WESTERN PACIFIC MINING CORPORATION

SEISMIC REFRACTION AND REFLECTION SURVEYS ON PINE CREEK, ATLIN MINING DIVISION, BRITISH COLUMBIA

M.A. Power M.Sc. P. Geo.

Placer claims and leases

PL7305, P63435
PML 1846, 1826, 1827

Location: 59° 36' N 133° 35' W
NTS: 104 N 11/12
Mining Division: Atlin
Claim Owner: Alex ~~MacDonald~~ MACKENZIE
Operator: Western Pacific Mining Corporation
Date: January 6, 1995 6

Summary

Seismic reflection and refraction surveys were run at three widely separated sites on the north side (right limit) of Pine Creek in the Atlin Mining Division to determine whether a buried pre-glacial channel might exist here. Site locations are shown in Figure 3 together with the inferred location of the paleochannel. The West Site is located just east of the Spruce Creek Road junction on the Surprise Lake Road, the Moose Lake Site is between Elk and Moose Lakes and the East Site is near Birch Creek on a 4x4 mining access road. At each site, two lines orthogonal to the inferred trend of the paleochannel and centred on the inferred channel axis were surveyed. At the East and West Sites, reflection surveys were shot with a broadside offset T array because of the apparent depth to bedrock indicated by nearby churn drill holes. At the Moose Lake Site, a more shallow depth to bedrock was indicated in drill holes and a 60 m (5 m phone separation) seismic refraction array was used with centre spread, end spread and offline offset shots for each array. The seismic surveys appear to have mapped the top of bedrock or the top of a boulder lag deposit overlying bedrock based on the correlation between limited drill hole and the seismic data.

The results of the seismic surveys are summarized in Figure 16. This diagram shows all the seismic lines in their relative geographic locations looking west or, equivalently, down the inferred paleochannel towards its mouth at Atlin Lake. The inferred top of bedrock is shown in each of the profiles as a thick line. It appears that a buried pre-glacial channel might exist on the property given the bedrock topography at the East and West Sites. At the East Site, a wide bedrock depression was identified with bedrock occurring at a depth of 40 m in the trough of the depression. Profiles from the West Site mapped bedrock or the top of a boulder lag deposit on bedrock at a depth of 44 to 60 m. A bedrock depression averaging 70 m wide and 10 m deep is apparent in the seismic sections. The bedrock profile at the Moose Lake Site is flat and the depth to bedrock is shallow; it appears that no channel is located here.

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1.0 Introduction

This report describes seismic refraction and reflection surveys conducted on portions of Pine Creek in the Atlin Mining Division of northern British Columbia between November 8 and 15, 1995. Pine Creek is a historic and very productive placer creek which has been extensively mined since 1898. The surveys were conducted for Western Pacific Mining Corporation to determine whether a deep, hitherto unexplored channel might exists within the valley containing Pine Creek.

2.0 Location and access

The Pine Creek Placer property is in the Atlin Mining Division, northern British Columbia at 59° 36' N 133° 35' W. The property is 5 km east of Atlin, B.C. (Figure 1). It can be reached via the Surprise Lake road from Atlin and via 4x4 seasonal roads branching from the Surprise Lake Road.

3.0 Property

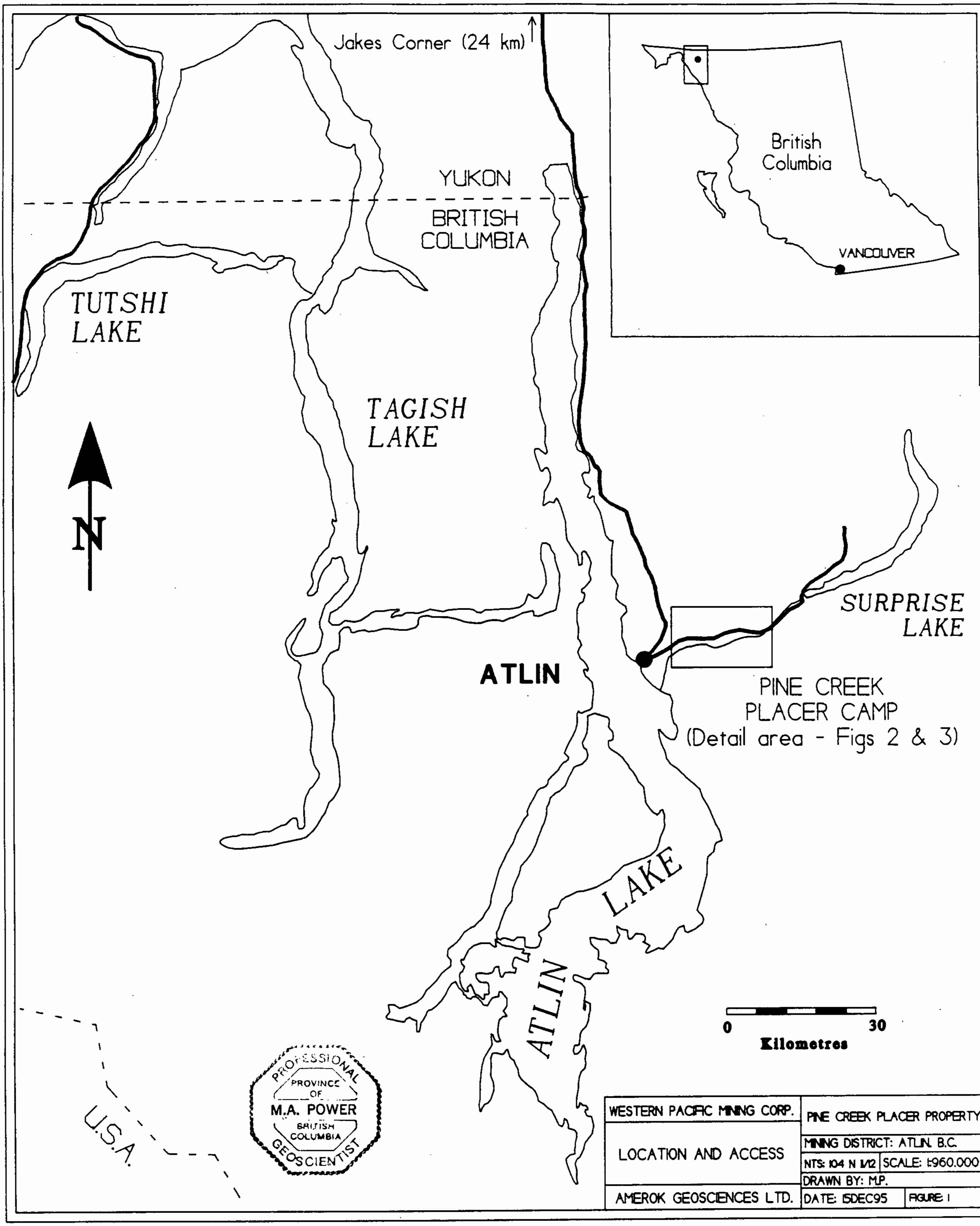
The Pine Creek Placer Property consists of a series of placer claims and leases on the north side (right limit) of Pine Creek extending from the Spruce Creek Road on the west to Birch Creek at the eastern limit. The surveys were conducted at three sites covering the following placer claims and leases:

SITE	CLAIMS/LEASES
West Site	PL7305 P63435
Moose Lake Site	PML 1846
East Site	PML 1826 PML 1827

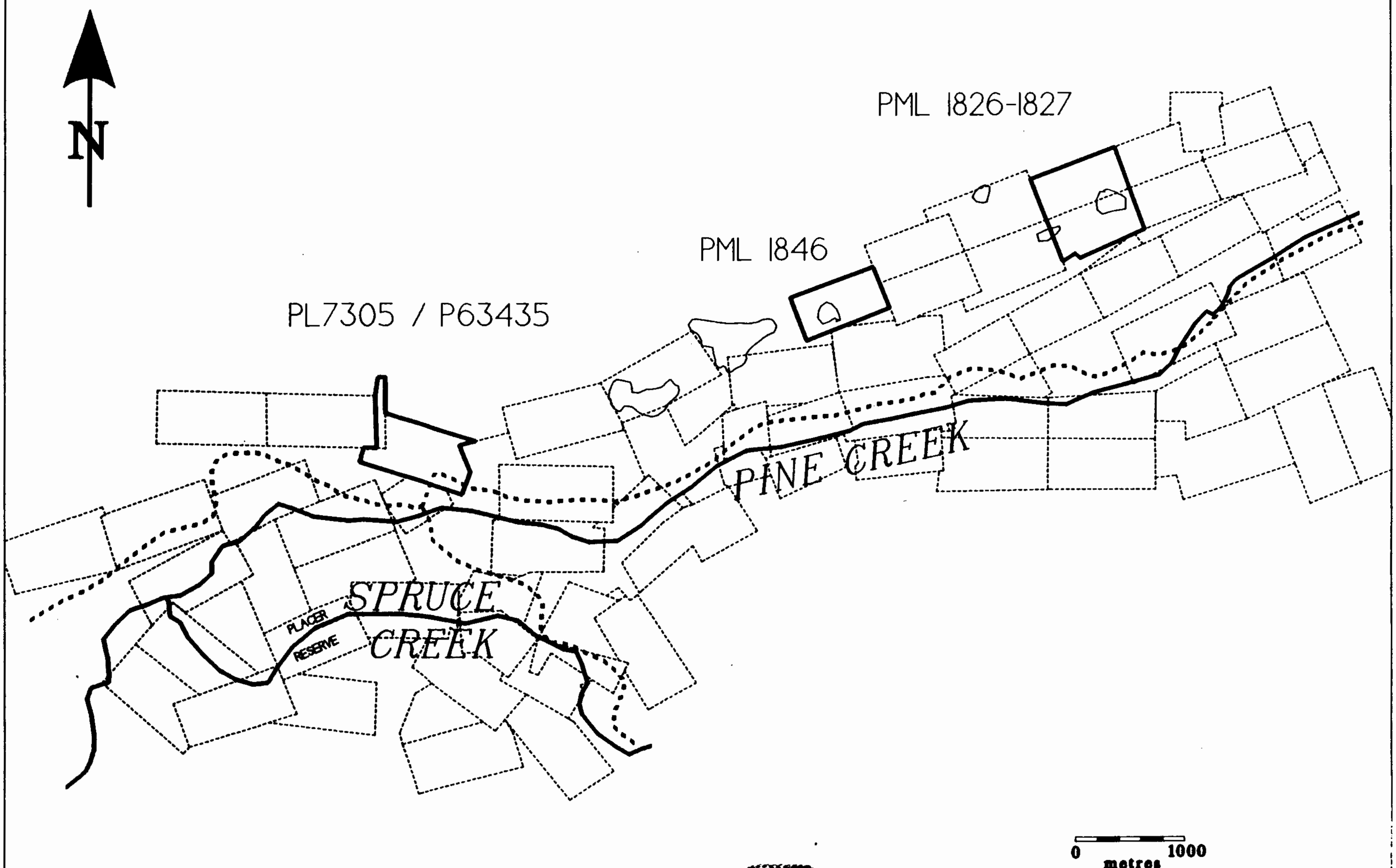
The three sites are outlined with heavy lines in Figure 2.

4.0 Topography and vegetation

Pine Creek rises in Surprise Lake and drains to Atlin Lake (Figure 3). It lies within a broad U-shaped east-west trending valley which widens dramatically near its mouth. The property is in the valley bottom at an average elevation of 850 m. Local relief



Jakes Corner (24 km)
YUKON
BRITISH COLUMBIA
TUTSHI LAKE
TAGISH LAKE
N
ATLIN
SURPRISE LAKE
PINE CREEK PLACER CAMP
(Detail area - Figs 2 & 3)
ATLIN LAKE
U.S.A.
British Columbia
VANCOUVER
0
30
Kilometres
PROFESSIONAL
PROVINCE OF
M.A. POWER
BRITISH COLUMBIA
GEOSCIENTIST
WESTERN PACIFIC MINING CORP.
LOCATION AND ACCESS
AMEROK GEOSCIENCES LTD.
PINE CREEK PLACER PROPERTY
MINING DISTRICT: ATLIN, B.C.
NTS: 104 N 1/12
SCALE: 1:960.000
DRAWN BY: M.P.
DATE: 15DEC95
FIGURE: 1



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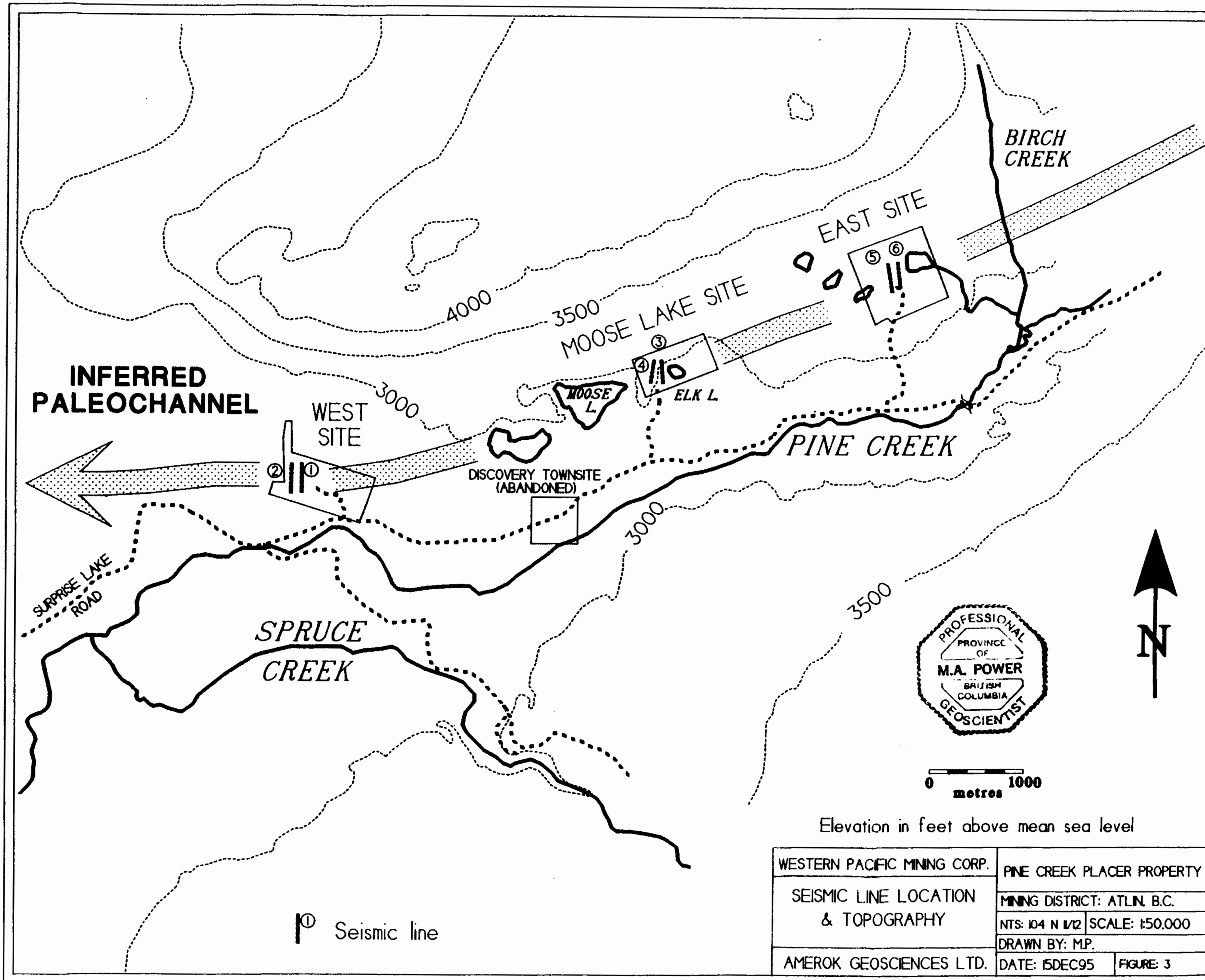
BRITISH COLUMBIA
GEOSCIENTIST

PLACER PROPERTY DISPOSITIONS AS RECORDED
ON B.C. DEPARTMENT OF MINES PLACER CLAIM MAPS
104 N 11 & 12 ON NOV 13, 1995

WESTERN PACIFIC MINING CORP.	PINE CREEK PLACER PROPERTY
CLAIM AND LEASE LOCATIONS	MINING DISTRICT: ATLIN, B.C.
	NTS: 104 N 11/12 — SCALE: 1:50,000
	DRAWN BY: M.P.
AMEROK GEOSCIENCES LTD.	DATE: 15DEC95 — FIGURE: 2



WESTERN PACIFIC MINING CORP.	PINE CREEK PLACER PROPERTY
SEISMIC LINE LOCATION & TOPOGRAPHY	MINING DISTRICT: ATLIN, B.C.
	NTS: 104 N 11/12 · SCALE: 1:50,000
	DRAWN BY: M.P.
AMEROK GEOSCIENCES LTD.	DATE: 15DEC95 · FIGURE: 3

varies from 700 m near Surprise Lake to 180 m near the mouth of Pine Creek. Pine Creek has an average gradient of 15 m per km; near the property it averages approximately 7 m per km. Where the creek traverses areas undisturbed by placer mining, it follows a single meandering channel approximately 15 m wide. The valley bottom is covered with open stands of pine and thicker stands of spruce in more poorly drained areas. The valley has not been extensively logged and timber suitable for mining purposes is available on the property. Small bogs thickly vegetated with stunted black spruce, willow and alder are found in the Moose and Elk Lakes area.

5.0 Bedrock geology

The Pine Creek area is underlain by Pennsylvanian to Permian mafic and ultramafic rocks of the Cache Greek Group (Carnes 1913). Most of the Pine Creek valley in the area of the claims is underlain by serpentinized peridotite and gabbros. At higher elevations, metavolcanic rocks (greenstone) and greywackes are found in outcrop. Gold mineralization in quartz-carbonate (listwanite) veins occurs in and adjacent to the serpentinized ultramafic rocks and probably provides the principal source of placer gold in the area.

6.0 Placer geology

The geology of the placer deposits in the Atlin area is well described by Gwillim (1901). Two gravel sequences are found in the Pine Creek drainage. Pre-glacial gravels are found beneath up to 60 m of glacial overburden on Spruce Creek and beneath a lesser thickness of glacial sediments on Pine Creek. Post-glacial gravels are found in the present channels of Spruce and Pine creeks and in abandoned channels within the Pine Creek valley.

Pre-glacial gravels are described as having a distinctive yellow colour, attributed to iron oxides, which pervades both the gravel matrix and clasts. Placer deposits in this unit can be quite rich, with grades of up to 9.3 g Au per cubic yard reported by Gwillim. The pre-glacial gravels are covered by glacial moraine and periglacial sediments and they are only exposed by down-cutting in post-glacial channels. Deposits exposed in Pine Creek suggest that a series of wide pre-glacial channels are present in the valley. The main pre-glacial channel appears to follow the north side of Pine Creek upstream near Birch Creek, crosses over through the modern channel near Gold Run Creek above the Discovery townsite and follows the south side of Pine Creek down past the Spruce Creek Road. Near the Discovery townsite, the grade of the known pre-glacial channel is roughly the same as the modern channel. In general, the pre-glacial channels are completely buried and have little or no topographic expression.

Post-glacial gravels are described as being darker and more argillaceous than the pre-glacial gravels. In addition, they lack the pervasive iron oxide characteristic of the pre-glacial gravels. Placer deposits in post-glacial gravels appear to result from reworking of pre-glacial placers. In the Pine Creek valley there are two dry pre-glacial channels parallel to the modern creek channel; Gold Run Creek and Willow Creek. Both roughly parallel the present creek channel in a wide section of the valley above the Discovery townsite. Gold Run Creek is 800 m long and is centred approximately 2000 m upstream from Discovery townsite on the south side (left limit) of Pine Creek. The elevation of the Gold Run channel is roughly 5 m above the Pine Creek channel. Willow Creek is approximately the same length as Gold Run and is centred 600 m above Discovery townsite. It is separated from Pine Creek by a low bedrock ridge on the margins of which are thin deposits of pre-glacial gravels. No pre-glacial gravels are found in Willow Creek and the gravels found therein are apparently of glacial origin. They are poorly sorted with abundant clay and the clasts are marked with glacial striations. In general, post-glacial channels show some topographic expression.

On Pine Creek, no pre-glacial gravels have been found below around 2700 ft (823 m). The apparent downstream limit occurs near the Spruce Creek Road junction. Disruption and dispersion of pre-glacial placers could have been caused by a large ice sheet in the Atlin Lake valley (Gwillim 1901). Alternatively, preserved blind pre-glacial channels may exist beneath a thick blanket of overburden on at least the protected section of Pine Creek valley between the Spruce Creek road and the airstrip at Km 2.0 on the Surprise Lake Road. Glacial deposits of boulder clay cover the fluvial gravels in Pine Creek valley as far as the Willow Creek channel.

In summary, two auriferous gravel deposits are found in the Pine Creek valley. Pre-glacial gravels containing placers derived primarily from listwanite gold veins in the underlying metamorphosed ultramafic rocks contain the richest gold concentrations. These deposits, while generally following the line of the Pine Creek valley, appear to have developed over a wider area than that covered by the present drainage and have little or no topographic expression. Post-glacial auriferous gravels are found in channels parallelling the present drainage. These appear to be reworked pre-glacial placers and show some topographic expression. Both pre- and post-glacial gravels have been extensively mined where exposed on Pine Creek. The known widespread distribution of pre-glacial gravels suggests that there may be several paleochannels in the Pine Creek valley. If significant new reserves exist on Pine Creek they will most probably been found in a blind pre-glacial channel. The survey described in this report was designed to test the hypothesis that such a channel exists on the north side of Pine Creek extending from Birch Creek through Moose and Elk Lakes to the Spruce Creek Road junction (Figure 3).

7.0 Theory of Seismic Methods

Seismic methods employ an energy source to generate acoustic waves in the earth and record reflected and refracted seismic waves with long period microphones known as geophones. For ease of operation, the geophones and shots are commonly laid out along a single cut line and the shot is spaced some distance from the geophones.

Seismic wave theory is well described in such standard texts at Telford *et. al.* (1990) and is briefly summarized below. An energy sources such as explosives, a sledge hammer or dropped weight is used to generate mechanical waves which radiate away from the shot or impact point. Compressional (**P**) and transverse (**S**) seismic waves generated by the source reflect and refract at the boundary between media with different seismic wave velocities (Figure 4(a)). Different earth materials have characteristic seismic velocities (Table I). The angle of emergence for a reflected wave equals the angle of incidence while the angle of refraction is governed by Snell's Law:

$$\frac{\sin\theta_i}{v_i}=\frac{\sin\theta_r}{v_r} \qquad (1)$$

where v_i and v_r are the seismic wave velocities in the incident (overlying) and refracting (underlying) medium. If the velocity of the underlying layer is faster than that of the overlying layer, the refracted wave will flatten with depth as the angle of refraction (θ_r) increases. In this case, at an angle described as the critical angle(θ_c), the emergent wave will be refracted to 90° and travel along the boundary between the two layers at the faster velocity of the lower medium:

$$\sin\theta_c=\frac{v_i}{v_r} \qquad (2)$$

As it travels along the boundary, the refracted wave will radiate energy back into the overlying medium at the critical angle and this energy will return to the surface. Near the shot point, energy travelling directly through the overlying medium (direct wave) will arrive before any refracted waves. At a distance known as the cross-over distance, the refracted wave begins to arrive before the direct wave and all subsequent first arrivals are refracted arrivals (Figure 4(b)).

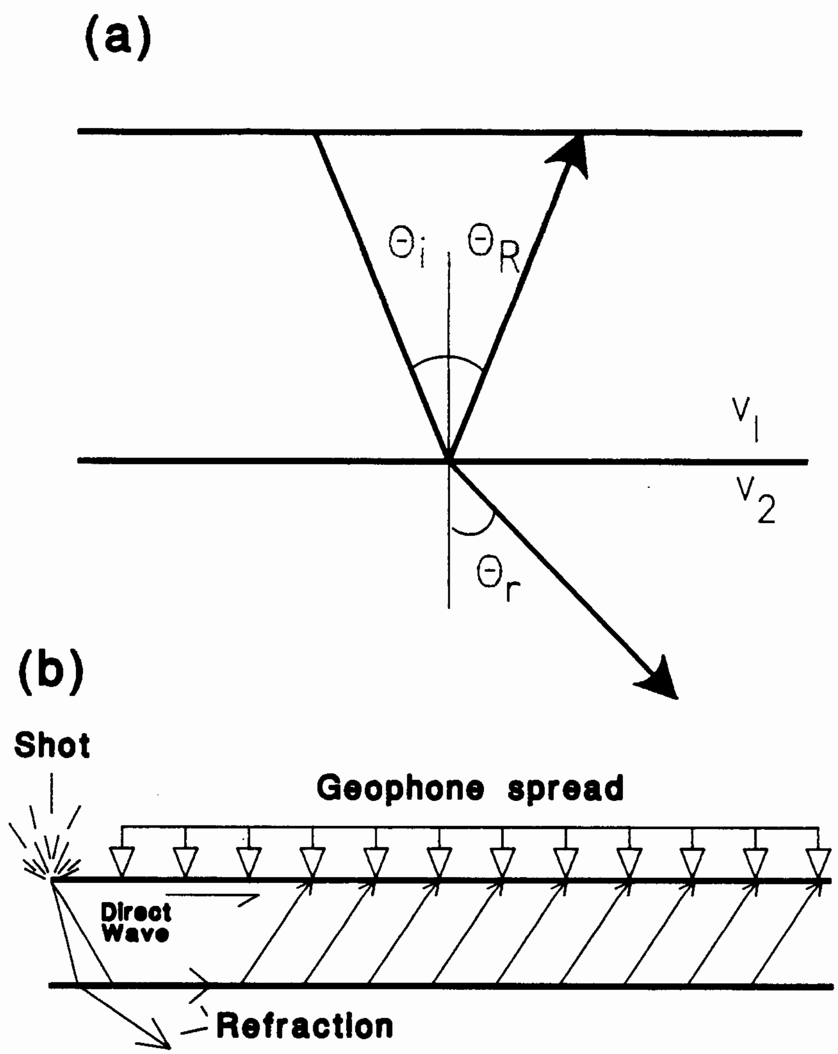


Figure 4. (a) Seismic reflection and refraction from a velocity boundary ($v_1 < v_2$) (b) At short separations, direct wave arrives before refraction. Past the crossover distance, the refracted wave arrives first.

Table I. Seismic Velocities of Rock and Overburden

Material	Velocity (m/s)
Air	330
Water	1400-1500
Ice	4000 ($\pm$)
Gravel - thawed	1800-2800
Gravel - frozen	4000 - 4600
Glacial till - frozen	3000 - 4300
Sand & silt - thawed	600 - 1500
Sand & silt - frozen	1500 -3000
Metamorphic and igneous rock	4000 - 6000
Shale and sandstones	2000 - 3500
Weathered granite	450 - 3200

Sources: Birch (1966)
Coates (1965)
Sims (1981)

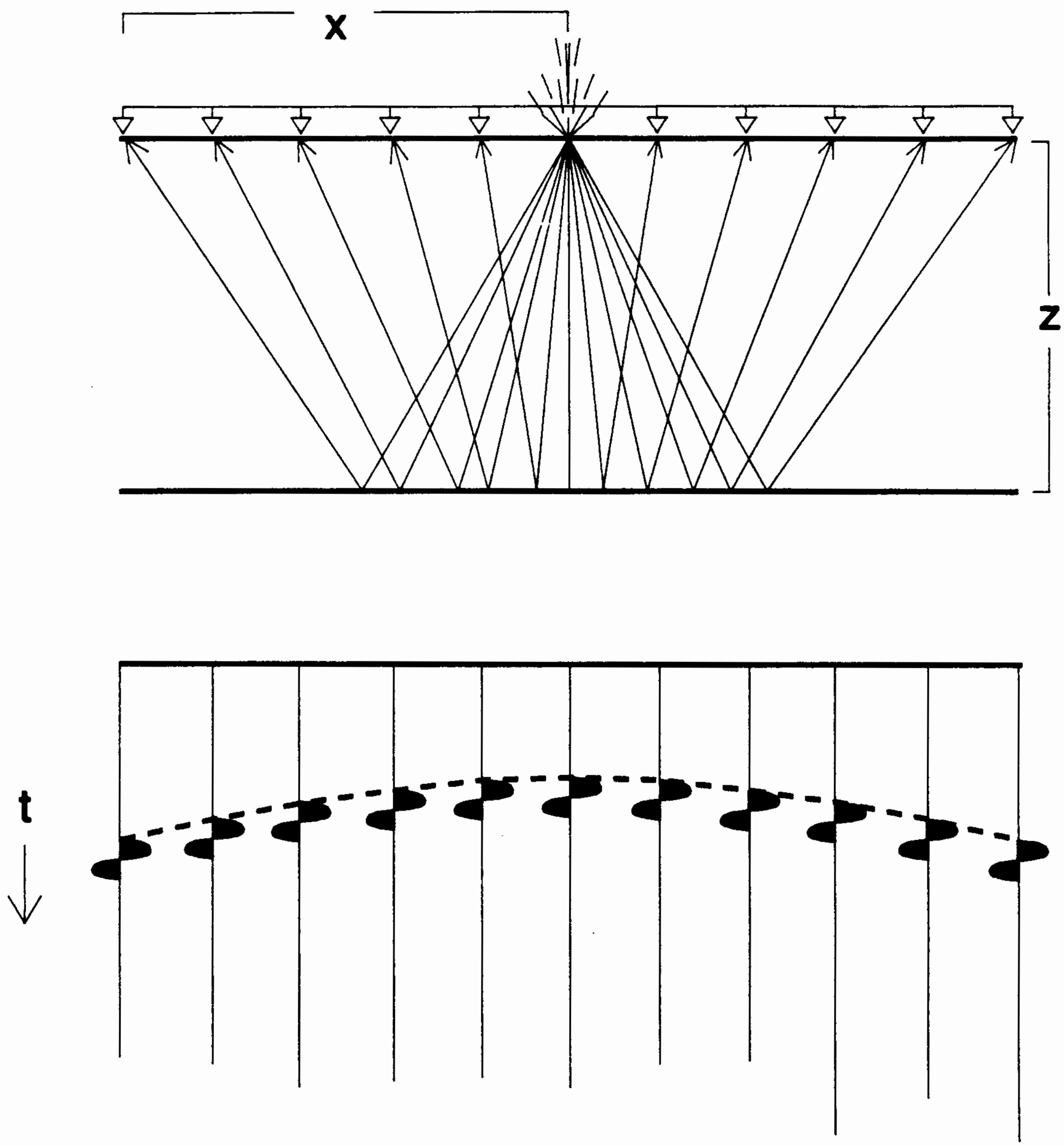


Figure 5. Reflection from a horizontal reflector. The hyperbolic pattern of arrivals is termed normal moveout.

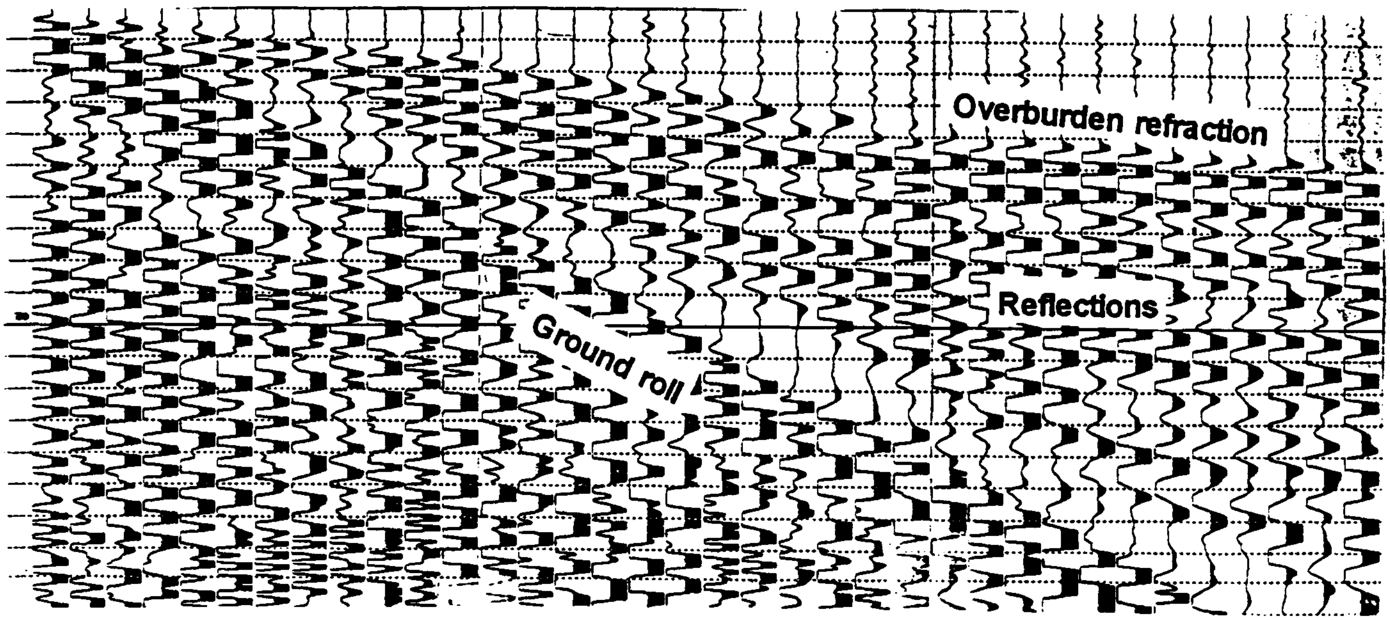


Figure 6. Walkaway seismic survey. Geophones spaced at 1 m intervals. Shot point is 1 m to the left of the geophone array. Refracted and reflected arrivals together with ground roll / blast wave are indicated on the record.

Seismic waves will reflect at the boundary between layers with different seismic velocities. The angle of reflection will equal the angle of incidence (Figure 4(a)) and the strength of the reflection is proportional to the velocity contrast. If the geophone and shot are coincident and the reflector is horizontal (normal incidence), the travel time (t) is given by:

$$t=2\frac{z}{v} \quad (3)$$

where z is the depth to the reflector and v is the velocity of the medium. This is illustrated in Figure 5. In the general case where the shot and geophone are separated by a distance x, the travel time equation becomes:

$$v^2t^2=x^2+4z^2 \quad (4)$$

This is the equation of a hyperbola with the curvature governed by z and v. Reflections on a shot record have a diagnostic hyperbolic shape referred to as Normal Moveout (NMO) and the apparent velocity which accounts for this shape is referred to as the normal moveout velocity or V_{NMO}.

Figure 6 is a shot record made with equally spaced geophones and a shot set off a single geophone spacing to the left of the geophone array. The geophone spacing is 1 m. The shot record shows reflected and refracted arrivals together with the ground roll. Ground roll is a chaotic series of relatively slow (~330 m/s) seismic waves generated by the energy source travelling along the low velocity layer at the earth's surface. Since this energy travels directly from the shot to the geophones, it is linear on the shot records. Generally , no reflections can be read during the passage of ground roll and seismic surveys are designed to ensure that the ground roll arrives before or after the reflections of interest. Refracted wave arrivals are also relatively linear and refractions from overburden and bedrock are visible as first arrivals in the shot record.

It is apparent that there is an optimum separation between the shot and geophone array in which reflections are visible before the arrival of ground roll. If the shot point is too close to the geophones, the ground roll will obscure the reflected arrivals. If the shot point is too far from the geophone array, most of the arriving energy will be refracted along the reflector rather than reflecting from it.

7.1 Seismic Refraction Method

The seismic refraction method uses waves refracted along the boundary between two velocity layers to determine the depth to the layers. As noted above, refractions are only visible if the layer below if faster than the layer above and only at distances beyond the critical distance where seismic energy is refracted along the layer boundary. At a slightly greater separation, the cross-over distance (x_{cx}) the refracted wave becomes the first arrival. In the simple case (Figure 7(a)) where a seismic wave is refracted along a horizontal layer boundary, the cross-over distance will be:

$$x_{cx}=2z\sqrt{\frac{V_2+V_1}{V_2-V_1}} \quad (5)$$

From this relation, the minimum separation between shot and geophone array required to detect refractions can be calculated. Using average velocities of around 1800 m/s for water saturated gravels and bedrock velocity of around 3500 m/s, the relation reduces to:

$$x_{cx}=3.5z \quad (6)$$

If the velocity contrast is greater, the separation will be less and, conversely, a larger separation will be required if the velocity contrast is smaller. This relation can be used to estimate the shot-geophone separations required to determine map a refractor if some estimate of the depth is available.

Refraction surveys are conducted by laying out a spread of geophones on the ground and firing shots at fixed locations relative to the spread. At a minimum, a shot is fired at one end of the spread (single ended spread). Usually, shots are fired at either end and in the middle of the spread and in some cases, at distances equal to the spread length off either end of the spread. An example of the spread and shot pattern is shown in Figure 7(b). The critical data in refraction seismic surveys is the time of the first arrivals - the direct and refracted waves which arrive before the ground roll and and reflections. This is usually plotted in time-distance (T-X) plots showing the geophone coordinates on the x-axis and the arrival times in milliseconds (or seconds) on the y-axis (Figure 7(c)).

There are several interpretation schemes available to interpret refraction data. Fitting the data to the simple case of planar dipping refractors is sometimes used to give very rough estimates of refractor geometry. Examples of T-X graphs for simple geometries are useful in gaining insight into the interpretation of refraction data. In the case of horizontal refractors (eg. Figure 7(c)) the travel time curves for shots at either end of the spread are symmetric. The slope of the refracted arrival is $1/V_2$ where V_2 is the velocity of the refractor. When the refractor dips, this is no longer the case. The apparent refractor velocity on down-dip shot travel time curve is faster than the true refractor velocity and the corresponding velocity for the up-dip shot is slower than the true refractor velocity. The true velocity can be approximated by the average of the two. If there is a depression or rise in the refractor along the spread, the

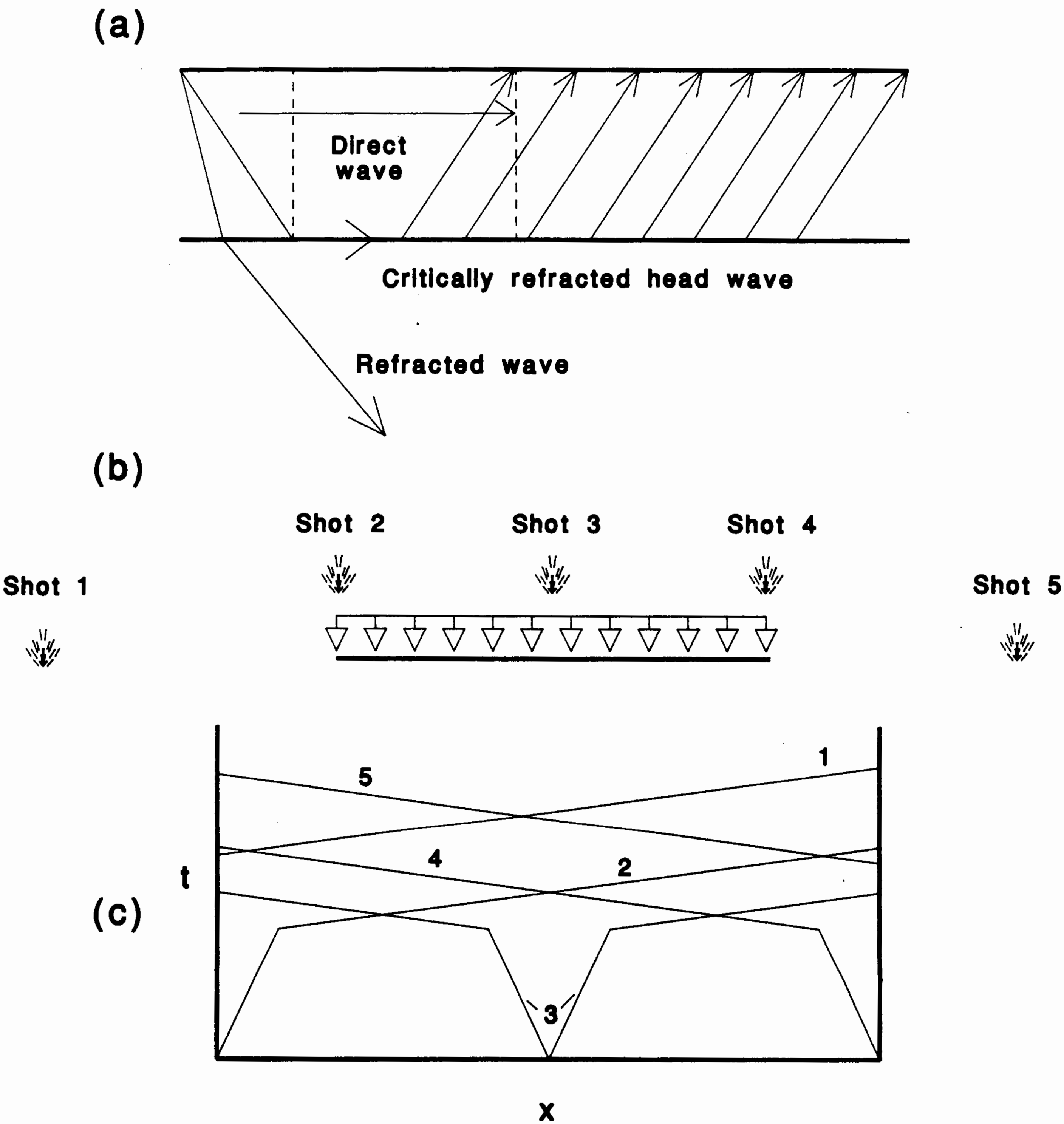


Figure 7. (a) Seismic refraction. Refractions are recorded at distances exceeding the critical distance and are the first arrivals at distances exceeding the cross over distance. (b) Shot pattern for a typical spread. (c) T-X diagram of first arrivals for the shots over a horizontal refractor.

corresponding travel time curves will show a similar depression or rise.

Delay time methods were developed in order to gain a more detailed more picture of the refractor geometry beneath the geophone spread. Figure 8 illustrates the theory behind this method. The delay time is defined as the observed travel time (ie. the time required to travel from **A** to **D** along the refraction path) less the time it would take to travel along the refractor from a point beneath **A** to a point beneath **D**. Essentially the delay time is the time is takes for the energy to travel directly down to the refractor beneath the shot plus the time it takes to travel directly up from the refractor to the geophone. This is the total delay time and it can be broken down into delay times for the shot (t_{ds}) and the geophone (t_{dg}). It is the plot of geophone delay times which is most useful since this indicates the depth of the layer beneath the geophone and thus defines the detailed geometry of the reflector.

The data collected in this report were interpreted using an automated delay time interpretation program (SIP T2) developed by James Scott of the U.S. Bureau of Mines (Scott 1973). Working from the top down, the program determines the geometry of individual layers by:

1. Calculating delay times for the layer.

2. Determining the geometry of the layer.

3. Calculating the portion of the refracted arrival time from deeper layers due to the layer in question.

4. Removing the contribution of the layer in question to the refracted arrival time of deeper layers. (Layer stripping).

This process is repeated iteratively, layer by layer working from the top down until a complete model of the refractors is constructed. The program incorporates uneven topography and any offset of shot points to either side of the seismic line in calculating the solution.

7.2 Seismic Reflection Method

Until recently, most shallow seismic investigations consisted of refraction surveys. With the advent of affordable, portable digital engineering seismographs, and the development of techniques to exploit them, it is now possible to conduct shallow seismic investigations and map reflectors at depths as shallow as 10 m. Reflection surveys require more care and expertise than refraction surveys however and to date are not as commonly used in shallow seismic work.

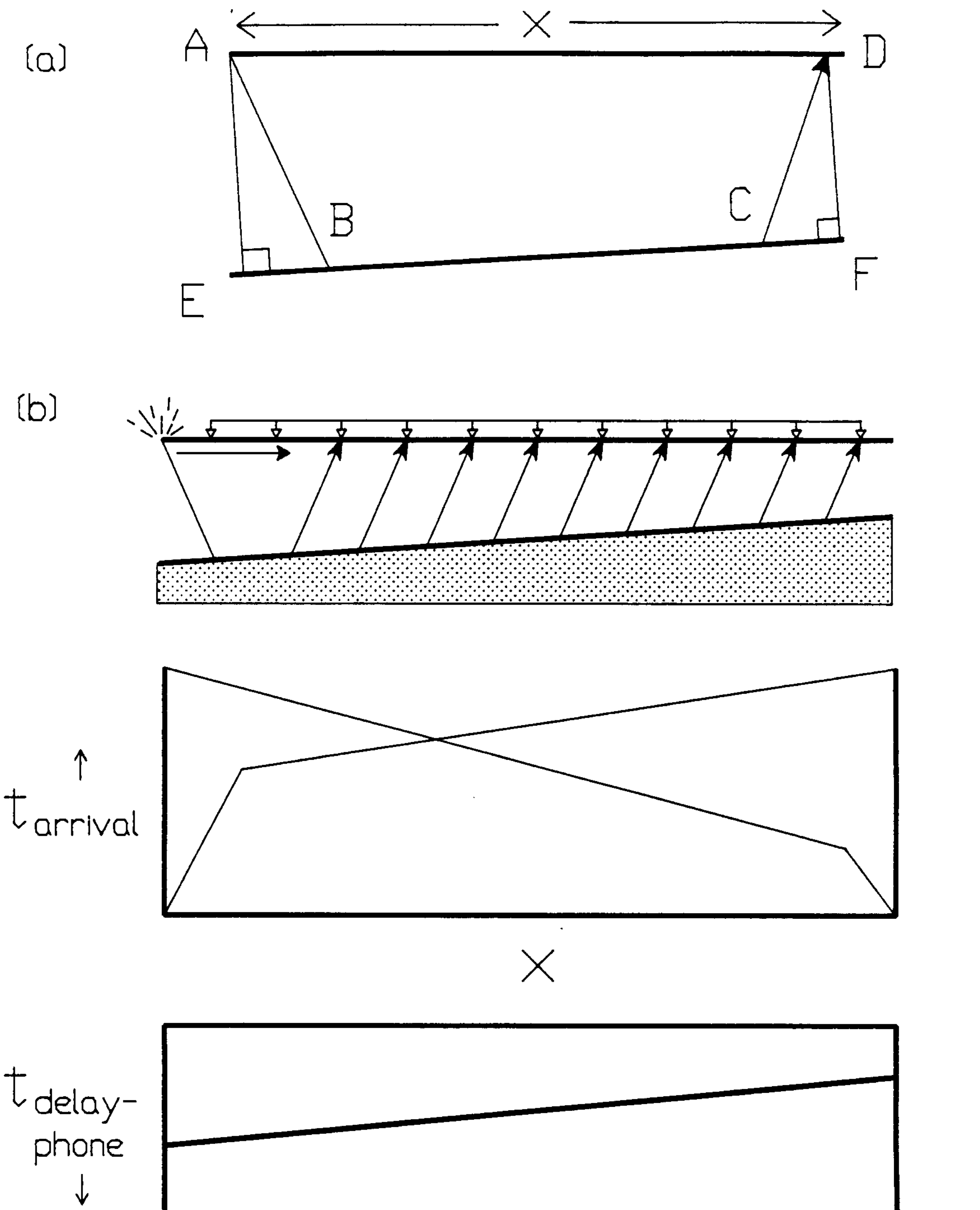


Figure 8. Delay time methods. (a) Delay time is the total arrival time over the path ABCE less the transit time along the refracted path EF. (b) Dipping refractor and T-X plot of the first arrivals. The delay time at the geophone follows the dip of the refractor and depths can be calculated from the delay times.

The central problem with determining depth to bedrock at shallow depths using reflection is that the ground motion created at the shot point where energy is applied will obliterate any bedrock reflections or refractions in nearby geophones. Since the bedrock reflections will arrive soon after the shot when bedrock is shallow, you cannot "wait out" the ground roll as is done in oilfield reflection surveys where deep reflectors are the target. The only way to record reflections at shallow depths is to design the seismic survey so that reflections arrive before the ground roll but after any refracted arrivals in overburden. Two approaches incorporating this principle - the Common Offset and Optimum Window techniques - were developed by the Geological Survey of Canada in the 1980's (Pullan and Hunter 1990). The Common Offset technique is an excellent means of recording high quality reflection seismograms with a minimum of data processing following collection. Unfortunately, the method requires frequent shots which increases the cost and time required to perform a survey. An alternative approach, described in Telford *et. al.* (1990) is to use an offset shot (broadside) array to suppress ground roll.

Broadside offset shooting is illustrated in Figure 9 using the case of 12 geophones. A shot is fired at an optimum broadside offset **d** and recorded at the geophones in the spread. The optimum broadside offset is that required to permit detection of strong reflections from bedrock without the interference of ground roll. Prior to running the survey a walkaway noise survey is conducted by placing geophones in-line using a short separation and firing shots at distances incremented by the geophone spread length moving away from the spread. This technique was used with a 12 channel seismograph to produce the seismic record shown in Figure 3 for example. The walkaway survey is used to identify the range of shot-geophone offsets within which strong reflections may be recorded without the interference of ground roll or refractions. The optimum broadside offset can be determined from the range of acceptable offsets as follows:

a. The geophone spread length must be no more than twice the width of the offset window. (eg. if the range of permissible offsets is 30 m, the maximum geophone spread is 60 m).

b. The optimum broadside offset is the shortest permissible offset determined from the walkaway survey. This will be the offset to the middle of the spread and the offset to all other points will be greater than this.

Using a properly determined optimum broadside offset, reflections from the target of interest can be recorded on individual shot records and, after data processing, can be linked together to form a reflection seismogram. The steps involved in this process include:

1. Determine the optimum normal moveout velocity. This is most accurately

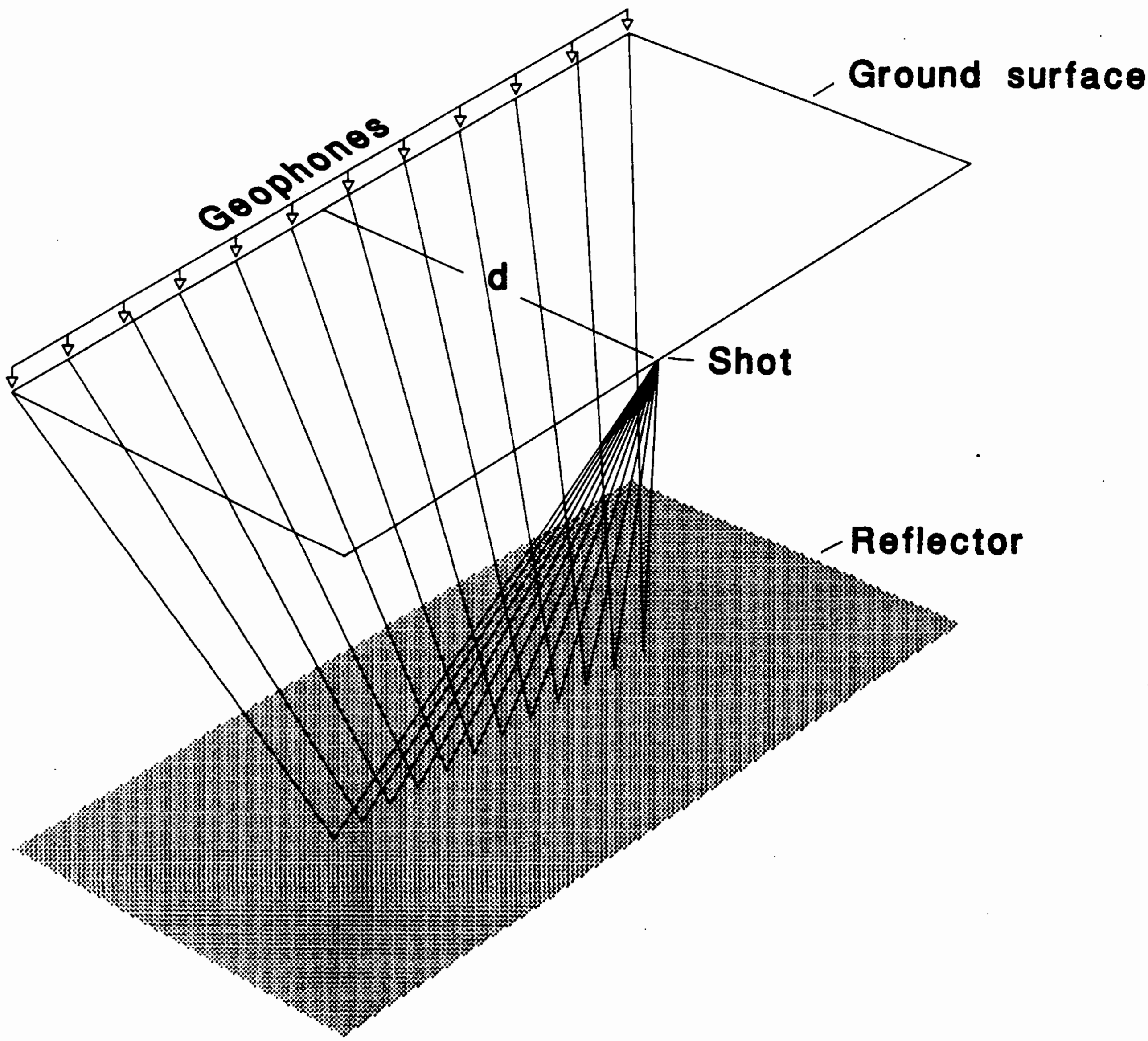


Figure 9. Broadside offset reflection shot. Shot is spaced a distance (**d**) from the geophone spread. Offset is set so as to ensure that reflections arrive before the ground roll and after overburden refractions.

done from the walkaway spread using NMO analysis and refraction analysis.

2. Correct the broadside shot for normal moveout using the velocity determined in the previous step.

3. Link adjacent reflection shot records together by matching reflections between sections. There may be a slight mismatch between first arrivals on adjacent sections because of variations in the low velocity layer.

4. Use the walkaway spread to determine a depth to the base of the low velocity layer and the equivalent first arrival time at the optimum broadside offset separation. Use this datum as the t=0 line for all of the reflection sections.

5. Time reflections from this datum and convert to depths. The depth conversion will be made assuming that the t=0 mark is at the base of the low velocity layer.

Converting the arrival times to depth is complicated by the broadside offset **d**. The normal moveout corrected sections show the reflections as if they were recorded with coincident shot and geophones. If $(z^2 + d^2)^{0.5}$ is substituted for **z** in equation 3, the depth to the reflector can be easily calculated. Normally a depth scale is calculated using this relation and is afixed to the reflection section.

7.3 Limitations of seismic methods

Seismic refraction and reflection methods suffer from inherent limitations. These arise from the narrow range of physical properties being measured and from the assumptions built into the interpretation methods.

Seismic refraction methods are based on the assumption that the velocities of the various layers in the earth increase with depth and that there will be an identifiable response from each layer. In situations where the velocity of a layer is lower than the velocity of an overlying layer, the refracted wave will bend downwards instead of refracting towards the horizontal (Figure 10(a)). Interpretation algorithms will assign a velocity to a combined layer (Layer 1 and 2) equal to the faster velocity of the upper layer. Consequently, if there is a low velocity layer in the package, the calculated depth to bedrock will be deeper than the true depth. This is termed the low velocity layer problem. It is most commonly encountered where permafrost overlies thawed gravel. Another situation which can cause problems is illustrated in Figure 10(b). If a thin high velocity layer is present, there may not be a significant inflection in the travel time curves to indicate to the interpreter that a velocity change has occurred. If the high velocity layer is missed, interpreted depths to bedrock may be slightly shallower

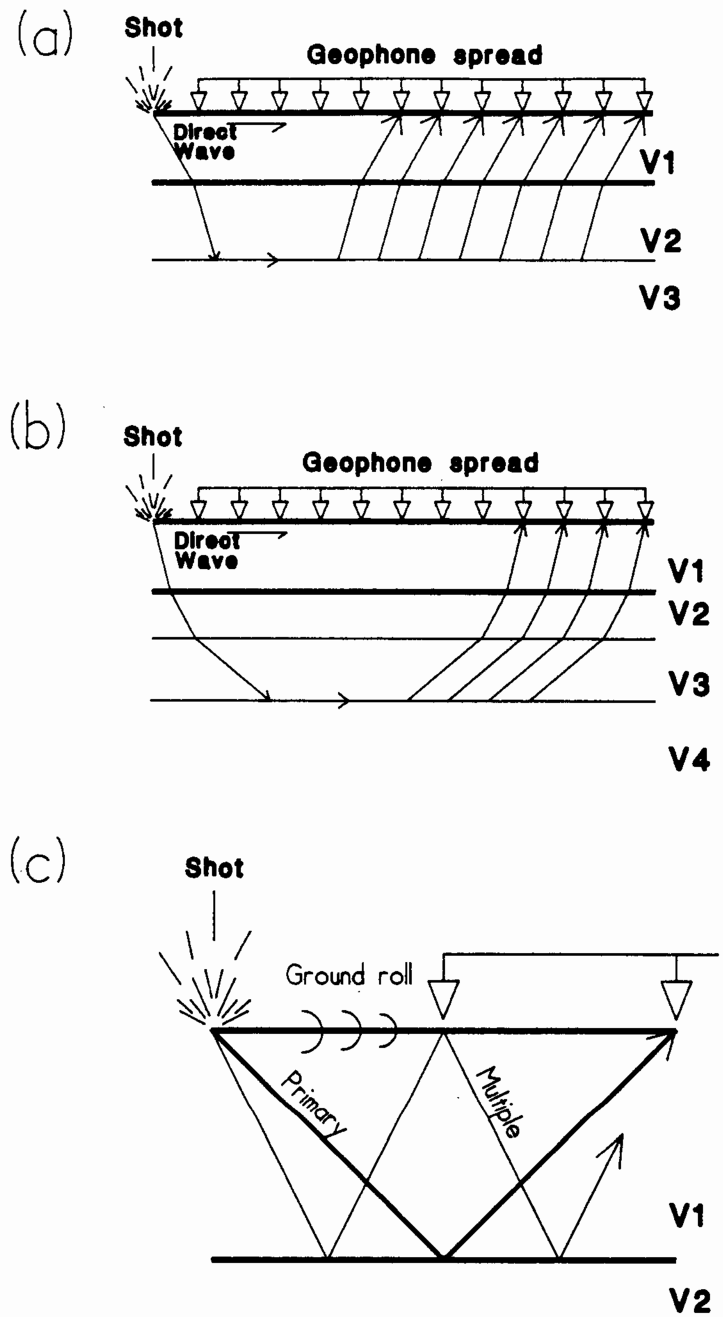


Figure 10. Errors in seismic depth determination. (a) Low velocity layer. V2 is slower than V1 and seismic waves refract downward. The apparent depth of the lower layer is deeper than it actually is. (b) Thin layer problem. V2 is faster than V1 but so thin that it cannot be resolved from the refraction data. The apparent depth of layers below the thin layer is shallower than the true depth. (c) Other reflection survey events. Multiple reflections arrive after the primary reflection and appear to be deeper horizons. Ground roll, if not identified as such may be misinterpreted as a reflection event.

than the true depth to bedrock. This phenomenon is termed the thin layer problem and is not usually serious in refraction interpretation. The severity of both problems is scale dependent. If a low velocity layer is very thin, the error in depth determination will consequently be very small as well.

Errors in shallow reflection surveys arise from misidentification of arrivals. If a walkaway survey is conducted at a site, this can be very useful in eliminating these problems. In addition to true reflections (Figure 10(c)), multiple reflections and ground roll are recorded during a shot. Either of these latter two phenomena can be misinterpreted as true reflections. In normal moveout corrected sections, multiples will not be flattened whereas true reflections will be. Ground roll can alias into the sections and appear to be reflections. It is eliminated by knowing the time interval in which true reflections are recorded between the first overburden refraction and the arrival of ground roll. Finally, an incorrect normal moveout velocity will produce a linear error in the indicated depth to the reflections. This error is most easily corrected by tying in the seismic sections to drill holes with known depths to reflectors of interest.

8.0 Survey parameters and data processing

The seismic surveys were performed at 3 sites. The West Site is approximately 300 m east of the Spruce Creek Road junction on the Surprise Lake Road and can be reached by a 4x4 road on the north side of the Surprise Lake Road. The Moose Lake Site is between Moose and Elk Lakes and can also be reached via a 4x4 trail branching north from the Surprise Lake Road. The East Site is on a 4x4 mining road built to access hard rock showings on Birch Creek. At each site, two lines approximately 250 m long were cut orthogonal to the inferred trend of the paleochannel. These were picketed with half-length lathe during the course of the seismic survey are labelled with the line and a point designation (P-?).

The seismic surveys were conduced by M. Power P. Geo. and J.W.R. Smith. The crew was equipped with a Geometrics S-12 digital engineering seismograph. This is a 12 channel instrument equipped with 16-bit analog to digital converters. Data is stored in both an on-board hard drive and floppy disks. The instrument produces thermal paper records of individual shots. Single 100 Hz geophones were used on each channel. Explosive charges consisting of 1 to 3 sticks laid on surface or buried to depths not exceeding 30 cm were used as the energy sources. Charges were primed with ICI Seismocaps and initiated electrically. Following the seismic surveys, topographic surveys of the grids were conducted with a Nikkon A-10 total station survey instrument.

The seismic surveys were designed using available churn drill hole information. At the

East and West Sites, bedrock was known to occur at depths exceeding 30 m and at the East Site, considerable bedrock relief was indicated. Consequently, seismic reflection surveys were conducted at these sites. At Moose Lake, all available information suggested that bedrock was at a shallow depth and a seismic refraction survey was run here.

Reflection survey specifications are listed on the composite profiles attached to this report. Walkaway surveys with phone intervals of 1 m or 2 m were run at each site prior to the reflection surveys to determine the minimum, maximum and optimum offset between the shot and the geophone array to detect reflections from the depth intervals of interest. Normal moveout velocities were also primarily determined from analysis of the walkaway survey data. The reflection survey data processing consisted of the following:

1. Normal moveout velocity determination using walkaway survey data and shot records.

2. Normal moveout correction, gain and filter adjustment.

3. Plotting of shot records.

4. Assembly of seismic sections using the overburden refraction as the datum.

5. Reflector picking and construction of the time section by digitizing shot records.

6. Depth scale calculation using the normal moveout velocity and arrival times.

7. Depth section construction and correction for topographic effects and scale distortion.

8. Section plotting and assembly.

The refraction surveys at the Moose Lake Site was conducted using a 60 m spread (5 m phone interval) and a 5 shot sequence. This included shots at either end of the spread, at the midpoint and at 60 m offsets from either end of the spread. The shot pattern for each spread is identical to that shown in Figure 7(b). Four contiguous spreads were shot on each line to provide a continuous refractor profile. The data interpretation algorithm has been described in the previous section.

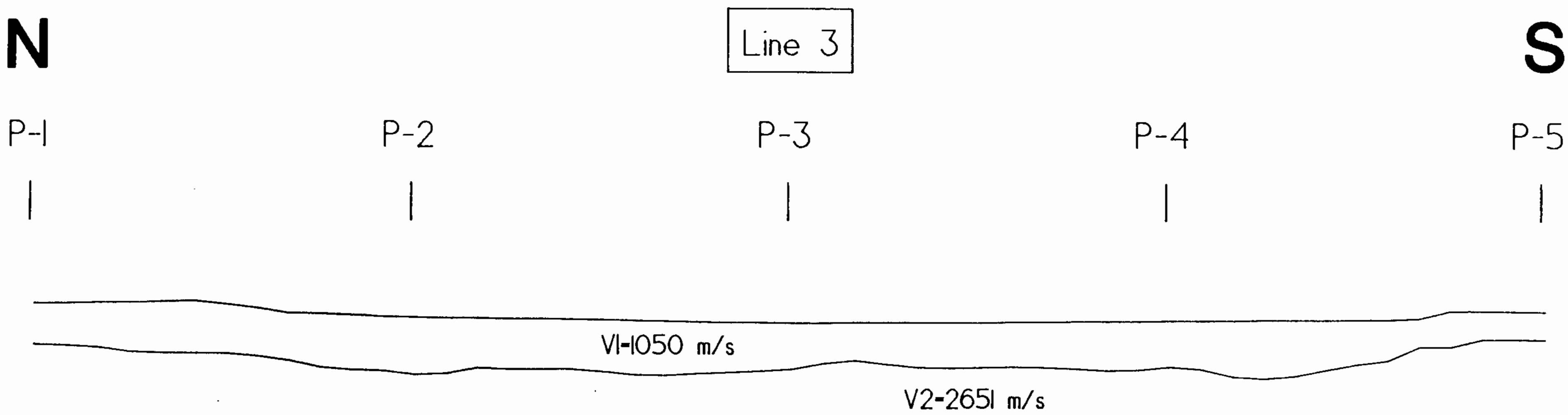
9.0 Results

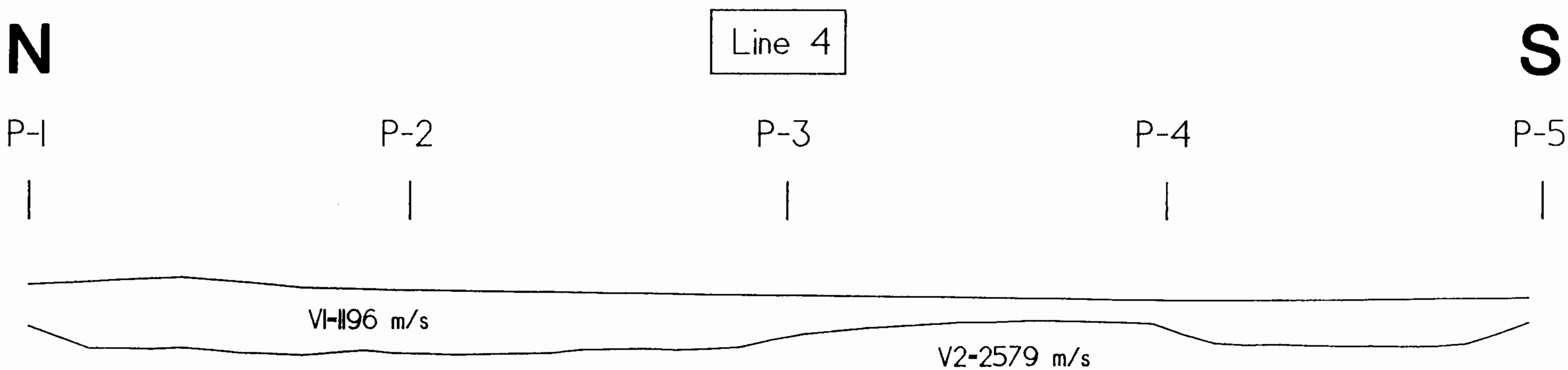
Line locations are shown in Figure 3. Lines 1 and 2 are at the West Site, lines 3 and 4 are at the Moose Lake Site and lines 5 and 6 are at the East Site. Composite profiles for Lines 1, 2, 5 and 6 are displayed in Figures 11, 12, 14 and 15 (in attached pockets). Figure 13 displays refraction profiles from lines 3 and 4.

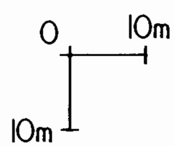
Each composite profile contains a normal moveout corrected reflection seismic section, a time section showing reflections identified in the seismic section and a depth section showing the apparent depth of the reflections. In the absence of other subsurface information, the source of individual reflections in the seismic profiles cannot be directly determined from the data. The general character of the reflections - their strength, continuity, attitude and geometric relation to other reflections - can be used to infer the source of individual reflections but they cannot be definitely attributed to any horizon unless logged drill holes extending to bedrock are available. The thick reflection shown in the time sections is the reflection interpreted to originate from the top of bedrock or the top of boulder layers on bedrock. Parabolic reflections in the seismic sections have been interpreted as multiples and disregarded. Depth sections are plotted with no vertical exaggeration but the depth scales are distorted at shallow depths (0-10 m). Elevations above the z=0 datum are plotted with no distortion. The thick line in the depth section indicates the interpreted top of bedrock.

Figures 11 and 12 display composite sections from lines 1 and 2 (West Site). In Figure 12, the 4 shots in the southern half of the seismic section are reverse plotted for technical reasons (ie. channel 1 plotted in channel 12 position for the first four 12-shot records). The reflections in the time section are displayed in their true position and relation however. On both lines, basal reflections from 120 to 160 ms (44 to 60 m apparent depth) were recorded. These arrivals are fairly continuous, have variable strength and are discordant with respect to the reflections above them - a feature expected in a bedrock reflection. The weak strength and discontinuous nature of these reflections might be attributed to boulder lag layers on bedrock. These are common in the Atlin district and tend to break-up the reflections from bedrock. One churn drill hole near position **P-6** on Line 1 terminated in boulders at a depth of 49 m. The apparent depth of the basal reflection at this point is 52 m suggesting that the reflection may be the top of the boulder layer. No strong deeper reflections are recorded beneath the basal reflection. On line 1, a series of strong, flat-lying reflections were recorded at 80 ms (30 m) in the centre of the section. These could be bedded fluvial sediments based on the their attitude and limited lateral extent.

Figure 13 displays the refraction profiles from lines 3 and 4 at the Moose Lake Site. Complete interpretation results are contained in Appendix A. The T-X graphs suggested that two layers are present and a two-layer model was fitted to the data. The inversion produced very similar results on both lines, supporting the validity of the

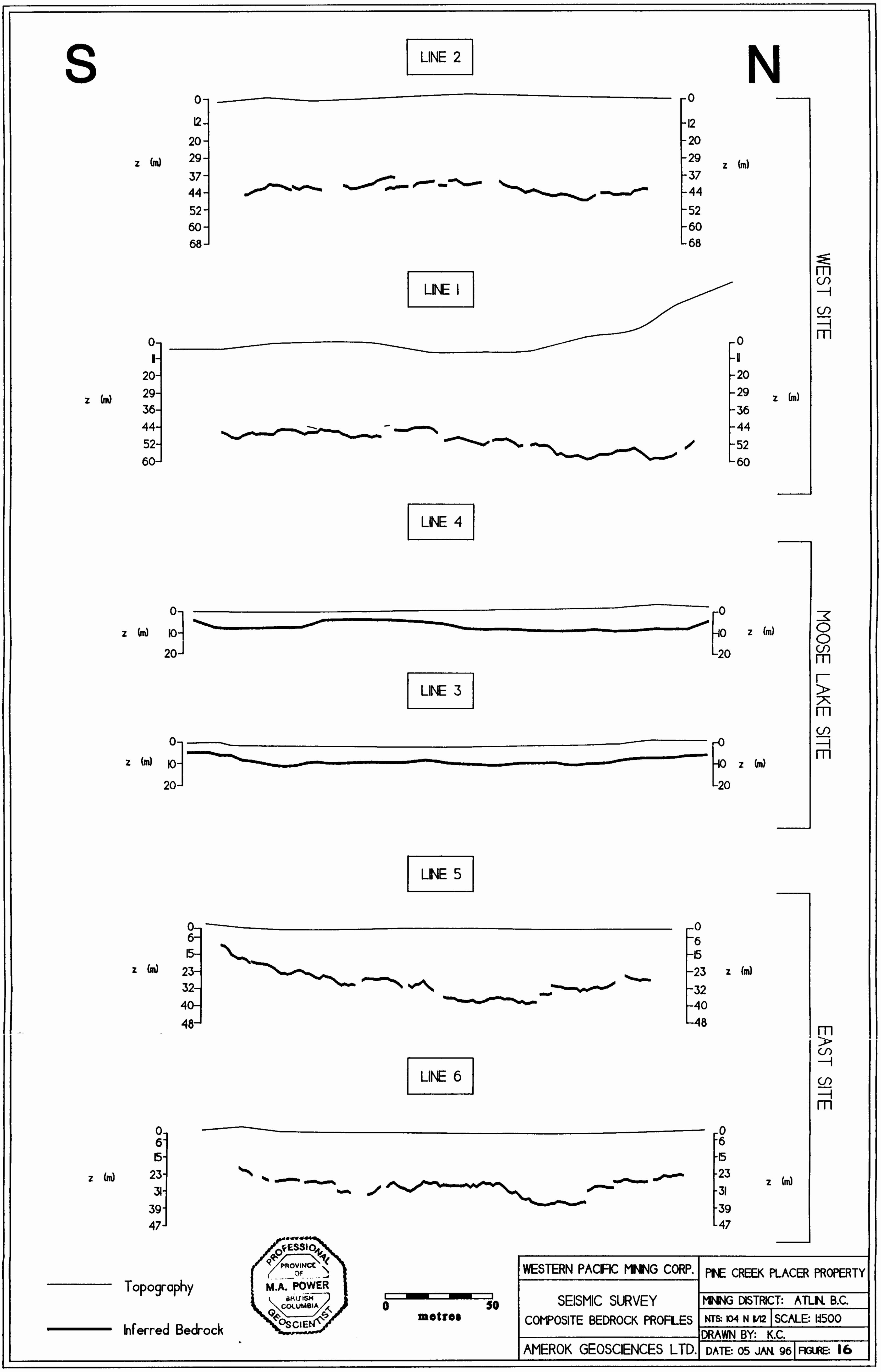






Vertical exaggeration: 1.0

WESTERN PACIFIC MINING CORP.	PINE CREEK PLACER PROPERTY	
MOOSE LAKE SITE REFRACTION PROFILES	MINING DISTRICT: ATLIN B.C.	
	NTS: 104 N 11	SCALE: 1:1,000
	OPERATOR: M.P. / R.S.	
AMEROK GEOSCIENCES LTD.	DATE: 29 DEC 95	FIGURE:


S
N
LINE 2
LINE 1
WEST SITE
LINE 4
LINE 3
MOOSE LAKE SITE
LINE 5
LINE 6
EAST SITE
z (m)
Topography
Inferred Bedrock
PROFESSIONAL
PROVINCE OF BRITISH COLUMBIA
M.A. POWER
GEOSCIENTIST
0
50
metres
WESTERN PACIFIC MINING CORP.
PINE CREEK PLACER PROPERTY
SEISMIC SURVEY
COMPOSITE BEDROCK PROFILES
MINING DISTRICT: ATLIN, B.C.
NTS: 104 N 1/12
SCALE: 1:500
DRAWN BY: K.C.
AMEROK GEOSCIENCES LTD.
DATE: 05 JAN. 96
FIGURE: 16

two layer assumption. An upper low velocity layer with an average velocity of 1125 m/s is interpreted to be overburden. This velocity suggests that the water table is low at this location since a velocity of around 1600 m/s is expected in water saturated sediments. The underlying layer is relatively flat, occurs at depths down to 11 m and has an average velocity of 2615 m/s. This is relatively slow for fresh bedrock and may be the top of either a lag deposit overlying bedrock or the top of weathered bedrock. Two churn drill holes in the area encountered bedrock at 9 to 12 m. During the field survey, it was noted that the area near line 3 is underlain by an extensive boulder field with clasts up to 1.5 m in diameter covered by a thin veneer of discontinuous soil and moss.

Figures 14 and 15 display the composite sections from lines 5 and 6 (East Site). On line 5, bedrock outcrops just south of the end of the survey line. A drill hole near **P-4** bottomed in boulders at 42 m and two others near **P-1** bottomed in bedrock at 9 to 12 m. The seismic profile on line 5 shows a prominent depression with a basal reflector as a slightly shallower depth than that indicated by the drillhole at **P-4**. This discrepancy might be caused by the reflection originating at the top of the boulders or by a change in bedrock elevation between **P-4** and the drill hole location, approximately 30 m west of the line. Line 6 shows the same pattern as line 5 with a narrower depression in the basal reflection occurring near **P- 5**. There is no subsurface control near Line 6.

Figure 16 displays stacked profiles of the interpreted bedrock surface for all the survey lines with no vertical exaggeration. There is slight distortion in the interval 0-10 m in the profiles for lines 1,2, 5 and 6. Survey lines are stacked in their relative geographic location with the western-most line at the top of the page and the eastern-most line at the bottom of the page. In effect, this is a down-channel view (ie. looking west) of the bedrock topography. Line 6 would be located at the upstream end of the interpreted channel and line 2 at the downstream end of the channel.

10.0 Conclusions

The seismic surveys conducted on Pine Creek and the drill hole data collected to date suggest the following conclusions:

a. The apparent bedrock profiles at the East Site indicate that a deep bedrock depression with relief in the order of 40 m exists here. This depression may have been caused by fluvial erosion and might contain pre-glacial gravels.

b. The apparent bedrock profiles at the West Site indicate that bedrock occurs at a depth ranging from 44 to 60 m in this area. An apparent bedrock depression approximately 10 m deep and 80 m wide centred at **P-3** on line 1 is the most prominent bedrock depression. On line 2 a depression 10 m deep and 60 m wide is centred at **P-8**. Pre-glacial gravels may be present in these depressions given the depth of burial.

c. The apparent bedrock profiles at the Moose Lake Site suggest that there is no buried channel in this area. Bedrock depths derived from the seismic and drill hole data are shallow and the seismic survey indicates that the bedrock topography is relatively flat.

d. The correlation between drill hole data and seismic reflections, while limited in scope because of the absence of drill logs, suggests that the basal reflections recorded in the reflection sections might in some areas be caused by boulder lag deposits on bedrock rather than by bedrock itself.

It appears possible that the surveys may have located a buried channel at the East and West Sites. The strongest evidence is the deep bedrock depression recorded on lines 5 and 6. At the West Site, the bedrock relief is somewhat more subdued but this is to be expected in this environment. Under normal tectonic conditions, streams downcut most dramatically in their upper reaches where active erosion occurs. Moving downstream, bedrock incision decreases together with channel gradient until at some location the stream begins to deposit sediment rather than erode bedrock. Thus it is not surprising that there is less bedrock relief at the West Site than at the East Site. Bedrock topography may in fact be a poor guide to locating pre-glacial channels in the downstream portion of Pine Creek. The considerable depth to bedrock at both the East and West Sites is the best argument for a buried channel in these locations. Gwillim (1901) noted that the apparent gradient of the pre-glacial channels was quite similar to that of post-glacial and modern channels in Pine Creek valley. Thus, bedrock depressions at a consistent and considerable depth for some distance along the valley are good indications that a buried channel might exist since they have the same gradient as the recent channel.

The absence of an any deep bedrock depression at the Moose Lake Site could merely be caused by looking in the wrong place. The inferred paleochannel in Figure 3 is remarkably - and unnaturally - straight given the present course of Pine Creek and, more importantly, given the meandering location of the pre-glacial channel in Pine Creek (Gwillim 1901). If the gradient of the pre-glacial and recent streams are roughly the same and if sediment loading has not changed significantly in the time interval between them, the wavelength and amplitude of both stream channels should be roughly the same. The wavelength and amplitude of the present channel could be used to guide future exploration for pre-glacial channels in the area. Topographic maps indicate that the Pine Creek channel meanders have an amplitude of up to 300 m and a wavelength of 2.0 to 3.0 km near Discovery townsite.

11.0 Recommendations

The above conclusions lead to the following recommendations:

a. At least two holes should be drilled at the East Site. One hole should be at P-5 on Line 5 and the other at P-5 on Line 6. In addition to sampling, the holes should be logged by a geologist familiar with the area to determine whether pre-glacial gravels are intersected.

b. At least 3 holes should be drilled on at the West Site. One hole should be drilled at P-4 on Line 1. The location of pre-glacial channels may not be strongly controlled by bedrock in this portion of the creek and consideration should be given to drilling further south of P-4. In addition to sampling, the holes should be logged by a geologist to determine whether pre-glacial gravels are intersected.

c. If the results of the initial drilling are positive and it appears that a pre-glacial channel following the general line of Figure 3 exists on the north side of Pine Creek, the Company's property position should be reviewed and placer claims and leases to the south of those in the Moose Lake area acquired if they are already not included in the land holdings. Seismic surveys should be extended south to Pine Creek in this event to try and locate the channel axis.

d. If drill results are positive and additional seismic surveys are conducted to map a paleochannel, survey coverage should extend at least 300 m to either side of the inferred axis of the paleochannel. To ensure that major meanders are detected, lines should be spaced no more than 500 m apart along the general trend of the paleochannel.

Respectfully submitted,
AMEROK GEOSCIENCES LTD.

PROFESSIONAL PROVINCE OF M.A. POWER BRITISH COLUMBIA GEOSCIENTIST

M.A. Power, M.Sc. P. Geo.
Geophysicist

Whitehorse, Yukon Territory
January 8, 1996

References Cited

Birch, F. (1966) Compressibility; elastic constants. in: Clark, S.P. (ed) Handbook of Physical Constants. Geological Society of America Memoir 97 pp 97-173.

Carnes, D.D. (1913) Portions of Atlin District, British Columbia Geological Survey of Canada Memoir No. 37.

Coates, D.I. (1965) Rock Mechanics Principles. Mines Branch Monograph 874. Ottawa: Department of Mines and Technical Surveys.

Gwillim, J.C. (1901) Report on the Atlin Mining District, British Columbia in: Report B Geological Survey of Canada Annual Report Volume XII (1899).

Johnston, G.H. (1981) Permafrost: Engineering Design and Construction. Toronto: John Wiley and Son.

Pullan, S and J. Hunter (1990). Delineating of buried bedrock valleys using the optimum offset shallow seismic reflection technique. in: S. Ward (ed.) Geotechnical and Envirnomental Geophysics - Volume III: Geotechnical. Tulsa: Society of Exploration Geophysicists.

Scott, J.H. (1973). Seismic refraction modeling by computer. Geophysics Vol. 38. No. 2.

Telford, W.M., L.P. Geldart and R.E. Sheriff (1990). Applied Geophysics - Second Edition . New York: Cambridge University Press.

Statement of Qualifications

I, Michael Allan Power of Whitehorse, Yukon Territory, certify that:

1. I obtained a Bachelor of Science degree with First Class Honours in Geology from the University of Alberta in 1986 and a Masters degree in Geophysics from the University of Alberta in 1988. I am a Professional Geoscientist registered with the British Columbia Association of Engineers and Geoscientists (Number 21131).

2. I have worked in the mining exploration industry and in geophysical research since 1984.

3. I conducted the geophysical survey described in this report and prepared this report for submission.

4. I have not received nor expect to receive, directly or indirectly, any interest in the property of Western Pacific Mining Corporation.

Michael A. Power M.Sc. P. Geo.

Whitehorse, Yukon Territory
January 8, 1996

Appendix A. Refraction interpretation output

INPUT DATA FILE for LINE_3.SIP

TITLE FOR SIPT2/SIPLUS INPUT DATA SET for LINE_3.SIP

Pine Creek - Moose Lake Block - Line 3 (Spreads 1-4)

PROGRAM CONTROL DATA

```
S     L  V    PRINTER PLOT SCALES      DATUM   CONTROL    PLOT CONTROL              T O
p  E  a  O                                                                          r f I
r  x  y  v    Elev   Horiz    Time     Pt 1       Pt 2    Elevations                a f [
d  i  r  e                                                                          c S i
s  t  s  r   m/col  m/row  ms/col    Elev/X    Elev/X    Top  Bottom   BLim TLim    e P p
-  -  -  -   ------ ------ ------    ------    ------    ---  ------   ---- ----    - - -
4  6  2  0     0.0    0.0    0.0       0.0       0.0       0       0    0.5 10.0    0 0 (
                                       0.0       0.0
```

SHOTPOINT AND GEOPHONE DATA

Spread A, 4 SP's, 12 Geo's, X-Shift = 0.0, X-True = 1, Units: Meters.

```
 SP   Elev    X-Loc    Y-Loc    Depth   Uphole T   Fudge T   End SP
 --   ----    -----    -----    -----   --------   -------   ------
 A     3.0      0.0      5.0      0.0       0.0       0.0       1
 B     2.6     32.7      5.0      0.0       0.0       0.0       0
 C     0.8     60.4      5.0      0.0       0.0       0.0       2
 D    -0.1    120.8      5.0      0.0       0.0       0.0       0
```

ARRIVAL TIMES AND LAYERS REPRESENTED

```
Geo   Elev    X-Loc   Y    SP A     SP B     SP C     SP D
---   ----    -----  ---  -----L   -----L   -----L   -----L
 1     3.0      5.0  0.0 5.875 125.000 235.500 2 54.37 2
 2     3.1     10.1  0.015.120 121.870 233.870 2 54.00 2
 3     3.1     15.1  0.017.370 220.750 232.250 2 52.12 2
 4     3.2     20.1  0.020.750 219.120 230.250 2 51.25 2
 5     3.3     25.2  0.022.620 215.870 227.620 2 51.25 2
 6     2.8     30.2  0.024.870 211.250 225.370 2 50.37 2
 7     2.2     35.2  0.025.620 2 8.750 121.620 2 48.00 2
 8     1.4     40.2  0.029.370 215.620 220.370 2 46.75 2
 9     1.3     45.3  0.030.500 216.250 218.500 2 45.00 2
10     1.1     50.3  0.033.620 218.870 211.620 1 42.75 2
11     0.9     55.3  0.036.620 221.500 2 8.625 1 40.37 2
12     0.8     60.4  0.038.000 222.500 2 3.875 1 38.25 2
```

SHOTPOINT AND GEOPHONE DATA

Spread B, 5 SP's, 12 Geo's, X-Shift = 0.0, X-True = 1, Units: Meters.

SP	Elev	X-Loc	Y-Loc	Depth	Uphole T	Fudge T	End SP
A	3.0	0.0	5.0	0.0	0.0	0.0	0
B	0.6	60.4	5.0	0.0	0.0	0.0	1
C	0.4	92.7	5.0	0.0	0.0	0.0	0
D	-0.1	120.8	5.0	0.0	0.0	0.0	2
E	0.3	181.2	5.0	0.0	0.0	0.0	0

ARRIVAL TIMES AND LAYERS REPRESENTED

Geo	Elev	X-Loc	Y	SP A	L	SP B	L	SP C	L	SP D	L	SP E	L
1	0.7	65.4	0.0	39.87	2	7.000		121.620		234.250	2	55.12	2
2	0.7	70.4	0.0	41.50	2	9.000		119.620		231.870	2	53.25	2
3	0.6	75.5	0.0	43.87		220.000		218.000		231.000	2	52.50	2
4	0.6	80.5	0.0	44.87		221.250		214.750		228.620	2	49.50	2
5	0.5	85.5	0.0	46.00		223.750		212.750		226.120	2	49.37	2
6	0.4	90.6	0.0	48.25		226.250	2	6.125		125.000	2	49.12	2
7	0.3	95.6	0.0	50.00		229.500	2	7.875		122.370	2	47.37	2
8	0.2	100.7	0.0	52.87		233.370		217.120		222.870	2	47.12	2
9	0.1	105.7	0.0	52.87		233.370		217.000		218.120	2	43.37	2
10	0.0	110.7	0.0	52.62		234.370		217.250		215.500	1	40.75	2
11	0.0	115.8	0.0	55.62		236.620		220.750		210.000	1	39.62	2
12	-0.1	120.8	0.0	55.75		239.000		221.750	2	4.375	1	37.00	2

SHOTPOINT AND GEOPHONE DATA

Spread C, 5 SP's, 12 Geo's, X-Shift = 0.0, X-True = 1, Units: Meters.

SP	Elev	X-Loc	Y-Loc	Depth	Uphole T	Fudge T	End SP
A	0.7	60.4	5.0	0.0	0.0	0.0	0
B	-0.1	120.8	5.0	0.0	0.0	0.0	1
C	0.0	153.5	5.0	0.0	0.0	0.0	0
D	0.3	181.2	5.0	0.0	0.0	0.0	2
E	1.7	241.6	5.0	0.0	0.0	0.0	0

ARRIVAL TIMES AND LAYERS REPRESENTED

```
ARRIVAL TIMES AND LAYERS REPRESENTED
------------------------------------
Geo   Elev     X-Loc    Y   SP A     SP B     SP C     SP D     SP E
---   ----     -----   ---  -----L   -----L   -----L   -----L   -----L
 1    -0.1     125.8   0.0 40.37 2 5.625 120.870 232.120 2 49.62 2
 2     0.0     130.9   0.0 43.37 2 8.375 119.870 233.120 2 48.62 2
 3     0.0     135.9   0.0 44.62 212.750 117.750 230.120 2 47.87 2
 4     0.0     140.9   0.0 47.25 218.500 216.000 228.250 2 47.12 2
 5     0.0     146.0   0.0 48.75 220.500 210.370 126.000 2 45.50 2
 6     0.0     151.0   0.0 50.75 223.000 2 6.375 124.250 2 45.00 2
 7     0.1     156.0   0.0 51.50 224.750 2 4.125 121.620 2 43.25 2
 8     0.1     161.1   0.0 53.50 226.750 2 7.250 119.870 2 42.62 2
 9     0.2     166.1   0.0 53.12 228.870 215.500 217.750 2 40.12 2
10     0.2     171.1   0.0 56.12 232.120 217.500 216.120 2 39.87 2
11     0.2     176.1   0.0 57.62 235.120 220.250 2 9.125 1 37.50 2
12     0.3     181.2   0.0 57.87 236.750 222.120 2 5.625 1 36.50 2
```

SHOTPOINT AND GEOPHONE DATA

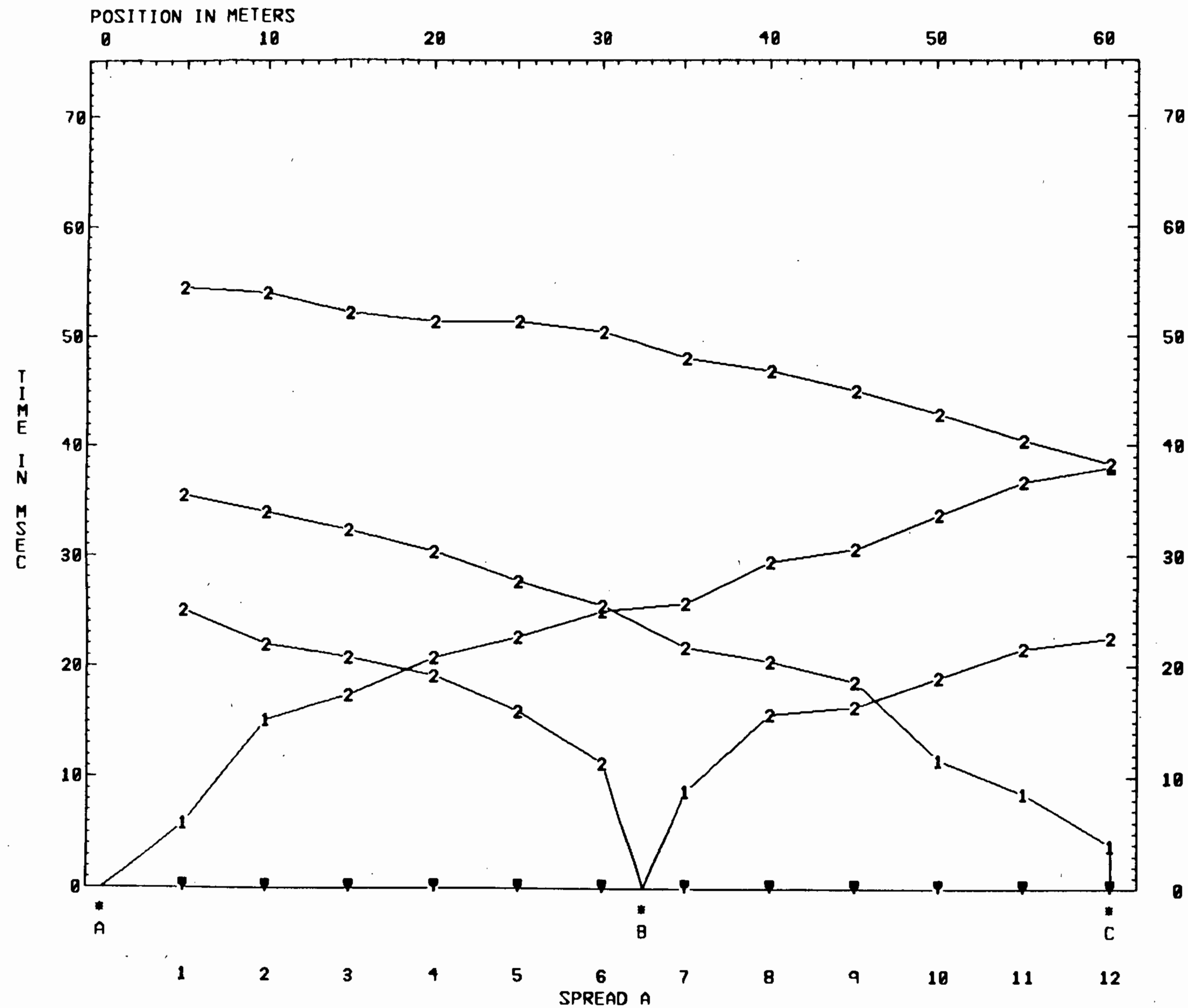
```
SHOTPOINT AND GEOPHONE DATA
---------------------------
Spread D,  4 SP's,  12 Geo's,  X-Shift = 0.0,  X-True = 1,  Units: Meters.

 SP   Elev     X-Loc     Y-Loc     Depth  Uphole T  Fudge T  End SP
 --   ----     -----     -----     -----  --------  -------  ------
 A    -0.1     120.8       5.0       0.0       0.0      0.0     0
 B     0.3     181.2       5.0       0.0       0.0      0.0     1
 C     0.5     213.9       5.0       0.0       0.0      0.0     0
 D     1.7     241.6       5.0       0.0       0.0      0.0     2
```

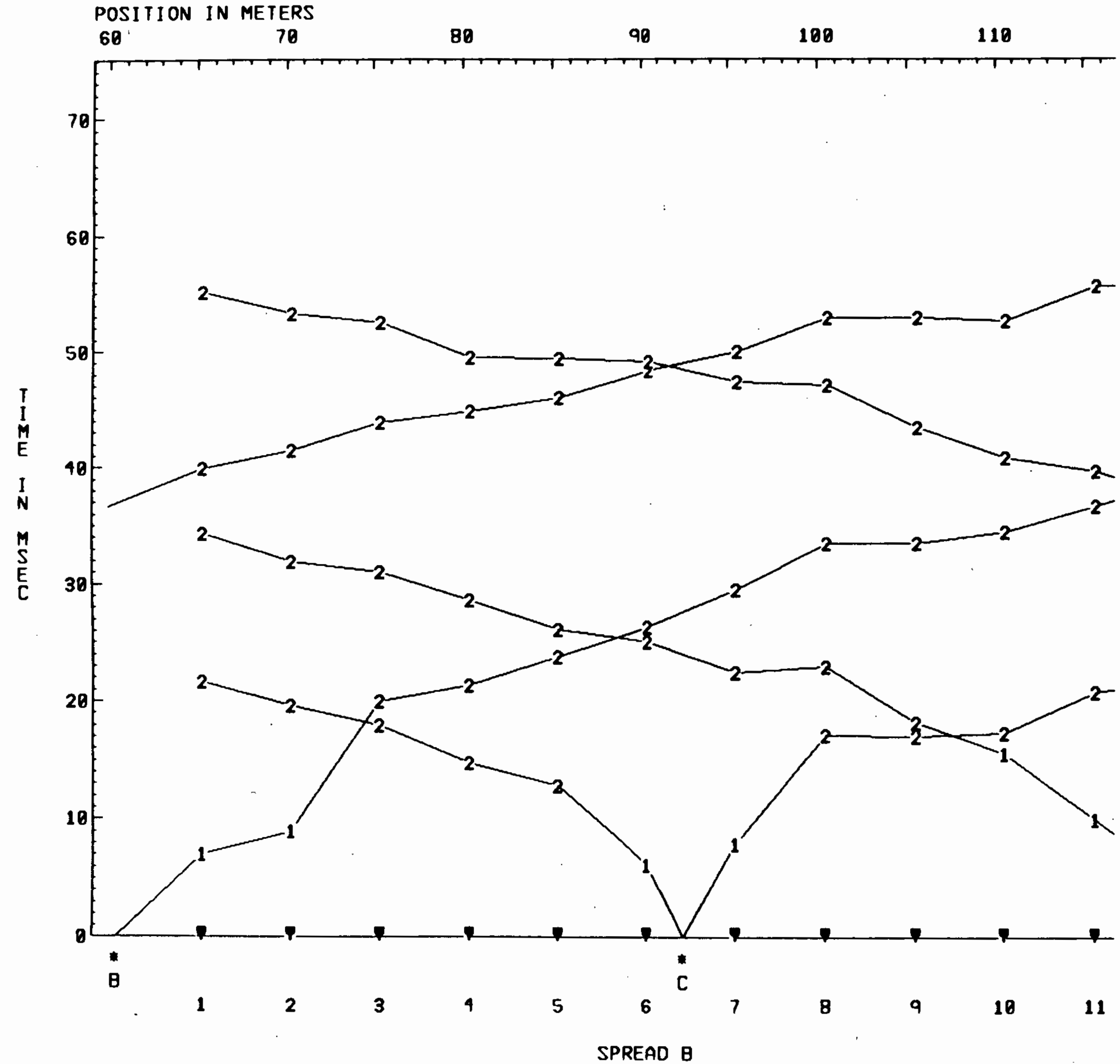
ARRIVAL TIMES AND LAYERS REPRESENTED

```
ARRIVAL TIMES AND LAYERS REPRESENTED
------------------------------------
Geo   Elev     X-Loc    Y   SP A     SP B     SP C     SP D
---   ----     -----   ---  -----L   -----L   -----L   -----L
 1     0.3     186.2   0.0 37.37 2 4.750 124.000 234.000 2
 2     0.3     191.3   0.0 39.25 211.250 122.000 232.500 2
 3     0.4     196.3   0.0 41.37 220.370 121.620 230.870 2
 4     0.4     201.3   0.0 42.62 221.500 218.500 227.370 2
 5     0.4     206.4   0.0 43.75 221.750 215.500 224.500 2
 6     0.5     211.4   0.0 44.37 223.750 2 7.500 122.370 2
 7     0.5     216.4   0.0 45.12 225.750 2 6.000 118.870 2
 8     0.7     221.5   0.0 47.00 228.250 216.250 216.500 2
 9     1.9     226.5   0.0 48.25 229.750 217.370 212.620 2
10     1.9     231.5   0.0 49.25 232.370 218.000 2 6.500 2
11     1.8     236.6   0.0 50.37 233.620 221.120 2 3.750 1
12     1.7     241.6   0.0 51.12 236.250 224.000 2 3.125 1
```

FILE LINE_3.SIP
PINE CREEK - MOOSE LAKE BLOCK - LINE 3 (SPREADS 1-4) - RAW ARRIVAL TIMES



FILE LINE_3.SIP
PINE CREEK - MOOSE LAKE BLOCK - LINE 3 (SPREADS 1-4) - RAW ARRIVAL TIMES



VELOCITY ANALYSIS TABLES for LINE_3.SIP

Layer 1 Velocity from direct arrivals

Spread A

SP	Geo	DD	V	Avg V
A	1	7.1	1204	
A	2	11.3	745	
				974
B	7	5.6	641	
				641
C	10	11.3	970	
C	11	7.1	828	
C	12	5.0	1290	
				1030

Spread B

SP	Geo	DD	V	Avg V
B	1	7.1	1010	
B	2	11.2	1242	
				1126
C	6	5.4	885	
C	7	5.8	734	
				810
D	10	11.3	727	
D	11	7.1	707	
D	12	5.0	1143	
				859

Spread C

SP	Geo	DD	V	Avg V
B	1	7.1	1257	
B	2	11.3	1346	
B	3	15.9	1248	
				1283
C	5	9.0	869	
C	6	5.6	877	
C	7	5.6	1355	
C	8	9.1	1255	
				1089
D	11	7.1	783	
D	12	5.0	889	
				836

Spread D	SP	Geo	DD	V	Avg V
	B	1	7.1	1489	
	B	2	11.3	1002	
	B	3	15.9	781	
					1090
	C	6	5.6	745	
	C	7	5.6	932	
					839
	D	11	7.1	1886	
	D	12	5.0	1600	
					1743

Wtd Avg Velocity computed for Layer 1 = 1050

Layer 2 Velocity computed by regression of datum-corrected arrivals

Spread A

V	Ti	Geos	<-SP->	Geos	Ti	V		Avg V	Avg Ti	Pts
			A	3 12	6.8	1966		1966	6.8	10
1813	7.5	1 6	B	8 12	10.3	2365		2028	8.9	11
2421	12.0	1 9	C					2421	12.0	9
4087	25.6	1 12	D					4087	25.6	12
							Avg =	2447	for	42 Pts

Spread B

V	Ti	Geos	<-SP->	Geos	Ti	V		Avg V	Avg Ti	Pts
			A	1 12	21.0	3286		3286	21.0	12
			B	3 12	14.2	2252		2252	14.2	10
2125	10.0	1 5	C	8 12	15.0	3563		2662	12.5	10
2718	15.2	1 9	D					2718	15.2	9
3338	21.3	1 12	E					3338	21.3	12
							Avg =	2826	for	53 Pts

Spread C

V	Ti	Geos	<-SP->	Geos	Ti	V		Avg V	Avg Ti	Pts
			A	1 12	23.2	3359		3359	23.2	12
			B	4 12	10.4	2213		2213	10.4	9
2807	12.6	1 4	C	9 12	10.4	2211		2474	11.5	8
2439	12.1	1 10	D					2439	12.1	10
3950	21.8	1 12	E					3950	21.8	12
							Avg =	2832	for	51 Pts

Spread D

V	Ti	Geos	<-SP->	Geos	Ti	V	Avg V	Avg Ti	Pts
			A	1 12	25.6	4954	4954	25.6	12
			B	4 12	13.7	2967	2967	13.7	9
2275	12.0	1 5	C	8 12	11.1	2773	2500	11.5	10
1579	-0.4	1 10	D				1579	-0.4	10

Avg = 2596 for 41 Pts

Avg of all regression velocities: 2682 for 187 points in Layer 2.

Layer 2 Velocity computed by Hobson-Overton method

Spread A

SPs	Geos	V	Avg TdSP	Std Err Overall	4 Highest Err	Geo	Std Err at Err	Geo	geophones Err	Geo	Err	Geo
A B	3 6	1641	-2.4	0.694	-0.982	5	0.789	6	0.499	3	-0.306	4
A C	3 9	2191	-0.7	0.512	-0.886	9	0.665	8	-0.644	3	0.281	4
A D	3 12	2606	-1.4	1.207	-1.745	7	1.629	4	-1.594	9	1.504	11
B C	8 9	3771	-1.6	0.000	-0.000	9	0.000	8				
B D	8 12	2414	-2.1	0.643	-0.986	9	0.786	11	0.617	8	-0.270	12

Avg = 2413 for 28 Pts

Spread B

SPs	Geos	V	Avg TdSP	Std Err Overall	4 Highest Err	Geo	Std Err at Err	Geo	geophones Err	Geo	Err	Geo
A C	1 5	2558	3.4	0.203	0.362	4	-0.188	5	-0.159	2	-0.090	3
A D	1 9	2804	2.1	0.389	-0.719	8	0.534	9	0.504	7	0.378	2
A E	1 12	3312	0.1	0.613	1.301	4	-1.029	6	0.648	11	-0.544	7
B C	3 5	2093	2.9	0.026	-0.037	4	0.019	5	0.018	3		
B D	3 9	2239	1.9	0.464	0.799	7	-0.675	6	-0.406	4	0.329	3
B E	3 12	2637	1.3	0.595	-1.339	6	0.861	4	0.726	12	-0.495	11
C D	8 9	2009	-0.1	0.000	0.000	9	-0.000	8				
C E	8 12	2650	-3.3	0.316	-0.627	10	0.215	11	0.179	9	0.129	8

Avg = 2705 for 53 Pts

Spread C			Avg	Std Err	4 Highest Std Err at geophones							
SPs	Geos	V	TdSP	Overall	Err	Geo	Err	Geo	Err	Geo	Err	Geo
A C	1 4	2559	4.8	0.220	-0.367	3	0.210	4	0.108	2	0.049	1
A D	1 10	2770	4.2	0.688	-1.239	9	-1.170	2	0.642	6	0.558	8
A E	1 12	3630	5.4	0.522	0.924	11	-0.782	1	-0.697	9	-0.630	12
B D	4 10	2331	-1.3	0.259	0.429	10	-0.377	8	-0.329	9	0.177	7
B E	4 12	2739	0.1	0.694	-1.321	8	1.262	11	0.554	4	0.498	5
C D	9 10	2583	-1.3	0.000	-0.000	9	0.000	10				
C E	9 12	2756	-2.5	0.591	-0.898	10	0.653	11	0.381	9	-0.136	12

Avg = 2889 for 48 Pts

Spread D			Avg	Std Err	4 Highest Std Err at geophones							
SPs	Geos	V	TdSP	Overall	Err	Geo	Err	Geo	Err	Geo	Err	Geo
A C	1 5	2681	-0.8	0.461	-0.848	3	0.429	5	0.322	2	0.205	1
A D	1 10	2377	-1.9	1.200	2.783	10	-1.371	6	-1.289	7	-1.278	8
B C	4 5	2929	0.6	0.000	0.000	4	0.000	5				
B D	4 10	1905	2.6	1.509	2.636	10	1.979	4	-1.287	8	-1.213	6
C D	8 10	1593	6.8	0.412	-0.583	9	0.292	8	0.292	10		

Avg = 2265 for 27 Pts

Avg of all Hobson-Overton velocities: 2633 for 156 points in Layer 2.

Wtd Avg Velocity computed for Layer 2 = 2651

VELOCITY ANALYSIS TABLES for LINE_3.SIP

Layer 1 Velocity from direct arrivals

Spread A	SP	Geo	DD	V	Avg V
	A	1	7.1	1204	
	A	2	11.3	745	
					974
	B	7	5.6	641	
					641
	C	10	11.3	970	
	C	11	7.1	828	
	C	12	5.0	1290	
					1030

Spread B	SP	Geo	DD	V	Avg V
	B	1	7.1	1010	
	B	2	11.2	1242	
					1126
	C	6	5.4	885	
	C	7	5.8	734	
					810
	D	10	11.3	727	
	D	11	7.1	707	
	D	12	5.0	1143	
					859

Spread C	SP	Geo	DD	V	Avg V
	B	1	7.1	1257	
	B	2	11.3	1346	
	B	3	15.9	1248	
					1283
	C	5	9.0	869	
	C	6	5.6	877	
	C	7	5.6	1355	
	C	8	9.1	1255	
					1089
	D	11	7.1	783	
	D	12	5.0	889	
					836

Spread D	SP	Geo	DD	V	Avg V
	B	1	7.1	1489	
	B	2	11.3	1002	
	B	3	15.9	781	
					1090
	C	6	5.6	745	
	C	7	5.6	932	
					839
	D	11	7.1	1886	
	D	12	5.0	1600	
					1743

Wtd Avg Velocity computed for Layer 1 = 1050

Layer 2 Velocity computed by regression of datum-corrected arrivals

Spread A

V	Ti	Geos	<-SP->	Geos	Ti	V		Avg V	Avg Ti	Pts
			A	3 12	6.8	1966		1966	6.8	10
1813	7.5	1 6	B	8 12	10.3	2365		2028	8.9	11
2421	12.0	1 9	C					2421	12.0	9
4087	25.6	1 12	D					4087	25.6	12
							Avg =	2447	for	42 Pts

Spread B

V	Ti	Geos	<-SP->	Geos	Ti	V		Avg V	Avg Ti	Pts
			A	1 12	21.0	3286		3286	21.0	12
			B	3 12	14.2	2252		2252	14.2	10
2125	10.0	1 5	C	8 12	15.0	3563		2662	12.5	10
2718	15.2	1 9	D					2718	15.2	9
3338	21.3	1 12	E					3338	21.3	12
							Avg =	2826	for	53 Pts

Spread C

V	Ti	Geos	<-SP->	Geos	Ti	V		Avg V	Avg Ti	Pts
			A	1 12	23.2	3359		3359	23.2	12
			B	4 12	10.4	2213		2213	10.4	9
2807	12.6	1 4	C	9 12	10.4	2211		2474	11.5	8
2439	12.1	1 10	D					2439	12.1	10
3950	21.8	1 12	E					3950	21.8	12
							Avg =	2832	for	51 Pts

Spread D

V	Ti	Geos	<-SP->	Geos	Ti	V	Avg V	Avg Ti	Pts
			A	1 12	25.6	4954	4954	25.6	12
			B	4 12	13.7	2967	2967	13.7	9
2275	12.0	1 5	C	8 12	11.1	2773	2500	11.5	10
1579	-0.4	1 10	D				1579	-0.4	10
						Avg =	2596	for	41 Pts

Avg of all regression velocities: 2682 for 187 points in Layer 2.

Layer 2 Velocity computed by Hobson-Overton method

Spread A

SPs	Geos	V	Avg TdSP	Std Err Overall	4 Highest Err	Geo	Std Err Err	Geo	at geophones Err	Geo	Err	Geo
A B	3 6	1641	-2.4	0.694	-0.982	5	0.789	6	0.499	3	-0.306	4
A C	3 9	2191	-0.7	0.512	-0.886	9	0.665	8	-0.644	3	0.281	4
A D	3 12	2606	-1.4	1.207	-1.745	7	1.629	4	-1.594	9	1.504	11
B C	8 9	3771	-1.6	0.000	-0.000	9	0.000	8				
B D	8 12	2414	-2.1	0.643	-0.986	9	0.786	11	0.617	8	-0.270	12
Avg =		2413	for	28 Pts								

Spread B

SPs	Geos	V	Avg TdSP	Std Err Overall	4 Highest Err	Geo	Std Err Err	Geo	at geophones Err	Geo	Err	Geo
A C	1 5	2558	3.4	0.203	0.362	4	-0.188	5	-0.159	2	-0.090	3
A D	1 9	2804	2.1	0.389	-0.719	8	0.534	9	0.504	7	0.378	2
A E	1 12	3312	0.1	0.613	1.301	4	-1.029	6	0.648	11	-0.544	7
B C	3 5	2093	2.9	0.026	-0.037	4	0.019	5	0.018	3		
B D	3 9	2239	1.9	0.464	0.799	7	-0.675	6	-0.406	4	0.329	3
B E	3 12	2637	1.3	0.595	-1.339	6	0.861	4	0.726	12	-0.495	11
C D	8 9	2009	-0.1	0.000	0.000	9	-0.000	8				
C E	8 12	2650	-3.3	0.316	-0.627	10	0.215	11	0.179	9	0.129	8
Avg =		2705	for	53 Pts								

Spread C SPs	Geos		V	Avg TdSP	Std Err Overall	4 Highest Std Err at geophones Err	Geo	Err	Geo	Err	Geo	Err	Geo
A C	1	4	2559	4.8	0.220	-0.367	3	0.210	4	0.108	2	0.049	1
A D	1	10	2770	4.2	0.688	-1.239	9	-1.170	2	0.642	6	0.558	8
A E	1	12	3630	5.4	0.522	0.924	11	-0.782	1	-0.697	9	-0.630	12
B D	4	10	2331	-1.3	0.259	0.429	10	-0.377	8	-0.329	9	0.177	7
B E	4	12	2739	0.1	0.694	-1.321	8	1.262	11	0.554	4	0.498	5
C D	9	10	2583	-1.3	0.000	-0.000	9	0.000	10				
C E	9	12	2756	-2.5	0.591	-0.898	10	0.653	11	0.381	9	-0.136	12

Avg = 2889 for 48 Pts

Spread D SPs	Geos		V	Avg TdSP	Std Err Overall	4 Highest Std Err at geophones Err	Geo	Err	Geo	Err	Geo	Err	Geo
A C	1	5	2681	-0.8	0.461	-0.848	3	0.429	5	0.322	2	0.205	1
A D	1	10	2377	-1.9	1.200	2.783	10	-1.371	6	-1.289	7	-1.278	8
B C	4	5	2929	0.6	0.000	0.000	4	0.000	5				
B D	4	10	1905	2.6	1.509	2.636	10	1.979	4	-1.287	8	-1.213	6
C D	8	10	1593	6.8	0.412	-0.583	9	0.292	8	0.292	10		

Avg = 2265 for 27 Pts

Avg of all Hobson-Overton velocities: 2633 for 156 points in Layer 2.

Wtd Avg Velocity computed for Layer 2 = 2651

DEPTH MODEL TABLES for LINE_3.SIP

Spread A Depth and Elev of layers directly beneath SPs and Geos

SP	Surface X-Loc	Surface Elev	Layer 2 Depth	Layer 2 Elev
A	0.0	3.0	6.6	-3.6
B	32.7	2.6	7.9	-5.3
C	60.4	0.8	9.2	-8.4

Geo	Surface X-Loc	Surface Elev	Layer 2 Depth	Layer 2 Elev
1	5.0	3.0	6.8	-3.8
2	10.1	3.1	7.2	-4.1
3	15.1	3.1	7.9	-4.8
4	20.1	3.2	8.2	-5.0
5	25.2	3.3	8.4	-5.1
6	30.2	2.8	7.9	-5.1
7	35.2	2.2	7.7	-5.5
8	40.2	1.4	7.6	-6.2
9	45.3	1.3	8.6	-7.3
10	50.3	1.1	8.8	-7.7
11	55.3	0.9	8.7	-7.8
12	60.4	0.8	9.2	-8.4

Spread B Depth and Elev of layers directly beneath SPs and Geos

SP	Surface X-Loc	Surface Elev	Layer 2 Depth	Layer 2 Elev
B	60.4	0.6	9.0	-8.4
C	92.7	0.4	8.5	-8.1
D	120.8	-0.1	7.4	-7.5

Geo	Surface X-Loc	Surface Elev	Layer 2 Depth	Layer 2 Elev
1	65.4	0.7	8.9	-8.2
2	70.4	0.7	8.0	-7.3
3	75.5	0.6	8.1	-7.5
4	80.5	0.6	8.1	-7.5
5	85.5	0.5	8.0	-7.5
6	90.6	0.4	8.3	-7.9
7	95.6	0.3	8.7	-8.4
8	100.7	0.2	8.7	-8.5
9	105.7	0.1	8.3	-8.2
10	110.7	0.0	8.0	-8.0
11	115.8	0.0	7.8	-7.8
12	120.8	-0.1	7.4	-7.5

Spread C Depth and Elev of layers directly beneath SPs and Geos

	Surface		Layer 2	
SP	X-Loc	Elev	Depth	Elev
B	120.8	-0.1	7.4	-7.5
C	153.5	0.0	7.1	-7.1
D	181.2	0.3	7.4	-7.1

	Surface		Layer 2	
Geo	X-Loc	Elev	Depth	Elev
1	125.8	-0.1	6.5	-6.6
2	130.9	0.0	6.1	-6.1
3	135.9	0.0	6.7	-6.7
4	140.9	0.0	7.2	-7.2
5	146.0	0.0	7.3	-7.3
6	151.0	0.0	7.2	-7.2
7	156.0	0.1	7.2	-7.1
8	161.1	0.1	7.3	-7.2
9	166.1	0.2	7.6	-7.4
10	171.1	0.2	7.9	-7.7
11	176.1	0.2	7.8	-7.6
12	181.2	0.3	7.4	-7.1

Spread D Depth and Elev of layers directly beneath SPs and Geos

	Surface		Layer 2	
SP	X-Loc	Elev	Depth	Elev
B	181.2	0.3	7.4	-7.1
C	213.9	0.5	6.9	-6.4
D	241.6	1.7	4.5	-2.8

	Surface		Layer 2	
Geo	X-Loc	Elev	Depth	Elev
1	186.2	0.3	7.8	-7.5
2	191.3	0.3	9.0	-8.7
3	196.3	0.4	9.4	-9.0
4	201.3	0.4	9.0	-8.6
5	206.4	0.4	8.0	-7.6
6	211.4	0.5	7.2	-6.7
7	216.4	0.5	6.6	-6.1
8	221.5	0.7	5.9	-5.2
9	226.5	1.9	5.8	-3.9
10	231.5	1.9	4.6	-2.7
11	236.6	1.8	4.5	-2.7
12	241.6	1.7	4.5	-2.8

Velocities used to formulate the Depth Model

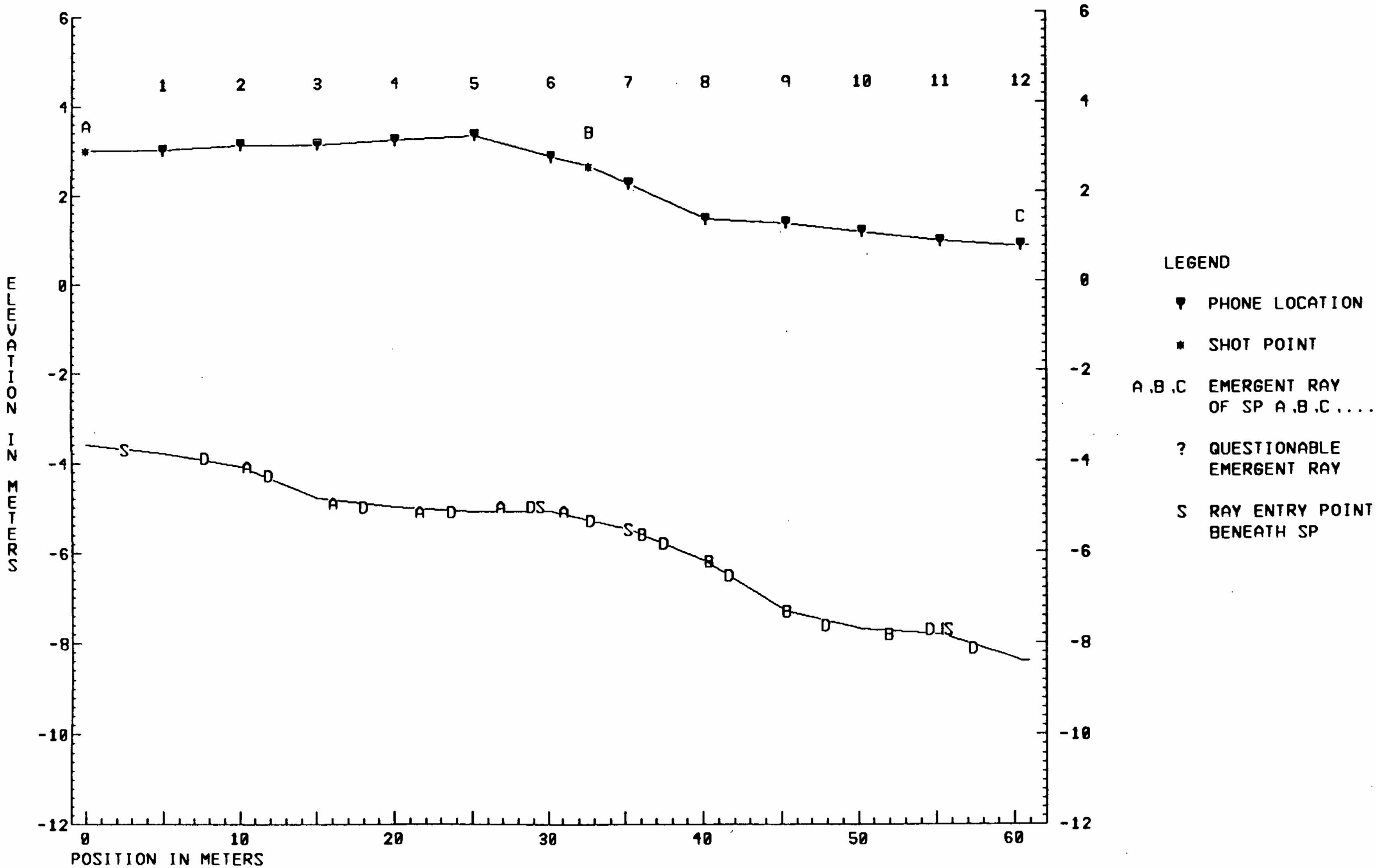
Spread A	Layer 1	Layer 2
Vertical	1050	
Horizontal		2651

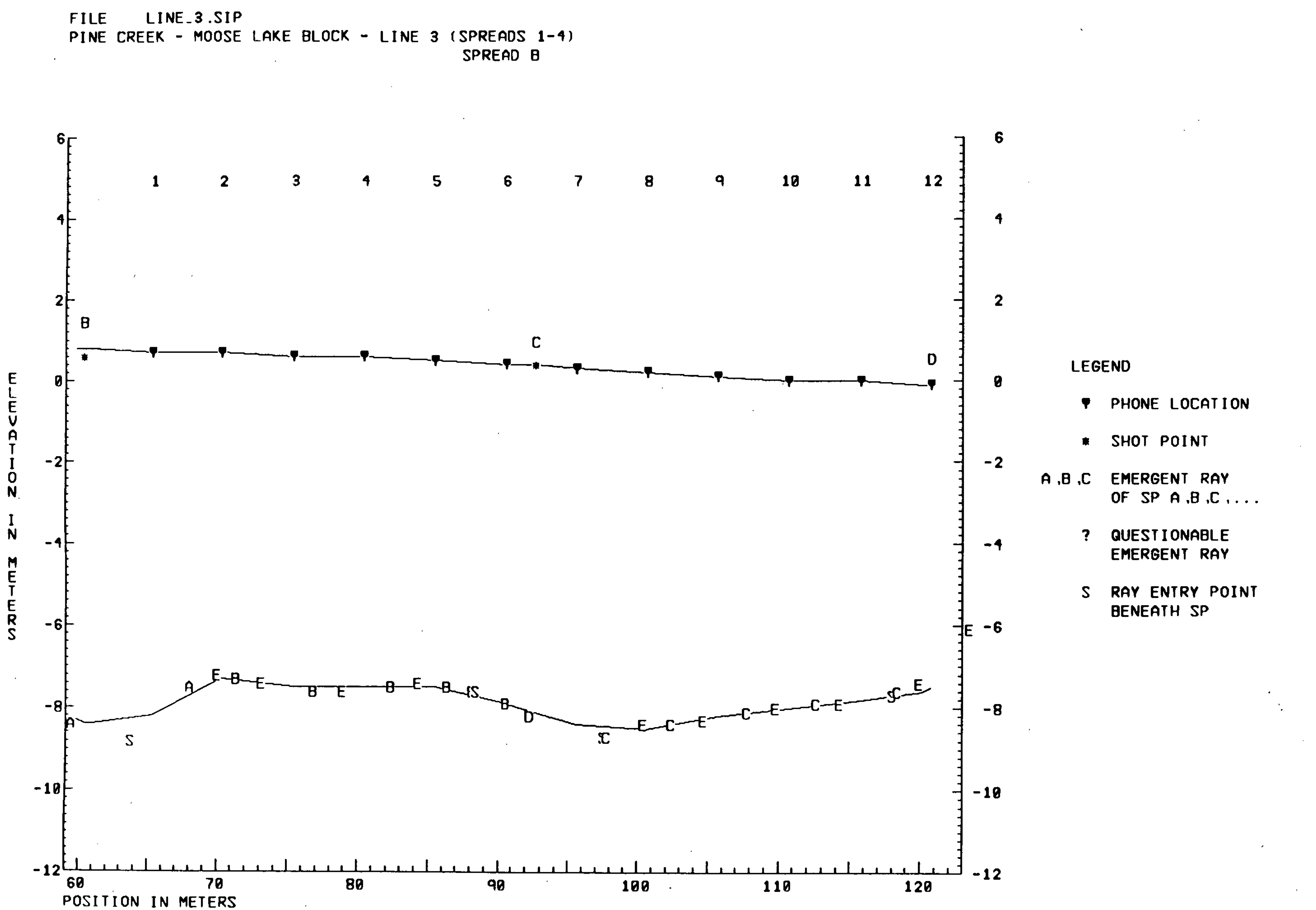
Spread B	Layer 1	Layer 2
Vertical	1050	
Horizontal		2651

Spread C	Layer 1	Layer 2
Vertical	1050	
Horizontal		2651

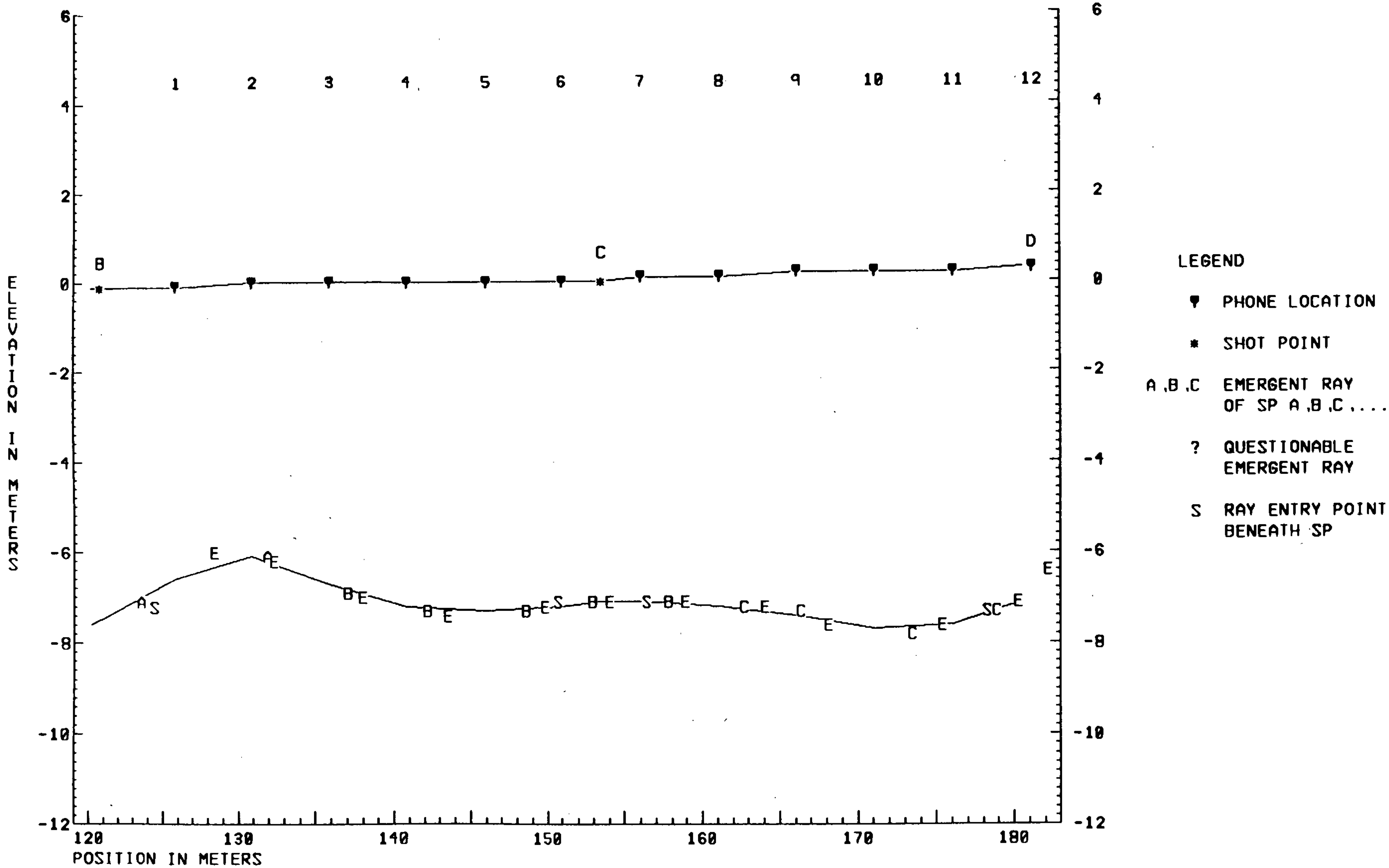
Spread D	Layer 1	Layer 2
Vertical	1050	
Horizontal		2651

FILE LINE_3.SIP
PINE CREEK - MOOSE LAKE BLOCK - LINE 3 (SPREADS 1-4)
SPREAD A

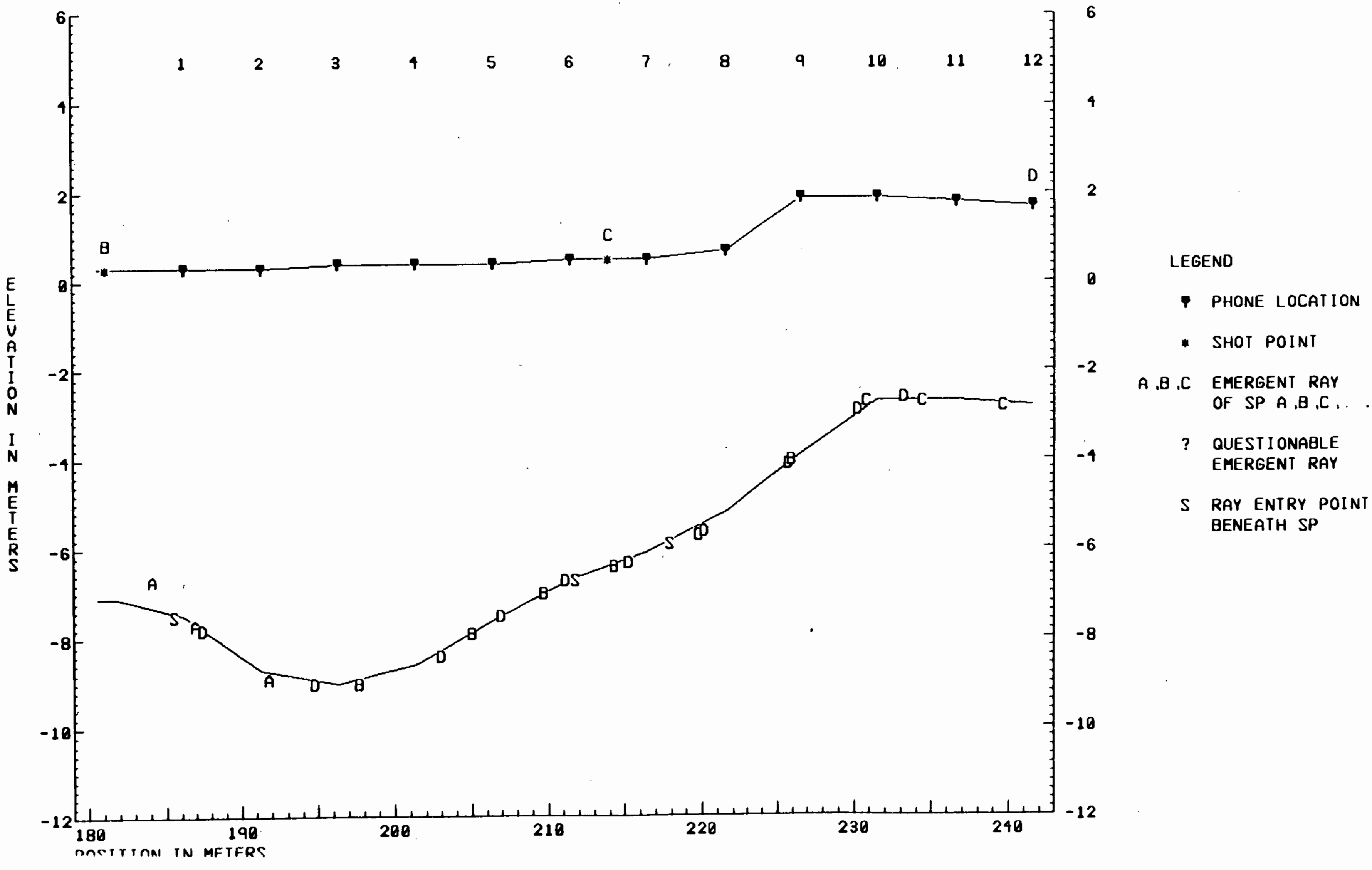



FILE LINE_3.SIP
PINE CREEK - MOOSE LAKE BLOCK - LINE 3 (SPREADS 1-4)
SPREAD B
ELEVATION IN METERS
POSITION IN METERS
LEGEND
PHONE LOCATION
SHOT POINT
A,B,C EMERGENT RAY OF SP A,B,C,...
? QUESTIONABLE EMERGENT RAY
S RAY ENTRY POINT BENEATH SP

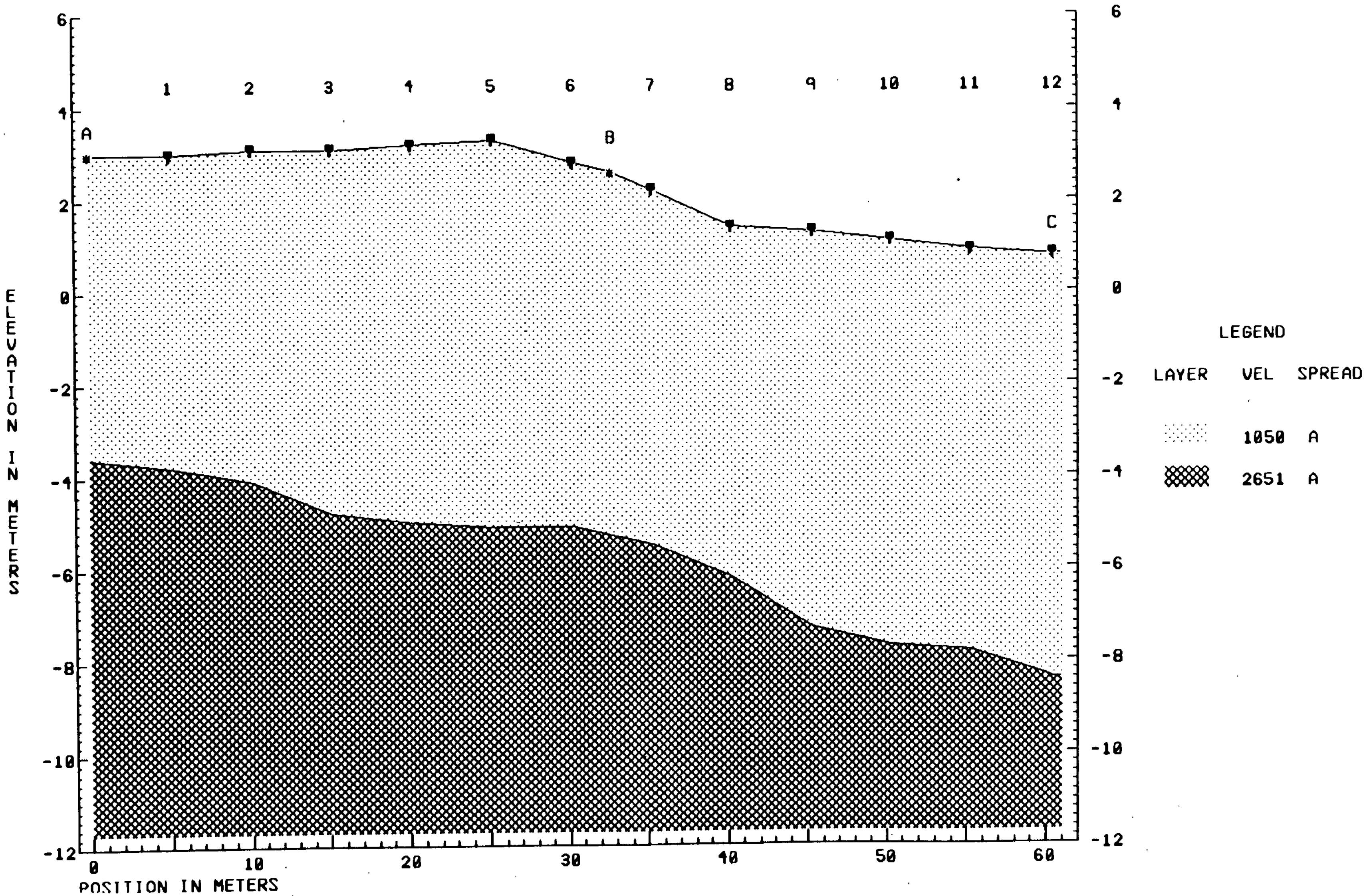
FILE LINE_3.SIP
PINE CREEK - MOOSE LAKE BLOCK - LINE 3 (SPREADS 1-4)
SPREAD C



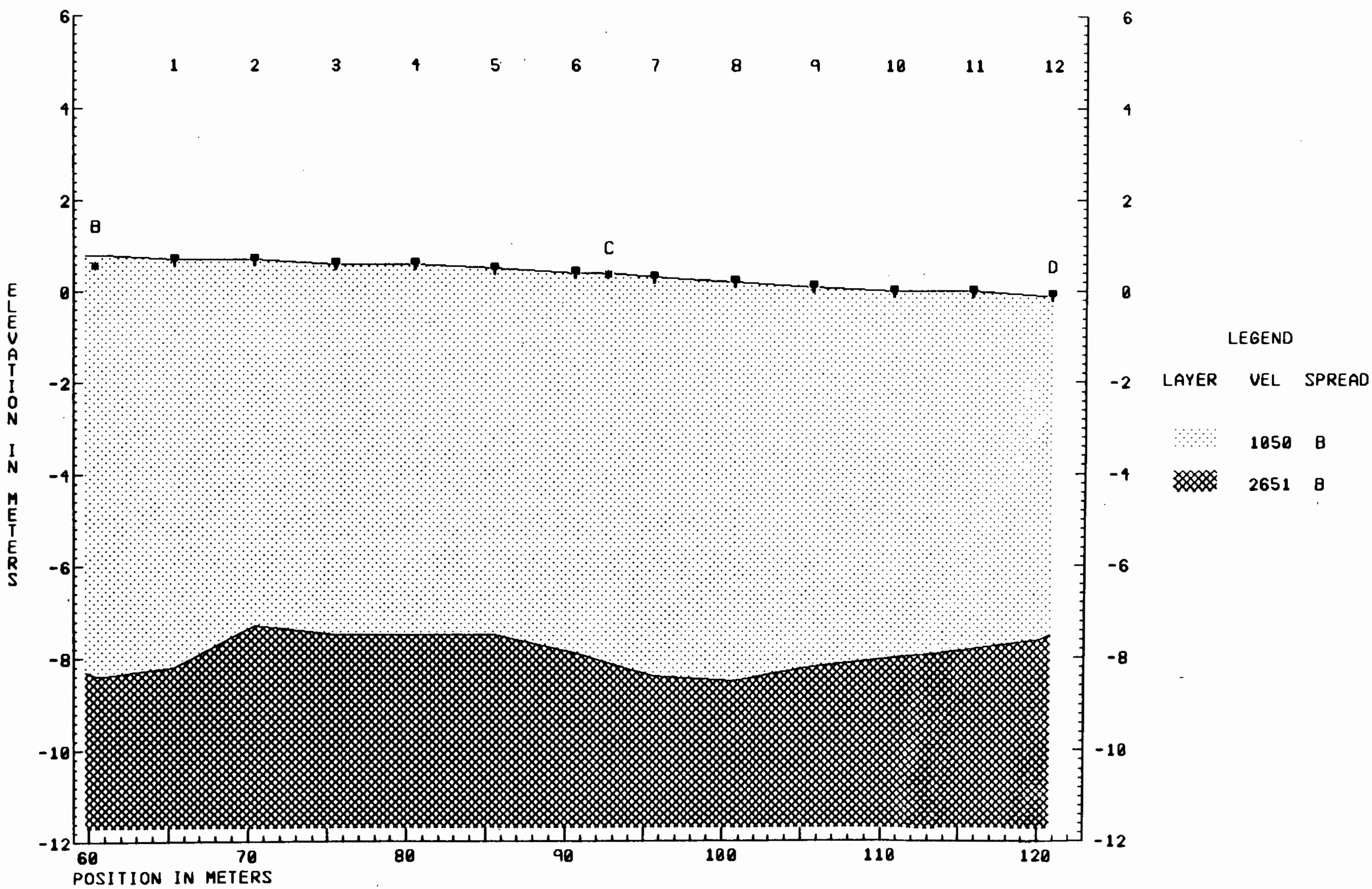
FILE LINE_3.SIP
PINE CREEK - MOOSE LAKE BLOCK - LINE 3 (SPREADS 1-4)
SPREAD D



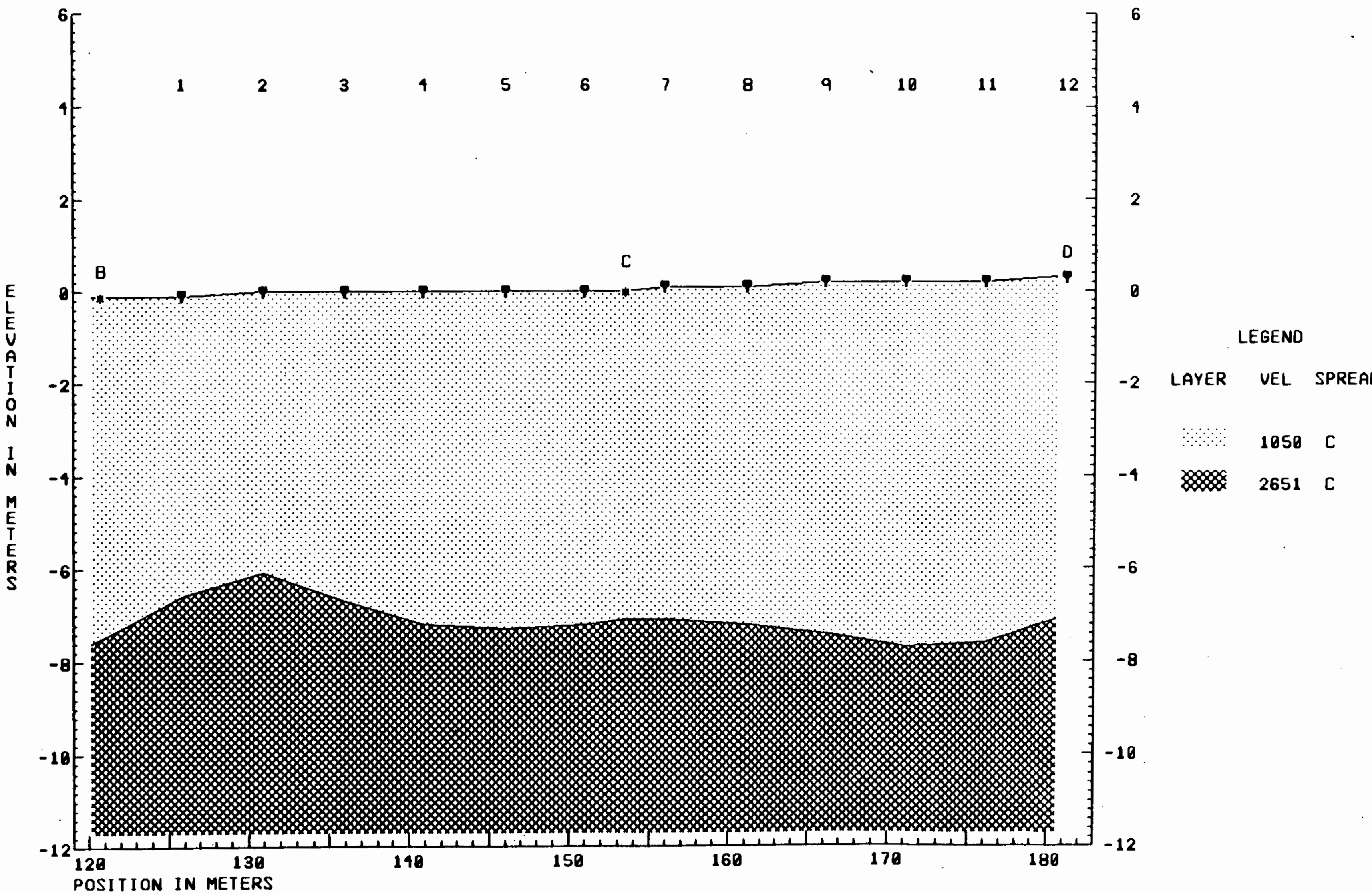
FILE LINE_3.SIP
PINE CREEK - MOOSE LAKE BLOCK - LINE 3 (SPREADS 1-4)
SPREAD A



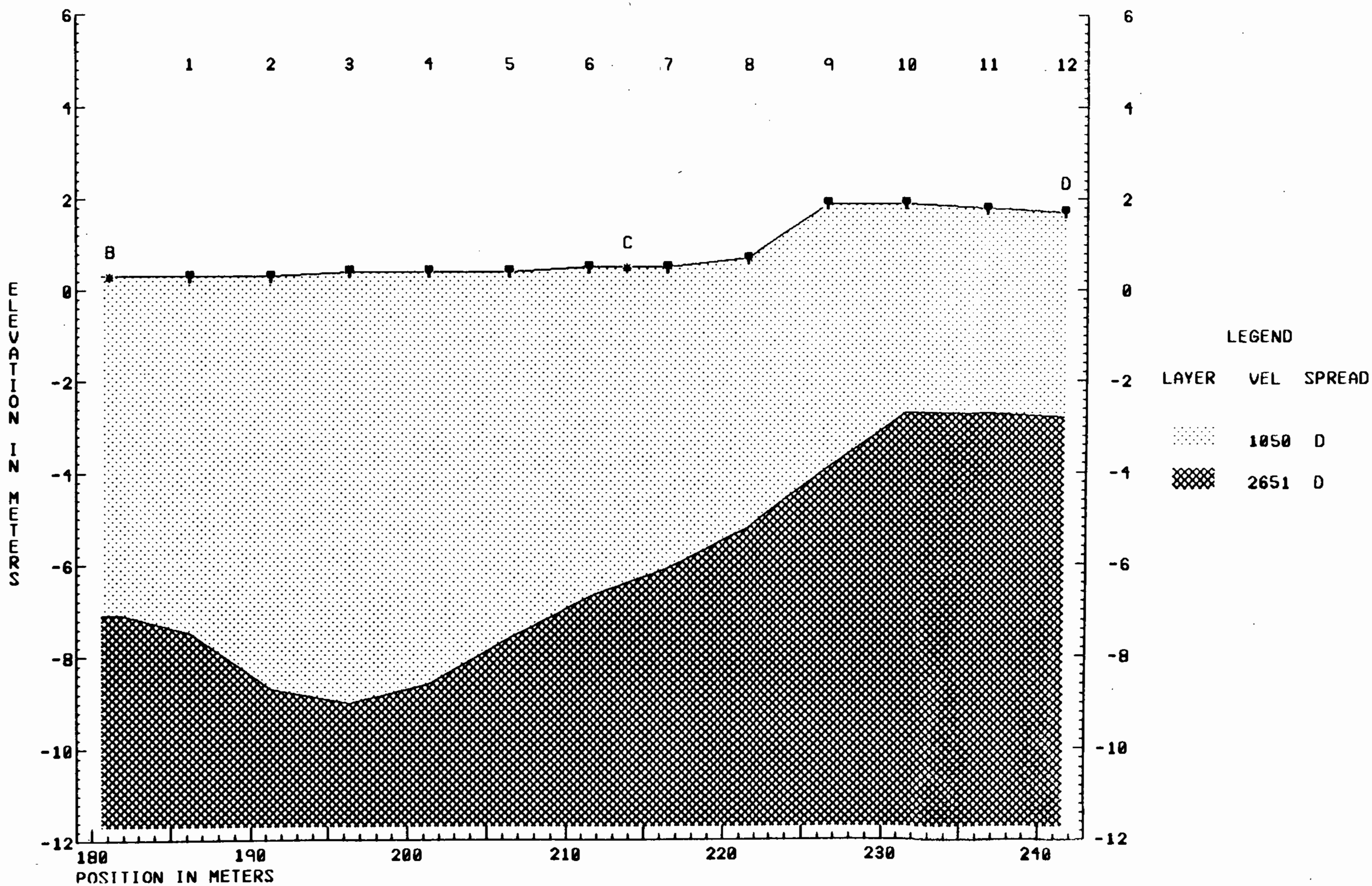
FILE LINE_3.SIP
PINE CREEK - MOOSE LAKE BLOCK - LINE 3 (SPREADS 1-4)
SPREAD B



FILE LINE_3.SIP
PINE CREEK - MOOSE LAKE BLOCK - LINE 3 (SPREADS 1-4)
SPREAD C



FILE LINE_3.SIP
PINE CREEK - MOOSE LAKE BLOCK - LINE 3 (SPREADS 1-4)
SPREAD D



INPUT DATA FILE for LINE_4.SIP

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TITLE FOR SIPT2/SIPLUS INPUT DATA SET for LINE_4.SIP
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Job 95-31 Atlin Seismic - Moose Lake Block - Line 4 (Spreads 1-4)

PROGRAM CONTROL DATA
--------------------
S     L  V   PRINTER PLOT SCALES    DATUM   CONTROL    PLOT CONTROL              T O
p  E  a  O                                                                        r f I
r  x  y  v    Elev   Horiz   Time   Pt 1       Pt 2    Elevations                a f D
d  i  r  e                                                                        c S i
s  t  s  r   m/col  m/row  ms/col  Elev/X   Elev/X    Top   Bottom   BLim TLim  e P p
-  -  -  -  ------ ------ ------  ------   ------    ---   ------   ---- ----  - - -
4  6  2  0     0.0    0.0    0.0     0.0      0.0      0        0    0.5 10.0  0 0 0
                                     0.0      0.0

SHOTPOINT AND GEOPHONE DATA
---------------------------
Spread A,  4 SP's,  12 Geo's,  X-Shift = 0.0,  X-True = 1,  Units: Meters.

 SP   Elev    X-Loc    Y-Loc    Depth   Uphole T   Fudge T   End SP
 --   ----    -----    -----    -----   --------   -------   ------
 A     2.5      0.0      5.0      0.0        0.0       0.0      1
 B     3.2     28.9      5.0      0.0        0.0       0.0      0
 C     1.5     57.8      5.0      0.0        0.0       0.0      2
 D     0.7    118.6      5.0      0.0        0.0       0.0      0

ARRIVAL TIMES AND LAYERS REPRESENTED
------------------------------------
Geo   Elev    X-Loc   Y   SP A     SP B    SP C     SP D
---   ----    -----  ---  -----L   -----L  -----L   -----L
 1     2.7      4.8  0.0 7.375 125.120 236.750 2 59.25 2
 2     2.9      9.6  0.016.120 222.120 235.370 2 58.00 2
 3     3.2     14.5  0.019.000 219.370 232.250 2 55.87 2
 4     3.4     19.3  0.022.500 217.000 230.500 2 55.37 2
 5     3.6     24.1  0.024.120 211.620 128.870 2 54.62 2
 6     3.2     28.9  0.026.620 2 7.375 126.000 2 51.87 2
 7     2.8     33.7  0.029.250 2 6.375 123.000 2 49.75 2
 8     2.4     38.5  0.031.000 216.000 220.500 2 47.50 2
 9     1.9     43.4  0.034.750 219.370 220.750 2 47.00 2
10     1.8     48.2  0.034.370 219.620 210.750 1 42.12 2
11     1.7     53.0  0.037.500 221.620 2 4.500 1 41.50 2
12     1.5     57.8  0.039.750 224.500 2 5.125 1 39.50 2
```

SHOTPOINT AND GEOPHONE DATA

Spread B, 5 SP's, 12 Geo's, X-Shift = 0.0, X-True = 1, Units: Meters.

SP	Elev	X-Loc	Y-Loc	Depth	Uphole T	Fudge T	End SP
A	2.5	0.0	5.0	0.0	0.0	0.0	0
B	1.5	57.8	5.0	0.0	0.0	0.0	1
C	1.1	90.7	5.0	0.0	0.0	0.0	0
D	0.7	118.6	5.0	0.0	0.0	0.0	2
E	0.0	179.2	5.0	0.0	0.0	0.0	0

ARRIVAL TIMES AND LAYERS REPRESENTED

Geo	Elev	X-Loc	Y	SP A	L	SP B	L SP C	L SP D	L	SP E	L
1	1.5	62.9	0.0	44.12	2	16.75	225.500	238.370	2	57.37	2
2	1.4	67.9	0.0	44.00	2	17.37	220.250	233.620	2	53.50	2
3	1.3	73.0	0.0	46.75	2	19.62	218.620	230.620	2	52.00	2
4	1.2	78.1	0.0	49.00	2	23.87	217.370	229.750	2	50.37	2
5	1.2	83.1	0.0	49.62	2	23.12	212.250	127.000	2	48.50	2
6	1.1	88.2	0.0	51.87	2	26.12	2 8.875	124.000	2	46.62	2
7	1.0	93.3	0.0	52.50	2	27.87	2 6.000	121.750	2	44.87	2
8	1.0	98.3	0.0	54.12	2	29.87	210.120	119.500	2	42.87	2
9	0.9	103.4	0.0	54.87	2	32.37	216.250	218.620	2	41.87	2
10	0.8	108.5	0.0	57.37	2	35.00	218.370	216.500	1	39.75	2
11	0.8	113.5	0.0	57.12	2	38.00	219.870	212.870	1	38.00	2
12	0.7	118.6	0.0	58.75	2	39.62	221.500	2 8.875	1	35.75	2

SHOTPOINT AND GEOPHONE DATA

Spread C, 5 SP's, 12 Geo's, X-Shift = 0.0, X-True = 1, Units: Meters.

SP	Elev	X-Loc	Y-Loc	Depth	Uphole T	Fudge T	End SP
A	1.5	57.8	5.0	0.0	0.0	0.0	0
B	0.7	118.6	5.0	0.0	0.0	0.0	1
C	0.4	146.3	5.0	0.0	0.0	0.0	0
D	0.0	179.2	5.0	0.0	0.0	0.0	2
E	0.2	239.5	5.0	0.0	0.0	0.0	0

ARRIVAL TIMES AND LAYERS REPRESENTED

Geo	Elev	X-Loc	Y	SP A	L	SP B	L	SP C	L	SP D	L	SP E	L
1	0.7	123.6	0.0	39.12	2	10.12	1	14.370	2	35.870	0	51.87	2
2	0.6	128.7	0.0	42.50	2	14.87	2	10.500	2	34.370	0	51.62	2
3	0.6	133.7	0.0	43.50	2	15.75	2	8.250	2	29.870	0	49.62	2
4	0.5	138.8	0.0	46.87	2	17.75	2	6.500	2	26.120	0	48.75	2
5	0.5	143.8	0.0	48.37	2	19.50	2	4.625	1	20.120	0	47.00	2
6	0.4	148.9	0.0	49.75	2	21.62	2	2.500	1	14.500	2	46.00	2
7	0.3	153.9	0.0	52.25	2	24.00	2	3.375	2	12.120	2	44.87	2
8	0.2	159.0	0.0	52.87	2	27.75	2	3.875	2	10.370	2	44.12	2
9	0.2	164.0	0.0	54.12	2	28.75	2	5.250	2	7.750	2	43.00	2
10	0.1	169.1	0.0	55.37	2	31.12	2	9.125	2	5.875	2	41.50	2
11	0.0	174.1	0.0	56.62	2	33.25	2	10.120	2	3.875	2	39.75	2
12	0.0	179.2	0.0	57.62	2	35.75	2	13.000	2	2.500	1	38.12	2

SHOTPOINT AND GEOPHONE DATA

Spread D, 4 SP's, 12 Geo's, X-Shift = 0.0, X-True = 1, Units: Meters.

SP	Elev	X-Loc	Y-Loc	Depth	Uphole T	Fudge T	End SP
A	0.7	118.6	5.0	0.0	0.0	0.0	0
B	0.0	179.2	5.0	0.0	0.0	0.0	1
C	-0.1	211.8	5.0	0.0	0.0	0.0	0
D	0.2	239.5	5.0	0.0	0.0	0.0	2

ARRIVAL TIMES AND LAYERS REPRESENTED

Geo	Elev	X-Loc	Y	SP A	L	SP B	L	SP C	L	SP D	L
1	-0.1	184.2	0.0	39.25	2	2.250	1	21.750	2	33.120	2
2	-0.1	189.2	0.0	39.62	2	5.625	1	19.120	2	31.500	2
3	-0.1	194.3	0.0	40.75	2	8.250	1	17.370	2	29.120	2
4	-0.1	199.3	0.0	43.37	2	10.000	1	16.370	2	28.120	2
5	-0.1	204.3	0.0	44.25	2	18.750	2	5.125	1	25.000	2
6	-0.1	209.3	0.0	45.50	2	21.370	2	4.375	1	23.000	2
7	0.0	214.4	0.0	46.87	2	23.620	2	6.500	1	21.000	2
8	0.0	219.4	0.0	49.00	2	26.250	2	9.875	1	19.870	2
9	0.1	224.4	0.0	51.62	2	29.750	2	17.750	2	18.370	2
10	0.1	229.5	0.0	51.12	2	30.620	2	18.750	2	14.870	1
11	0.1	234.5	0.0	54.37	2	34.120	2	22.250	2	8.625	1
12	0.2	239.5	0.0	54.00	2	34.500	2	22.750	2	4.375	1

VELOCITY ANALYSIS TABLES for LINE_4.SIP

Layer 1 Velocity from direct arrivals

Spread A	SP	Geo	DD	V	Avg V
	A	1	6.9	940	
					940
	B	5	6.9	597	
	B	6	5.0	678	
	B	7	6.9	1089	
					788
	C	10	10.8	1007	
	C	11	6.9	1541	
	C	12	5.0	976	
					1175

Spread B	SP	Geo	DD	V	Avg V
	C	5	9.1	743	
	C	6	5.6	630	
	C	7	5.6	939	
	C	8	9.1	899	
					803
	D	10	11.3	683	
	D	11	7.1	555	
	D	12	5.0	563	
					600

Spread C	SP	Geo	DD	V	Avg V
	B	1	7.1	699	
					699
	C	5	5.6	1209	
	C	6	5.6	2254	
					1732
	D	12	5.0	2000	
					2000

Spread D	SP	Geo	DD	V	Avg V
	B	1	7.1	3143	
	B	2	11.2	1988	
	B	3	15.9	1928	
	B	4	20.7	2071	
					2283
	C	5	9.0	1759	
	C	6	5.6	1278	
	C	7	5.6	867	
	C	8	9.1	921	
					1206
	D	10	11.2	752	
	D	11	7.1	820	
	D	12	5.0	1143	
					905

Wtd Avg Velocity computed for Layer 1 = 1196

Layer 2 Velocity computed by regression of datum-corrected arrivals

Spread A

V	Ti	Geos	<-SP->	Geos	Ti	V		Avg V	Avg Ti	Pts	
			A	2 12	11.1	1961		1961	11.1	11	
1551	8.3	1 4	B	8 12	10.8	2275		1884	9.6	9	
2187	12.5	1 9	C					2187	12.5	9	
2722	17.8	1 12	D					2722	17.8	12	
							Avg =	2168	for	41	Pts

Spread B

V	Ti	Geos	<-SP->	Geos	Ti	V		Avg V	Avg Ti	Pts	
			A	1 12	27.1	3649		3649	27.1	12	
			B	1 12	13.6	2321		2321	13.6	12	
1900	10.0	1 4	C	9 12	12.2	2854		2282	11.1	8	
2071	10.3	1 9	D					2071	10.3	9	
2757	14.1	1 12	E					2757	14.1	12	
							Avg =	2565	for	53	Pts

Spread C

V	Ti	Geos	<-SP->	Geos	Ti	V		Avg V	Avg Ti	Pts	
			A	1 12	19.9	3103		3103	19.9	12	
			B	2 12	9.4	2289		2289	9.4	11	
1822	1.5	1 4	C	7 12	-0.9	2400		2130	0.3	10	
2235	1.1	6 11	D					2235	1.1	6	
4068	24.0	1 12	E					4068	24.0	12	
							Avg =	2684	for	51	Pts

Spread D

V	Ti	Geos	<-SP->	Geos	Ti	V		Avg V	Avg Ti	Pts
			A	1 12	20.3	3582		3582	20.3	12
			B	5 12	7.6	2201		2201	7.6	8
2631	10.7	1 4	C	9 12	12.1	2755		2692	11.4	8
2482	10.3	1 9	D					2482	10.3	9
							Avg =	2724	for	37 Pts

Avg of all regression velocities: 2522 for 182 points in Layer 2.

Layer 2 Velocity computed by Hobson-Overton method

Spread A

SPs	Geos	V	Avg TdSP	Std Err Overall	4 Highest Err	Geo	Std Err at Err	geophones Geo	Err	Geo	Err	Geo
A B	2 4	1586	-0.3	0.086	-0.121	3	0.061	4	0.060	2		
A C	2 9	1984	0.6	0.702	-0.972	9	-0.910	2	0.896	4	0.865	7
A D	2 12	2269	1.7	0.496	-1.293	5	0.648	3	0.509	4	0.337	10
B C	8 9	2964	-1.4	0.000	0.000	9	-0.000	8				
B D	8 12	2317	-1.5	0.485	0.821	10	-0.641	11	-0.259	9	0.136	12
Avg =		2176	for	29 Pts								

Spread B

SPs	Geos	V	Avg TdSP	Std Err Overall	4 Highest Err	Geo	Std Err at Err	geophones Geo	Err	Geo	Err	Geo
A C	1 4	2295	3.8	0.411	0.414	3	-0.412	4	-0.411	1	0.409	2
A D	1 9	2594	4.3	1.023	-1.840	9	-1.360	1	1.342	6	1.260	3
A E	1 12	3141	5.0	0.783	-1.274	1	1.142	6	-1.072	11	0.943	4
B C	1 4	1917	2.6	0.475	0.770	2	-0.400	3	-0.389	1	0.018	4
B D	1 9	2252	1.4	0.888	1.512	4	-1.398	1	-0.965	9	-0.858	5
B E	1 12	2524	3.3	0.758	1.989	4	-0.915	9	-0.804	5	-0.658	1
C E	9 12	2661	-2.0	0.197	0.329	10	-0.179	9	-0.119	11	-0.031	12
Avg =		2575	for	54 Pts								

Spread C			Avg	Std Err	4 Highest Std Err at geophones							
SPs	Geos	V	TdSP	Overall	Err	Geo	Err	Geo	Err	Geo	Err	Geo
A C	1 4	1952	3.6	0.804	1.348	2	-0.761	1	-0.386	3	-0.201	4
A D	6 11	2869	14.7	0.445	0.861	7	-0.563	6	-0.281	8	0.172	9
A E	1 12	3521	2.8	0.871	1.566	7	-1.377	1	1.286	5	0.872	4
B C	2 4	2736	6.8	0.140	-0.198	3	0.099	2	0.099	4		
B D	6 11	2203	7.5	0.395	0.839	8	-0.387	6	-0.187	11	-0.183	10
B E	2 12	2915	-3.3	0.497	0.782	12	-0.706	9	0.690	2	0.589	8
C D	7 11	2387	-2.6	0.769	0.881	7	-0.871	9	-0.864	8	0.822	10
C E	7 12	2903	-16.5	0.961	-1.540	9	1.391	7	0.740	12	-0.682	8

Avg = 2832 for 53 Pts

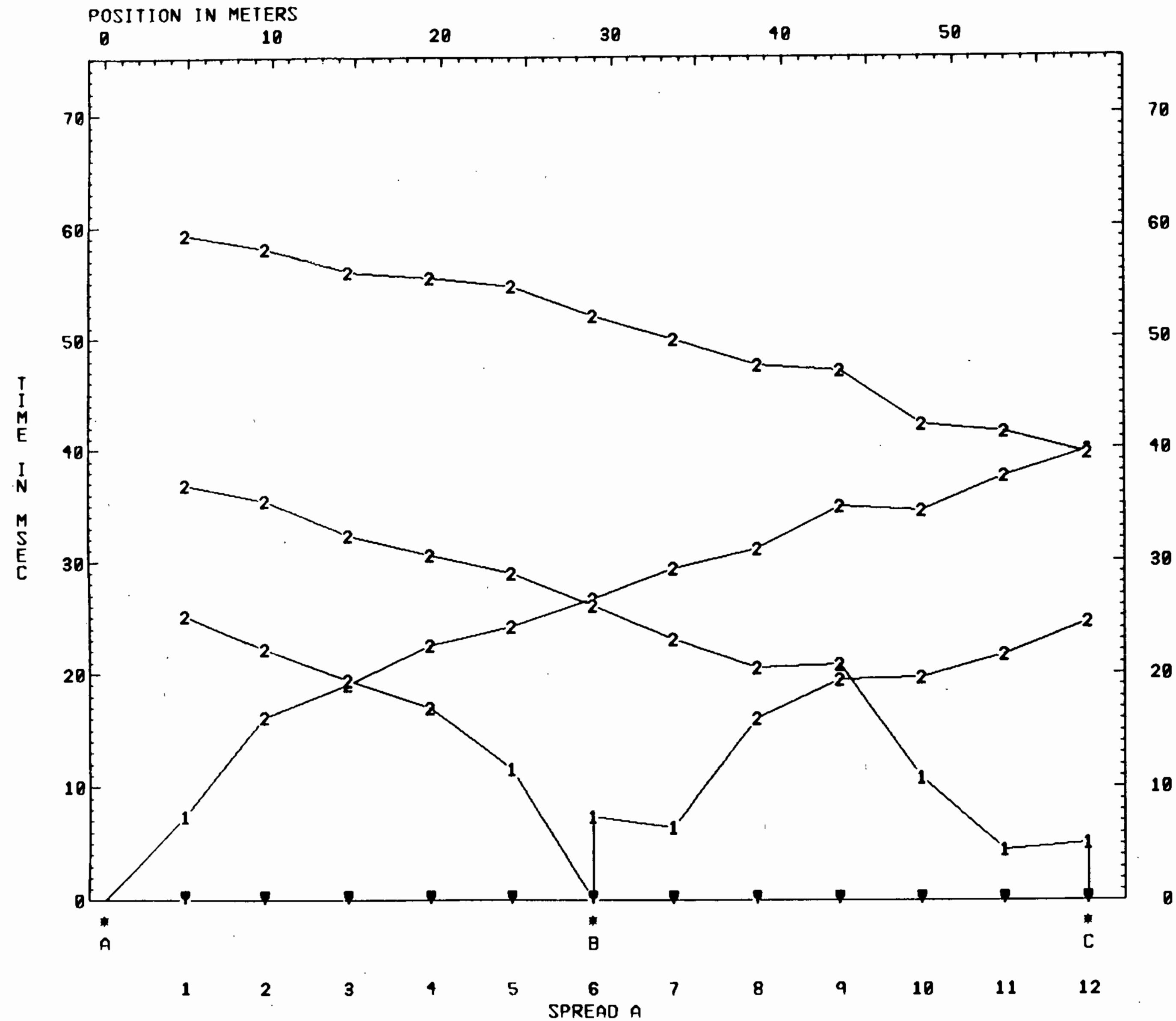
Spread D			Avg	Std Err	4 Highest Std Err at geophones							
SPs	Geos	V	TdSP	Overall	Err	Geo	Err	Geo	Err	Geo	Err	Geo
A C	1 4	3155	5.4	0.202	-0.318	3	0.220	4	0.116	1	-0.018	2
A D	1 9	2889	1.6	0.458	0.957	1	-0.508	3	-0.502	2	0.476	9
B D	5 9	2287	-1.8	0.264	-0.467	8	0.260	9	0.221	6	-0.087	5

Avg = 2781 for 18 Pts

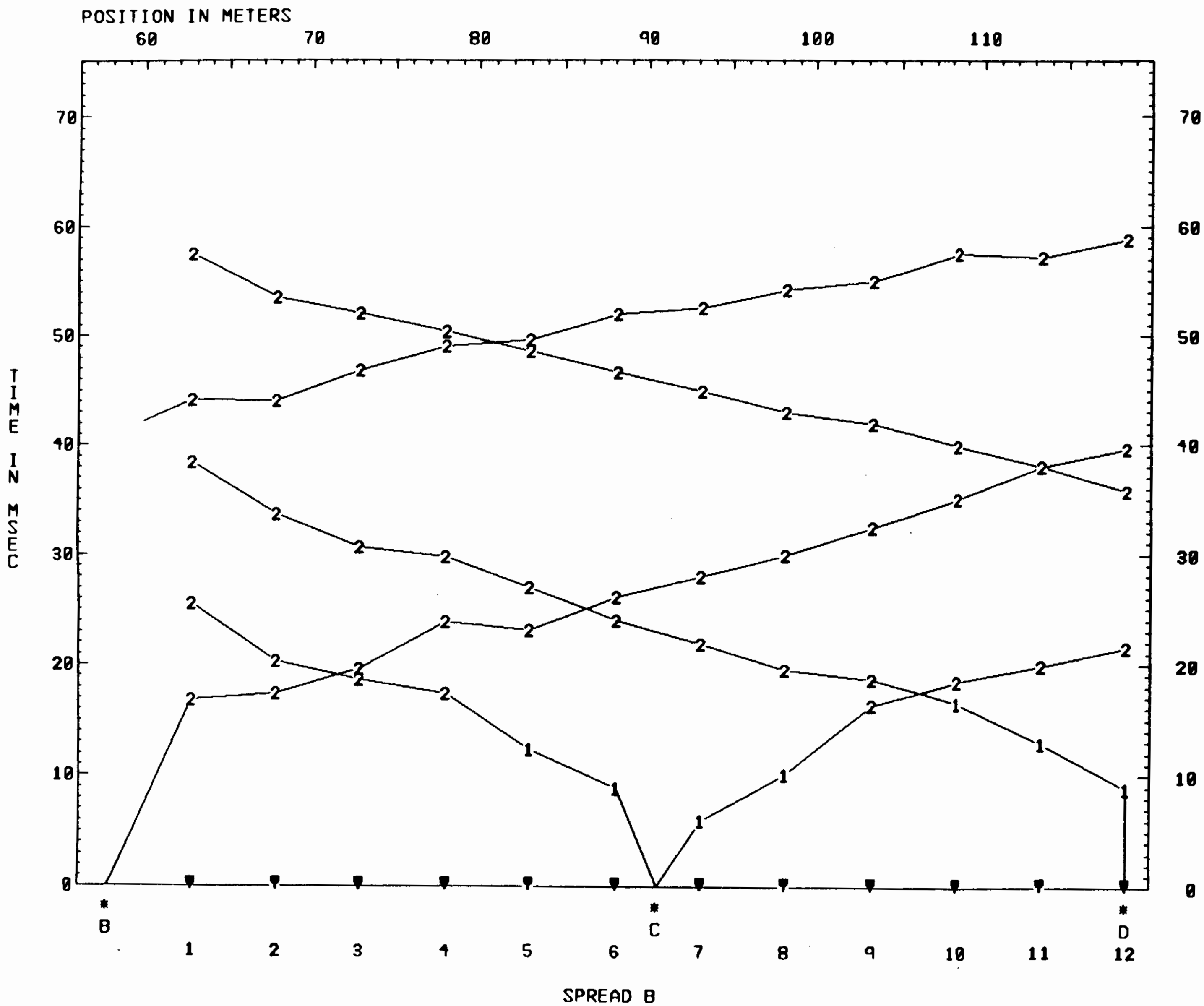
Avg of all Hobson-Overton velocities: 2613 for 154 points in Layer 2.

Wtd Avg Velocity computed for Layer 2 = 2579

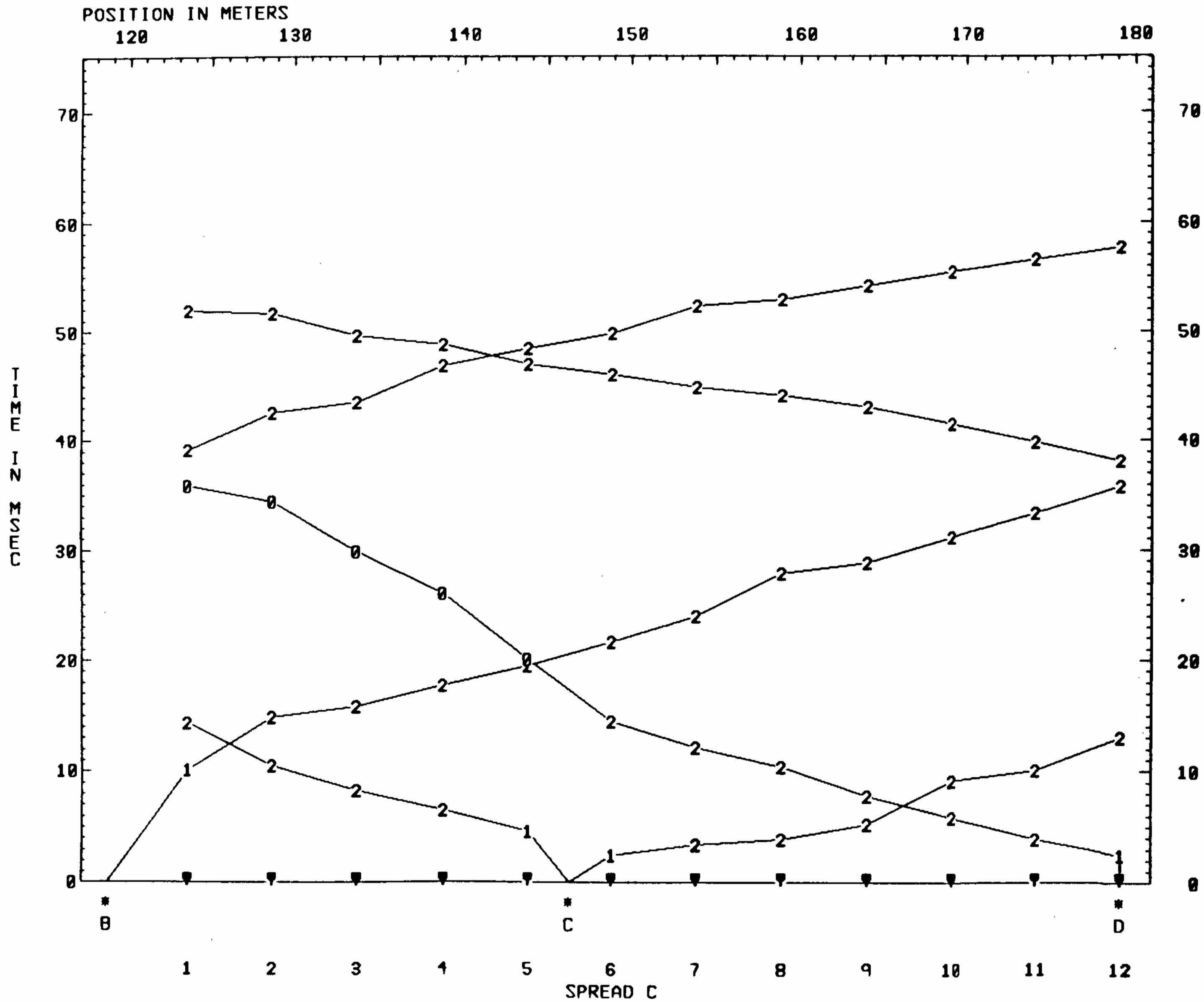
FILE LINE_4.SIP
JOB 95-31 ATLIN SEISMIC - MOOSE LAKE BLOCK - LINE 4 (SPREADS 1-4) - RAW ARRIVAL TIMES

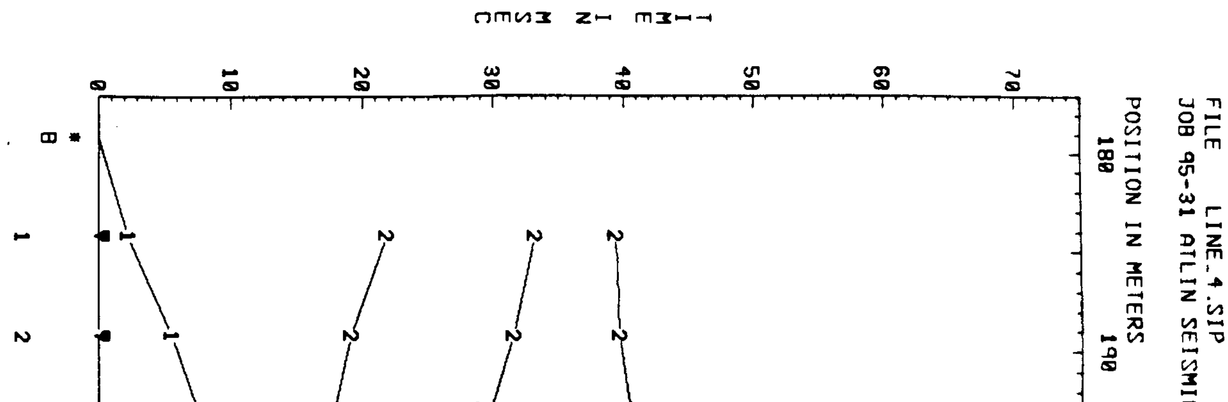


FILE LINE_4.SIP
JOB 95-31 ATLIN SEISMIC - MOOSE LAKE BLOCK - LINE 4 (SPREADS 1-4) - RAW ARRIVAL TIMES



FILE LINE_4.SIP
JOB 95-31 ATLIN SEISMIC - MOOSE LAKE BLOCK - LINE 4 (SPREADS 1-4) - RAW ARRIVAL TIMES





Spread A Depth and Elev of layers directly beneath SPs and Geos

SP	Surface X-Loc	Surface Elev	Layer 2 Depth	Layer 2 Elev
A	0.0	2.5	6.7	-4.2
B	28.9	3.2	11.3	-8.1
C	57.8	1.5	10.1	-8.6

Geo	Surface X-Loc	Surface Elev	Layer 2 Depth	Layer 2 Elev
1	4.8	2.7	8.7	-6.0
2	9.6	2.9	10.7	-7.8
3	14.5	3.2	11.0	-7.8
4	19.3	3.4	11.3	-7.9
5	24.1	3.6	11.3	-7.7
6	28.9	3.2	11.3	-8.1
7	33.7	2.8	11.4	-8.6
8	38.5	2.4	11.1	-8.7
9	43.4	1.9	10.8	-8.9
10	48.2	1.8	10.3	-8.5
11	53.0	1.7	9.8	-8.1
12	57.8	1.5	10.1	-8.6

Spread B Depth and Elev of layers directly beneath SPs and Geos

SP	Surface X-Loc	Surface Elev	Layer 2 Depth	Layer 2 Elev
B	57.8	1.5	10.1	-8.6
C	90.7	1.1	9.2	-8.1
D	118.6	0.7	7.1	-6.4

Geo	Surface X-Loc	Surface Elev	Layer 2 Depth	Layer 2 Elev
1	62.9	1.5	10.2	-8.7
2	67.9	1.4	10.3	-8.9
3	73.0	1.3	10.1	-8.8
4	78.1	1.2	9.9	-8.7
5	83.1	1.2	9.8	-8.6
6	88.2	1.1	9.2	-8.1
7	93.3	1.0	9.0	-8.0

8	98.3	1.0	8.9	-7.9
9	103.4	0.9	9.0	-8.1
10	108.5	0.8	8.7	-7.9
11	113.5	0.8	8.4	-7.6
12	118.6	0.7	7.1	-6.4

Spread C Depth and Elev of layers directly beneath SPs and Geos

SP	Surface X-Loc	Surface Elev	Layer 2 Depth	Layer 2 Elev
B	118.6	0.7	7.1	-6.4
C	146.3	0.4	4.2	-3.8
D	179.2	0.0	3.8	-3.8

Geo	Surface X-Loc	Surface Elev	Layer 2 Depth	Layer 2 Elev
1	123.6	0.7	6.2	-5.5
2	128.7	0.6	5.6	-5.0
3	133.7	0.6	5.1	-4.5
4	138.8	0.5	4.7	-4.2
5	143.8	0.5	4.4	-3.9
6	148.9	0.4	4.0	-3.6
7	153.9	0.3	3.9	-3.6
8	159.0	0.2	3.6	-3.4
9	164.0	0.2	3.6	-3.4
10	169.1	0.1	3.6	-3.5
11	174.1	0.0	3.6	-3.6
12	179.2	0.0	3.8	-3.8

Spread D Depth and Elev of layers directly beneath SPs and Geos

SP	Surface X-Loc	Surface Elev	Layer 2 Depth	Layer 2 Elev
B	179.2	0.0	3.8	-3.8
C	211.8	-0.1	7.4	-7.5
D	239.5	0.2	4.0	-3.8

Geo	Surface X-Loc	Surface Elev	Layer 2 Depth	Layer 2 Elev
1	184.2	-0.1	5.5	-5.6
2	189.2	-0.1	6.9	-7.0
3	194.3	-0.1	7.2	-7.3
4	199.3	-0.1	7.1	-7.2
5	204.3	-0.1	7.3	-7.4
6	209.3	-0.1	7.4	-7.5
7	214.4	0.0	7.5	-7.5
8	219.4	0.0	7.6	-7.6
9	224.4	0.1	7.7	-7.6
10	229.5	0.1	7.3	-7.2
11	234.5	0.1	5.7	-5.6
12	239.5	0.2	4.0	-3.8

Velocities used to formulate the Depth Model

Spread A	Layer 1	Layer 2
Vertical	1196	
Horizontal		2579

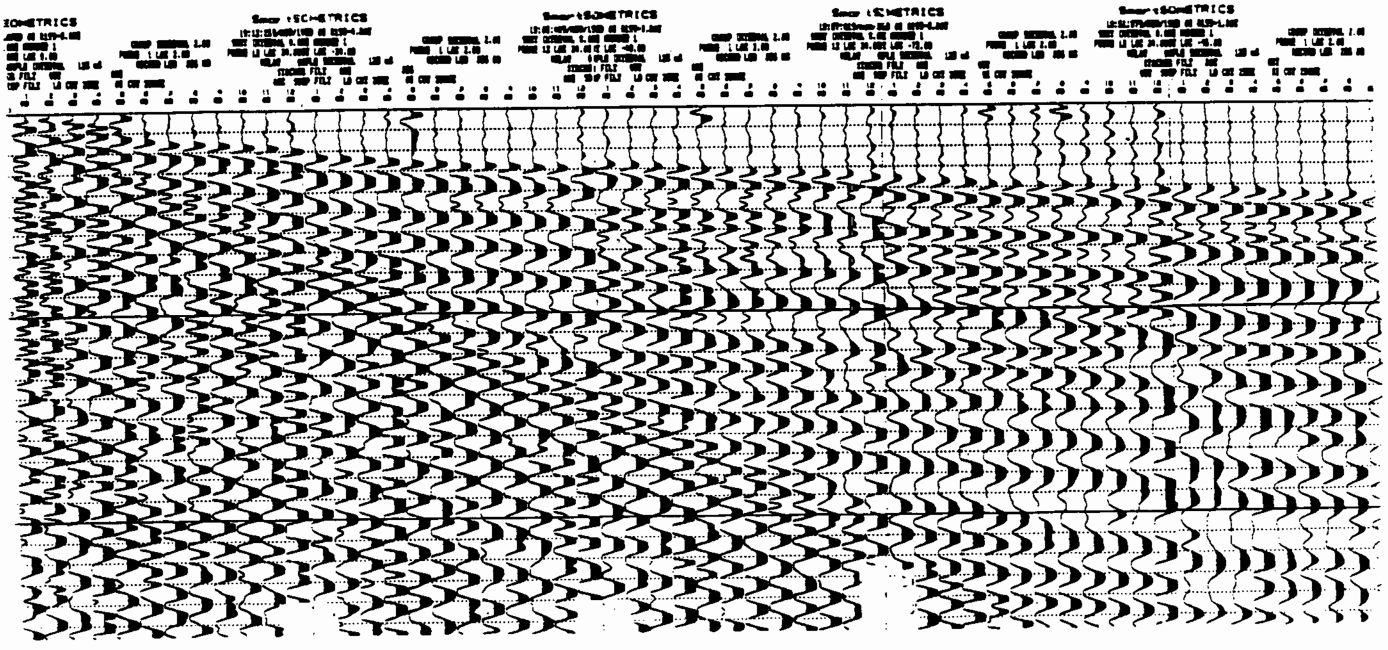
Spread B	Layer 1	Layer 2
Vertical	1196	
Horizontal		2579

Spread C	Layer 1	Layer 2
Vertical	1196	
Horizontal		2579

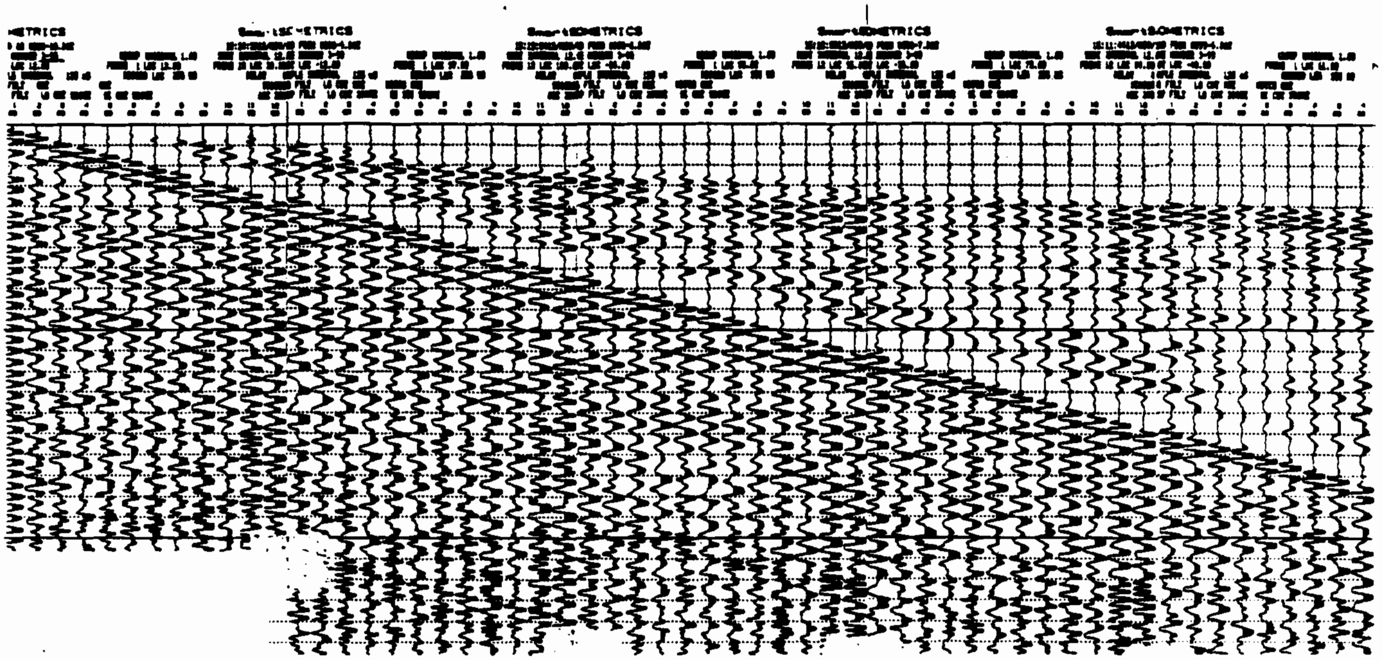
Spread D	Layer 1	Layer 2
Vertical	1196	
Horizontal		2579

Appendix B. Walkaway survey sections

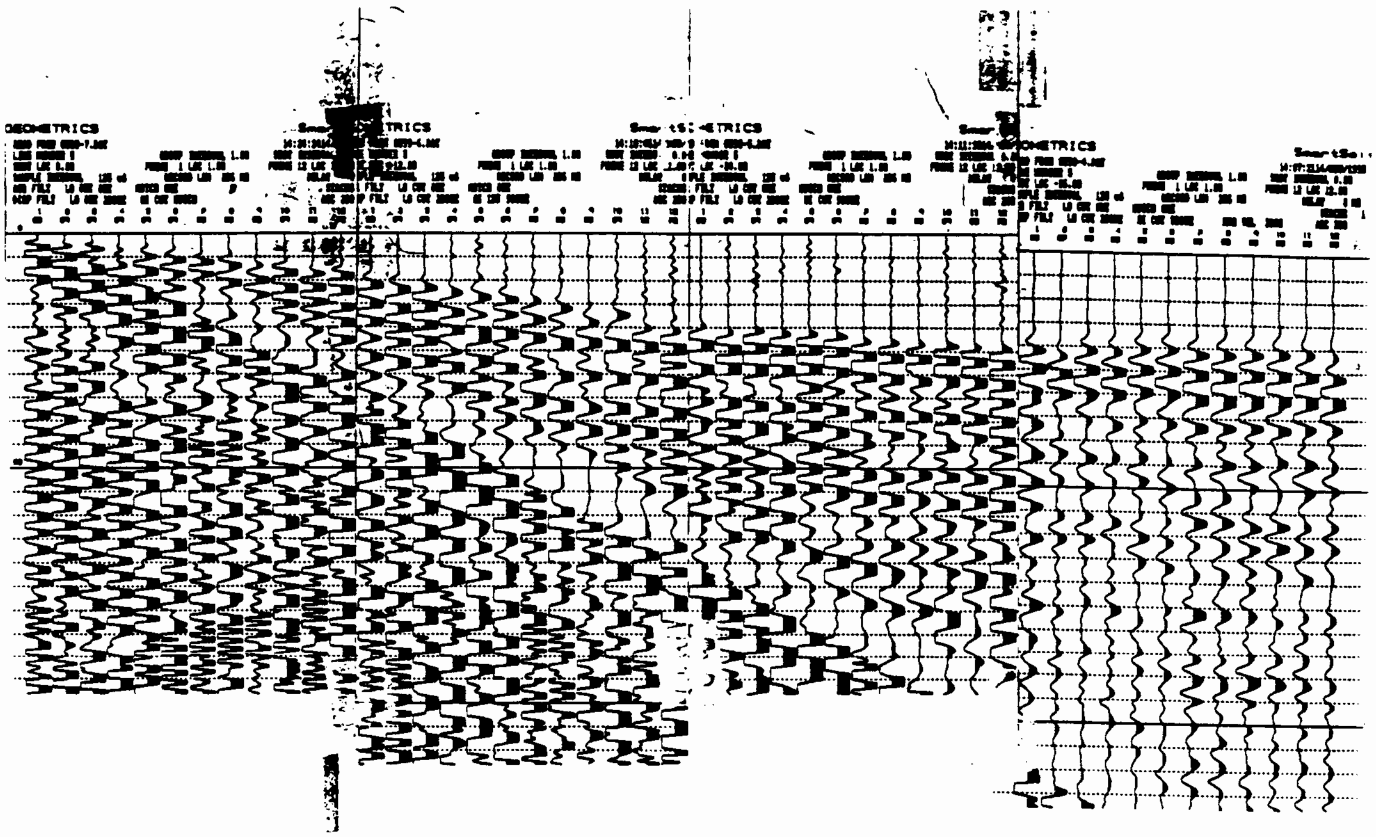
Walkaway Survey - West Site
Phone Interval: 2.0 m



Walkaway Survey - Moose Lake Site
Phone Interval: 1.0 m



Walkaway Survey - East Site
Phone Interval: 1.0 m

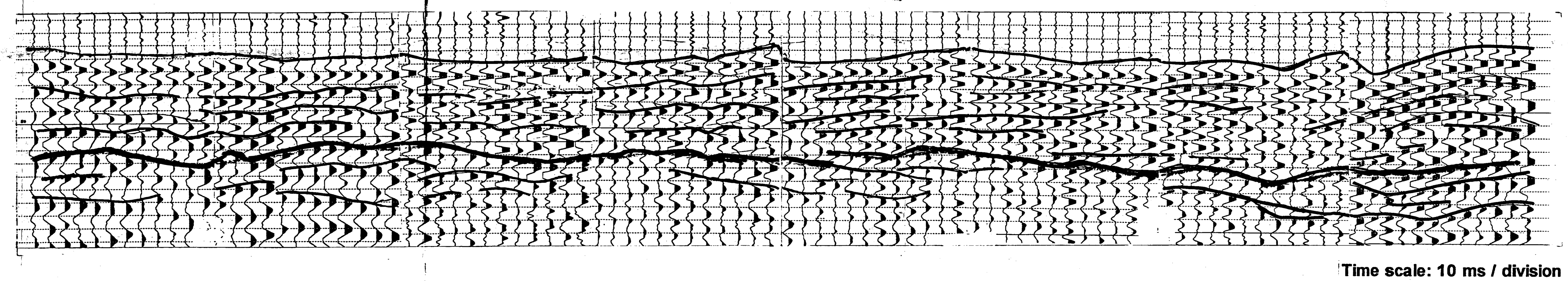


Appendix C. Survey Log

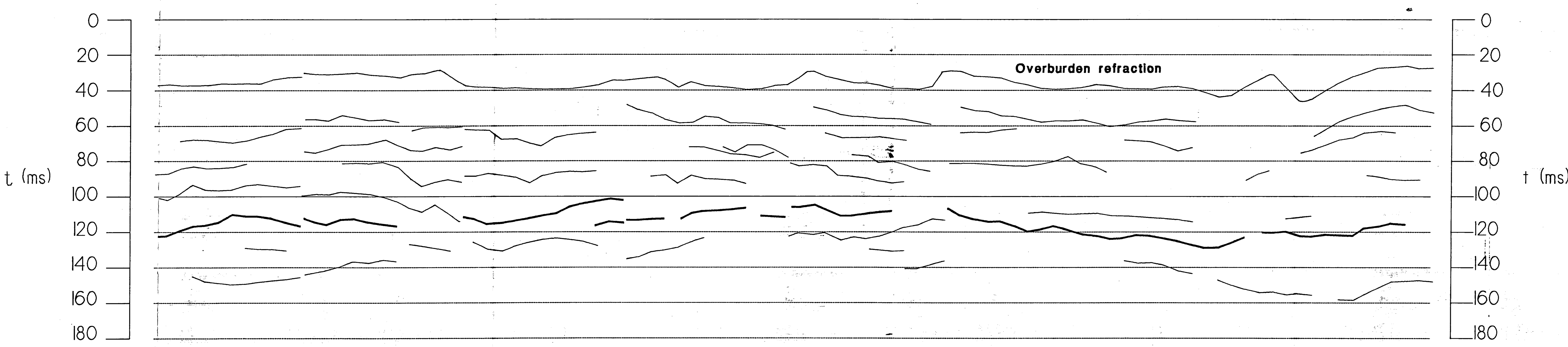
Date	**Remarks**
Tues 07 Nov 95	Prepare and pack instruments, drive to Atlin
Wed 08 Nov 95	Meet G. Turner, A. MACKENZIE [redacted] and locate drill sites, cut lines at West Stie, conduct walkaway survey at West Site.
Thurs 09 Nov 95	Reflection survey on Lines 1 and part of 2.
Fri 10 Nov 95	Finish surveys at West site, move to Moose Lake site, conduct walkaway survey.
Sat 11 Nov 95	Seismic refraction surveys at Moose Lake: Cut line and survey Line 3
Sun 12 Nov 95	Seismic refraction surveys at Moose Lake: Line 4 and topo survey.
Mon 13 Nov 95	Cut lines at East site, walkaway survey.
Tues 14 Nov 95	East Site: survey Line 5.
Wed 15 Nov 95	East Site: survey Line 6, topo survey, pack gear.
Thurs 16 Nov 95	Return to Whitehorse.

Appendix C. Statement of Costs

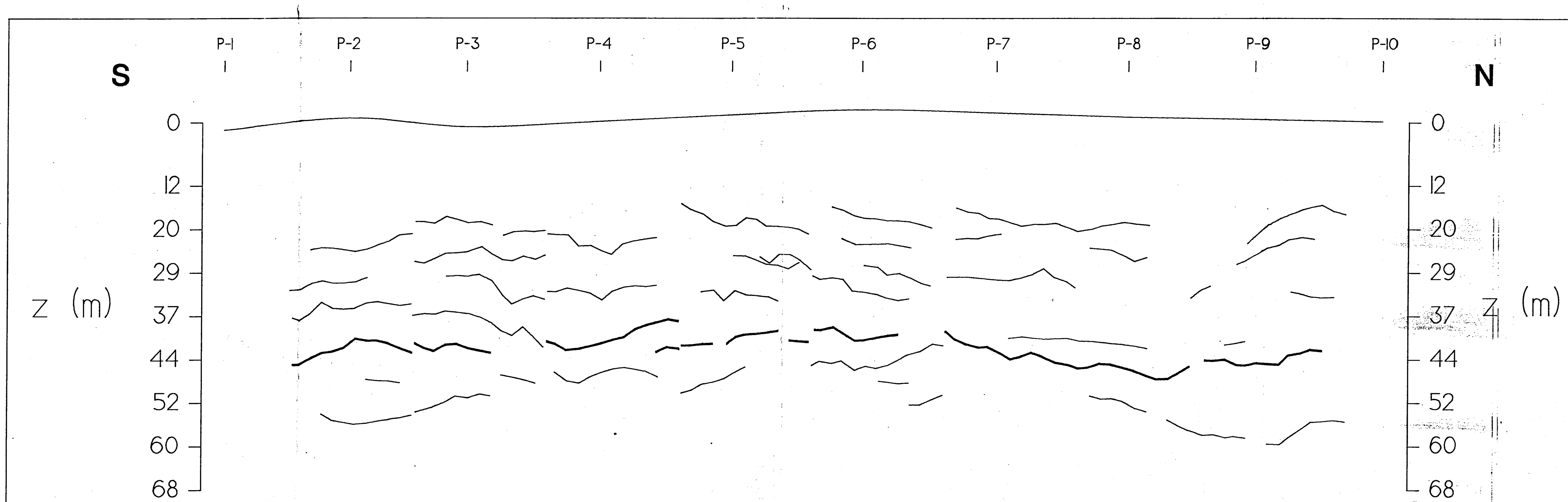
Mobe / demobe	$1,000.00
Seismic survey: 8.0 days @ $1000	8,000.00
Report	1,400.00
Total	$10,400.00



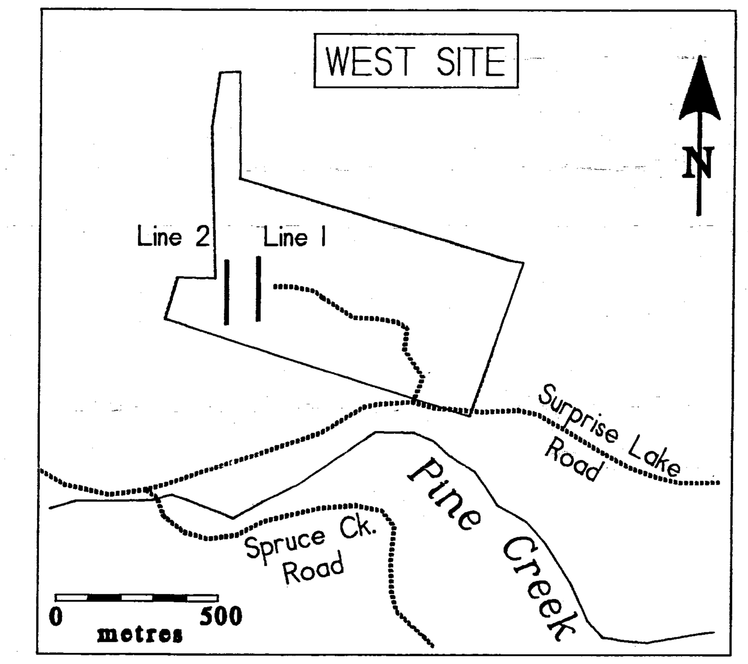
SEISMIC SECTION



TIME SECTION



DEPTH SECTION



GEOLOGICAL SURVEY BRANCH
ASSESSMENT REPORT

24,484

SURVEY & DISPLAY SPECIFICATIONS

INSTRUMENT: GEOMETRICS S-12

SPREAD: BROADSIDE OFFSET T

GROUP INTERVAL: 4 m

SHOT INTERVAL: 24 m, offset 50 m

FILTERS: HI CUT 500 Hz / LOW CUT 280 Hz

AGC: IN

NMO VELOCITY: 1900 m/s

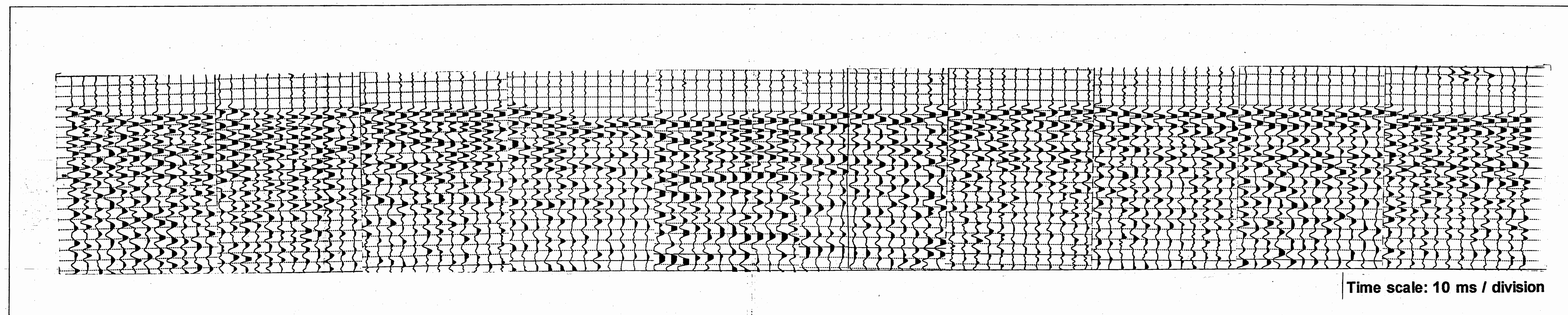
0 25
metres

PROFESSIONAL GEOSCIENTIST
PROVINCE OF BRITISH COLUMBIA
M.A. POWER

WESTERN PACIFIC MINING CORP.	PINE CREEK PLACER PROPERTY
REFLECTION SEISMIC SURVEY COMPOSITE PROFILES - LINE 2	MINING DISTRICT: A[illegible]IN B.C. NTS: 104 N 12 SCALE: 1:500 OPERATOR: M.P. / R.S.
AMEROK GEOSCIENCES LTD.	DATE: 08DEC95 FIGURE: 12

GEOLOGICAL SURVEY BRANCH
ASSESSMENT REPORT

24,484



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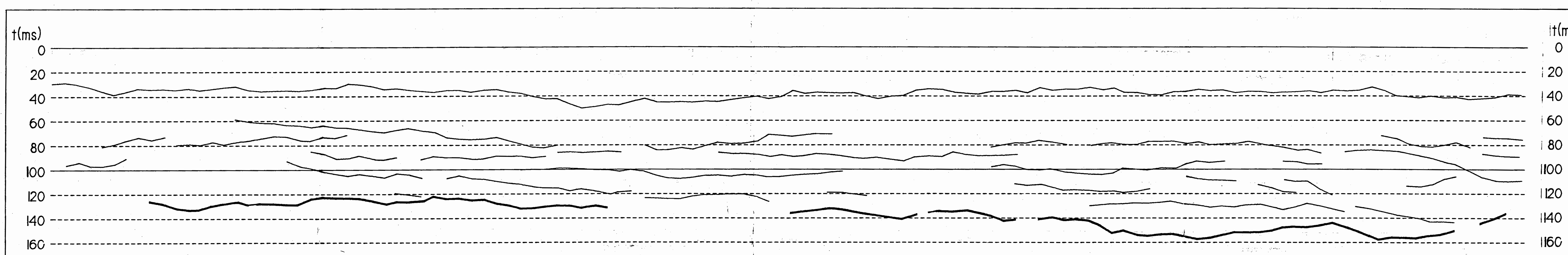

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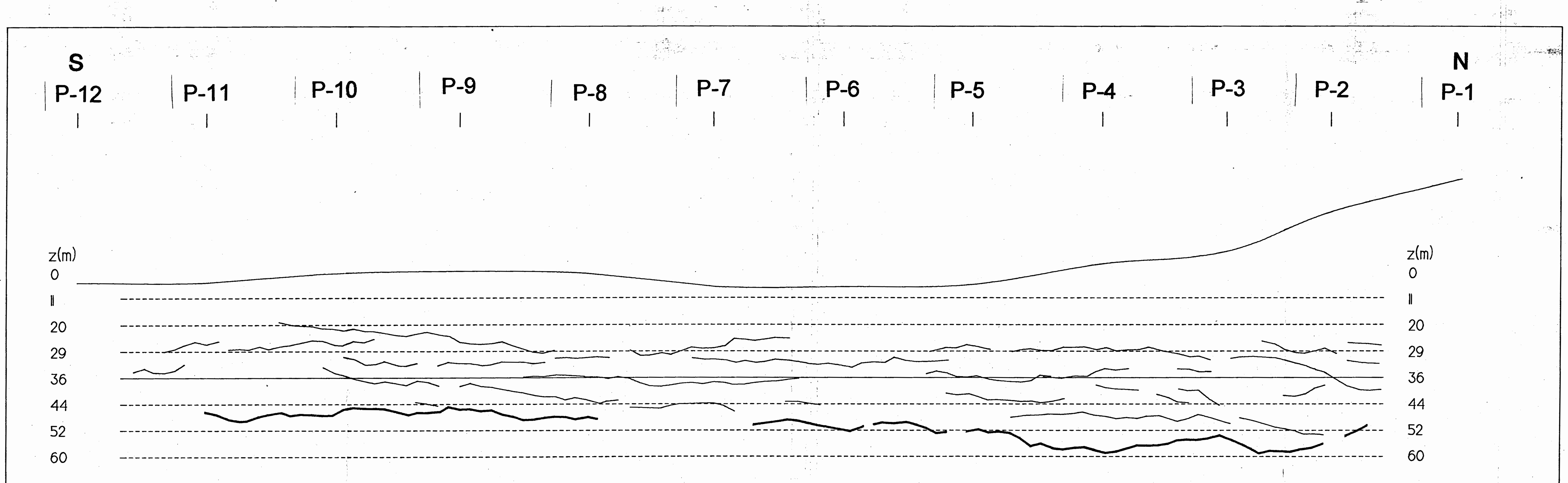
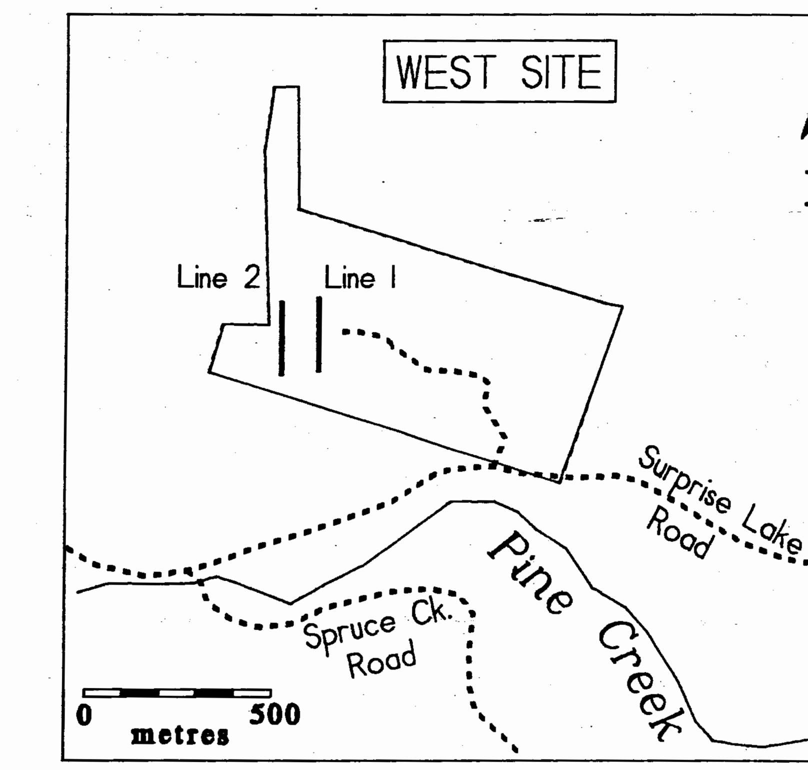


DEPTH SECTION



SURVEY & DISPLAY SPECIFICATIONS

INSTRUMENT: GEOMETRICS S-12

SPREAD: BROADSIDE OFFSET T

GROUP INTERVAL: 4 m

SHOT INTERVAL: 24 m, offset 50 m

FILTERS: HI CUT 500 Hz / LOW CUT 280 Hz

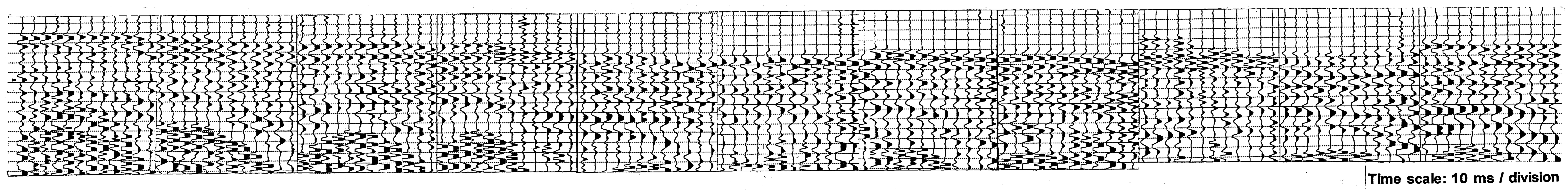
AGC: IN

NMO VELOCITY: 1900 m/s

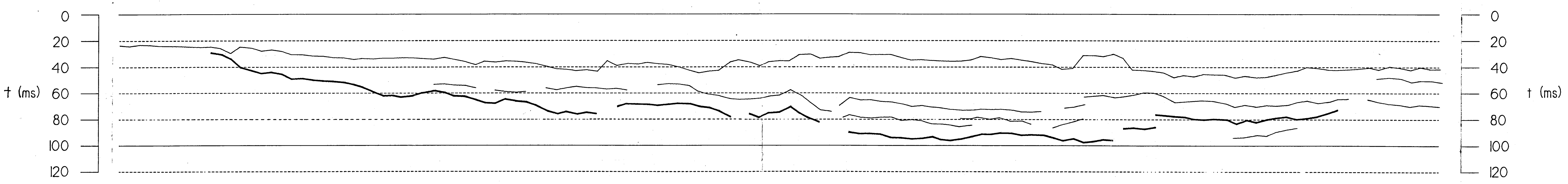
0 25
metres

PROFESSIONAL GEOSCIENTIST M.A. POWER BRITISH COLUMBIA

WESTERN PACIFIC MINING CORP.	PINE CREEK PLACER PROPERTY
REFLECTION SEISMIC SURVEY COMPOSITE PROFILES - LINE I	MINING DISTRICT: ATLIN B.C.
	NTS: 104 N 12 SCALE: 1:500
AMEROK GEOSCIENCES LTD.	OPERATOR: M.P. / R.S.
	DATE: 08DEC95 FIGURE: 11



SEISMIC SECTION



TIME SECTION

GEOLOGICAL SURVEY BRANCH
ASSESSMENT REPORT

24,484

SURVEY & DISPLAY SPECIFICATIONS

INSTRUMENT: GEOMETRICS S-12

SPREAD: BROADSIDE OFFSET T

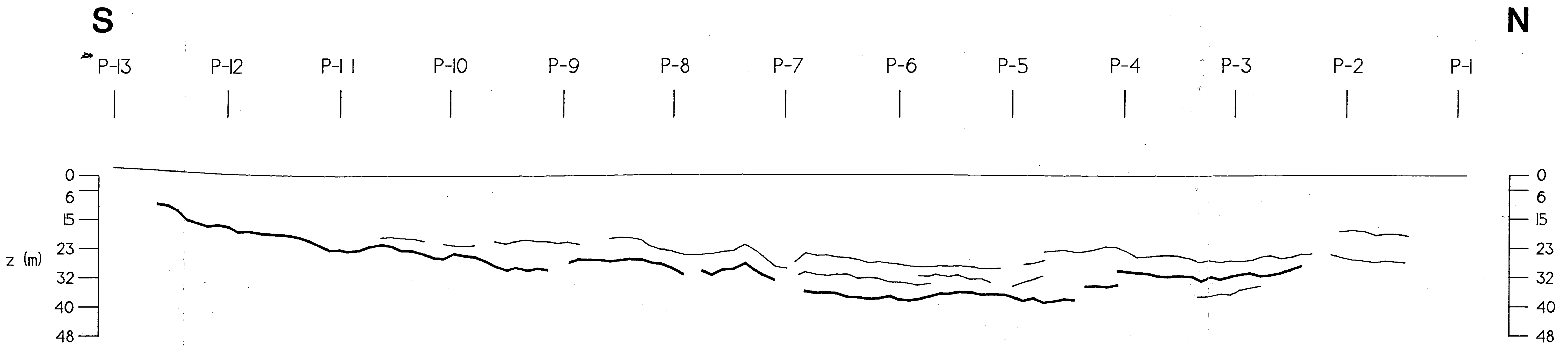
GROUP INTERVAL: 3 m

SHOT INTERVAL: 18 m, OFFSET 24 m

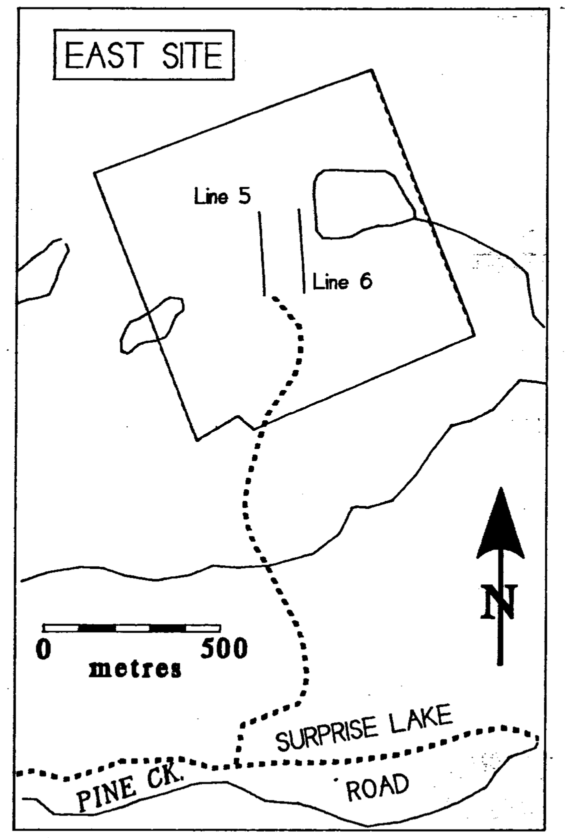
FILTERS: HI CUT 500 Hz / LOW CUT 280 Hz

AGC: IN

NMO VELOCITY: 2000 m/s

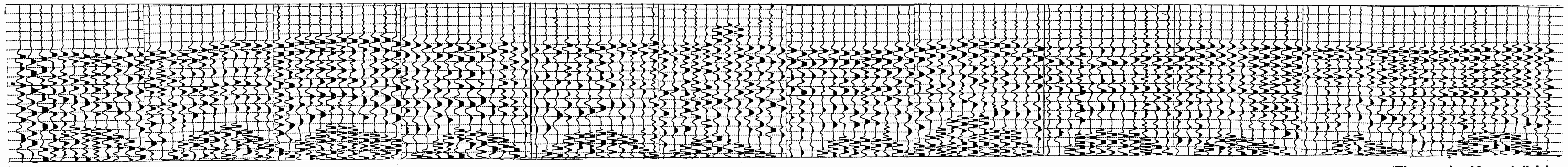


DEPTH SECTION

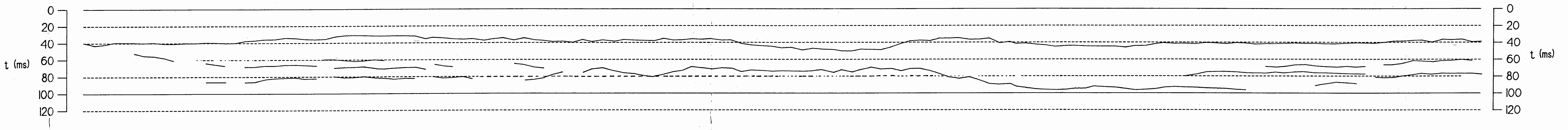


0 5 metres

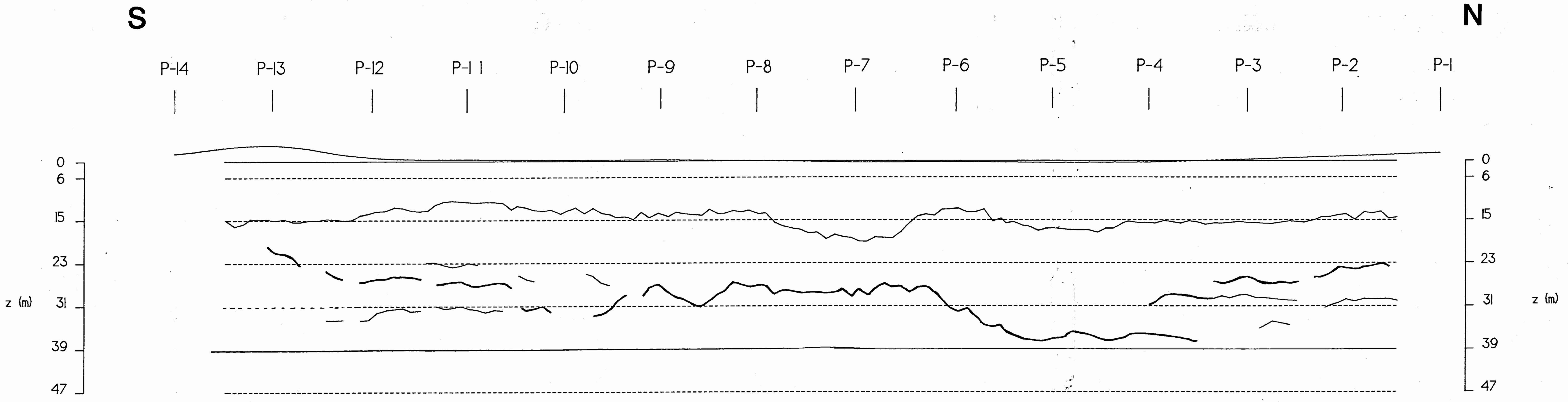
WESTERN PACIFIC MINING CORP.	PINE CREEK PLACER PROPERTY
REFLECTION SEISMIC SURVEY COMPOSITE PROFILES - LINE 5	MINING DISTRICT: ATLIN B.C.
	NTS:104 N 11 / SCALE: 1:500
	OPERATOR: M.P. / R.S.
AMEROK GEOSCIENCES LTD.	DATE: 16DEC95 / FIGURE: 14



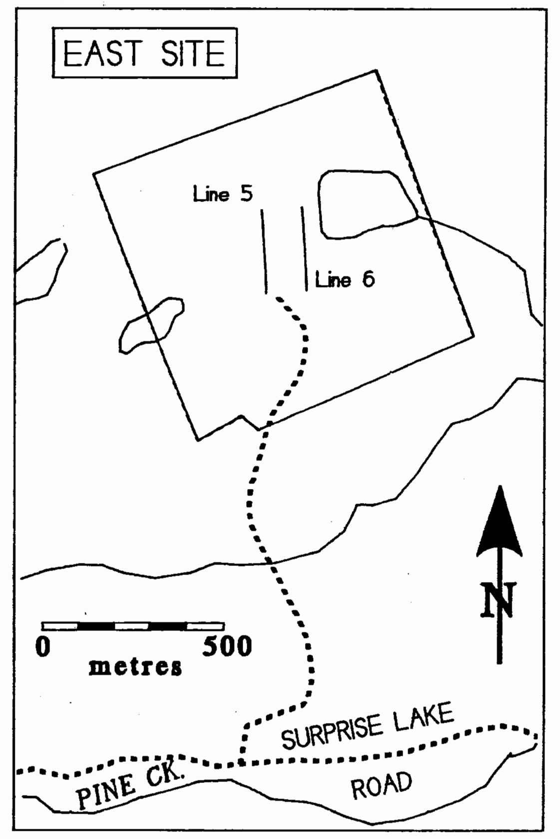
SEISMIC SECTION



TIME SECTION



DEPTH SECTION



SURVEY & DISPLAY SPECIFICATIONS

INSTRUMENT: GEOMETRICS S-12

SPREAD: BROADSIDE OFFSET T

GROUP INTERVAL: 3 m

SHOT INTERVAL: 18 m, OFFSET 24 m

FILTERS: HI CUT 500 Hz / LOW CUT 280 Hz

AGC: IN

NMO VELOCITY: 1950 m/s

0 5 metres

WESTERN PACIFIC MINING CORP.	PINE CREEK PLACER PROPERTY
REFLECTION SEISMIC SURVEY COMPOSITE PROFILES - LINE 6	MINING DISTRICT: ATLIN B.C. NTS:104 N 11 | SCALE: 1:500 OPERATOR: M.P. / R.S.
AMEROK GEOSCIENCES LTD.	DATE: 16DEC95 | FIGURE: 15