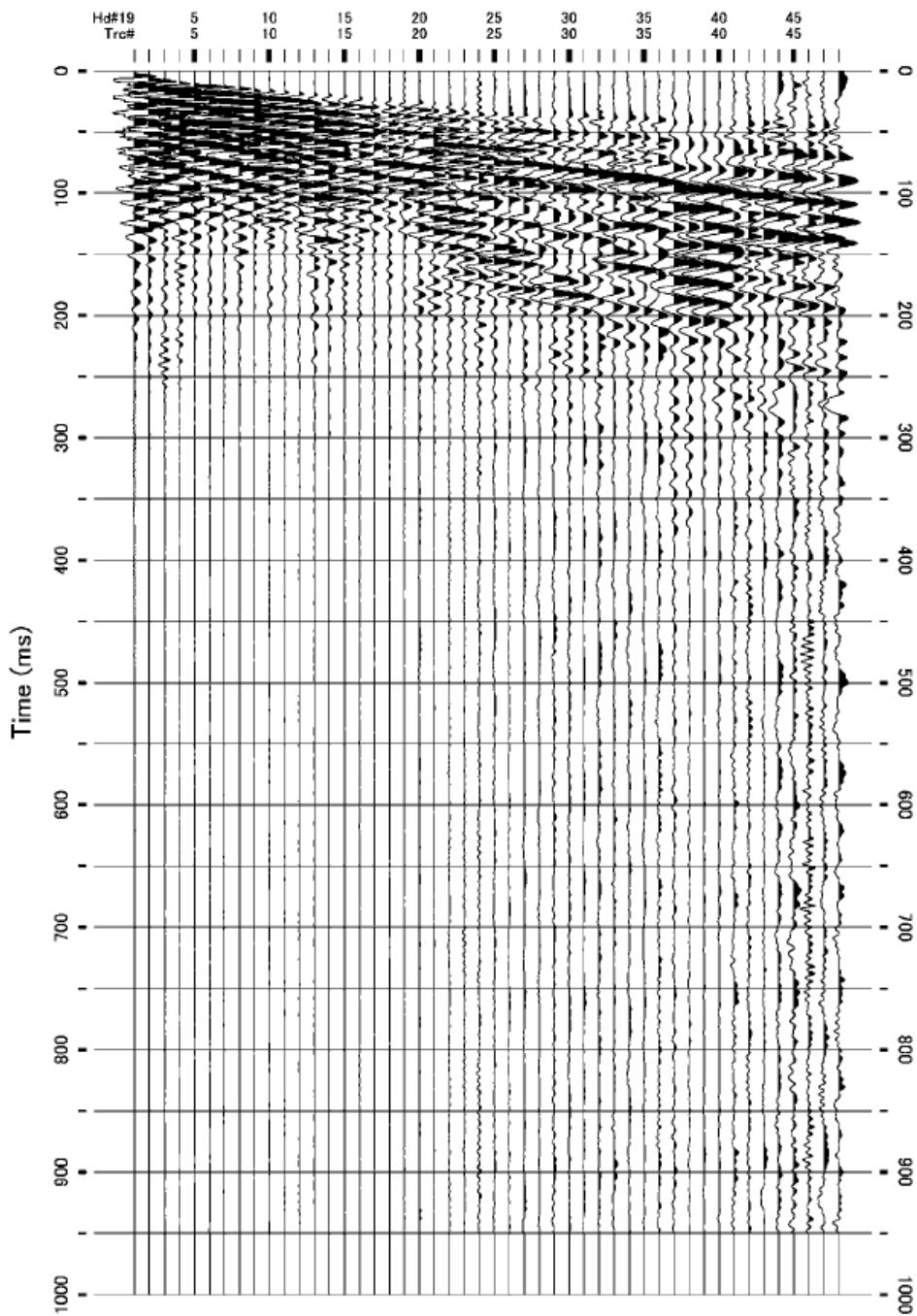
Field data (Surface wave shot record) : UB\_31



Field data (Surface wave shot record) : UB\_32

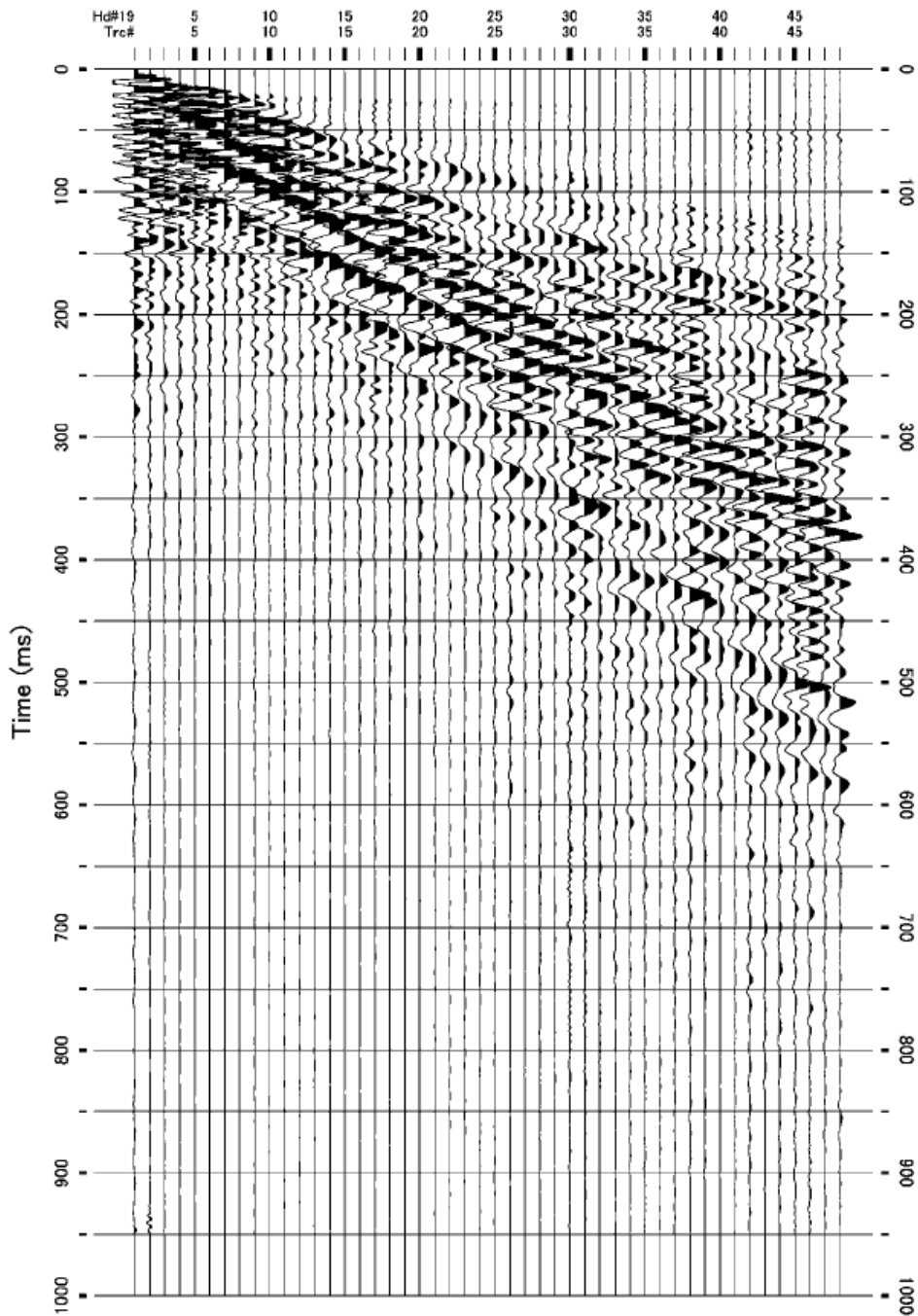


Field data (Surface wave shot record) : UB\_33

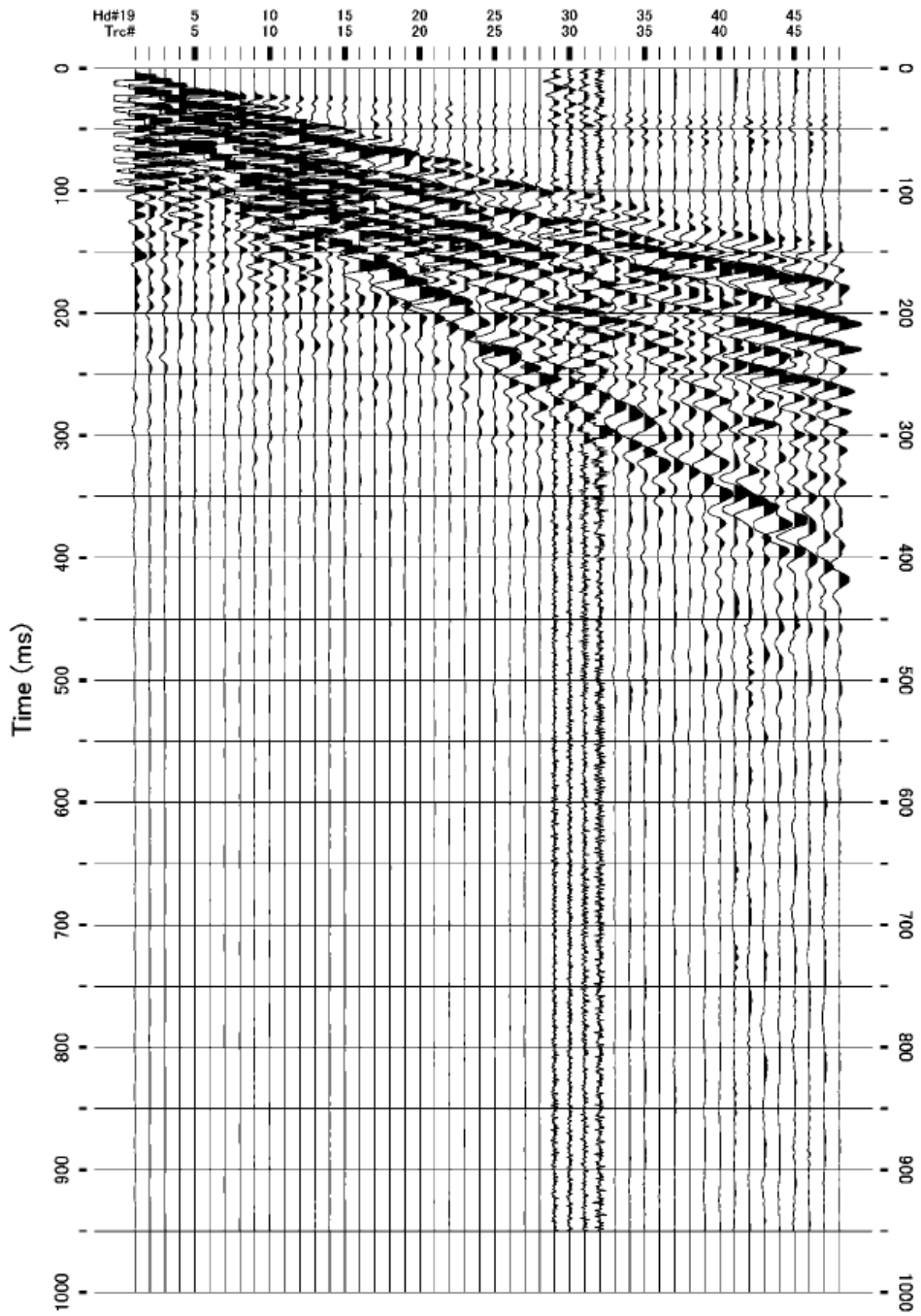


Field data (Surface wave shot record) : UB\_34

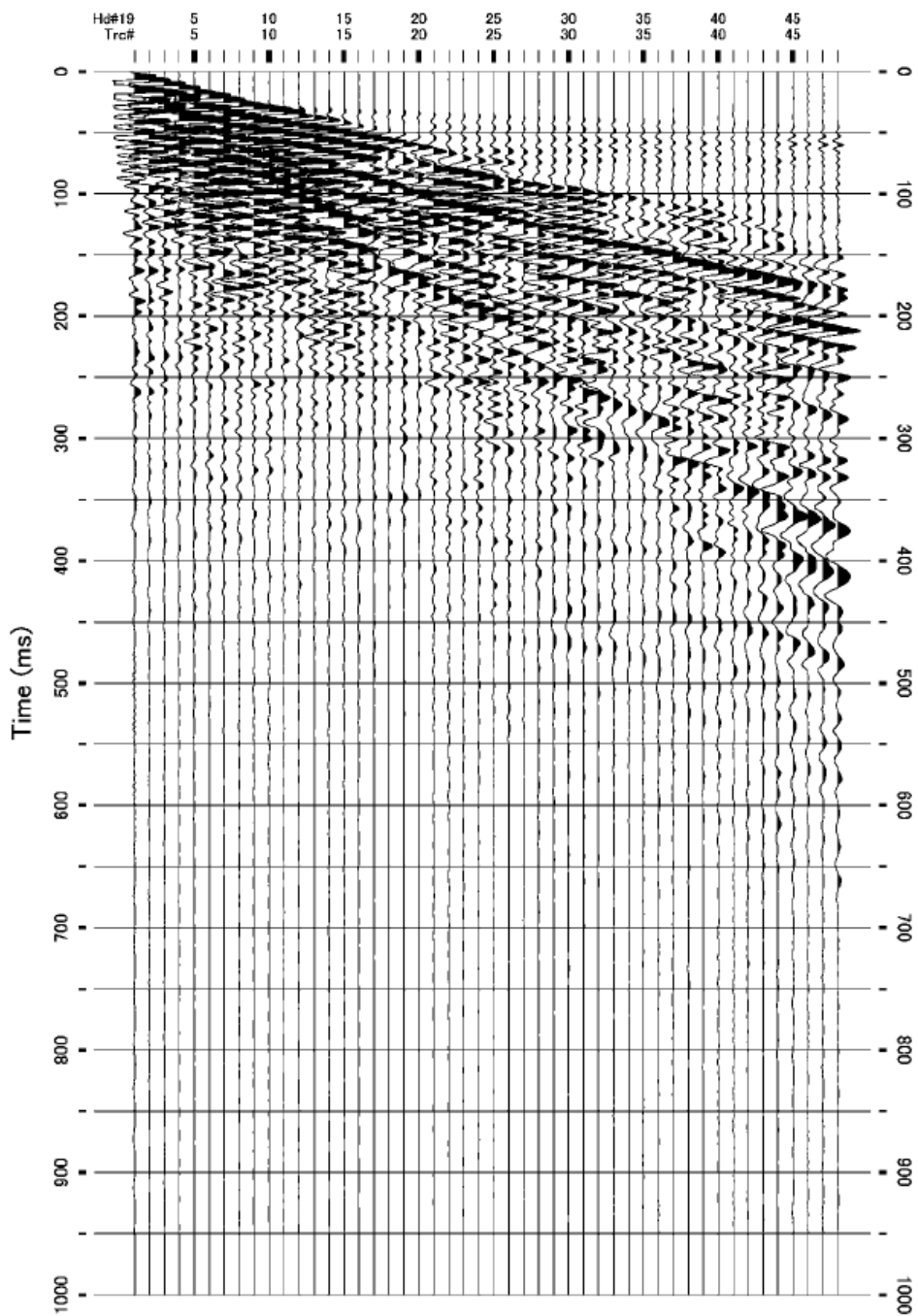




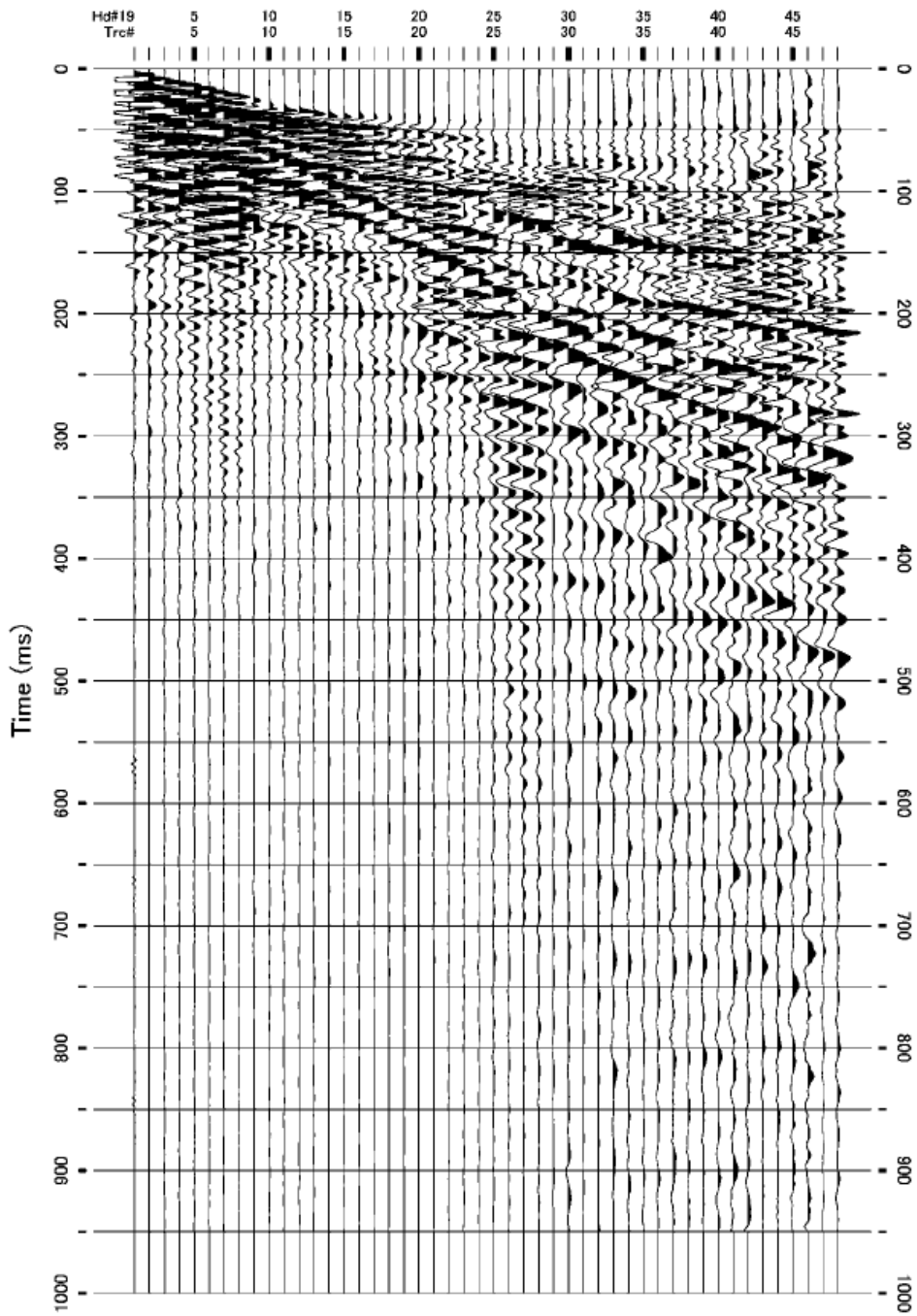
Field data (Surface wave shot record) : UB\_35



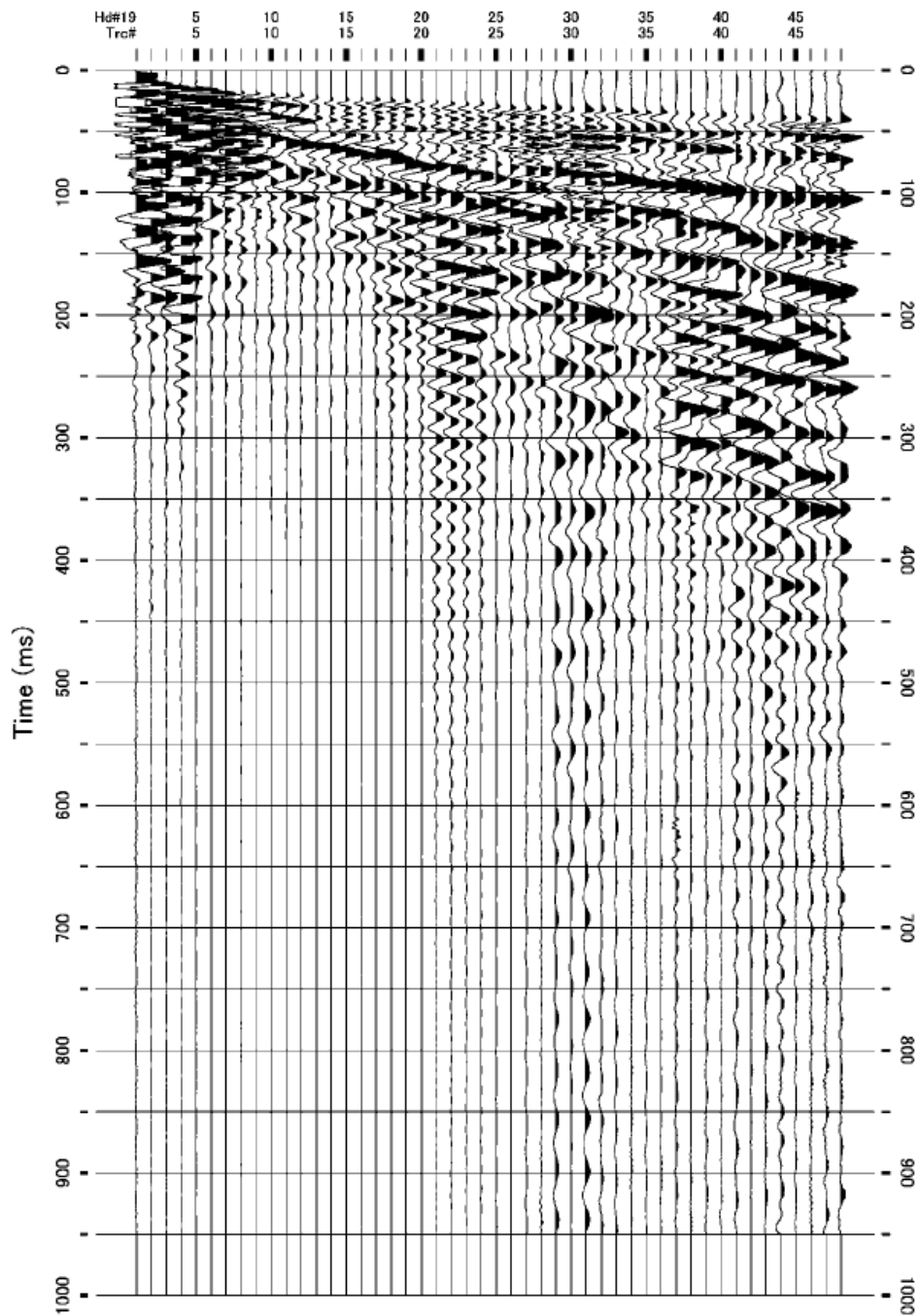
Field data (Surface wave shot record) : UB\_36



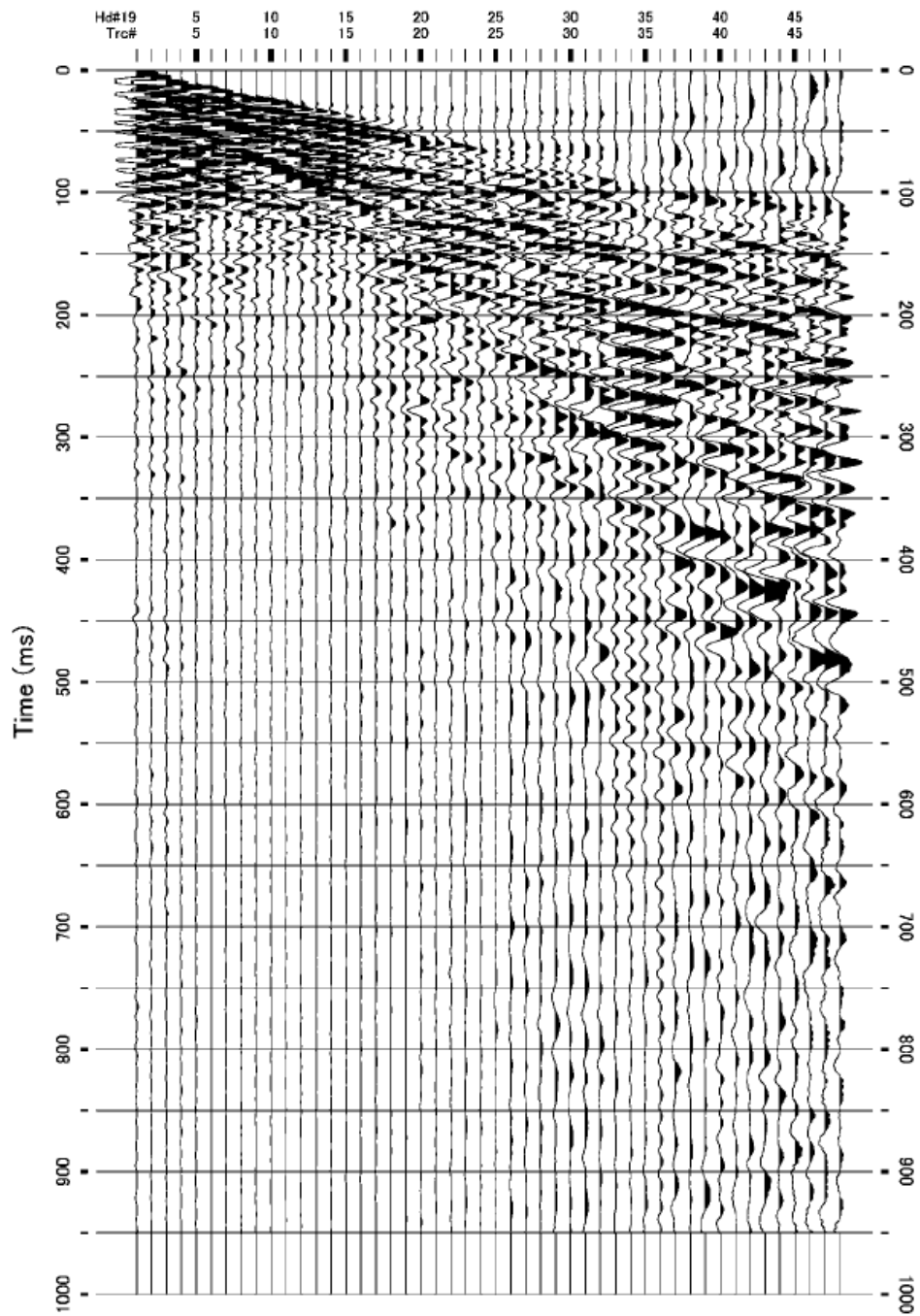
Field data (Surface wave shot record) : UB\_37



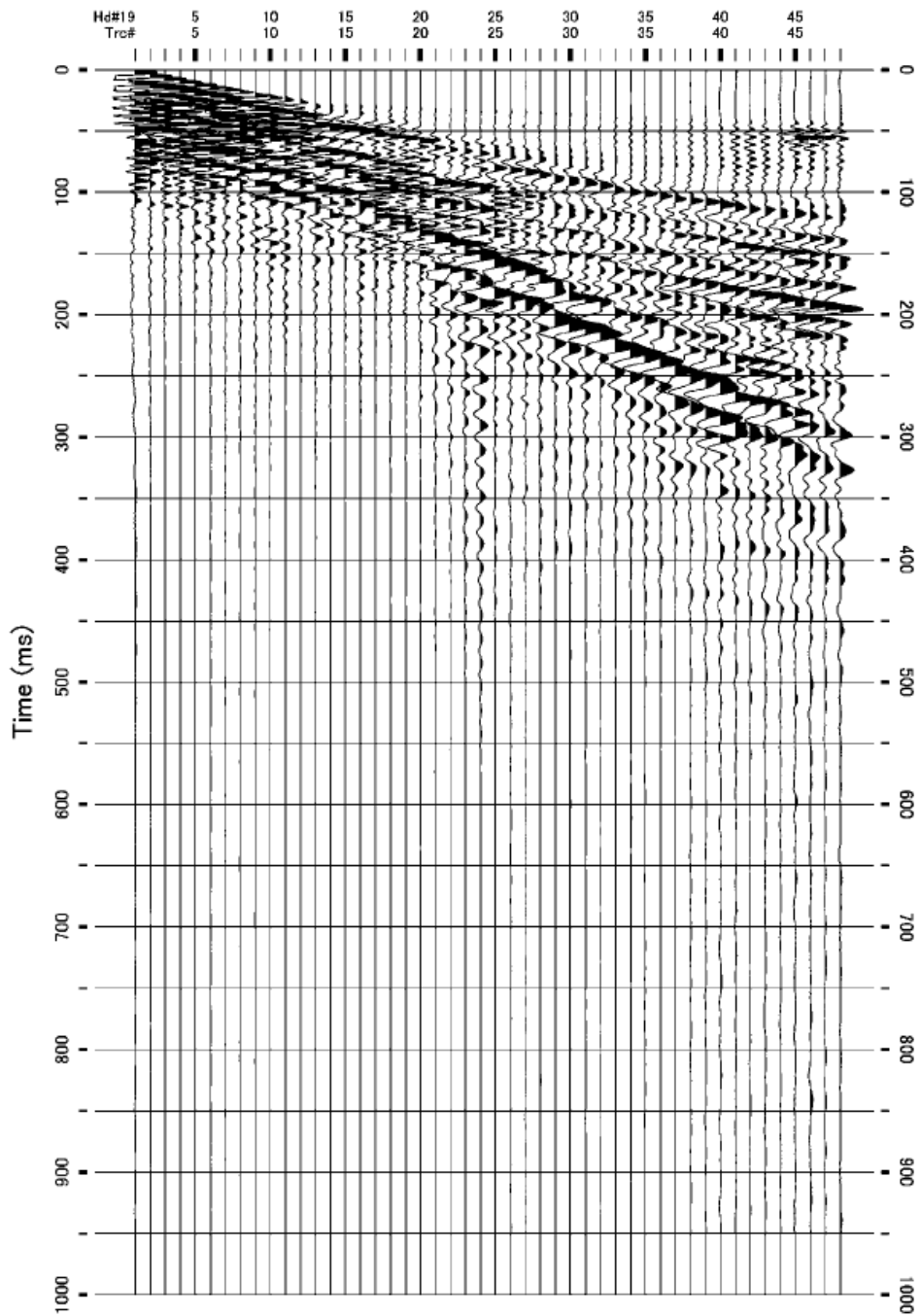
Field data (Surface wave shot record) : UB\_Bo\_01



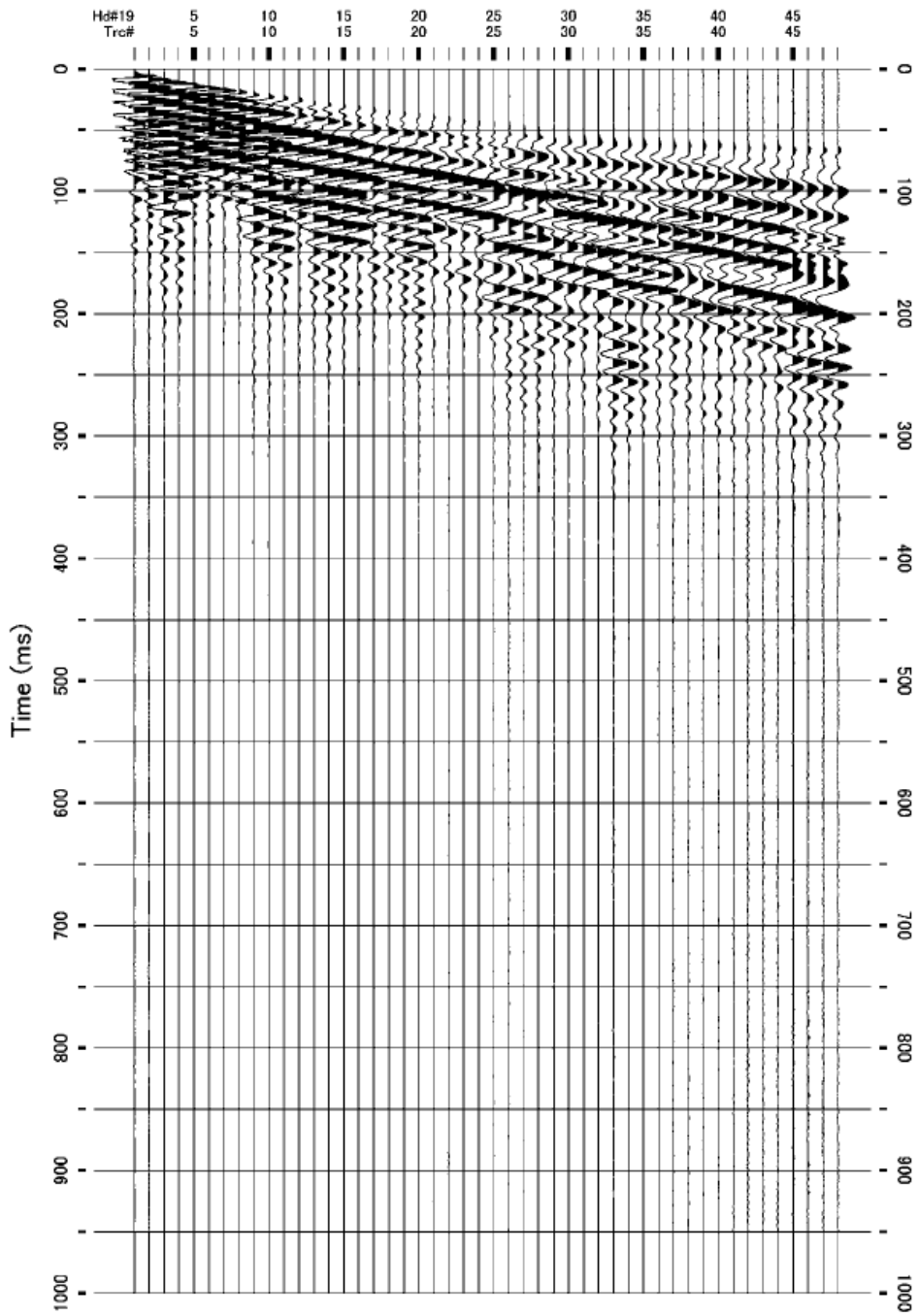
Field data (Surface wave shot record) : UB\_Bo\_02



Field data (Surface wave shot record) : UB\_Bo\_03

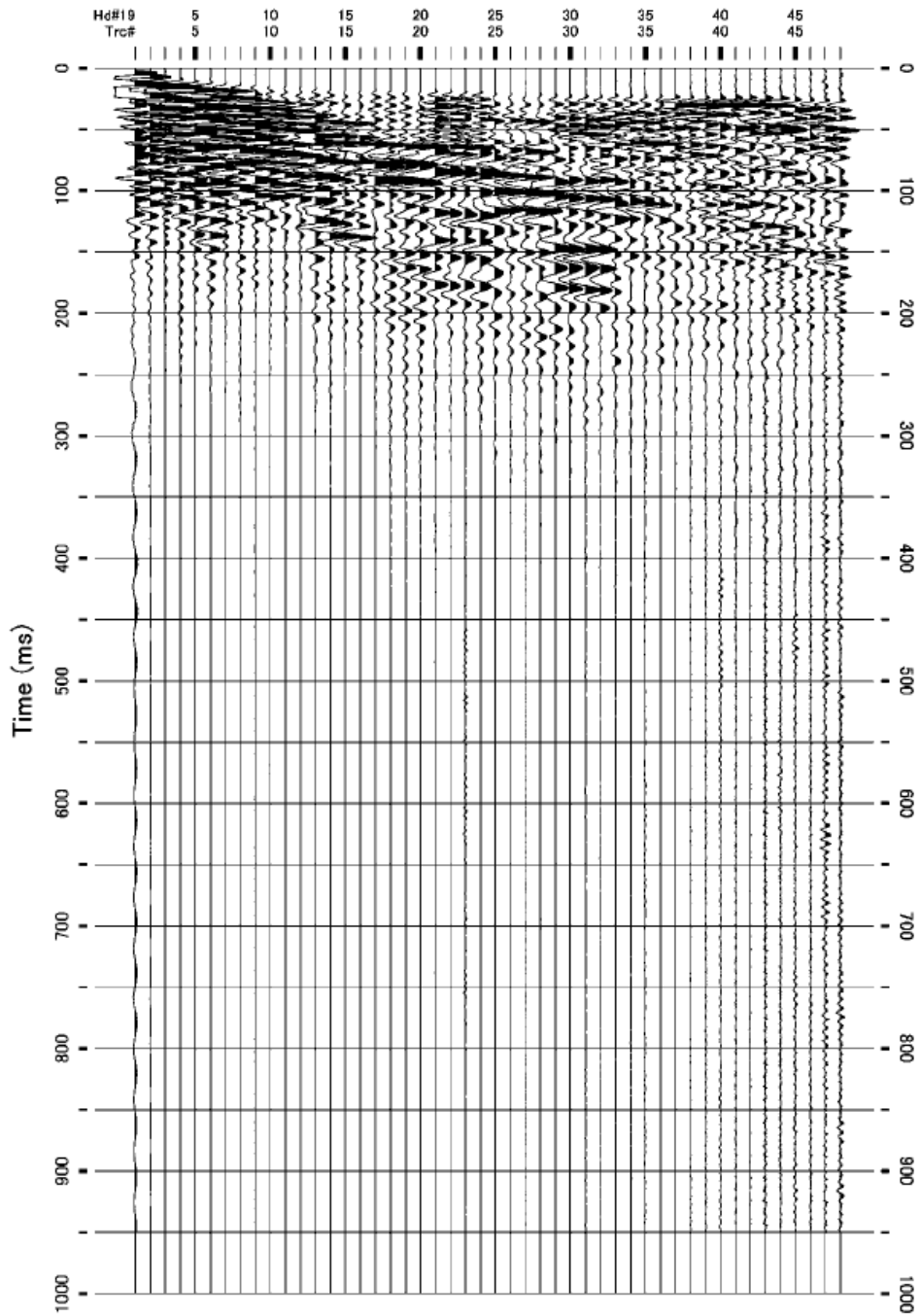


Field data (Surface wave shot record) : UB\_Bo\_04

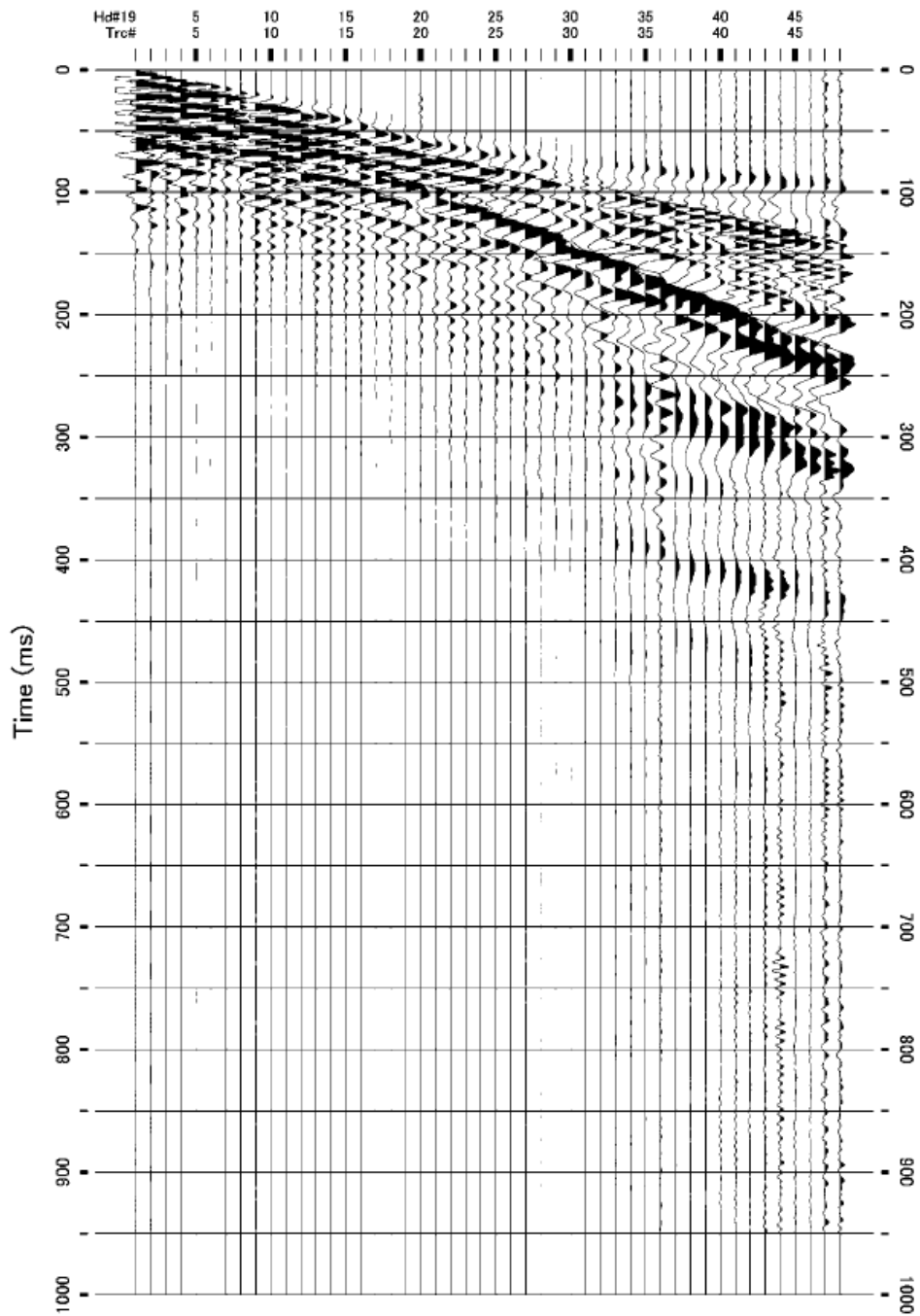


Field data (Surface wave shot record) : BI\_01

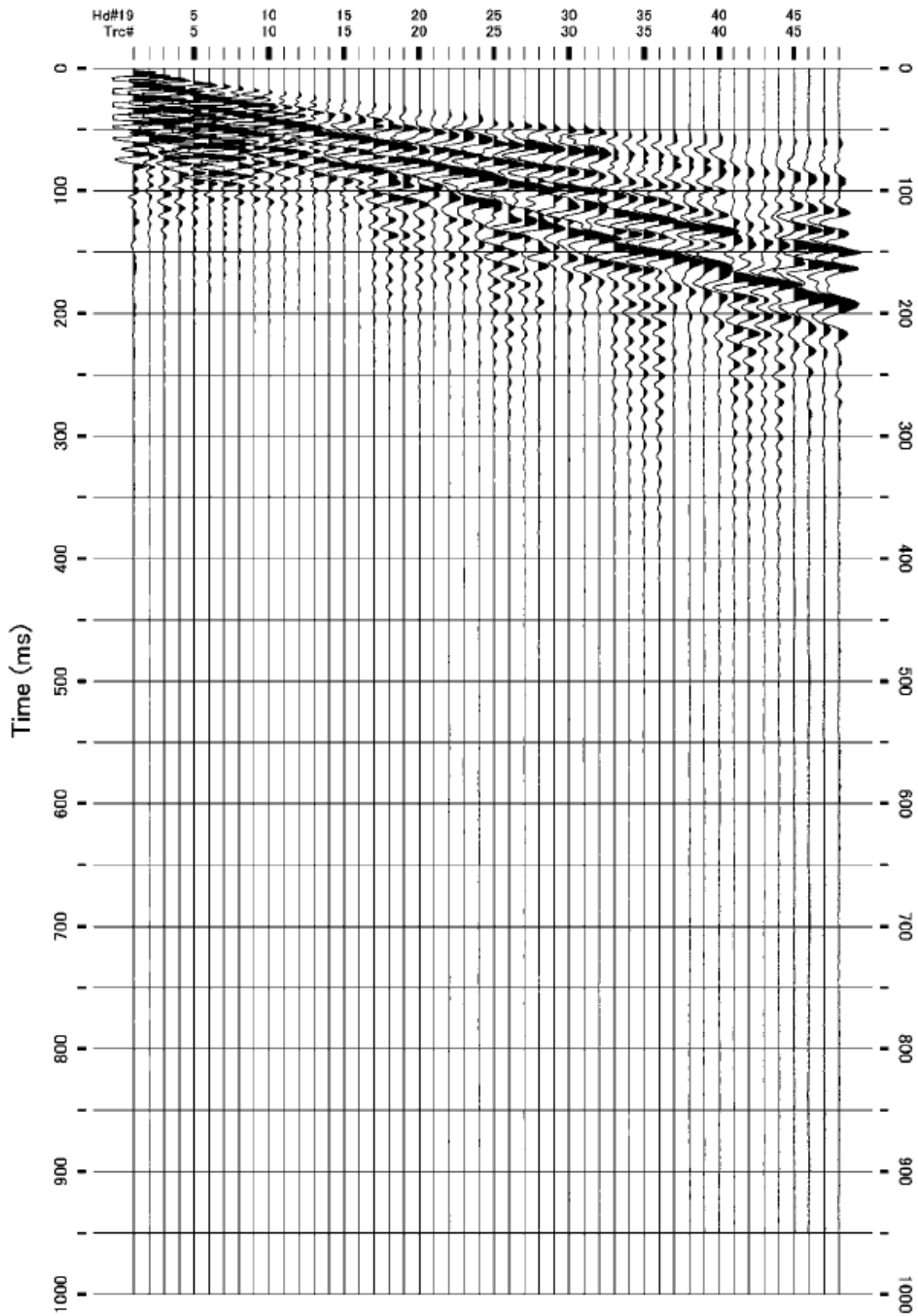




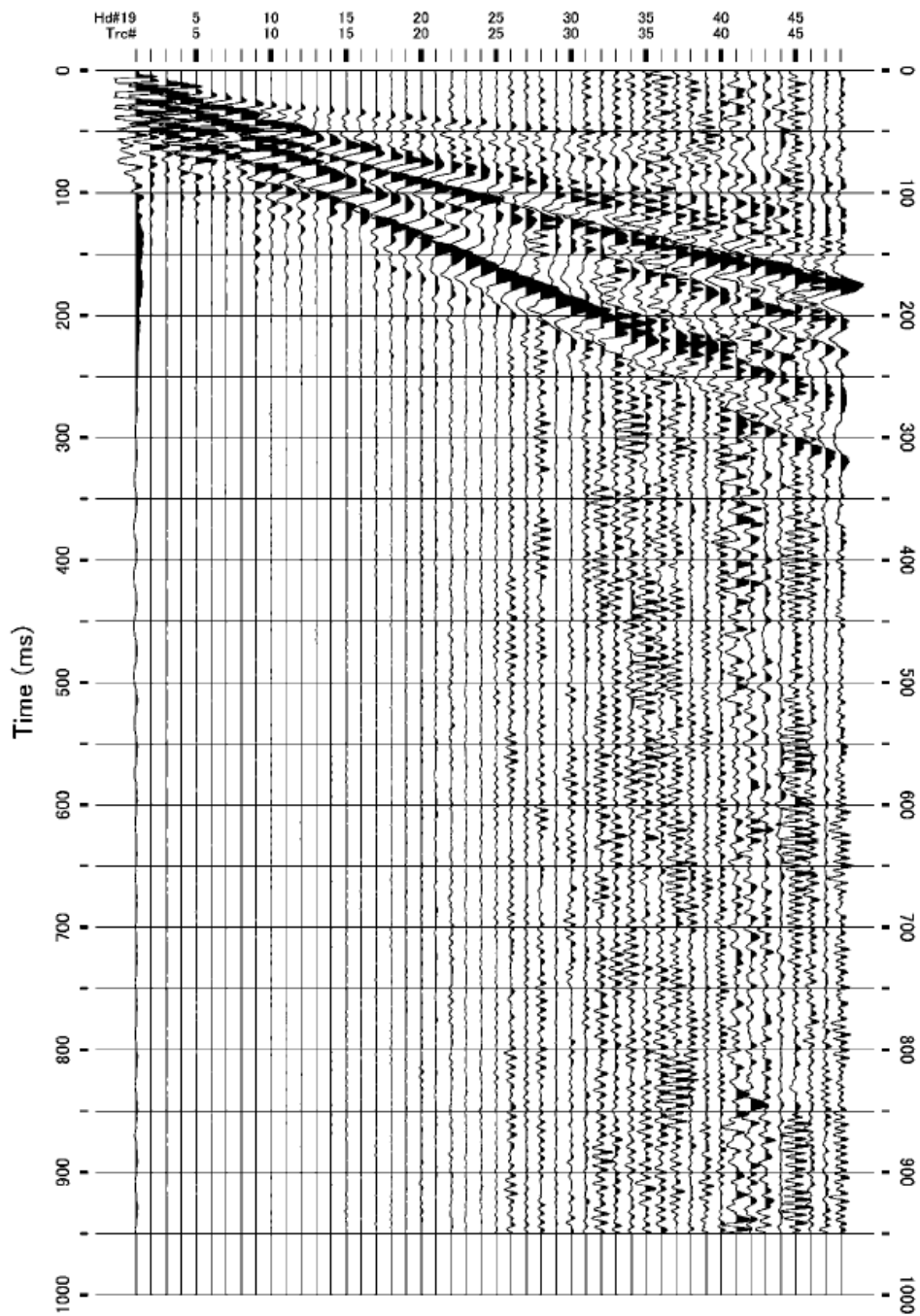
Field data (Surface wave shot record) : BI\_02



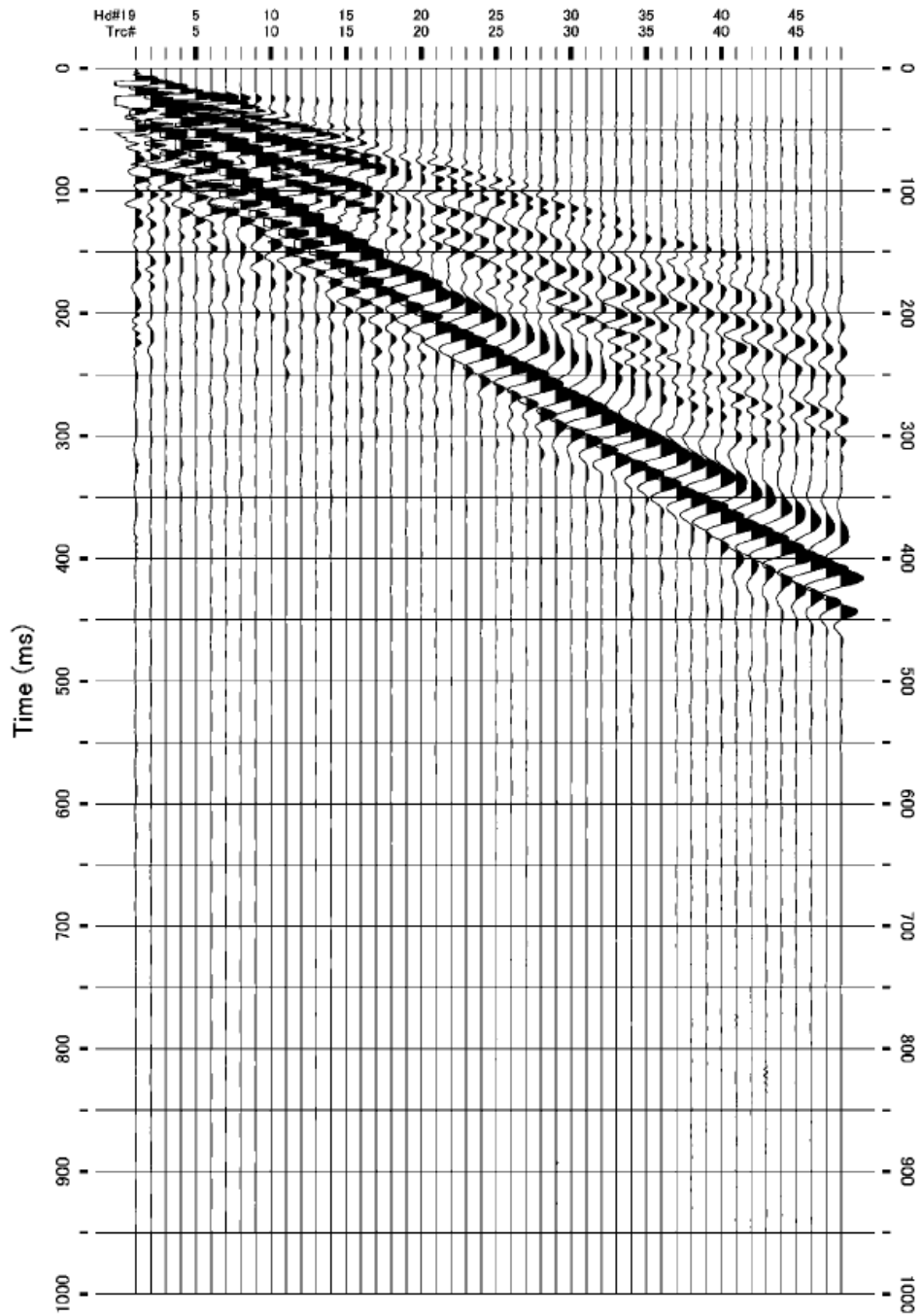
Field data (Surface wave shot record) : BI\_03



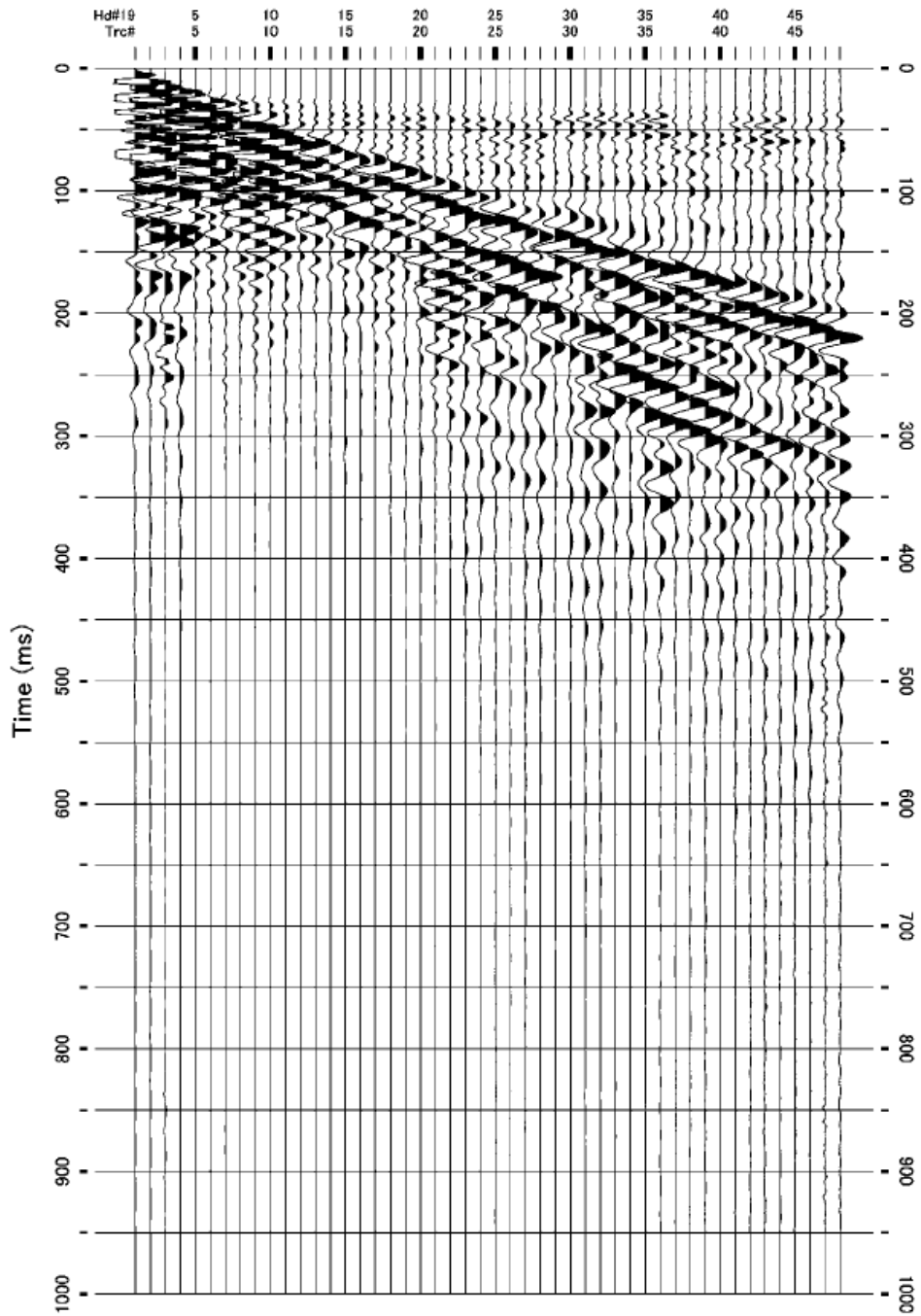
Field data (Surface wave shot record) : BR\_01



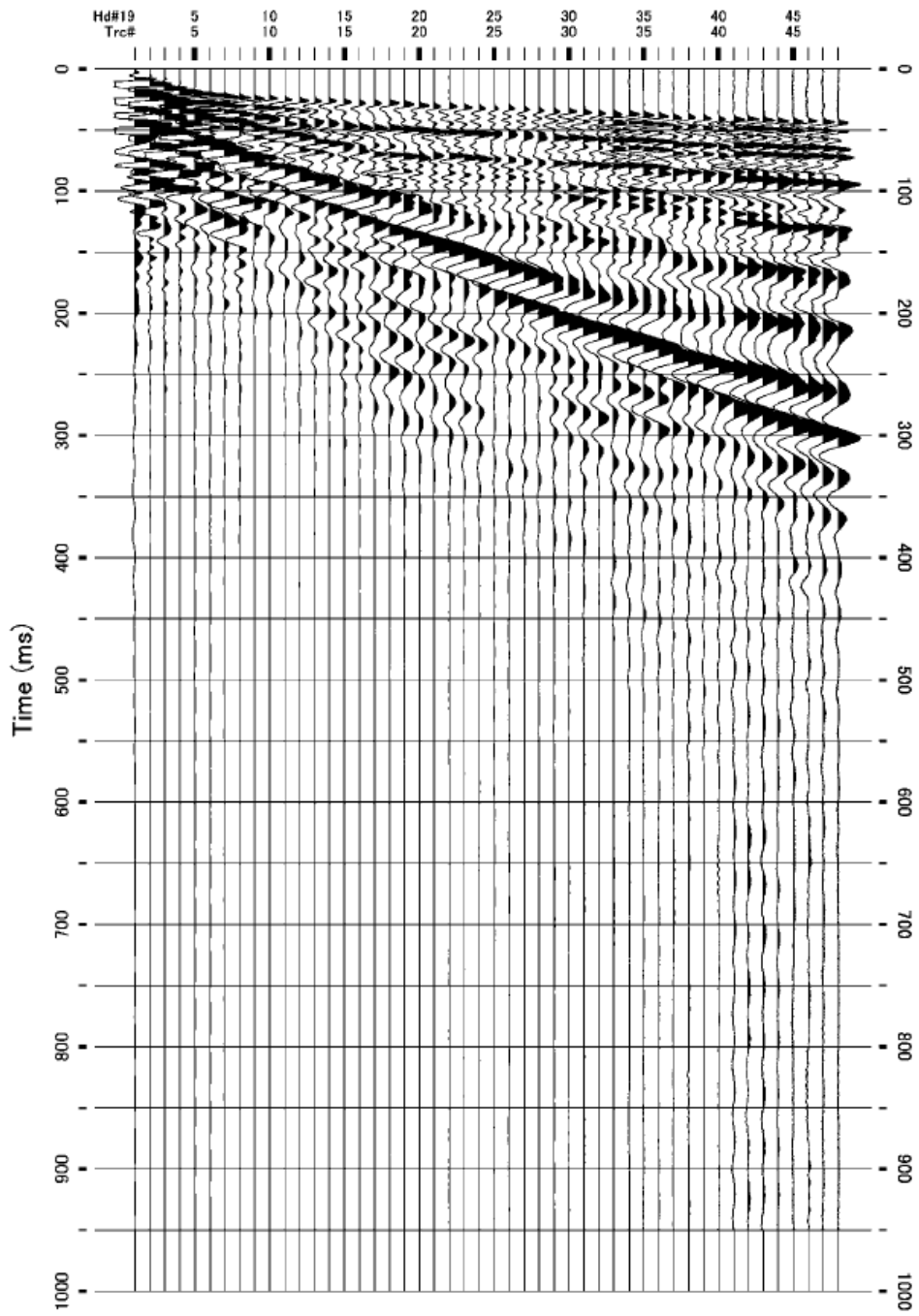
Field data (Surface wave shot record) : BR\_02



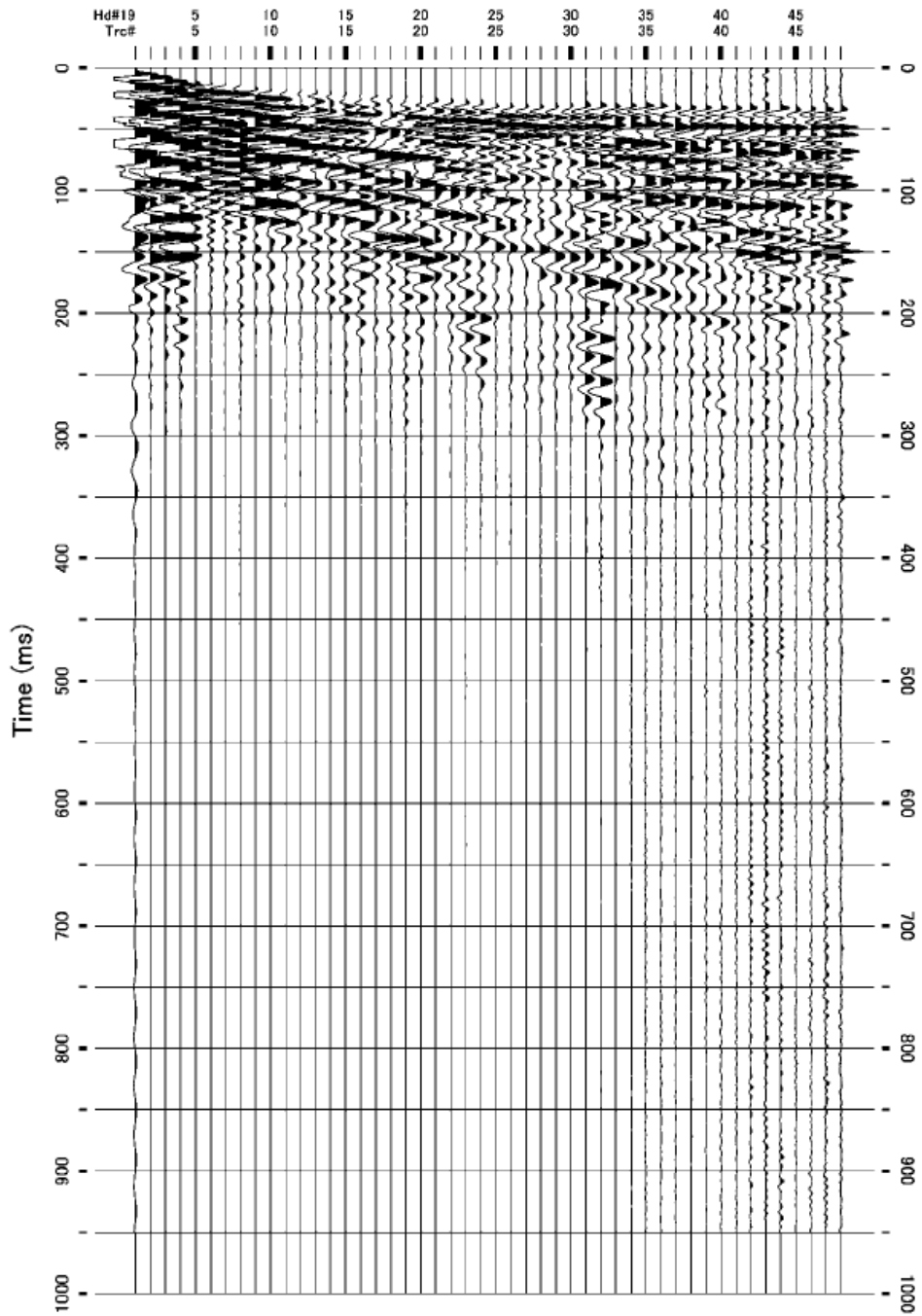
Field data (Surface wave shot record) : BR\_03



Field data (Surface wave shot record) : NH\_01



Field data (Surface wave shot record) : NH\_02

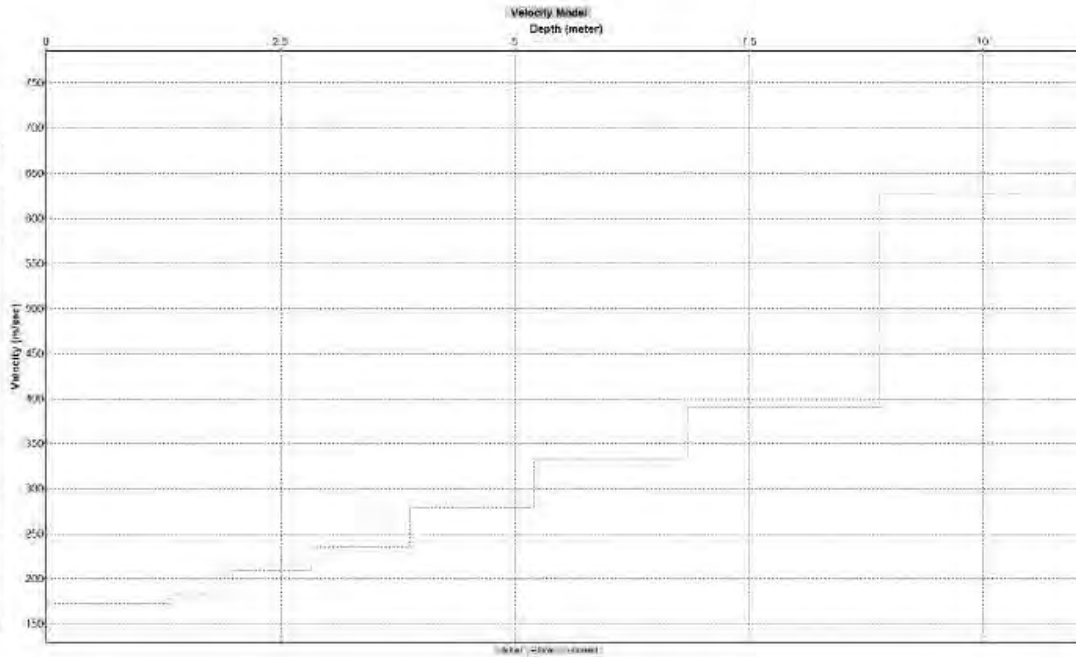


Field data (Surface wave shot record) : NH\_03



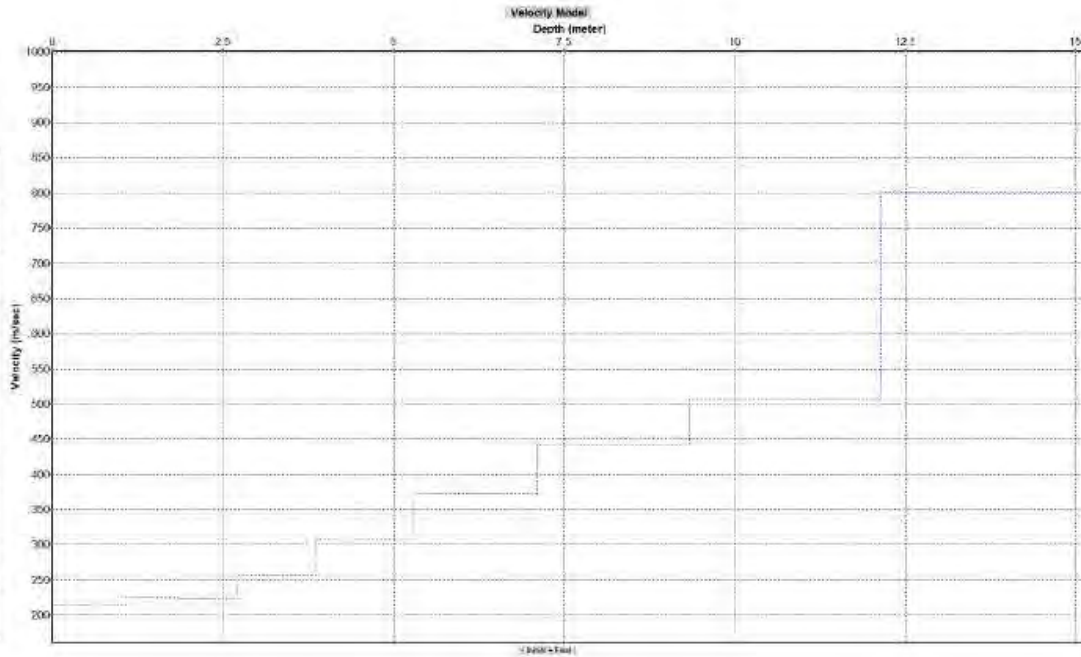
(2) Velocity Model

first velocity model (apparent velocity:Vs)		
1	0.34	172.3
2	0.78	172.3
3	1.31	171.8
4	1.99	180.8
5	2.83	209.2
6	3.88	235.3
7	5.19	278.9
8	6.83	332.1
9	8.89	390.4
10	-	628.3



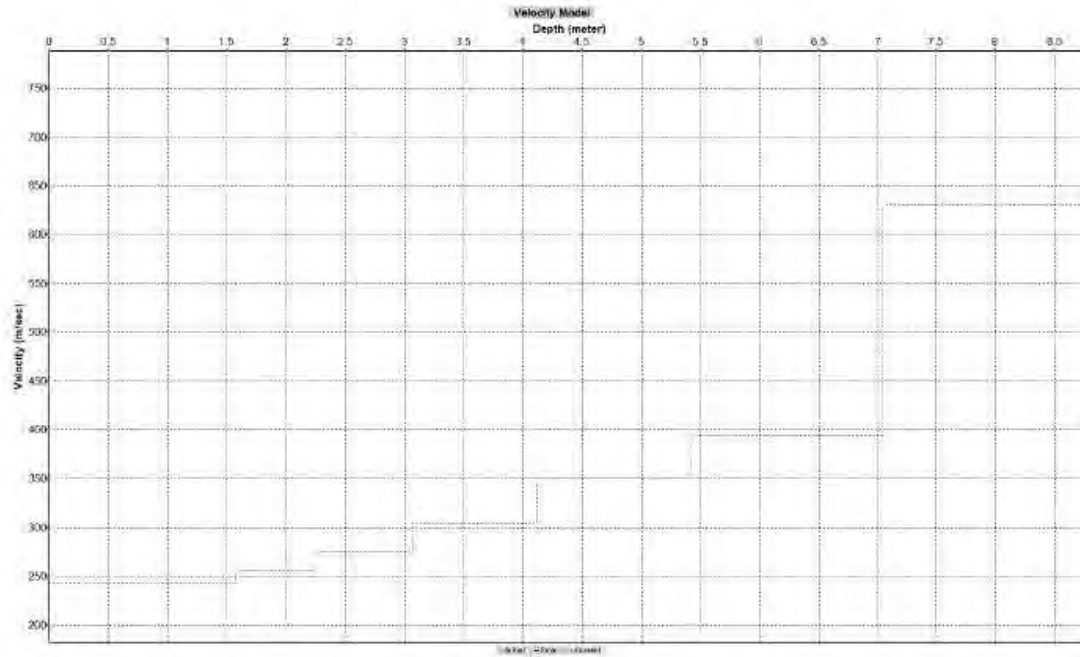
S-wave layer model (Surface wave) : UB\_01

first velocity model (apparent velocity: Vs)		
1	0.47	214.6
2	1.06	214.6
3	1.79	225.8
4	2.71	224.4
5	3.86	256.9
6	5.30	309.4
7	7.09	371.9
8	9.33	442.4
9	12.13	508.0
10	-	801.1



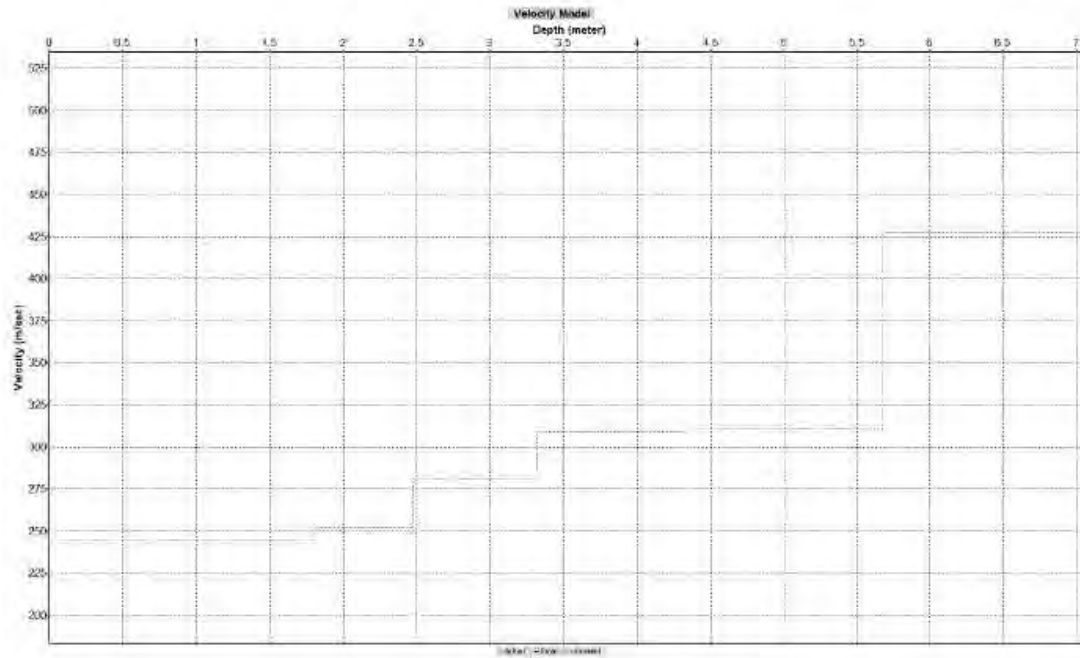
S-wave layer model (Surface wave) : UB\_02

first velocity model (apparent velocity:Vs)		
1	0.27	242.7
2	0.61	242.7
3	1.04	242.7
4	1.57	242.7
5	2.24	255.6
6	3.07	275.2
7	4.11	304.9
8	5.41	350.2
9	7.04	394.5
10	-	630.4



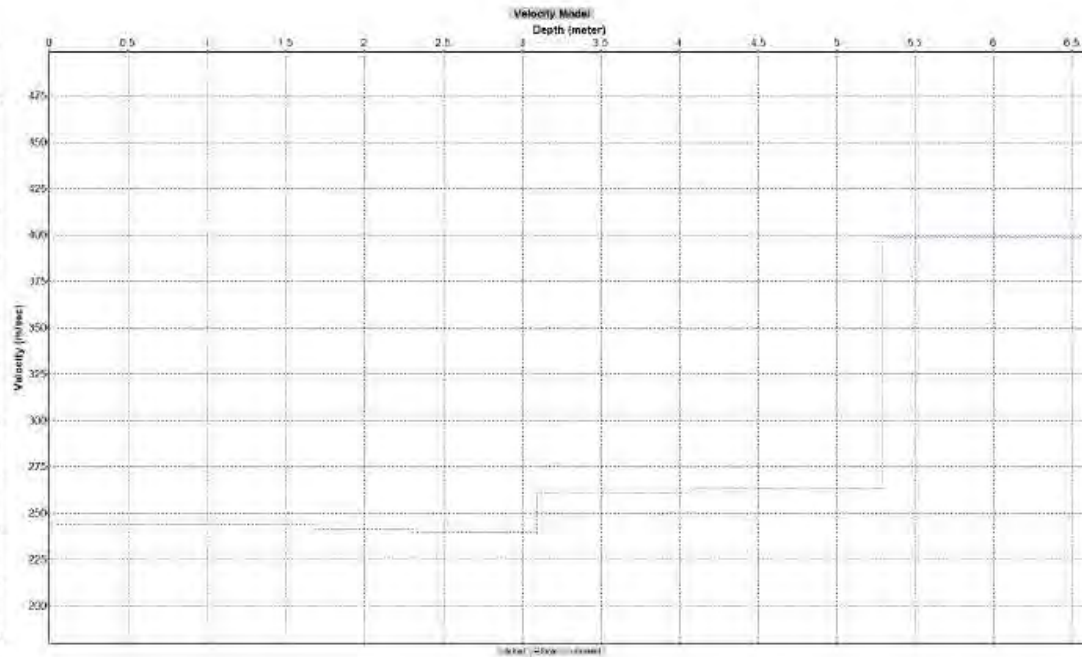
S-wave layer model (Surface wave) : UB\_03

first velocity model (apparent velocity:Vs)		
1	0.22	244.33
2	0.494	244.33
3	0.838	244.33
4	1.267	244.33
5	1.804	244.33
6	2.474	252.22
7	3.313	280.95
8	4.361	309.53
9	5.671	310.53
10	-	427.74



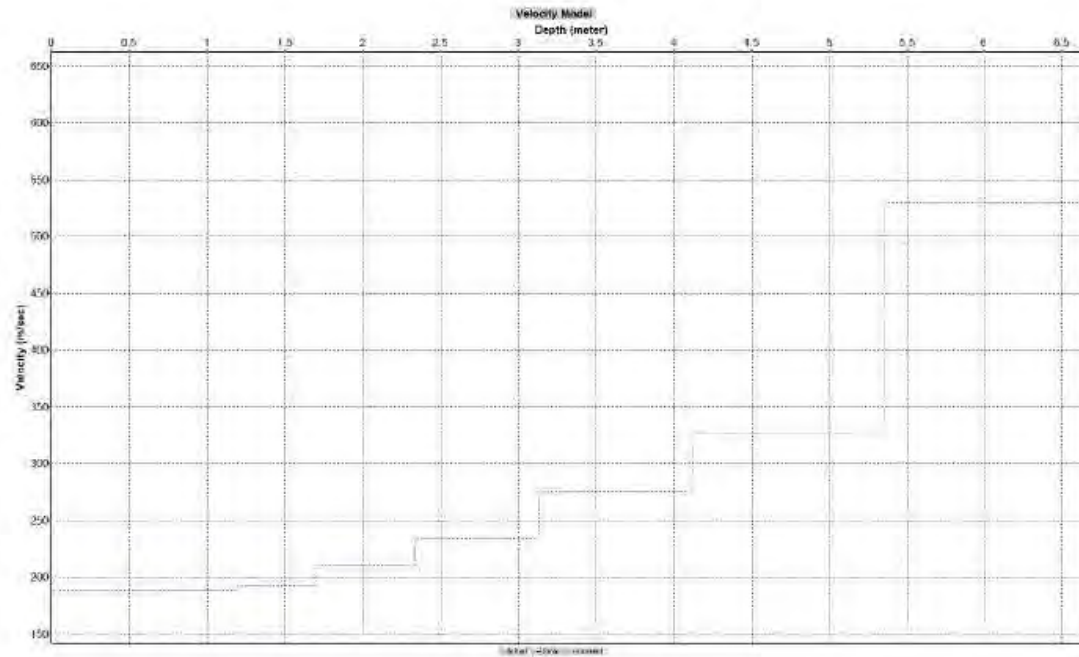
S-wave layer model (Surface wave) : UB\_04

first velocity model (apparent velocity:Vs)		
1	0.205	243.91
2	0.461	243.91
3	0.781	243.91
4	1.182	243.91
5	1.682	243.86
6	2.308	241.63
7	3.09	239.47
8	4.067	261.35
9	5.289	263.28
10	-	398.92



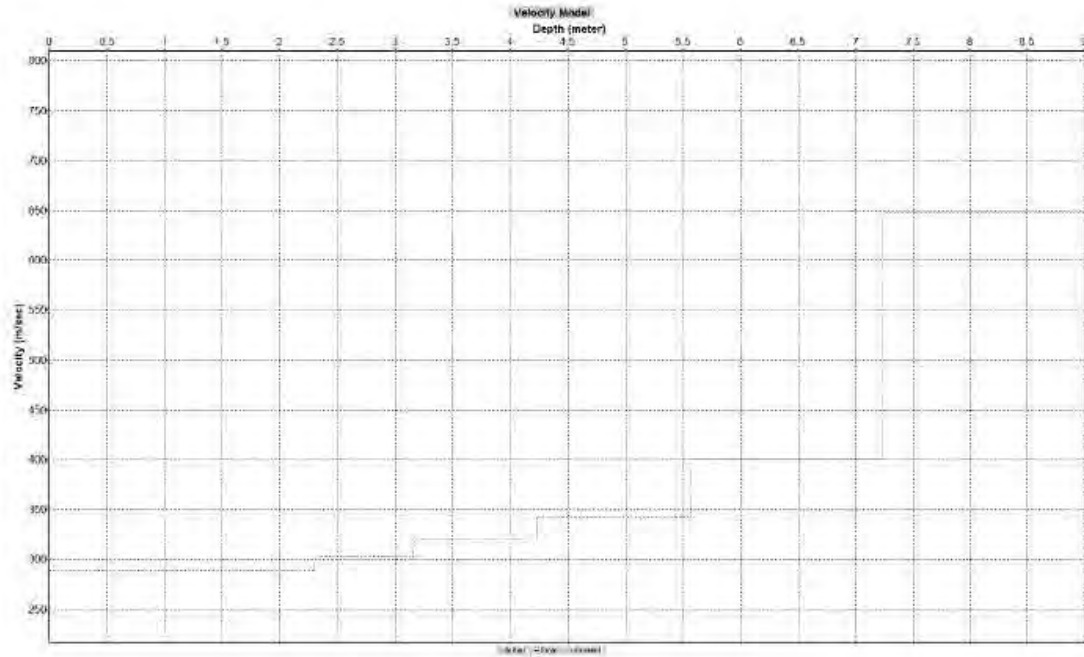
S-wave layer model (Surface wave) : UB\_05

first velocity model (apparent velocity:Vs)		
1	0.207	188.69
2	0.467	188.69
3	0.791	188.69
4	1.196	188.69
5	1.702	192.92
6	2.336	210.62
7	3.127	234.06
8	4.116	275.95
9	5.352	326.92
10	-	529.89



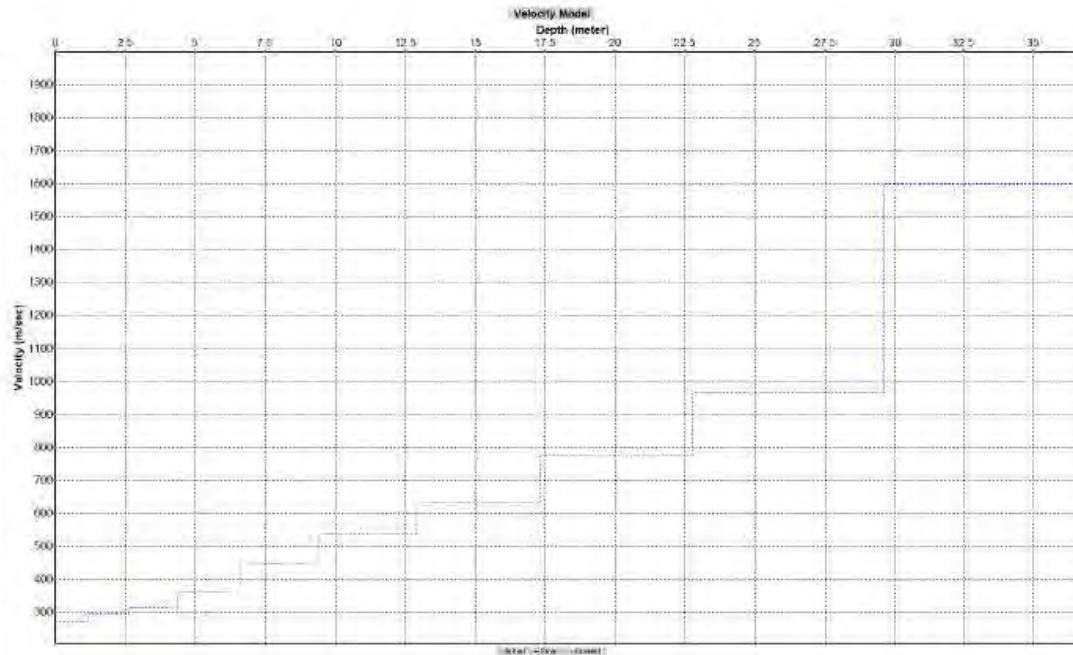
S-wave layer model (Surface wave) : UB\_06

first velocity model (apparent velocity:Vs)		
1	0.28	289.1
2	0.63	289.1
3	1.07	289.1
4	1.62	289.1
5	2.30	289.0
6	3.16	303.3
7	4.23	320.7
8	5.56	342.8
9	7.23	401.0
10	-	647.8



S-wave layer model (Surface wave) : UB\_07

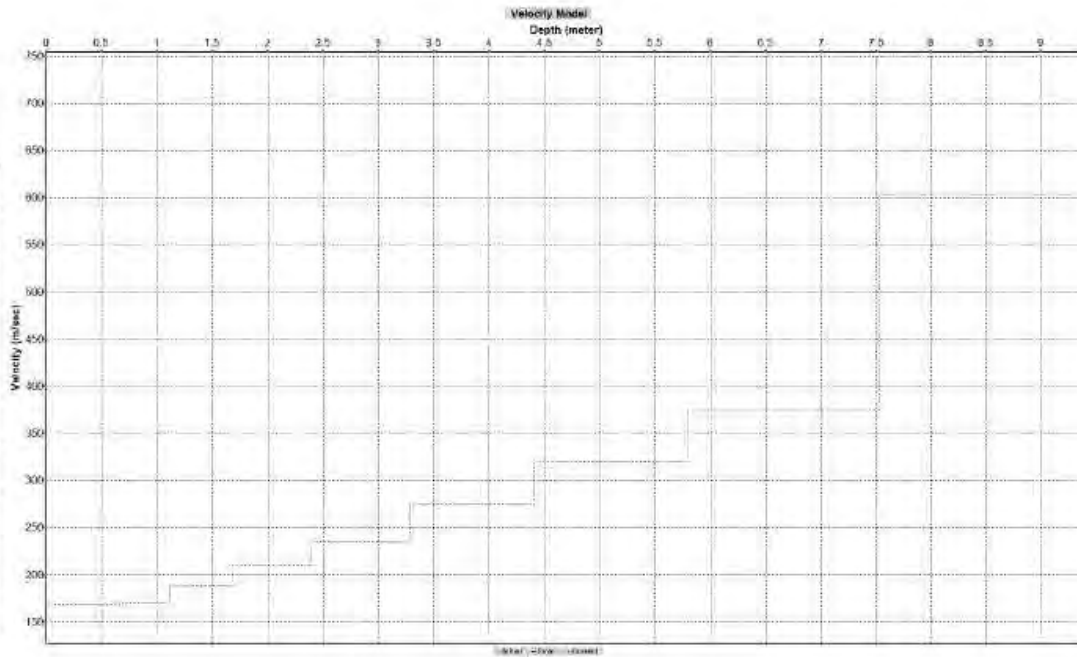
first velocity model (apparent velocity:Vs)		
1	1.148	271.6
2	2.58	293.6
3	4.38	313.7
4	6.62	362.0
5	9.42	449.4
6	12.92	536.5
7	17.29	634.9
8	22.77	775.6
9	29.61	964.0
10	-	1598.7



S-wave layer model (Surface wave) : UB\_08

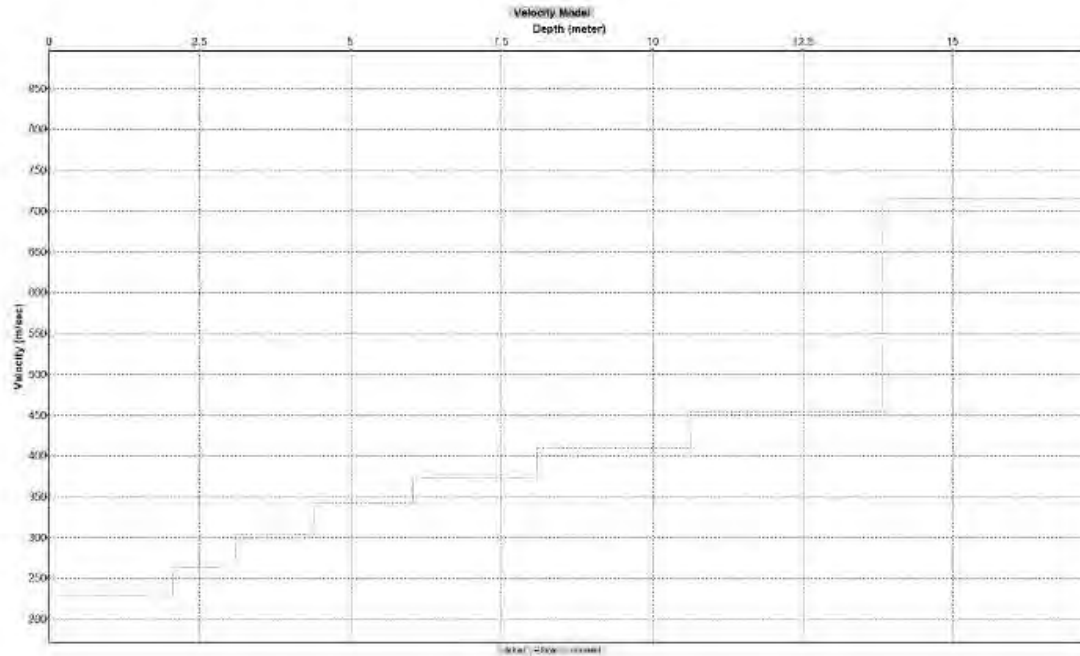


first velocity model (apparent velocity:Vs)		
1	0.29	169.3
2	0.66	169.3
3	1.11	170.2
4	1.68	188.3
5	2.40	209.9
6	3.29	235.6
7	4.40	274.4
8	5.79	319.6
9	7.53	374.3
10	-	603.4



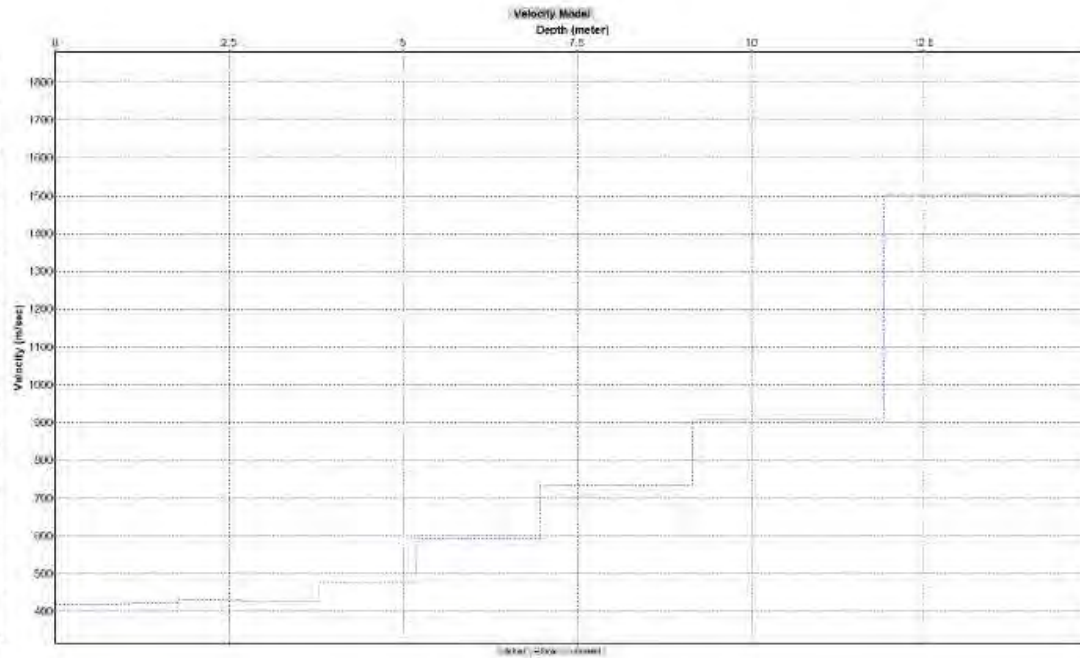
S-wave layer model (Surface wave) : UB\_09

first velocity model (apparent velocity:Vs)		
1	0.536	228.44
2	1.205	228.62
3	2.042	229.23
4	3.088	263.03
5	4.396	303.98
6	6.031	342.12
7	8.074	372.94
8	10.62	410.5
9	13.82	454.91
10	-	716.71



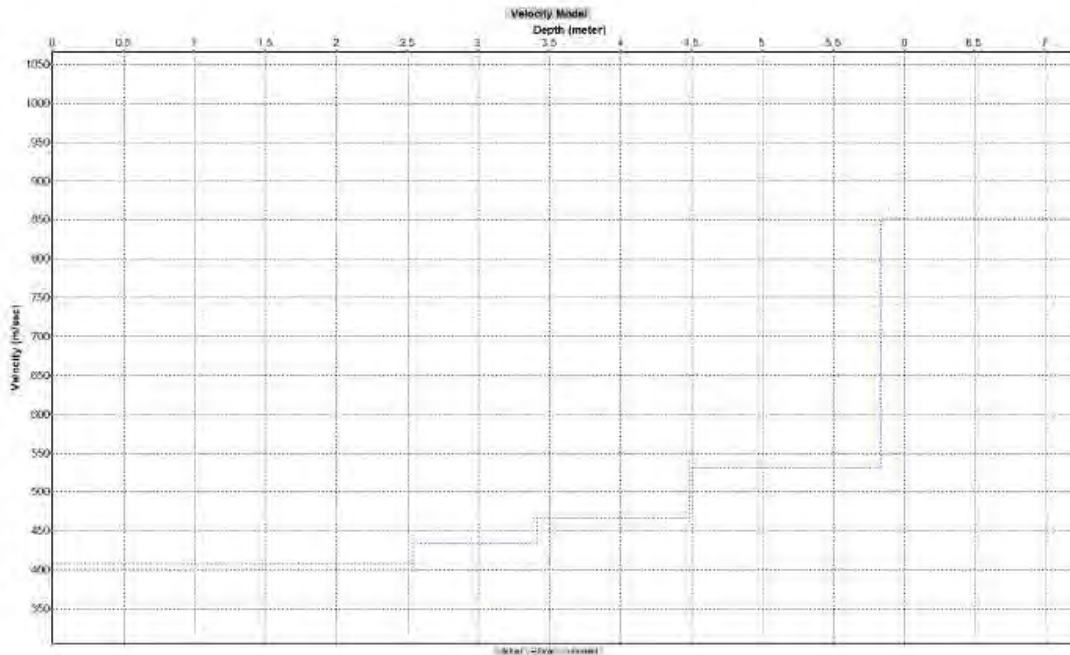
S-wave layer model (Surface wave) : UB\_10

first velocity model (apparent velocity: Vs)		
1	0.46	420.6
2	1.04	420.6
3	1.76	422.8
4	2.66	433.1
5	3.79	425.8
6	5.20	477.6
7	6.96	592.0
8	9.16	734.3
9	11.91	911.2
10	-	1503.7



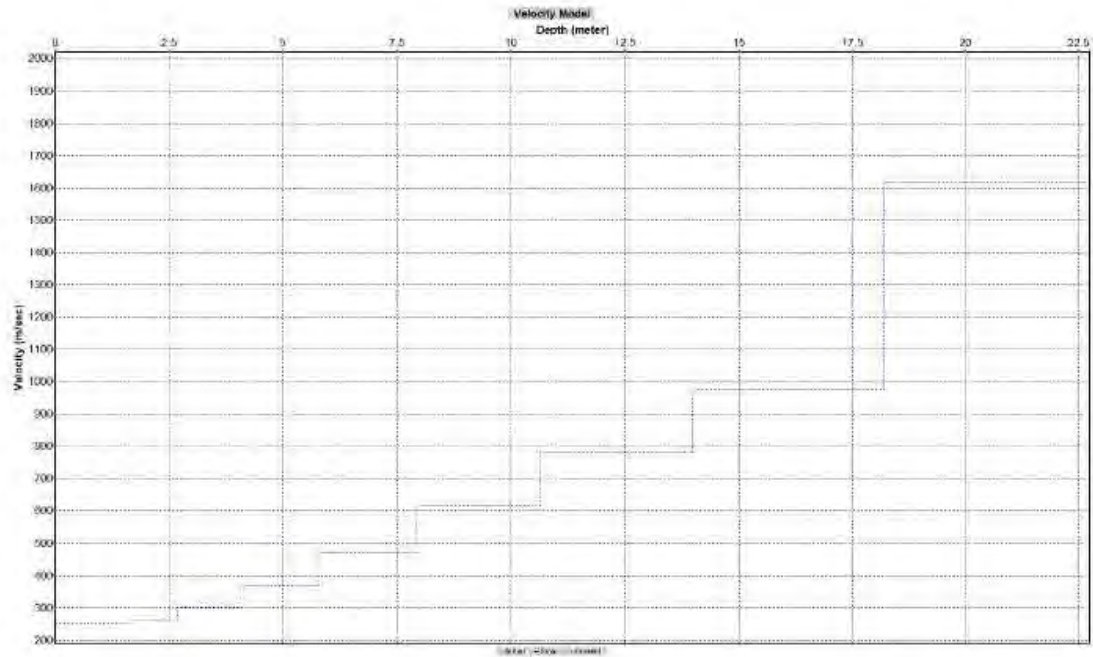
S-wave layer model (Surface wave) : UB\_11

first velocity model (apparent velocity:Vs)		
1	0.23	408.3
2	0.51	408.3
3	0.86	408.3
4	1.30	408.3
5	1.86	408.3
6	2.55	406.6
7	3.41	434.5
8	4.49	466.2
9	5.83	531.4
10	-	852.5



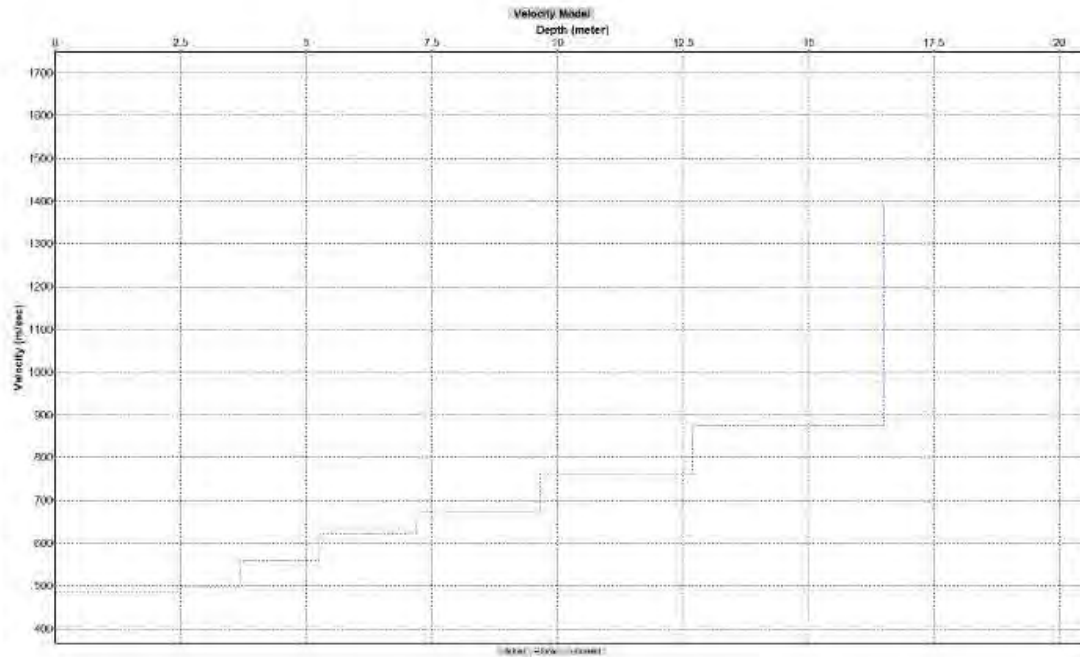
S-wave layer model (Surface wave) : UB\_12

first velocity model (apparent velocity:Vs)		
1	0.71	253.9
2	1.59	252.1
3	2.69	262.1
4	4.06	301.0
5	5.78	369.8
6	7.93	471.4
7	10.62	615.7
8	13.98	782.5
9	18.18	978.0
10	-	1615.8



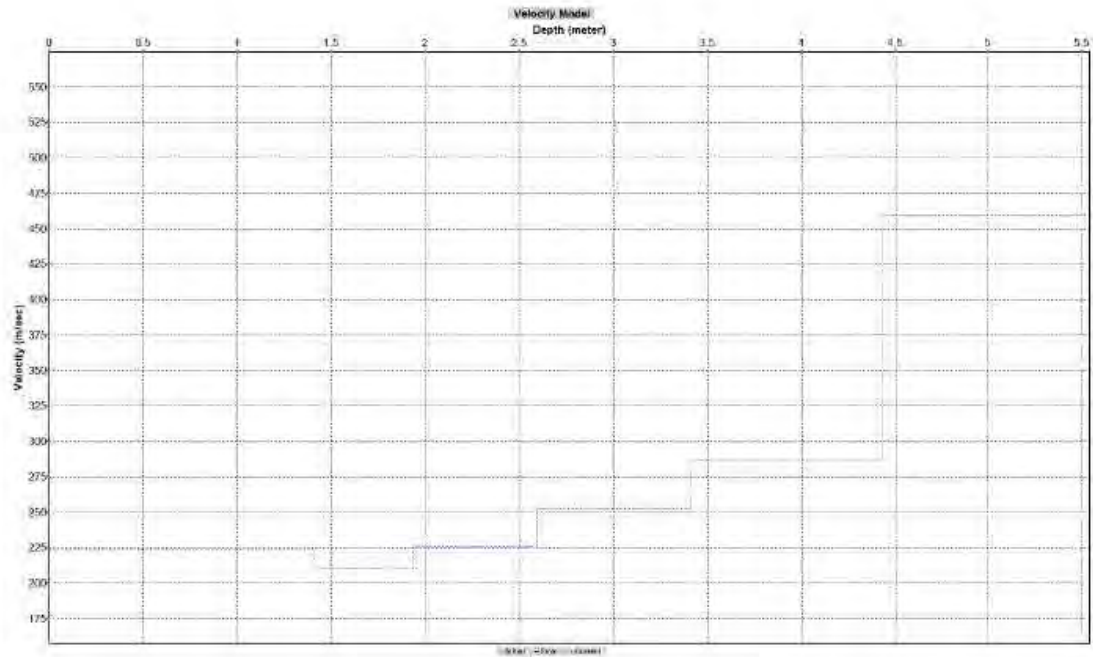
S-wave layer model (Surface wave) : UB\_13

first velocity model (apparent velocity:Vs)		
1	0.64	486.6
2	1.44	486.6
3	2.44	486.6
4	3.68	494.8
5	5.24	558.2
6	7.19	622.6
7	9.63	674.6
8	12.68	761.6
9	16.49	874.0
10	-	1398.8



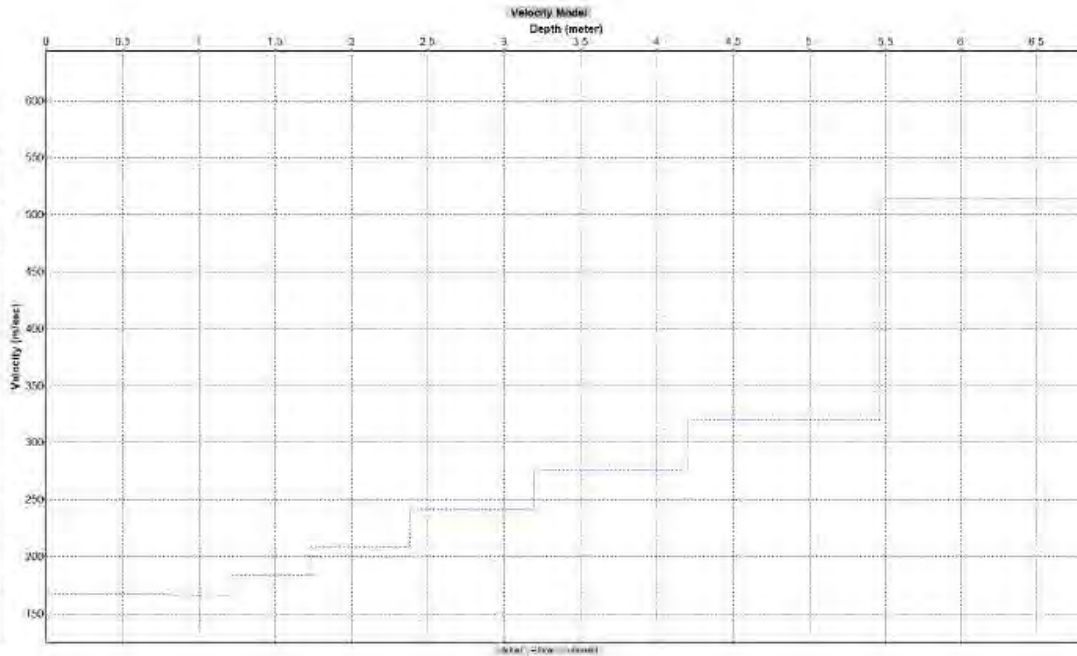
S-wave layer model (Surface wave) : UB\_14

first velocity model (apparent velocity:Vs)		
1	0.17	223.5
2	0.39	223.5
3	0.66	223.5
4	0.99	223.5
5	1.41	223.5
6	1.93	209.8
7	2.59	226.3
8	3.41	252.3
9	4.43	286.9
10	-	459.6



S-wave layer model (Surface wave) : UB\_15

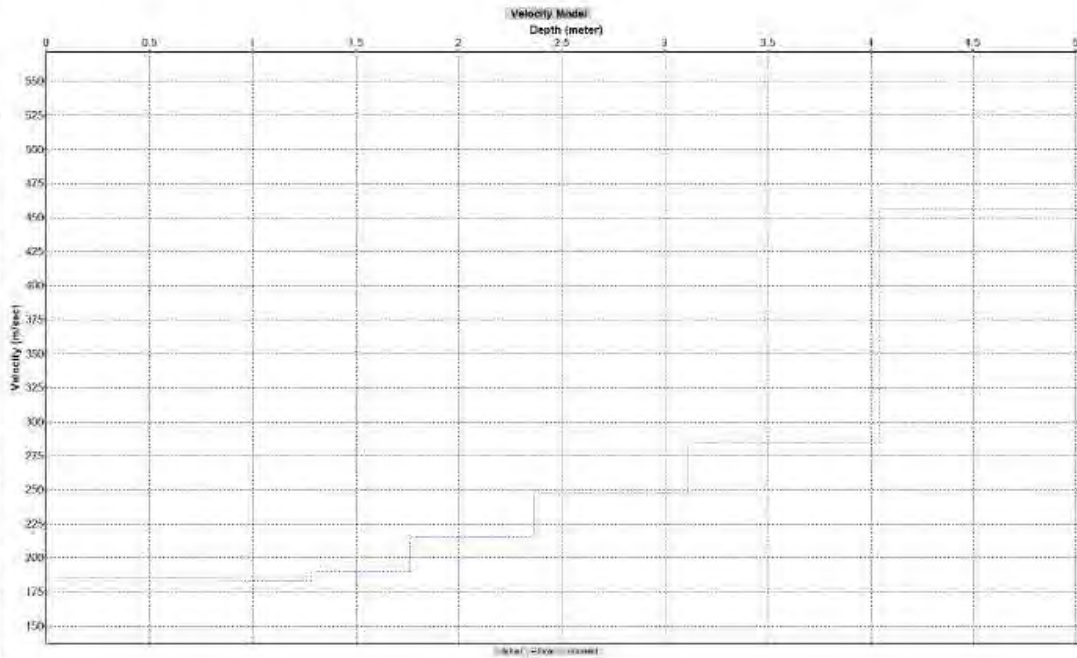
first velocity model (apparent velocity:Vs)		
1	0.21	166.6
2	0.48	166.6
3	0.81	166.6
4	1.22	165.9
5	1.74	183.6
6	2.38	208.7
7	3.19	241.0
8	4.20	275.4
9	5.46	319.4
10	-	514.7



S-wave layer model (Surface wave) : UB\_16

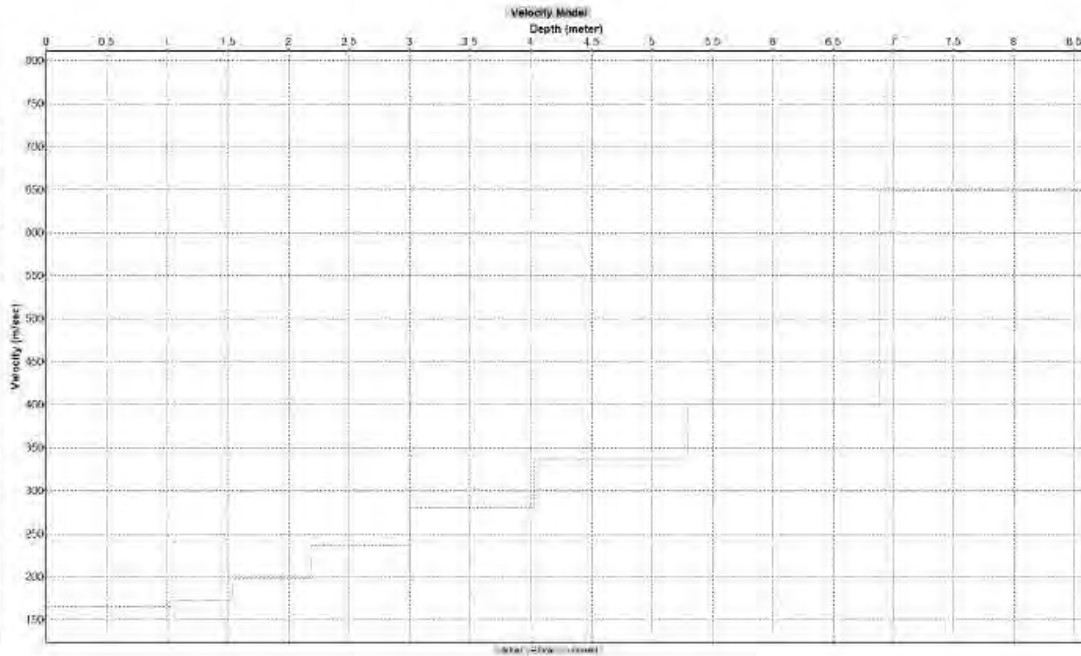


first velocity model (apparent velocity:Vs)		
1	0.16	185.3
2	0.35	185.3
3	0.60	185.3
4	0.90	185.3
5	1.29	182.7
6	1.76	190.1
7	2.36	215.3
8	3.11	247.7
9	4.04	285.4
10	-	457.2



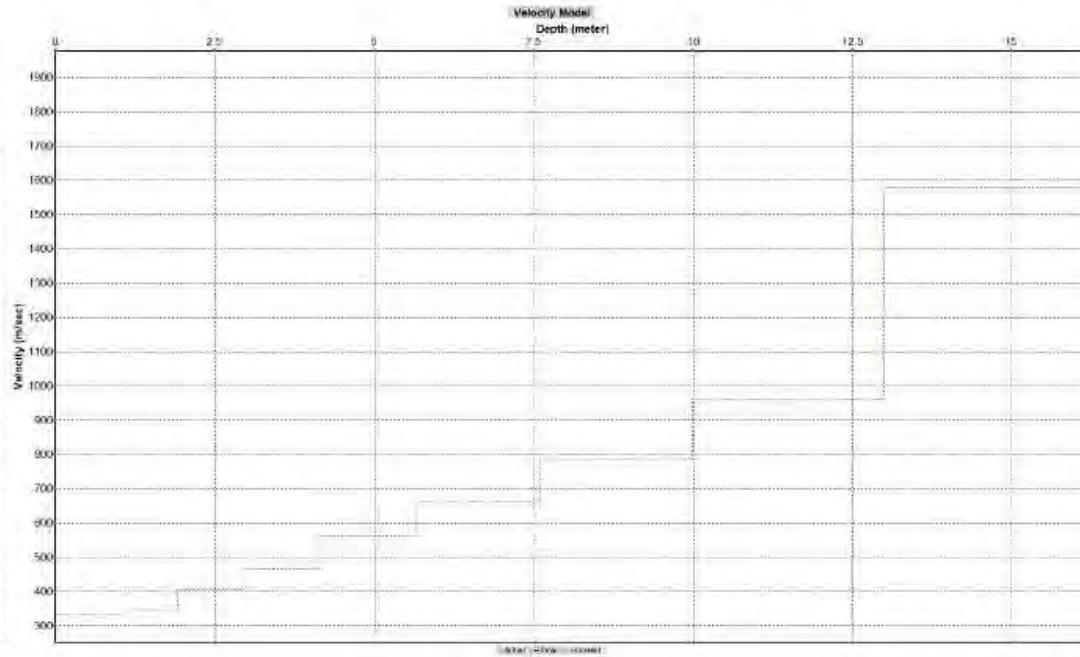
S-wave layer model (Surface wave) : UB\_17

first velocity model (apparent velocity: Vs)		
1	0.27	164.75
2	0.60	164.75
3	1.02	164.75
4	1.54	173.10
5	2.19	198.45
6	3.00	236.71
7	4.02	280.72
8	5.29	336.12
9	6.88	400.36
10	-	648.74



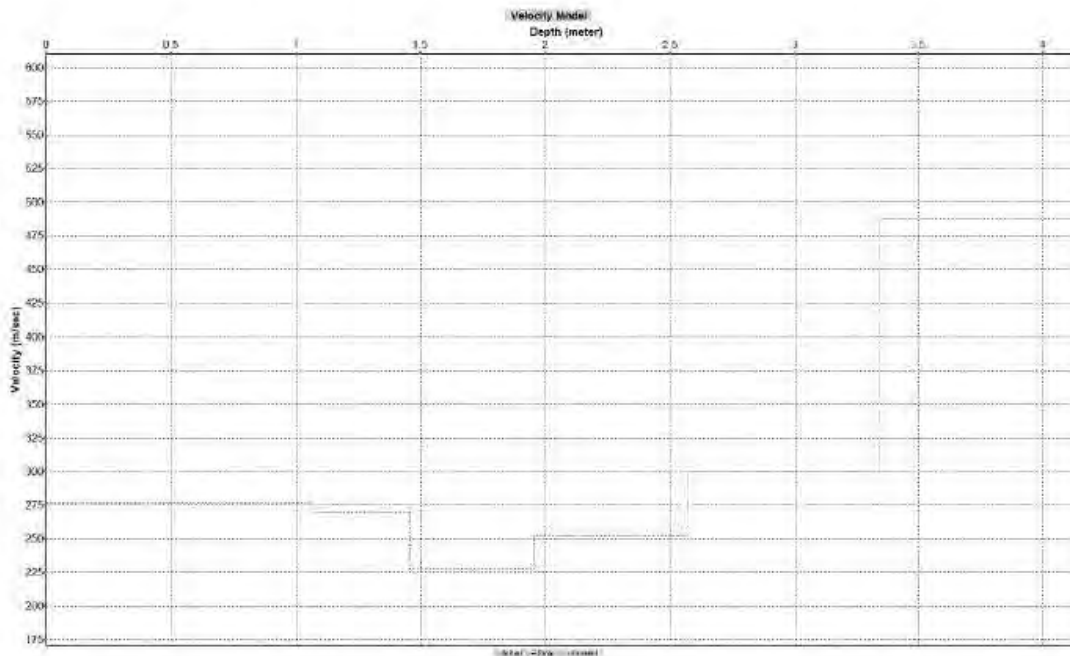
S-wave layer model (Surface wave) : UB\_18

first velocity model (apparent velocity:Vs)		
1	0.50	333.7
2	1.13	333.7
3	1.92	347.2
4	2.90	404.9
5	4.13	465.1
6	5.67	561.5
7	7.59	665.0
8	9.99	784.1
9	12.98	957.9
10	-	1581.6



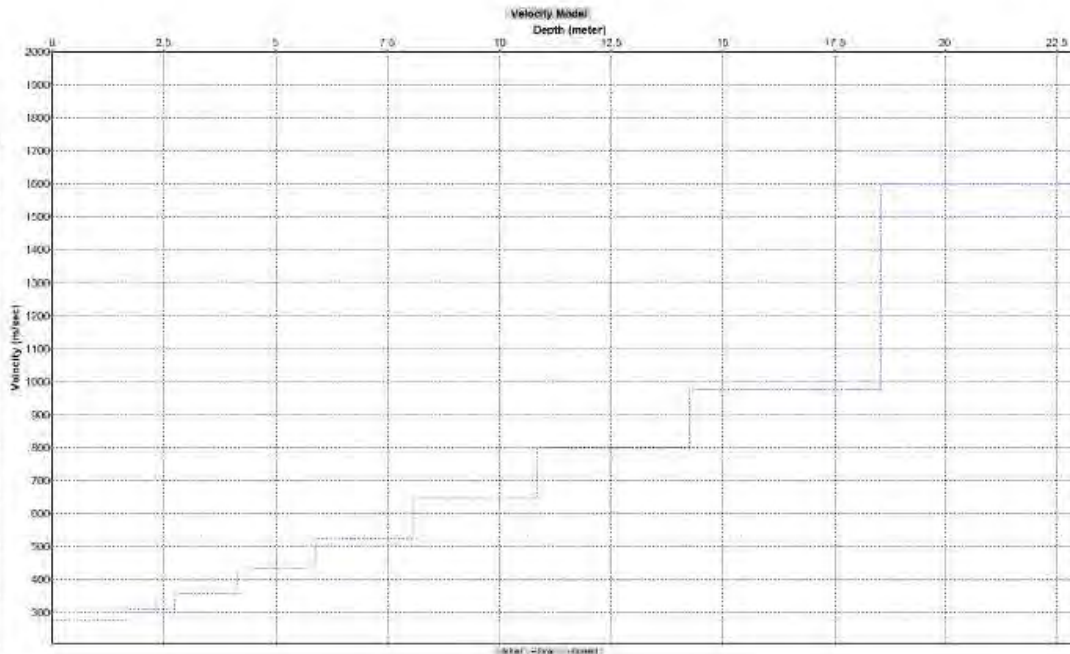
S-wave layer model (Surface wave) : UB\_19

first velocity model (apparent velocity:Vs)		
1	0.13	276.5
2	0.29	276.5
3	0.49	276.5
4	0.75	276.5
5	1.06	276.5
6	1.46	269.9
7	1.95	227.2
8	2.57	252.1
9	3.34	299.8
10	-	488.1



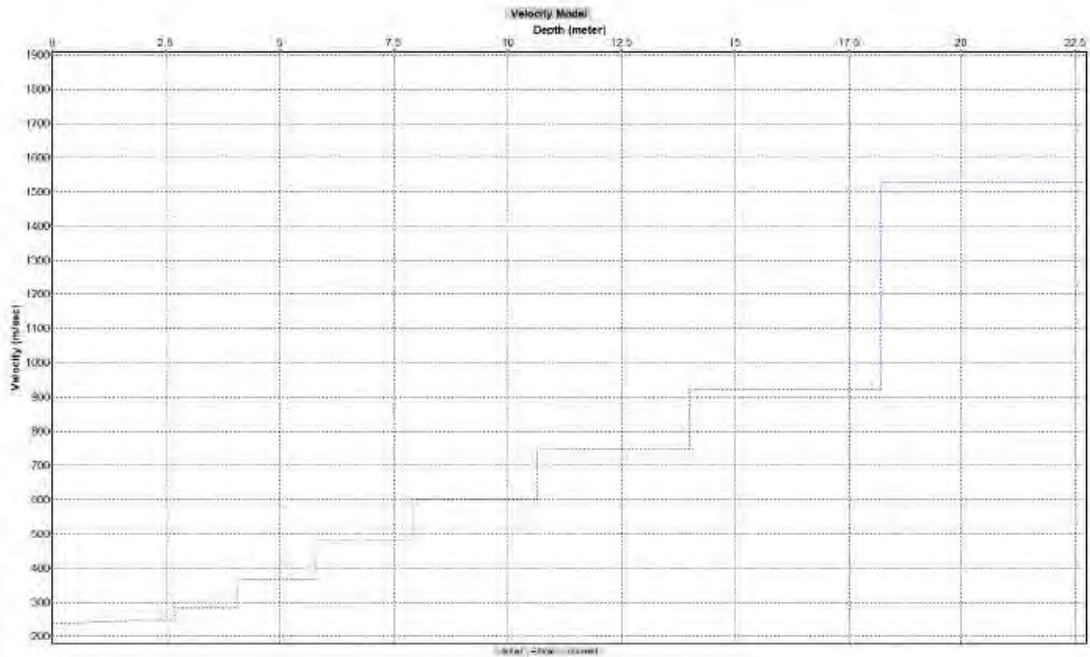
S-wave layer model (Surface wave) : UB\_20

first velocity model (apparent velocity:Vs)		
1	0.72	274.1
2	1.62	275.7
3	2.74	310.2
4	4.14	358.2
5	5.90	432.2
6	8.09	523.5
7	10.83	648.0
8	14.25	801.1
9	18.54	978.2
10	-	1600.6



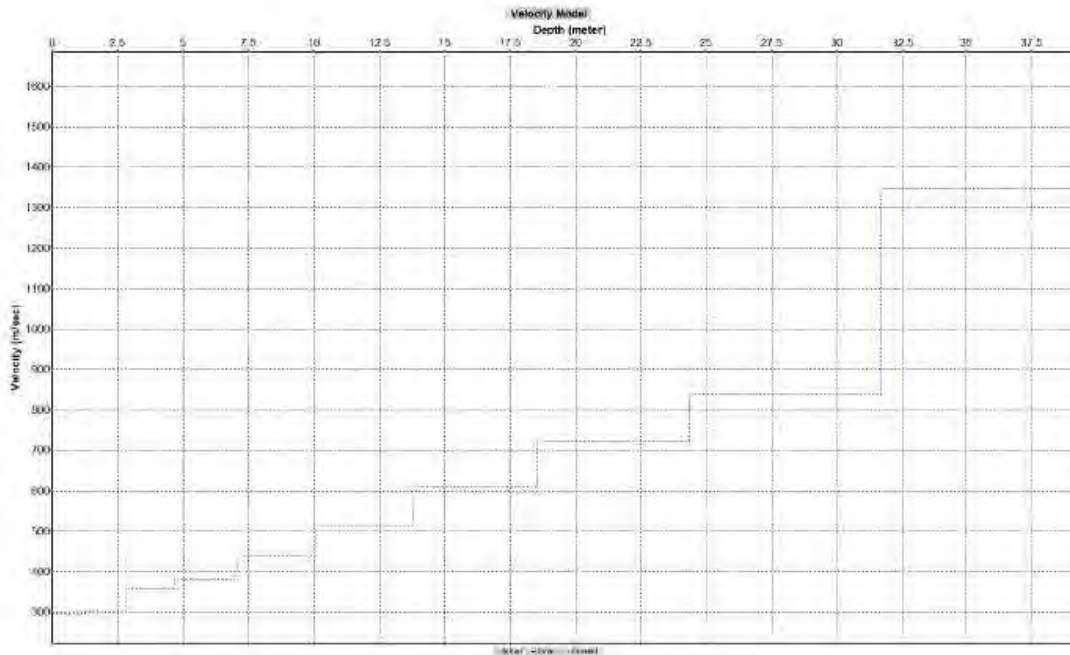
S-wave layer model (Surface wave) : UB\_21

first velocity model (apparent velocity:Vs)		
1	0.71	239.0
2	1.59	242.8
3	2.69	248.6
4	4.07	285.7
5	5.79	368.4
6	7.94	480.4
7	10.64	601.7
8	14.00	746.8
9	18.21	923.8
10	-	1526.5



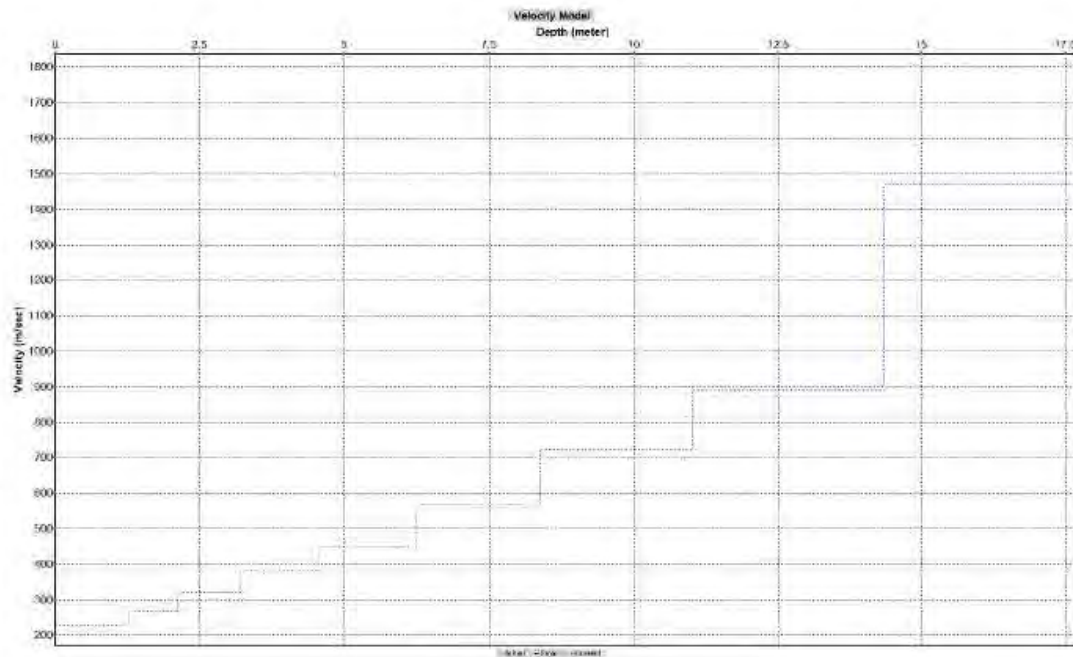
S-wave layer model (Surface wave) : UB\_22

first velocity model (apparent velocity:Vs)		
1	1.23	295.7
2	2.76	302.9
3	4.68	355.6
4	7.08	380.2
5	10.08	439.6
6	13.82	510.7
7	18.51	611.0
8	24.36	724.2
9	31.68	840.8
10	-	1347.9



S-wave layer model (Surface wave) : UB\_23

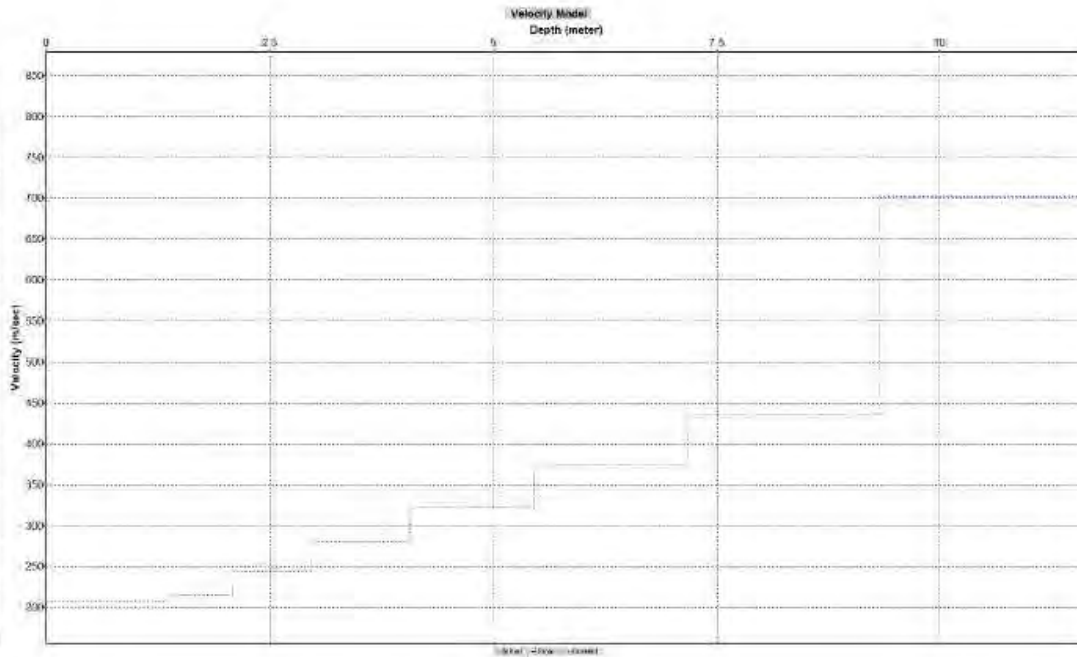
first velocity model (apparent velocity:Vs)		
1	0.56	227.3
2	1.25	228.5
3	2.12	266.9
4	3.20	319.3
5	4.56	381.9
6	6.25	451.2
7	8.37	568.1
8	11.02	722.9
9	14.33	892.8
10	-	1469.5



S-wave layer model (Surface wave) : UB\_24

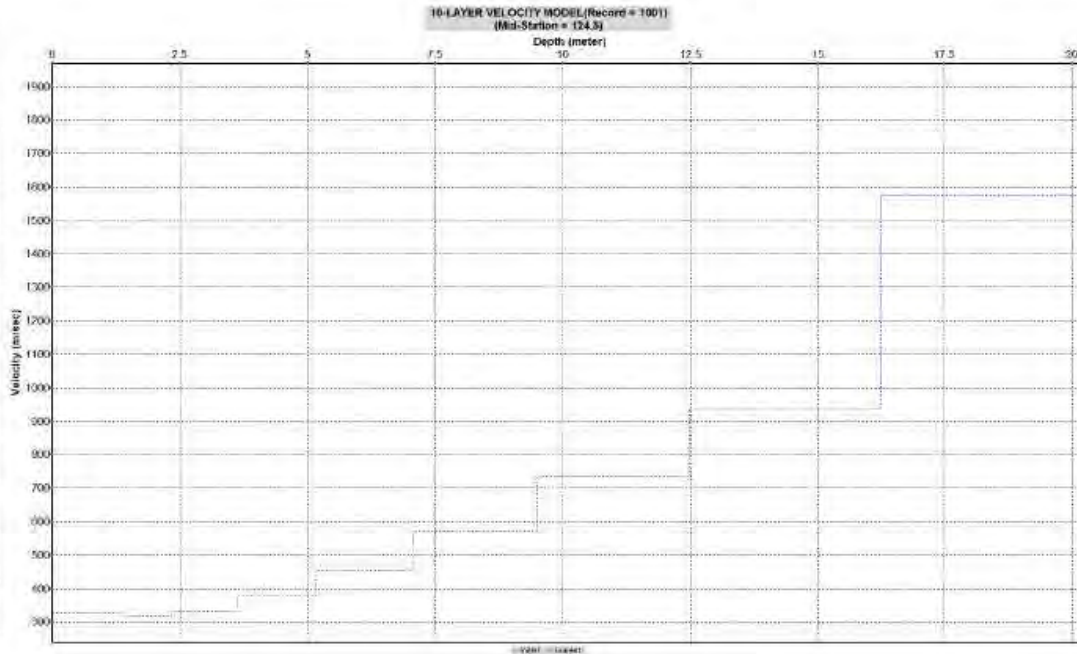


first velocity model (apparent velocity: Vs)		
1	0.36	207.9
2	0.81	207.9
3	1.38	207.9
4	2.08	215.5
5	2.96	244.4
6	4.07	280.8
7	5.44	323.7
8	7.17	374.0
9	9.32	436.7
10	-	702.9



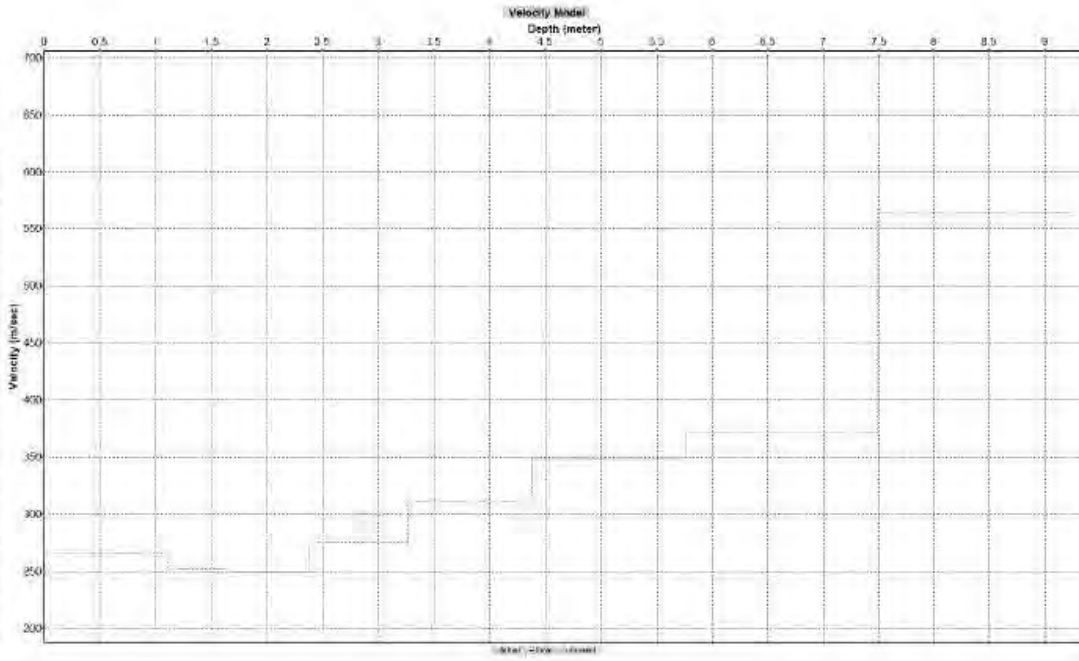
S-wave layer model (Surface wave) : UB\_25

first velocity model (apparent velocity:Vs)		
1	0.63	326.1
2	1.42	326.1
3	2.40	318.0
4	3.63	330.5
5	5.16	376.7
6	7.08	456.4
7	9.48	571.6
8	12.48	735.5
9	16.23	938.5
10	-	1574.0



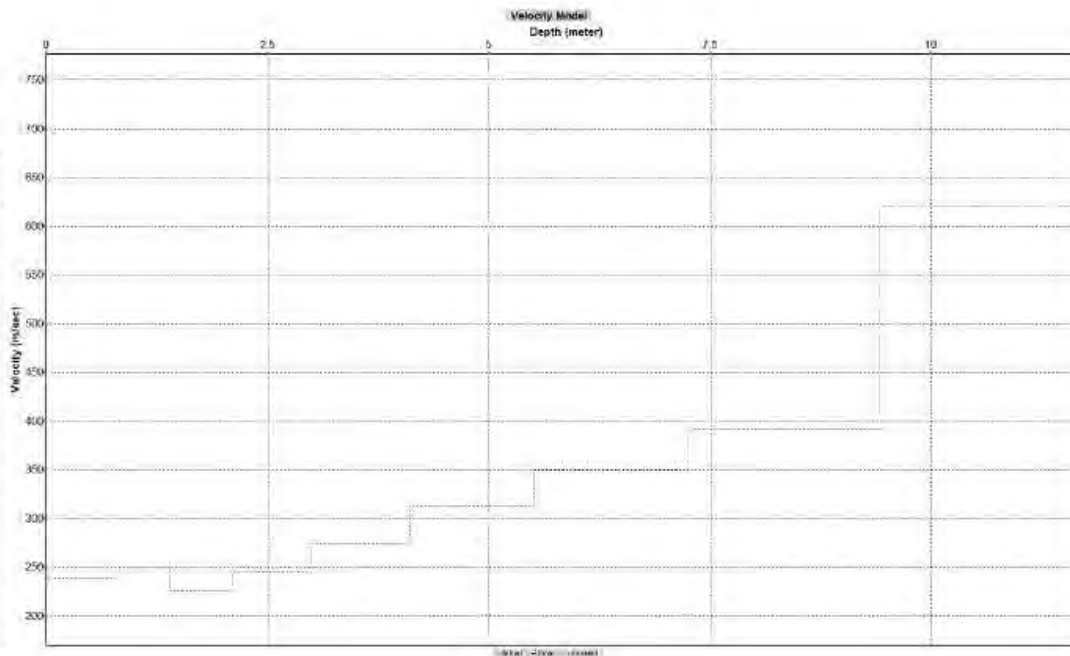
S-wave layer model (Surface wave) : UB\_26

first velocity model (apparent velocity:Vs)		
1	0.29	265.4
2	0.65	265.4
3	1.11	265.4
4	1.67	252.2
5	2.38	250.1
6	3.27	275.5
7	4.37	312.1
8	5.76	348.7
9	7.49	371.3
10	-	564.6



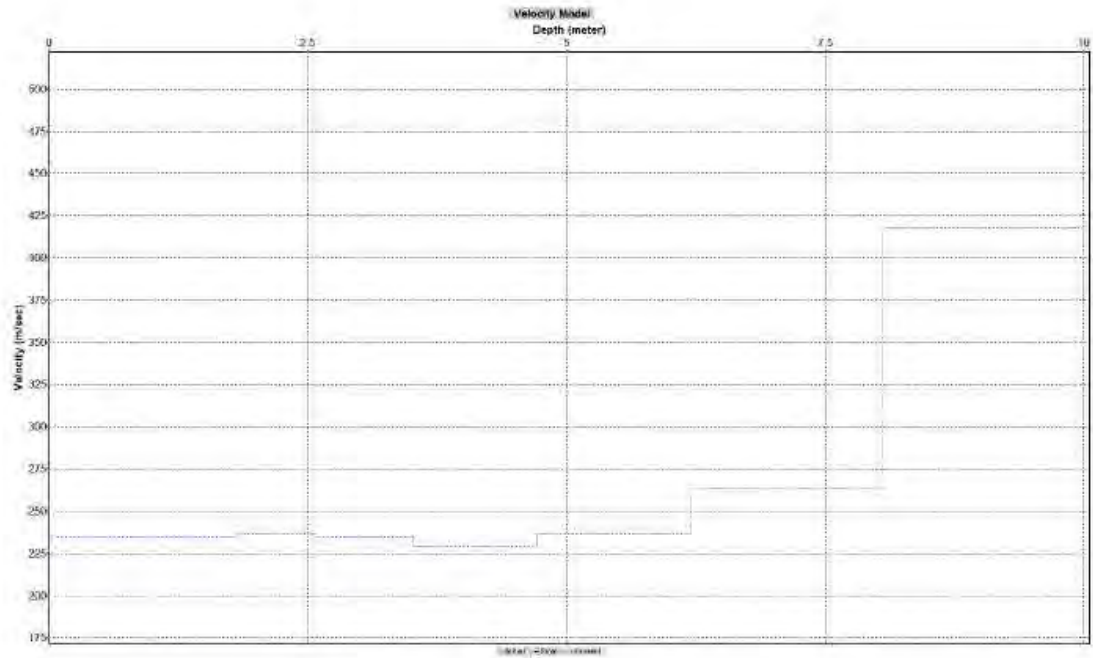
S-wave layer model (Surface wave) : UB\_27

first velocity model (apparent velocity:Vs)		
1	0.37	238.2
2	0.82	238.2
3	1.39	250.2
4	2.10	226.0
5	2.99	245.2
6	4.11	274.7
7	5.50	313.0
8	7.24	349.2
9	9.41	391.2
10	-	621.1



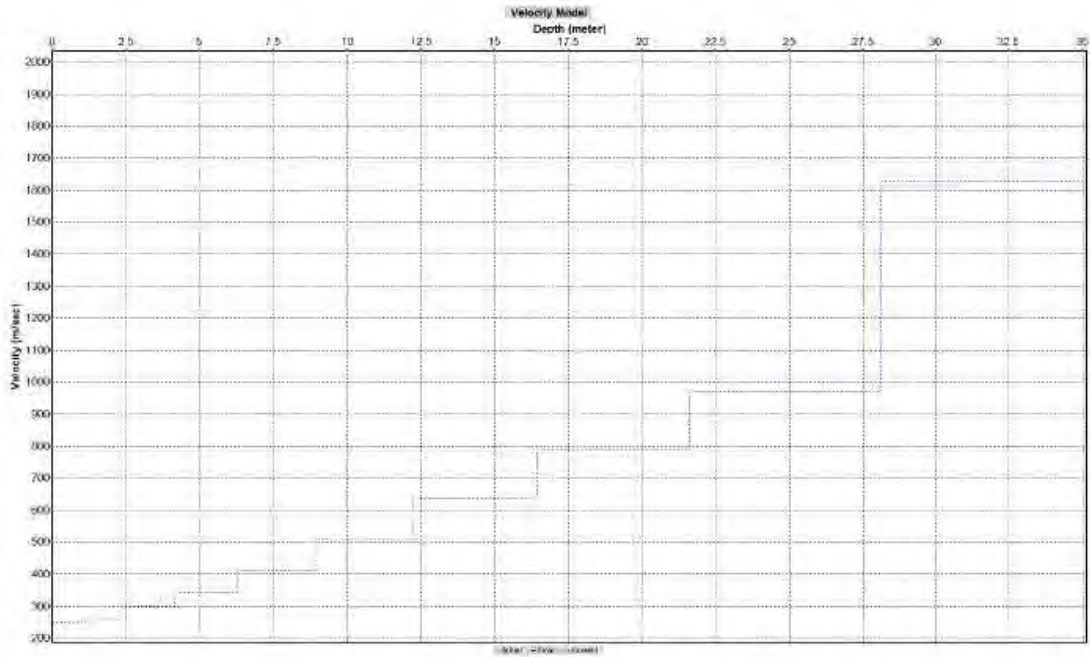
S-wave layer model (Surface wave) : UB\_28

first velocity model (apparent velocity:Vs)		
1	0.31	234.9
2	0.70	234.9
3	1.19	234.9
4	1.80	234.5
5	2.56	236.6
6	3.51	234.8
7	4.70	228.7
8	6.19	236.4
9	8.05	263.8
10	-	417.4



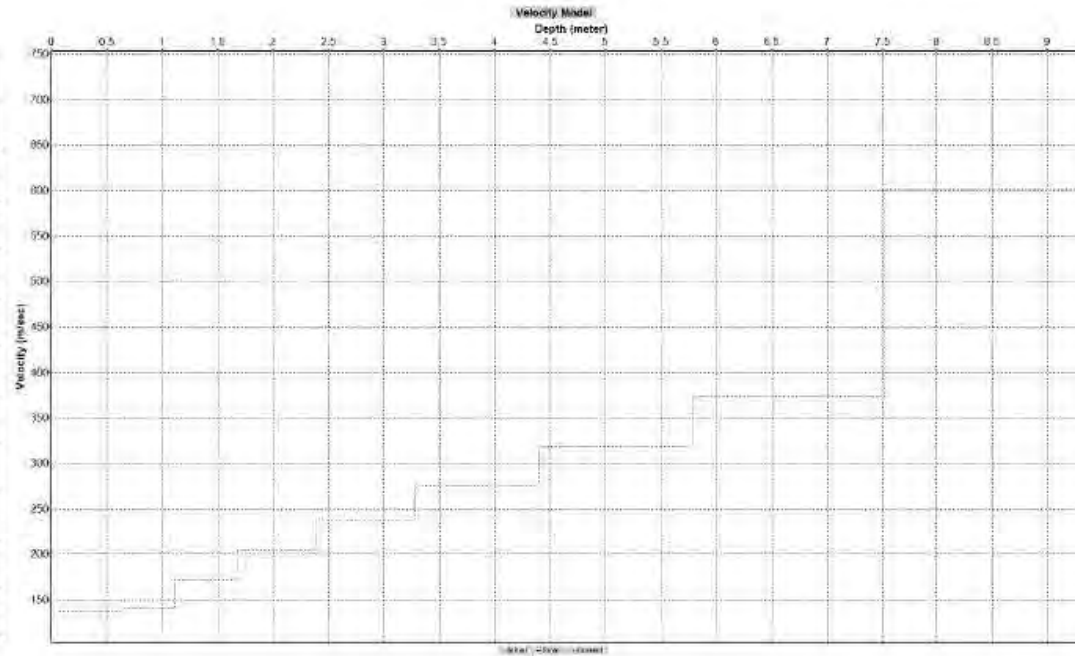
S-wave layer model (Surface wave) : UB\_29

first velocity model (apparent velocity:Vs)		
1	1.09	248.0
2	2.45	260.7
3	4.15	297.0
4	6.28	343.8
5	8.94	413.2
6	12.27	507.7
7	16.42	636.5
8	21.62	789.3
9	28.11	970.3
10	-	1627.2



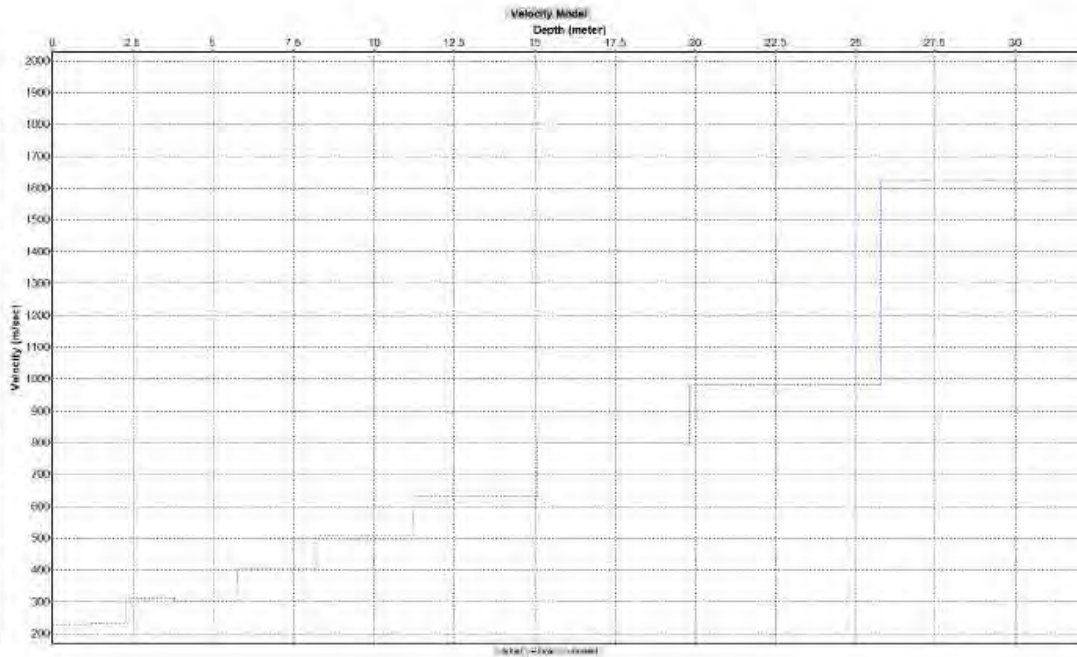
S-wave layer model (Surface wave) : UB\_30

first velocity model (apparent velocity:Vs)		
1	0.29	136.9
2	0.66	136.9
3	1.11	141.0
4	1.68	171.8
5	2.39	204.5
6	3.28	237.9
7	4.39	275.1
8	5.78	318.8
9	7.52	373.5
10	-	602.5



S-wave layer model (Surface wave) : UB\_31

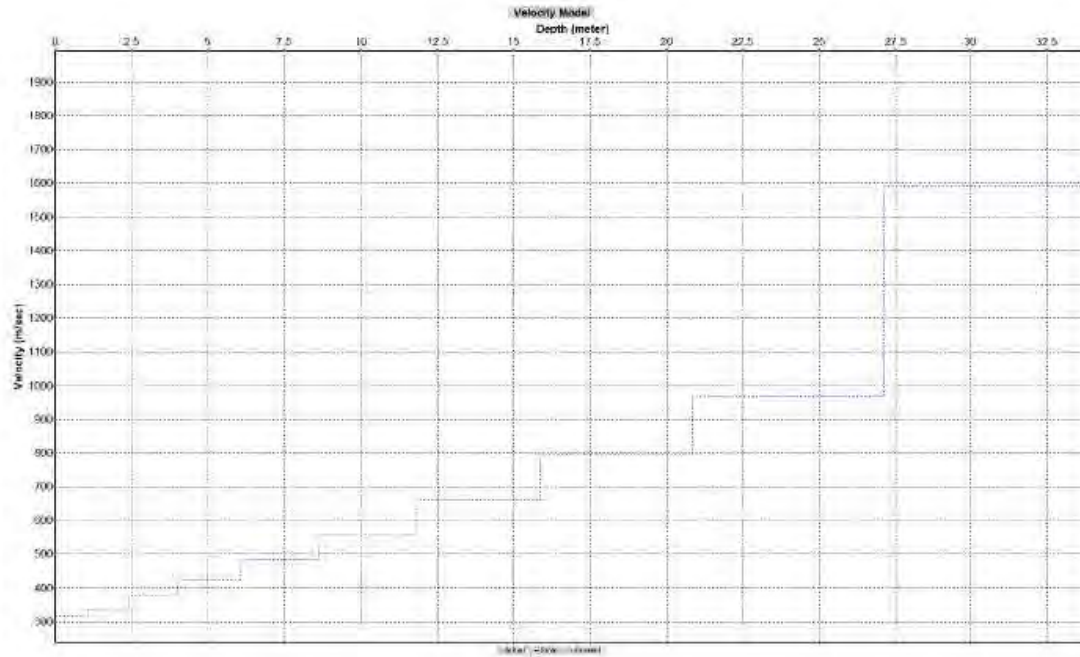
first velocity model (apparent velocity:Vs)		
1	1.05	317.2
2	2.37	337.4
3	4.01	378.0
4	6.06	422.8
5	8.63	482.4
6	11.84	560.6
7	15.85	660.5
8	20.86	797.8
9	27.12	969.5
10	-	1593.0



S-wave layer model (Surface wave) : UB\_32

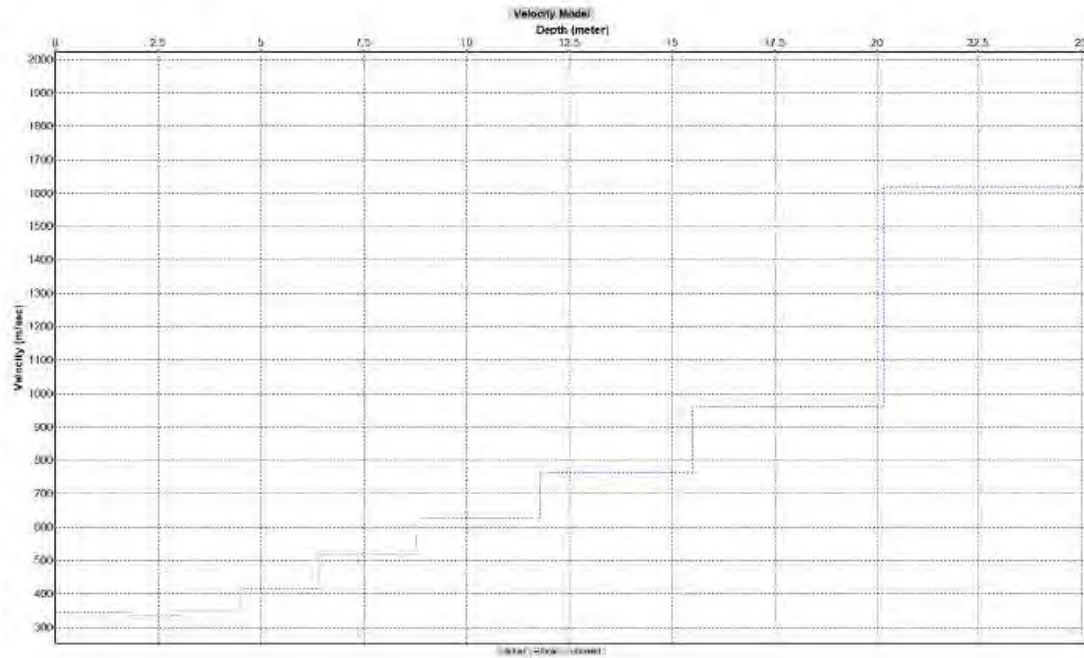


first velocity model (apparent velocity:Vs)		
1	0.78	343.8
2	1.76	345.7
3	2.98	334.8
4	4.51	349.5
5	6.41	416.3
6	8.80	515.8
7	11.78	626.2
8	15.51	763.6
9	20.17	961.9
10	-	1617.7



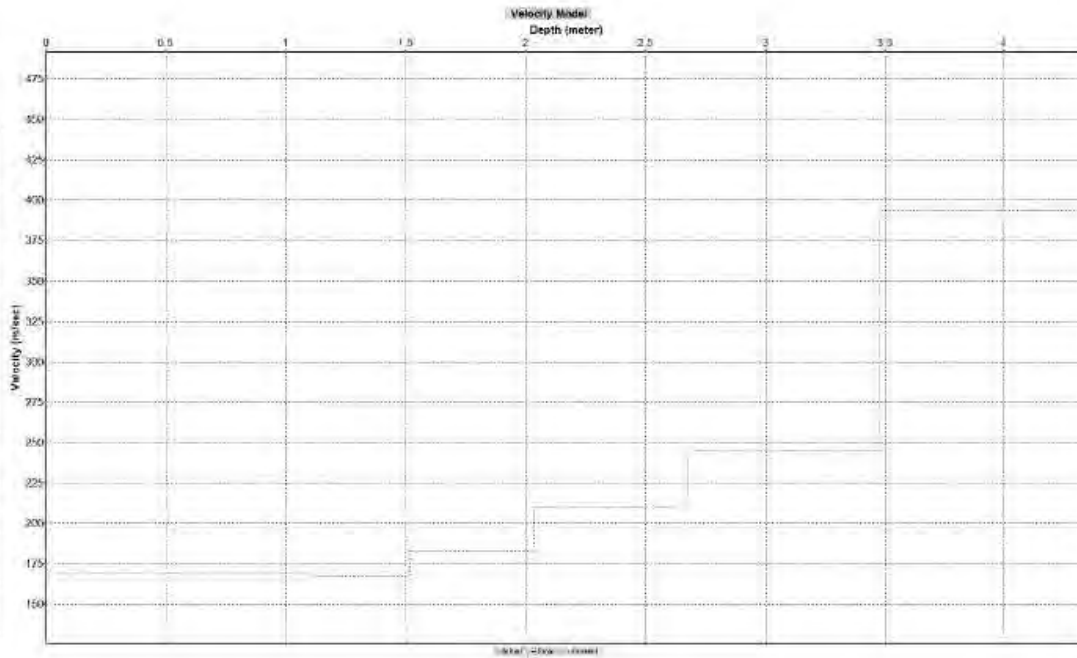
S-wave layer model (Surface wave) : UB\_33

first velocity model (apparent velocity:Vs)		
1	1.00	224.7
2	2.25	231.9
3	3.81	310.1
4	5.76	302.9
5	8.20	407.6
6	11.25	509.0
7	15.06	631.5
8	19.82	800.2
9	25.77	981.2
10	-	1621.5



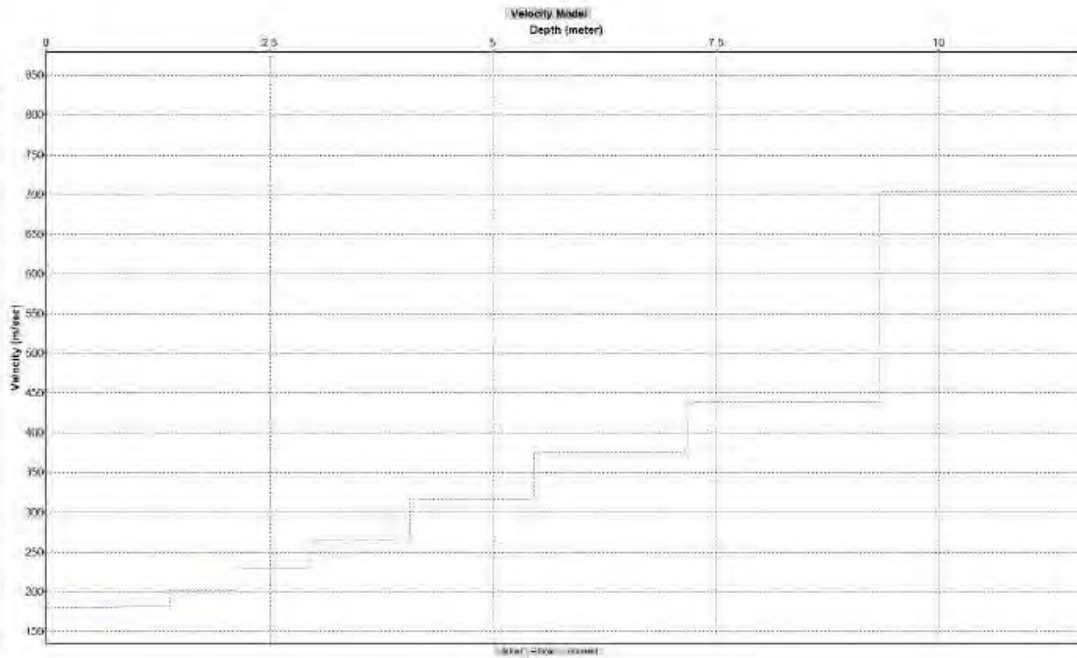
S-wave layer model (Surface wave) : UB\_34

first velocity model (apparent velocity:Vs)		
1	0.14	169.4
2	0.30	169.4
3	0.51	169.4
4	0.78	169.4
5	1.11	169.4
6	1.52	167.4
7	2.03	182.7
8	2.67	209.9
9	3.48	244.5
10	-	393.4



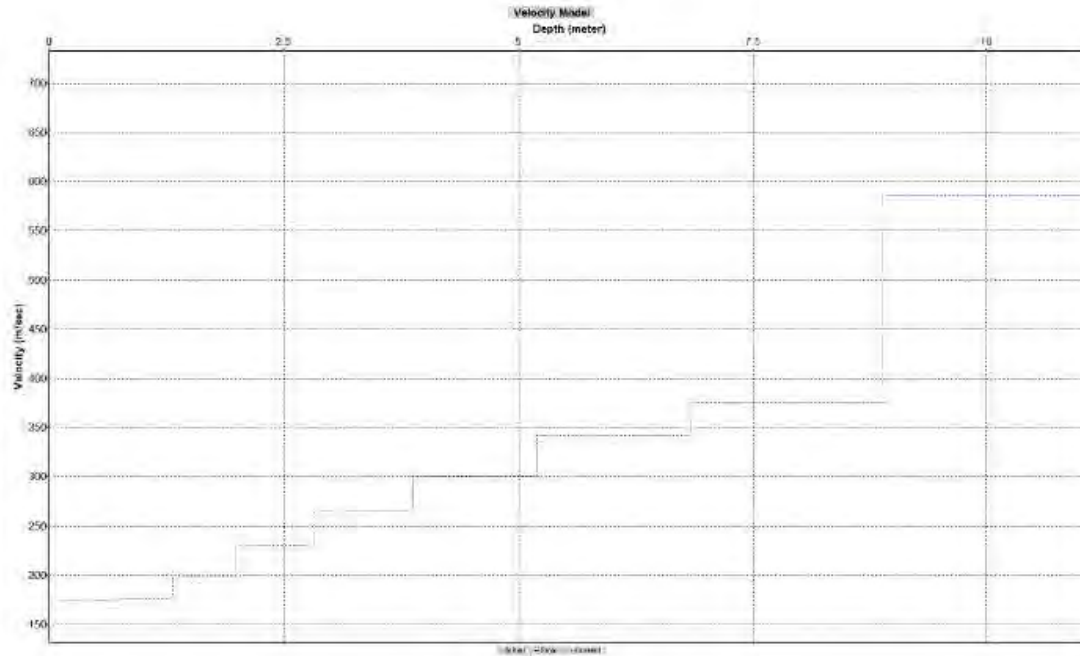
S-wave layer model (Surface wave) : UB\_35

first velocity model (apparent velocity:Vs)		
1	0.36	179.6
2	0.81	179.6
3	1.38	181.5
4	2.08	201.2
5	2.97	228.8
6	4.07	265.1
7	5.45	317.0
8	7.17	375.6
9	9.32	438.2
10	-	703.2



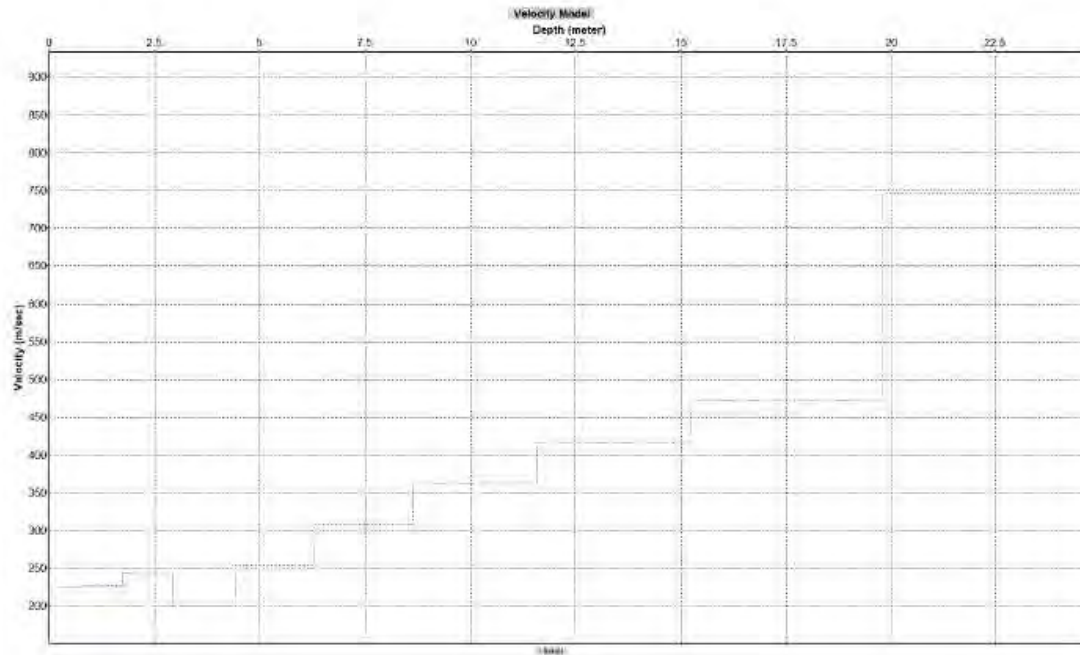
S-wave layer model (Surface wave) : UB\_36

first velocity model (apparent velocity:Vs)		
1	0.34	175.4
2	0.77	175.4
3	1.31	175.9
4	1.99	198.6
5	2.83	229.6
6	3.88	264.7
7	5.19	301.0
8	6.83	342.3
9	8.88	375.7
10	-	586.2



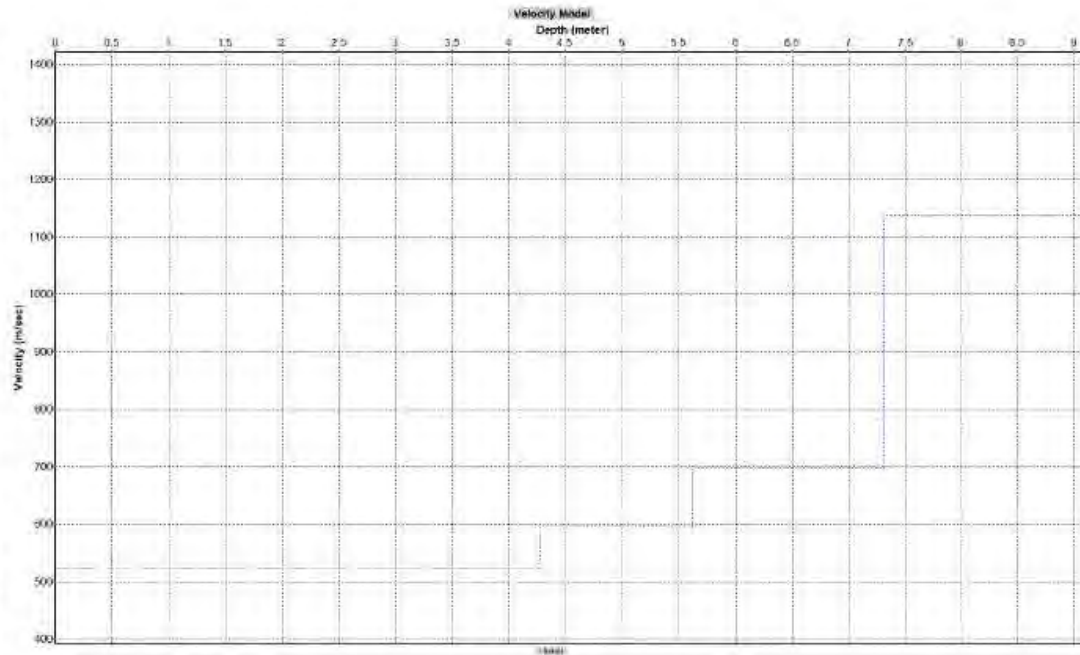
S-wave layer model (Surface wave) : UB\_37

first velocity model (apparent velocity:Vs)		
	depth	Velocity
	bottom (m)	(m/sec)
1	0.767	224.7
2	1.726	226.8
3	2.925	244.3
4	4.424	200.8
5	6.297	255.0
6	8.638	308.3
7	11.565	362.4
8	15.224	417.7
9	19.797	472.3
10	-	746.6



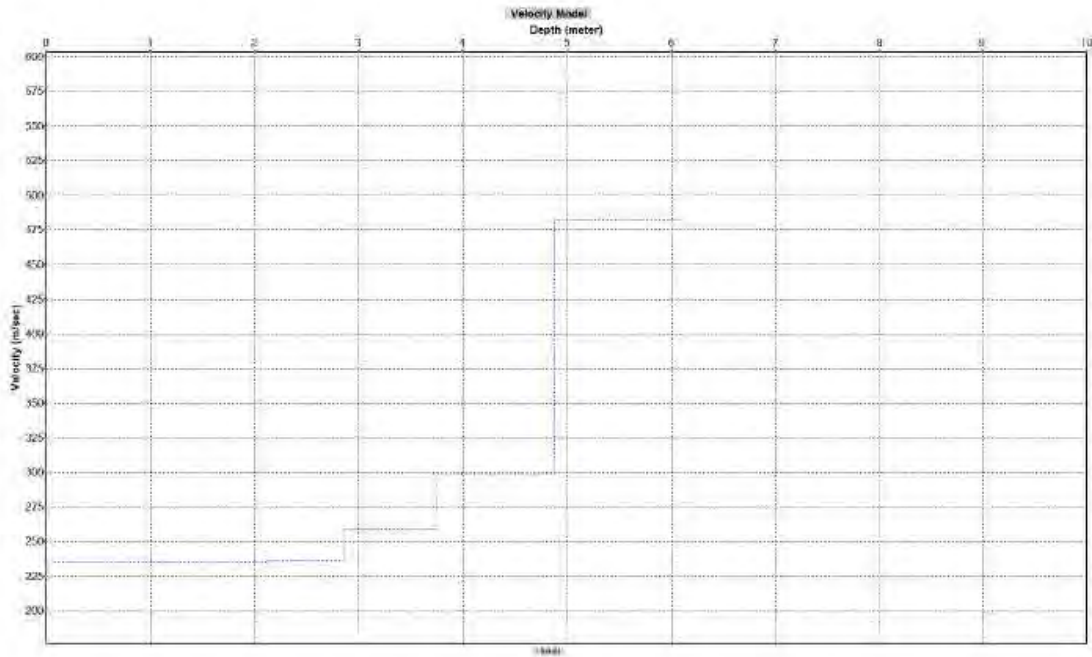
S-wave layer model (Surface wave) : UB\_Bo\_01

first velocity model (apparent velocity:Vs)		
	depth	Velocity
	bottom (m)	(m/sec)
1	0.283	523.6
2	0.637	523.6
3	1.08	523.6
4	1.633	523.6
5	2.325	523.6
6	3.19	523.6
7	4.27	522.8
8	5.621	595.9
9	7.31	699.0
10	-	-



S-wave layer model (Surface wave) : UB\_Bo\_02

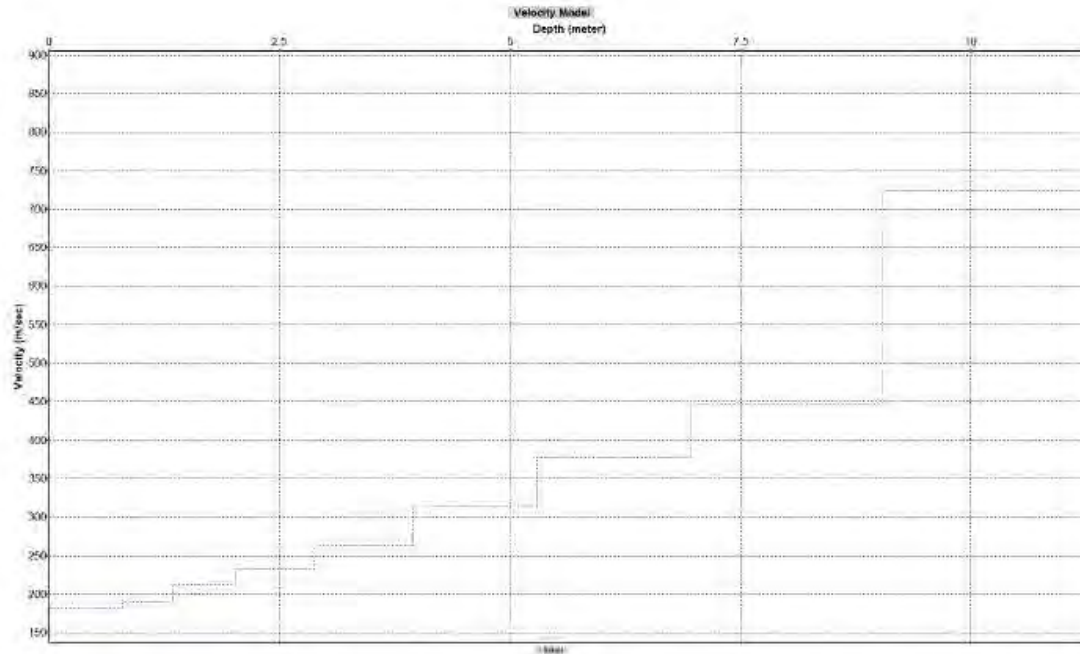
first velocity model (apparent velocity:Vs)		
	depth	Velocity
	bottom (m)	(m/sec)
1	0.189	235.1
2	0.425	235.1
3	0.72	235.1
4	1.089	235.1
5	1.551	235.1
6	2.127	235.1
7	2.848	236.6
8	3.749	258.8
9	4.875	298.9
10	-	482.7



S-wave layer model (Surface wave) : UB\_Bo\_03

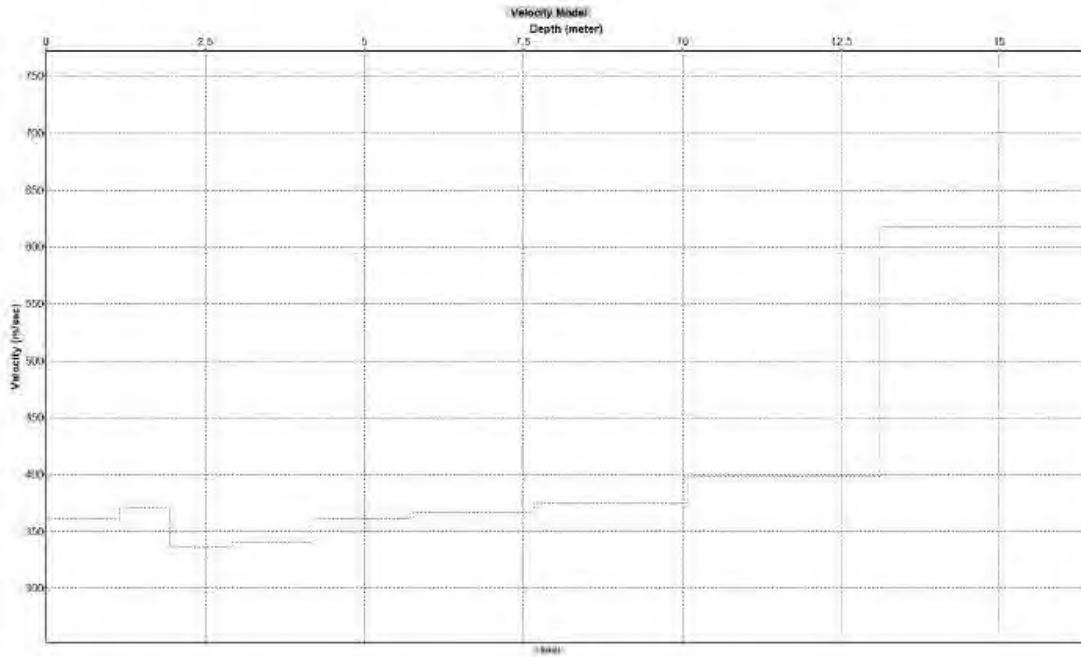


first velocity model (apparent velocity:Vs)		
	depth	Velocity
	bottom (m)	(m/sec)
1	0.35	182.8
2	0.788	182.8
3	1.335	189.4
4	2.019	213.3
5	2.873	231.9
6	3.942	262.8
7	5.277	315.1
8	6.947	378.1
9	9.033	448.0
10	-	724.0



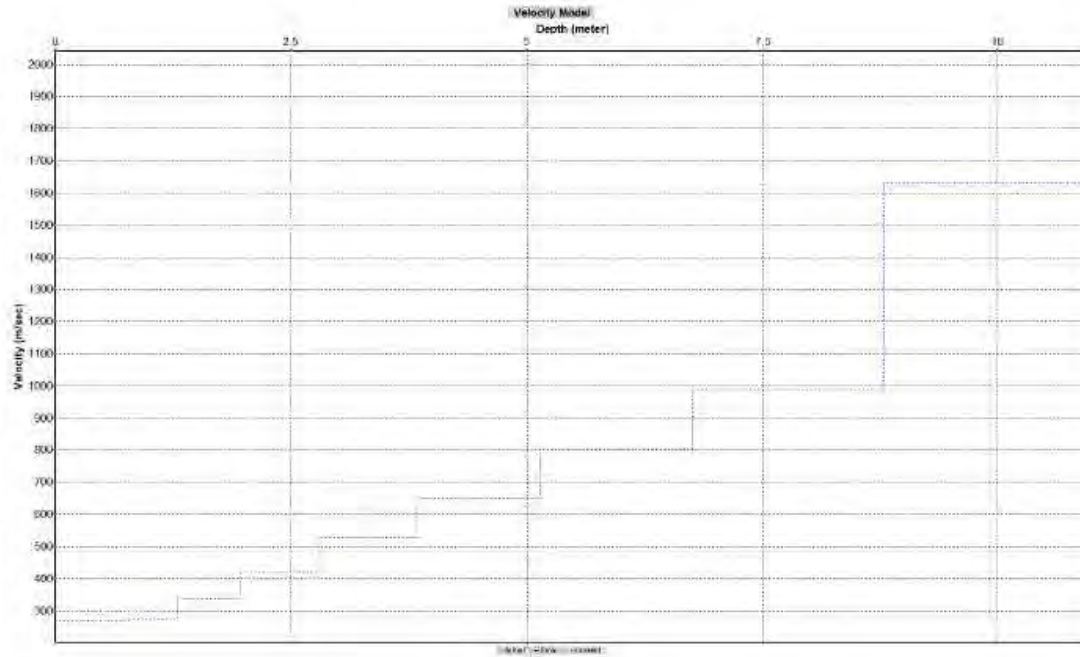
S-wave layer model (Surface wave) : UB\_Bo\_04

first velocity model (apparent velocity:Vs)		
	depth	Velocity
	bottom (m)	(m/ sec)
1	0.51	362.0
2	1.14	362.0
3	1.94	371.2
4	2.93	336.6
5	4.17	340.9
6	5.72	361.7
7	7.65	366.1
8	10.07	374.5
9	13.10	398.2
10	-	617.6



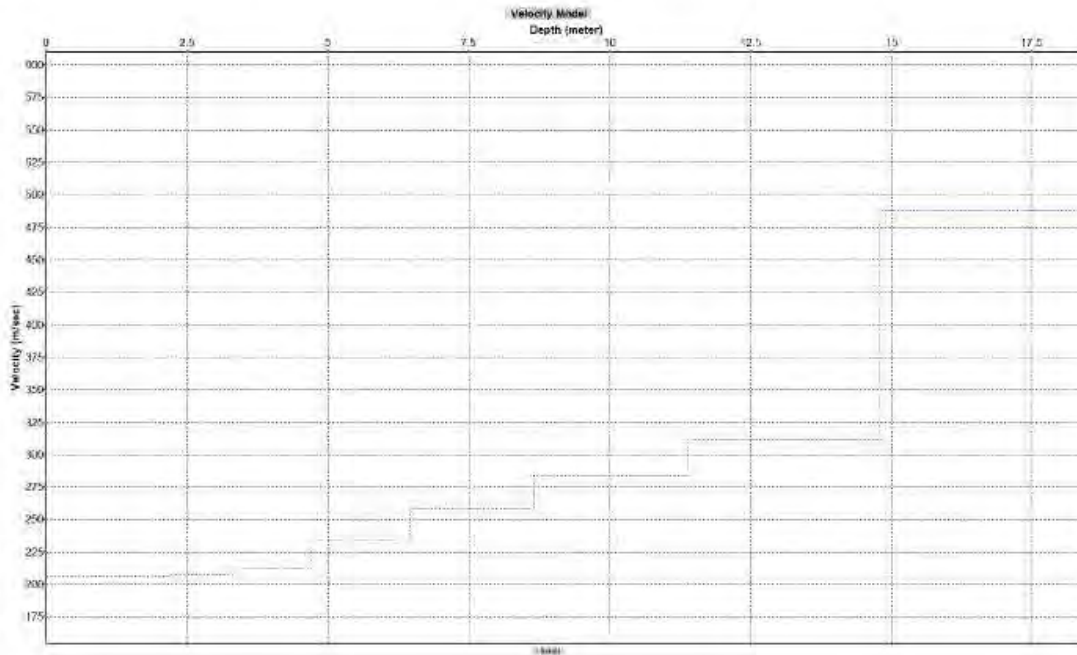
S-wave layer model (Surface wave) : BI\_01

first velocity model (apparent velocity:Vs)		
1	0.34	267.8
2	0.766	267.8
3	1.297	276.49
4	1.962	338.03
5	2.793	421.49
6	3.831	526.83
7	5.129	648.33
8	6.752	803.34
9	8.78	989.36
10	-	1632.9



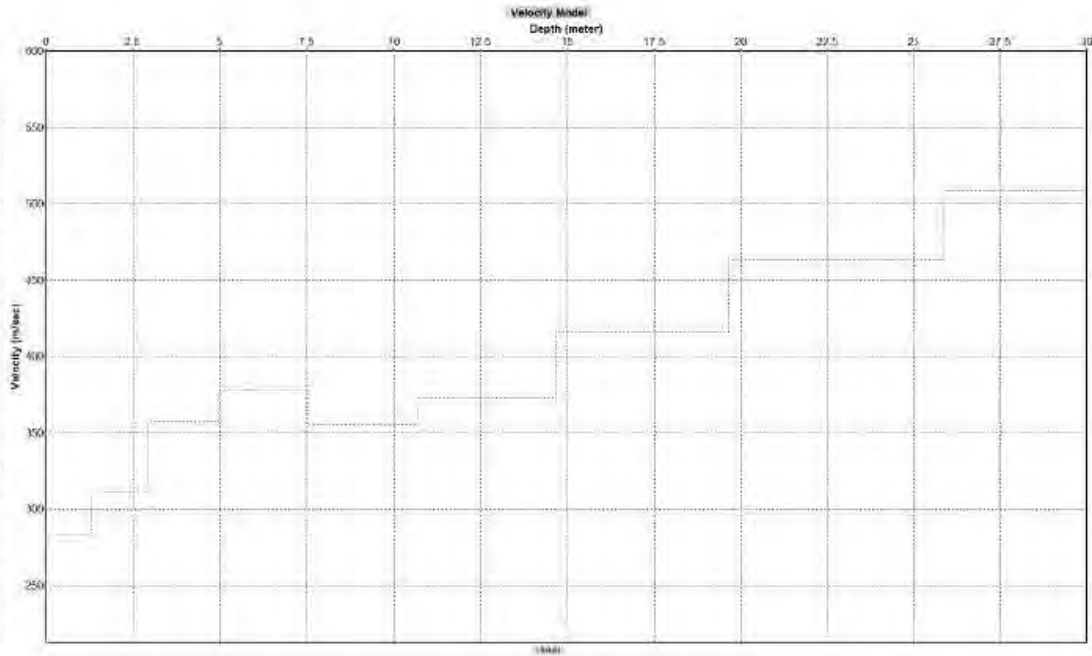
S-wave layer model (Surface wave) : BI\_02

first velocity model (apparent velocity:Vs)		
	depth	Velocity
	bottom (m)	(m/sec)
1	0.573	206.0
2	1.289	206.0
3	2.185	206.0
4	3.304	207.6
5	4.703	212.4
6	6.452	234.6
7	8.638	258.5
8	11.37	283.9
9	14.786	311.9
10	-	487.9



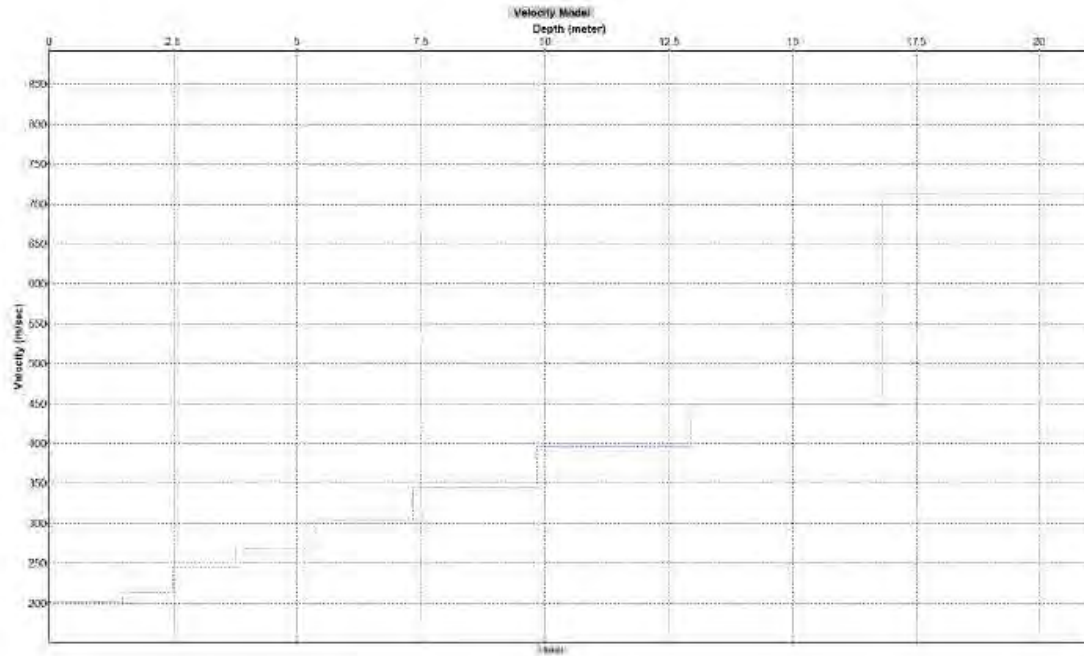
S-wave layer model (Surface wave) : BI\_03

first velocity model (apparent velocity:Vs)		
	depth	Velocity
	bottom (m)	(m/ sec)
1	1.304	283.1
2	2.934	310.9
3	4.971	357.5
4	7.517	377.8
5	10.7	354.9
6	14.679	372.6
7	19.653	415.9
8	25.87	463.4
9	33.641	508.2
10	-	793.0



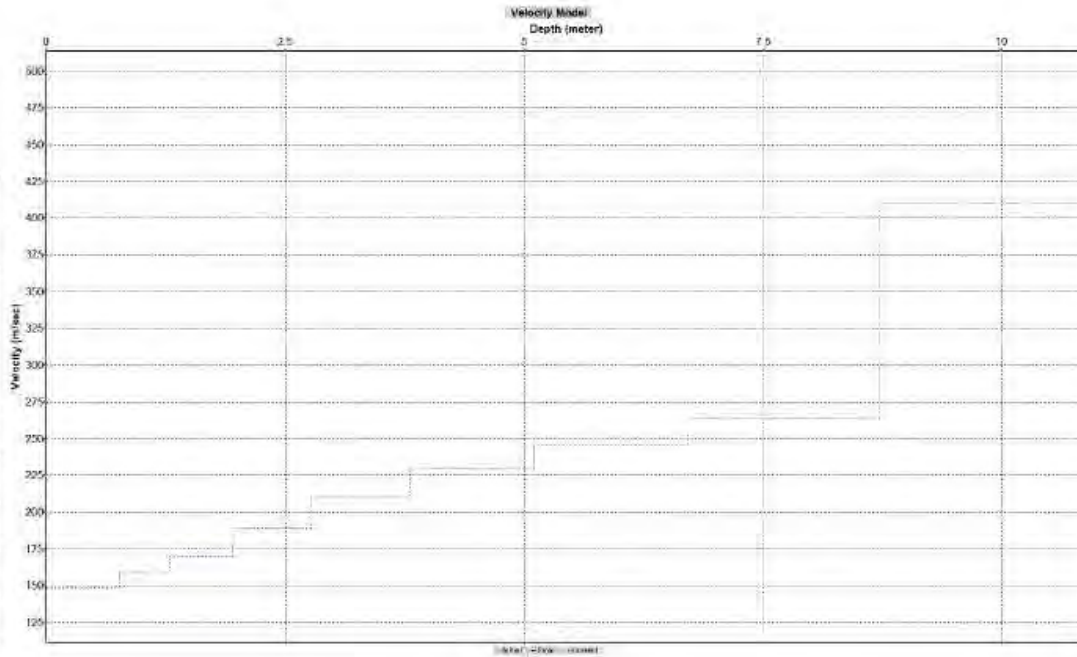
S-wave layer model (Surface wave) : BR\_01

first velocity model (apparent velocity:Vs)		
	depth	Velocity
	bottom (m)	(m/sec)
1	0.652	201.0
2	1.468	201.0
3	2.484	214.1
4	3.757	244.2
5	5.347	269.7
6	7.336	304.6
7	9.821	344.9
8	12.928	395.5
9	16.812	449.8
10	-	713.3



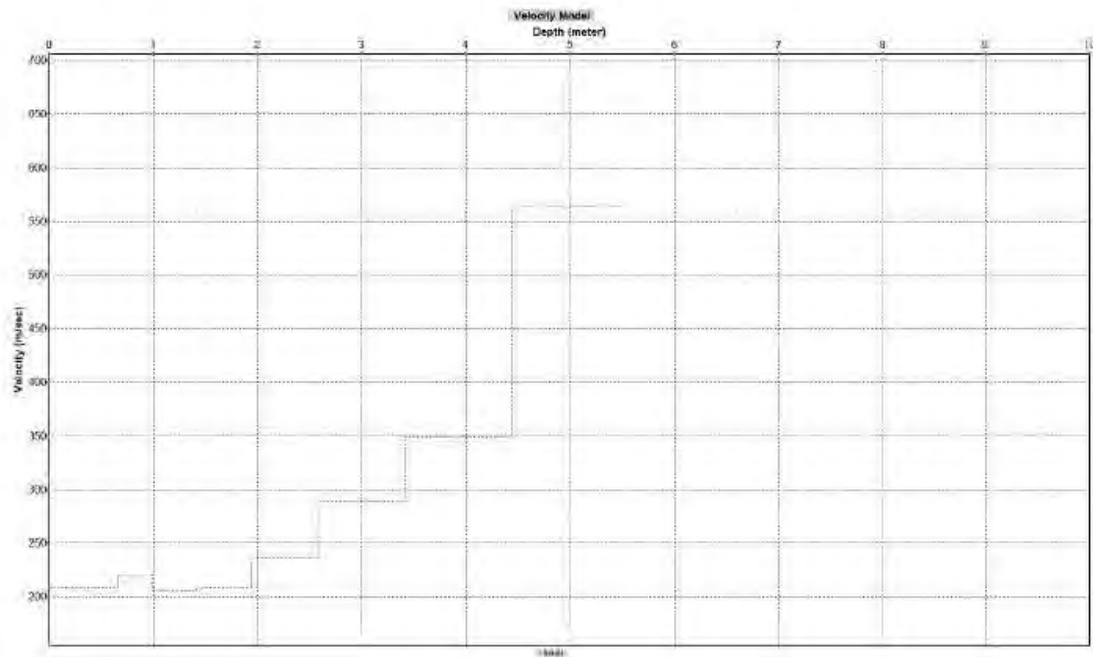
S-wave layer model (Surface wave) : BR\_02

first velocity model (apparent velocity:Vs)		
1	0.34	148.4
2	0.76	148.9
3	1.29	159.4
4	1.95	170.4
5	2.77	189.1
6	3.80	210.9
7	5.09	230.2
8	6.70	246.1
9	8.72	264.6
10	-	410.8



S-wave layer model (Surface wave) : BR\_03

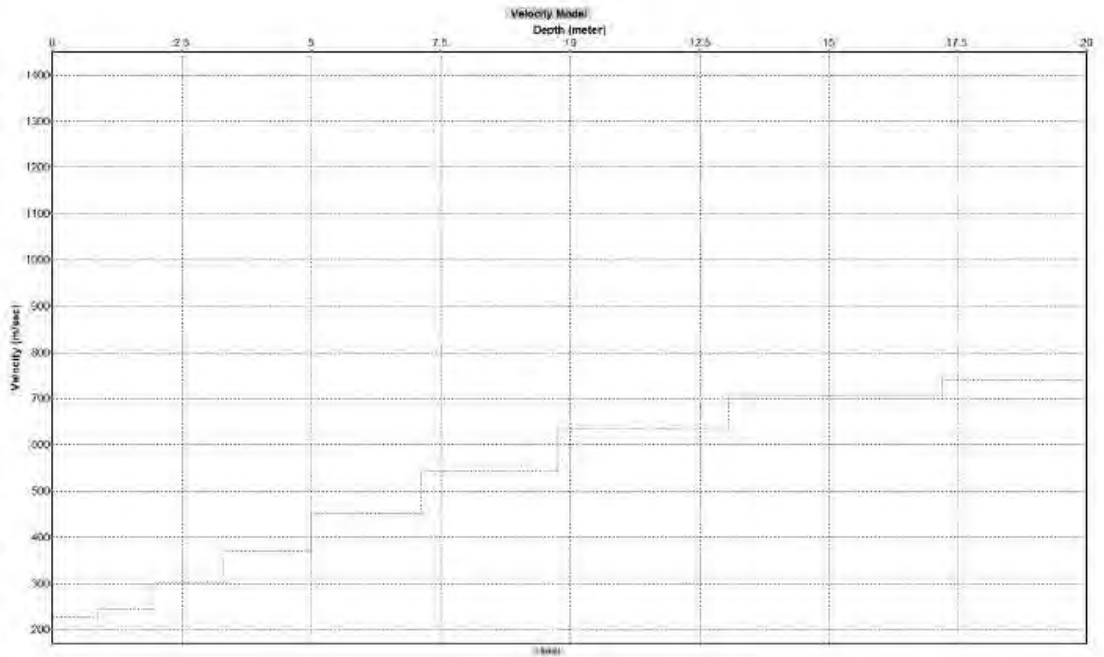
first velocity model (apparent velocity:Vs)		
	depth	Velocity
	bottom (m)	(m/sec)
1	0.172	208.4
2	0.387	208.4
3	0.655	208.4
4	0.991	220.7
5	1.411	205.8
6	1.936	208.2
7	2.591	236.4
8	3.411	289.1
9	4.436	348.4
10	-	564.6



S-wave layer model (Surface wave) : NH\_01

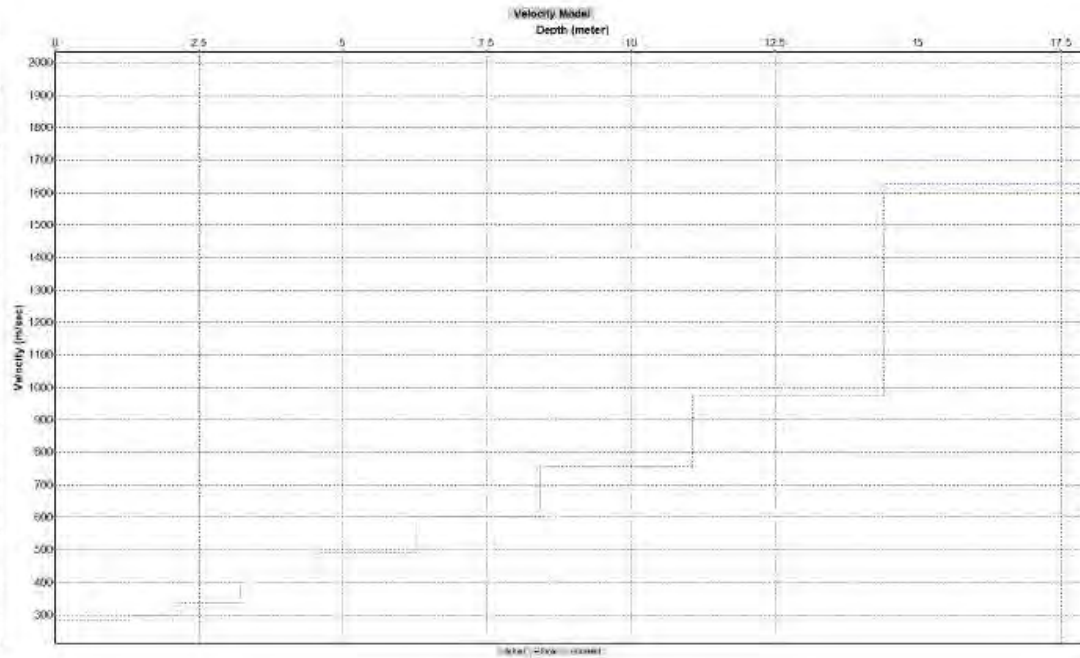


first velocity model (apparent velocity:Vs)		
	depth	Velocity
	bottom (m)	(m/sec)
1	0.867	226.6
2	1.95	243.6
3	3.304	301.0
4	4.996	368.8
5	7.112	450.4
6	9.756	542.0
7	13.062	636.5
8	17.194	704.7
9	22.359	742.0
10	-	-



S-wave layer model (Surface wave) : NH\_02

first velocity model (apparent velocity:Vs)		
1	0.56	281.7
2	1.26	282.3
3	2.13	297.7
4	3.22	337.9
5	4.58	400.5
6	6.28	489.8
7	8.41	603.1
8	11.07	757.9
9	14.40	972.9
10	-	1625.3



S-wave layer model (Surface wave) : NH\_03

### 1.3.6 Microtremor Measurement

#### (1) Spectral and H/V Ratio

