

GEOLOGICAL SURVEY OF CANADA



COMMISSION GÉOLOGIQUE DU CANADA

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**AIRBORNE GAMMA RAY SPECTROMETER  
SURVEY**

**SASKATCHEWAN**

**1989**

**KIMBERLITE TEST STUDY**



Energy, Mines and  
Resources Canada

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Ressources Canada

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GEOLOGICAL SURVEY OF CANADA  
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OTTAWA

SASKATCHEWAN KIMBERLITE STUDY: AIRBORNE GAMMA-RAY  
SPECTROMETRIC TEST SURVEY

R. Hetu  
Geological Survey of Canada

In 1989 the Geological Survey of Canada collected airborne geophysical data over known and potential kimberlite occurrences in the Prince Albert area, Saskatchewan. In addition to gamma-ray spectrometric data, VLF electromagnetic and total field magnetic data were recorded. The objective was to determine the usefulness of gamma ray spectrometric data as an exploration tool for kimberlites in this area.

The survey covered a 15 x 15 km area at Sturgeon Lake, and also individual flight lines in the Luck Lake, Hitch, Elbow, Dahinda and Querrin areas. The Sturgeon Lake survey area covers two known kimberlite occurrences (indicated by CC and SL on location map). The other five target areas were selected on the basis of anomalous seismic data as indicated by stippling on the flight line maps.

Data Presentation

This booklet contains flight line location maps at 1:50,000 scale, followed by the associated stacked profiles at the same scale. Profile data include the VLF quadrature and total field components, magnetic total field, gamma radiation exposure rate, potassium, equivalent uranium and equivalent thorium concentrations, eU/eTh, eU/K and eTh/K ratios, and at the top of the page, terrain clearance. A set of contour maps showing the radiometric parameters at 1:100,000 for the Sturgeon Lake survey is also included.

Results and Conclusion

Magnetic surveys have traditionally been the primary geophysical method used to explore for kimberlites. More recently electromagnetic methods (predominantly INPUT) have been employed successfully. The gamma ray spectrometric method has only been utilized on occasion.

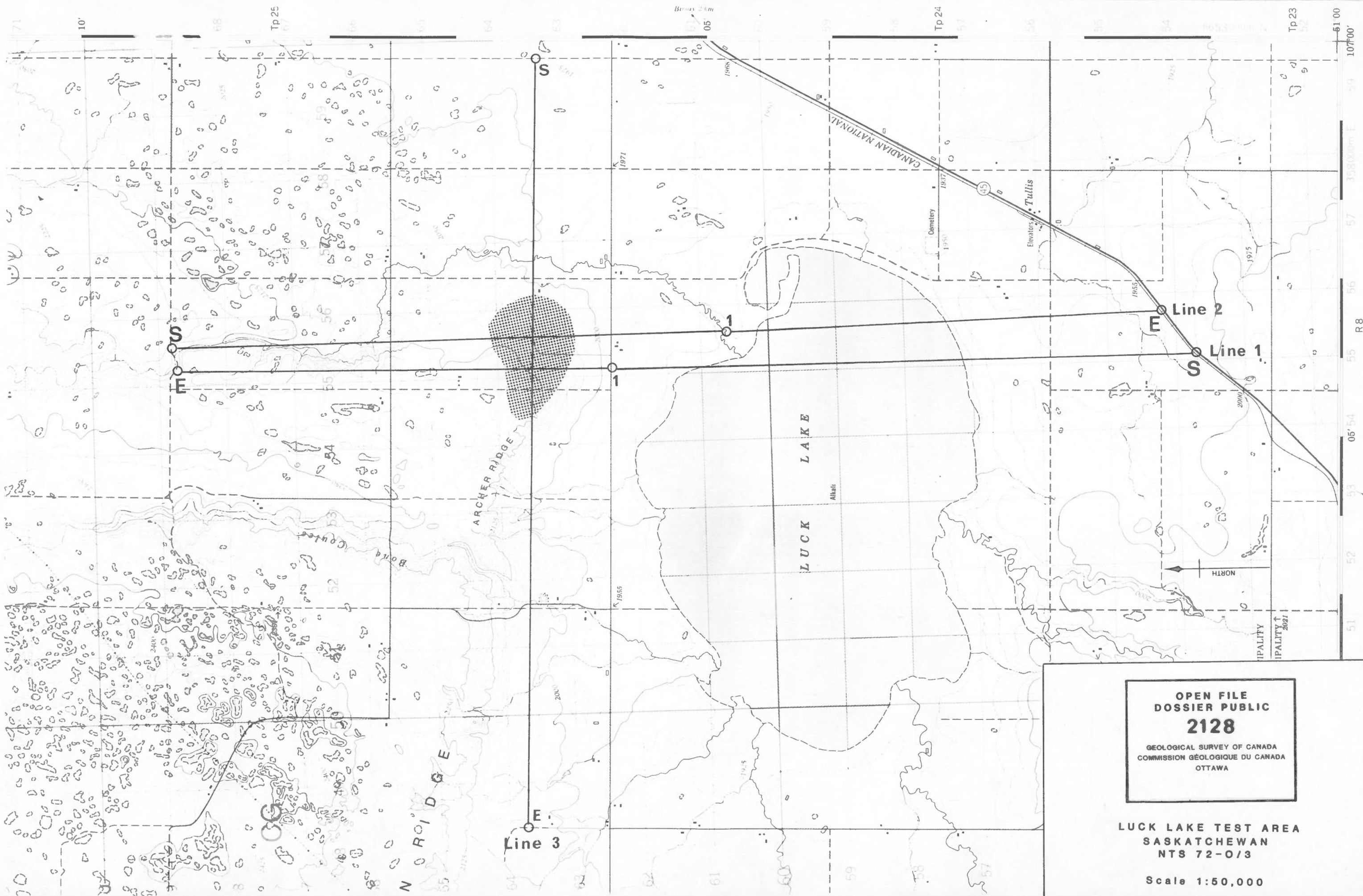
The magnetic and EM signature over kimberlites has proven to be quite variable. In a single kimberlite region, EM and/or magnetic contrasts may be non-existent or weak or very strong in comparison to adjacent rock units (Macnae, 1989). Based on the radioelement concentrations in kimberlites reported by Fesq et al., (1975) a similar variability might be expected in airborne gamma ray spectrometric data over kimberlites. However, insufficient data

have been collected to prove or disprove the merits of the gamma ray method.

The Geophysical survey results do not indicate any significant gamma-ray anomalies over the two known kimberlites in the Sturgeon Lake area. The absence of significant gamma-ray anomalies here is either the result of little radioelement contrast between the kimberlite and the host rock, or because the overburden masks the kimberlite signature. The VLF data are incomplete in the vicinity of the two kimberlites. The only significant geophysical expression is shown by the magnetic total field profile on Line 27, where a 60 to 90 nanotesla anomaly coincides with the Sturgeon Lake kimberlite pipe. This anomaly suggests a very small body with a diameter in the order of a hundred metres.

References

- Dunn, C.E., 1989: The Sturgeon Lake Kimberlite - an investigation into the geochemical response exhibited by organic sample media; Geol. Surv. Can., Saskatchewan, Report of Investigations.
- Fresq, H.W., Kable, E.J.D., Gurney, J.J. 1975: Aspects of the geochemistry of kimberlites from the Premier mine, and other selected South African occurrences with particular reference to the rare earth elements; Physics and Chemistry of the Earth, Vol. 9, pp. 687-707.
- Macnae, J., 1979: Kimberlites and exploration geophysics; Geophysics, Vol. 44, No. 8, pp. 1395-1416.

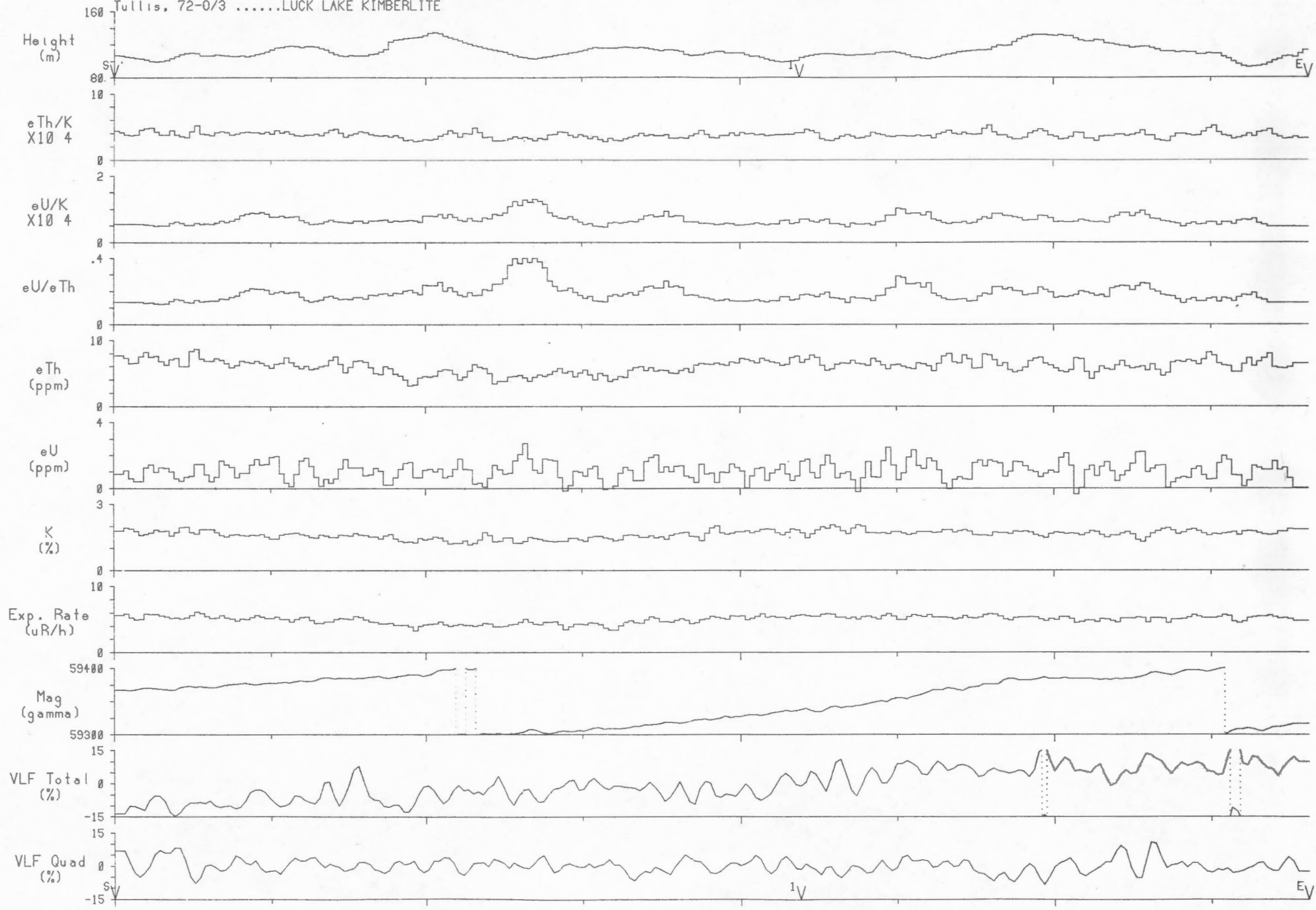


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**LUCK LAKE TEST AREA**  
**SASKATCHEWAN**  
**NTS 72-0/3**

Scale 1:50,000

REGINA KIMBERLITES SASKATCHEWAN 1989  
Tullis, 72-0/3 .....LUCK LAKE KIMBERLITE

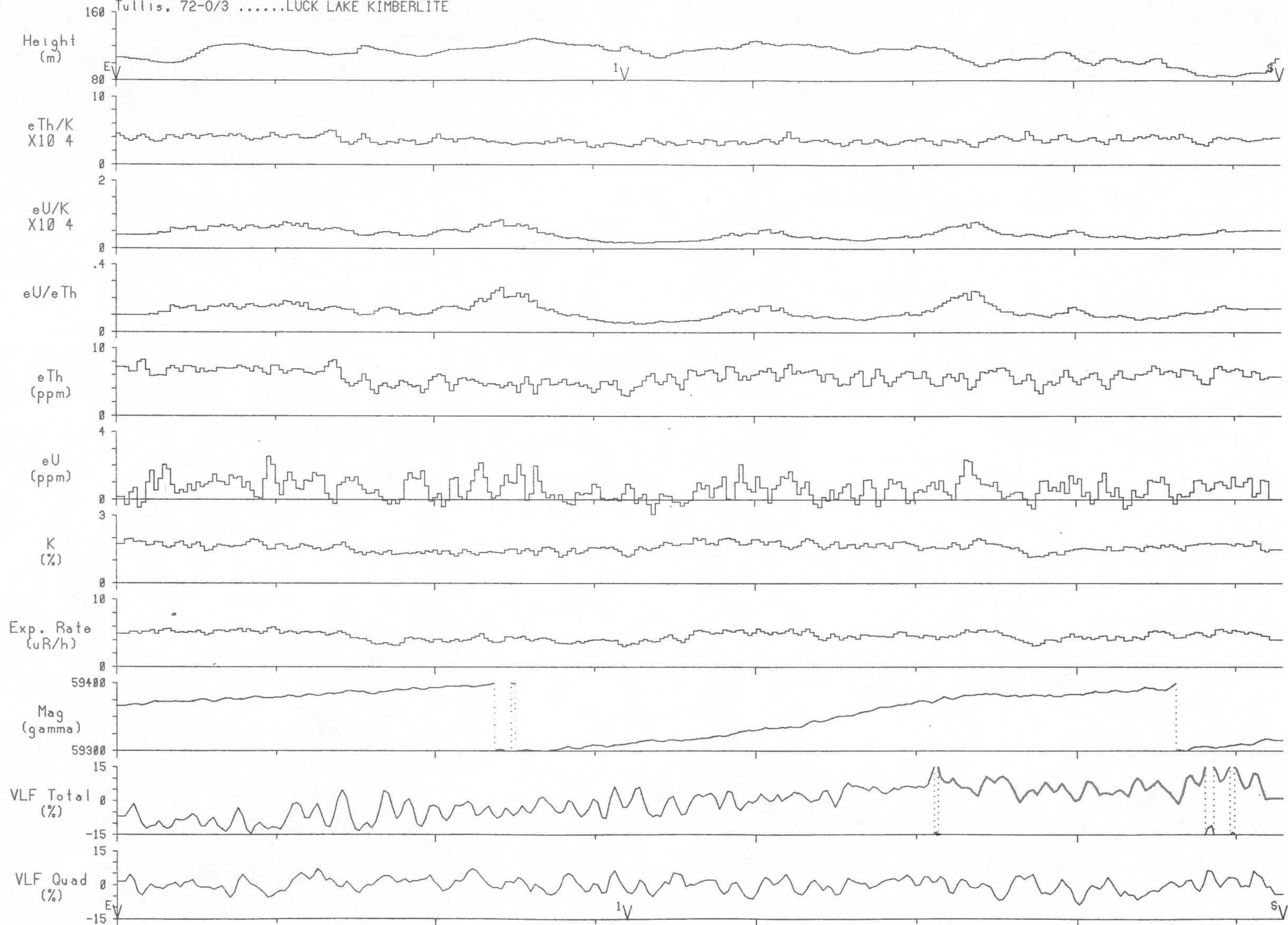


Line 1

2 km

Scale 1:50000

REGINA KIMBERLITES SASKATCHEWAN 1989  
Tullis, 72-0/3 .....LUCK LAKE KIMBERLITE

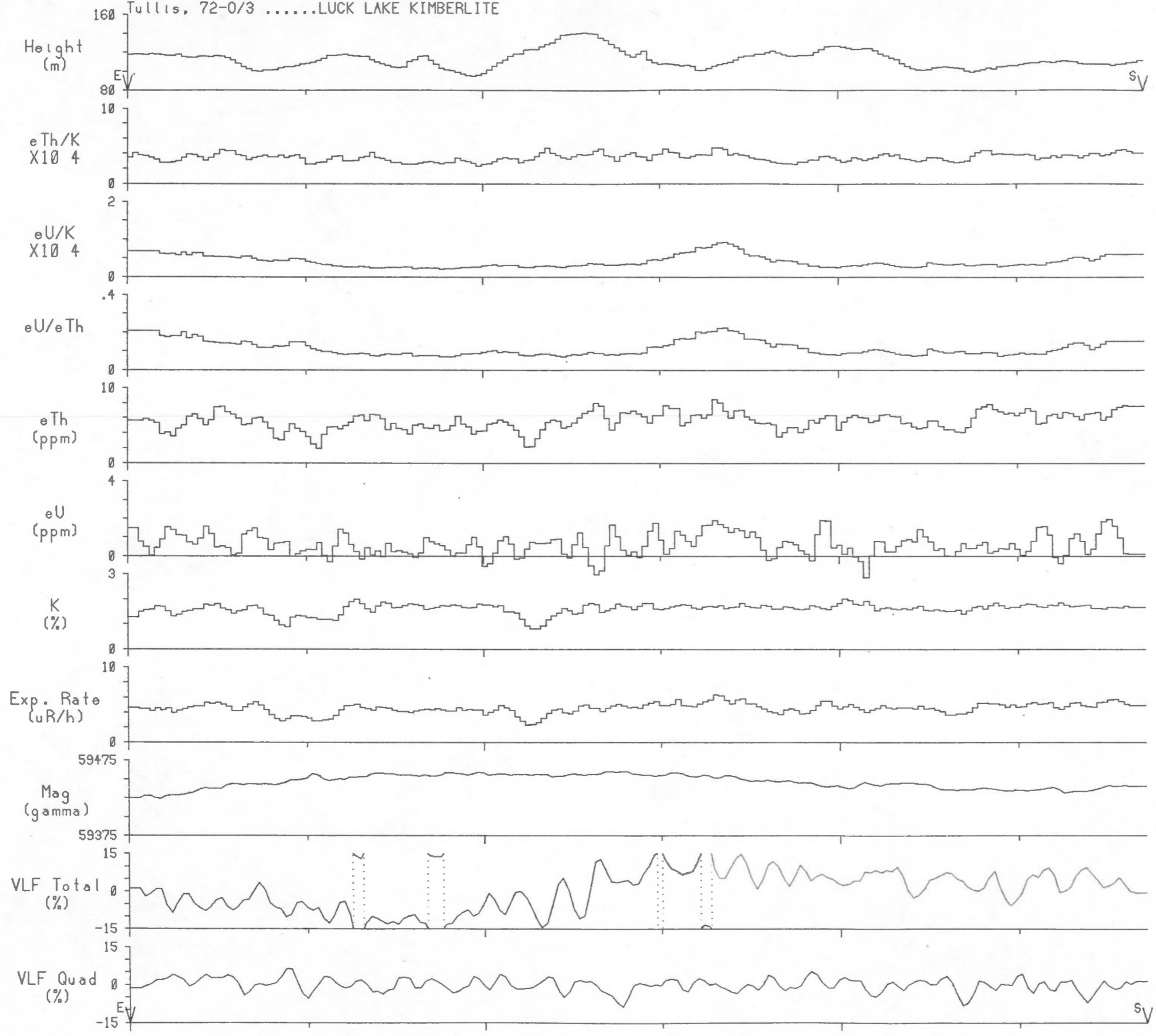


Line 2

2 km

Scale 1:50000

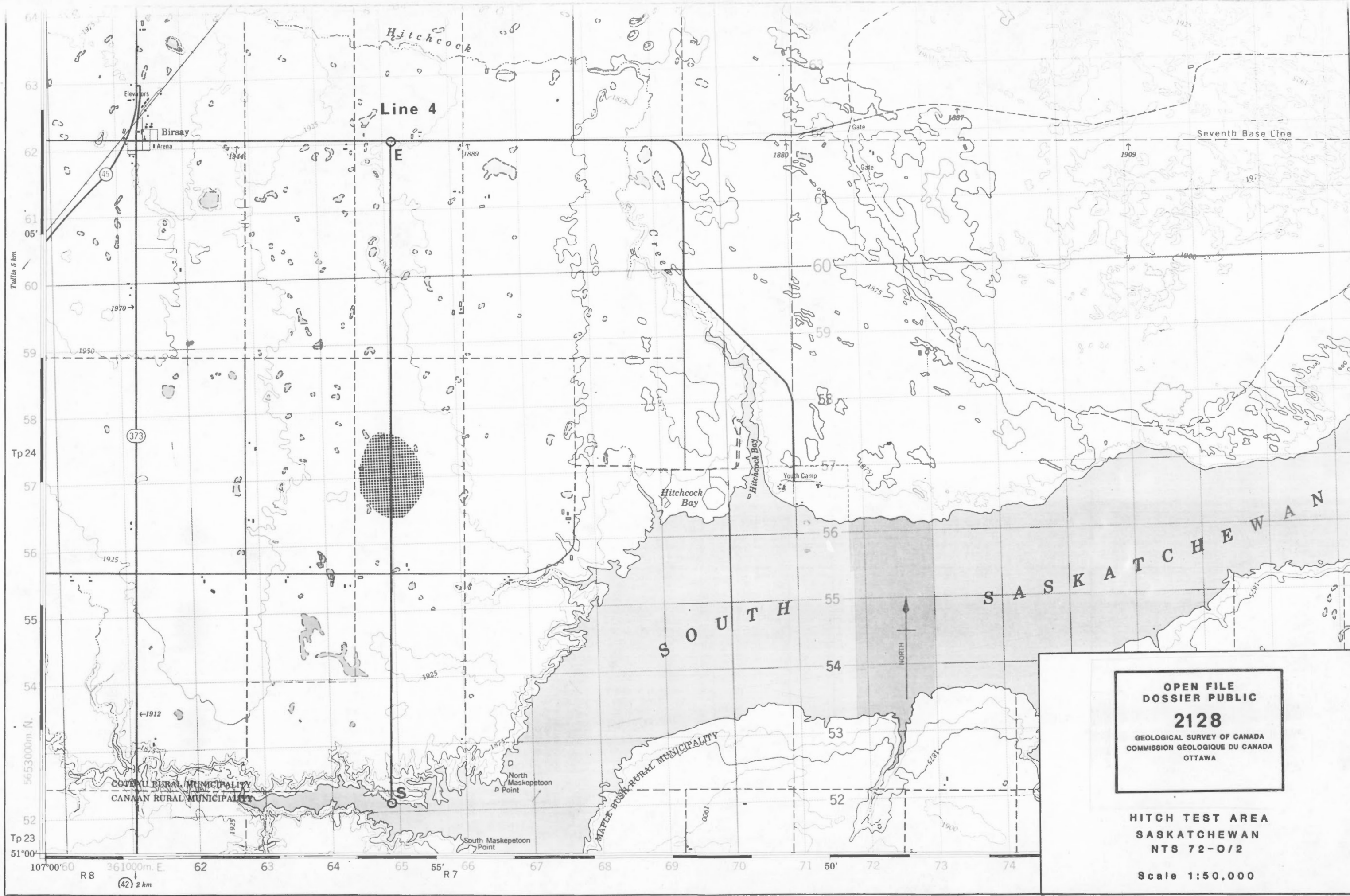
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Tullis, 72-0/3 .....LUCK LAKE KIMBERLITE



Line 3

2 km

Scale 1:50000

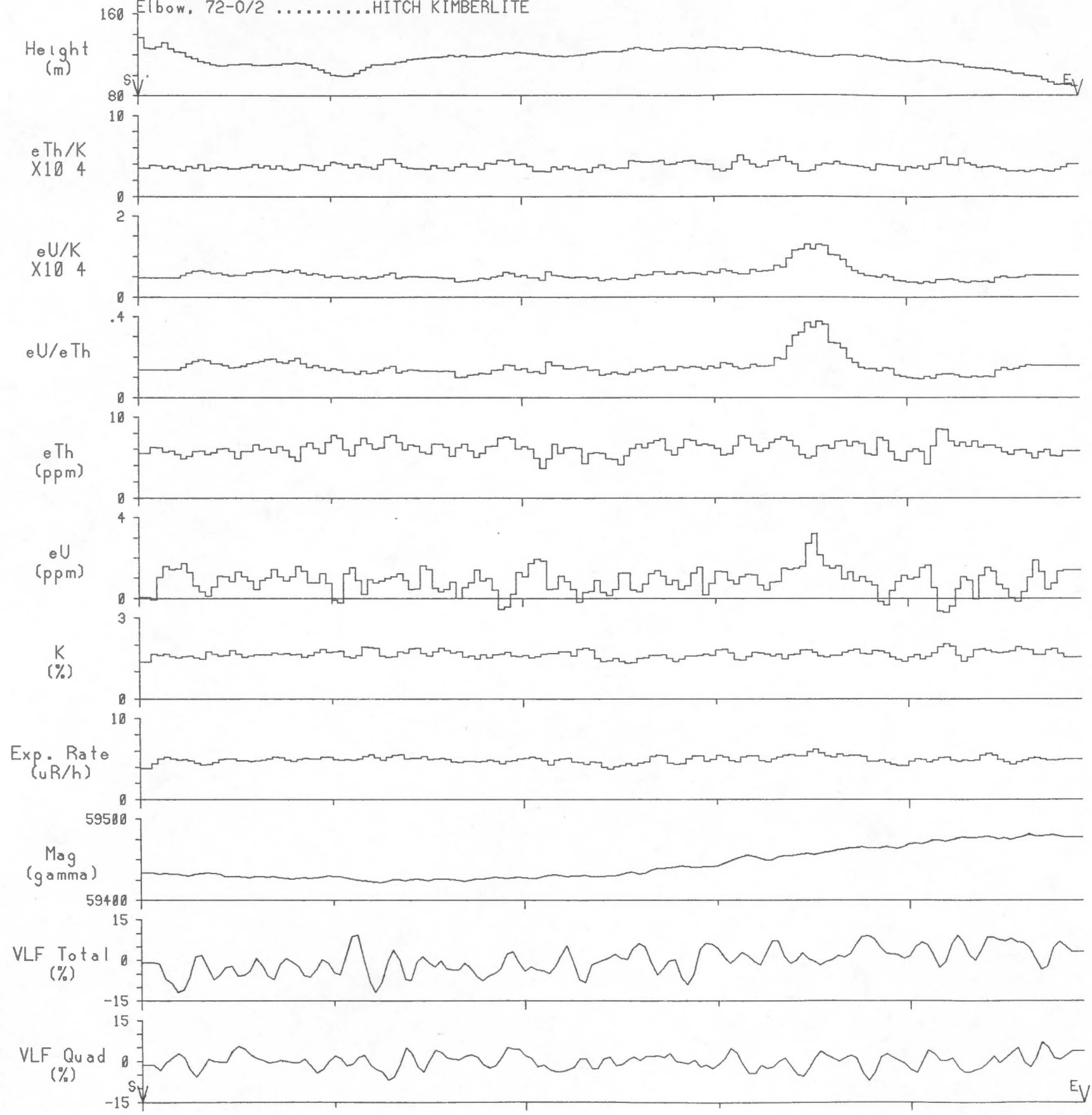


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**HITCH TEST AREA**  
**SASKATCHEWAN**  
**NTS 72-0/2**

Scale 1:50,000

REGINA KIMBERLITES SASKATCHEWAN 1989  
Elbow, 72-0/2 .....HITCH KIMBERLITE

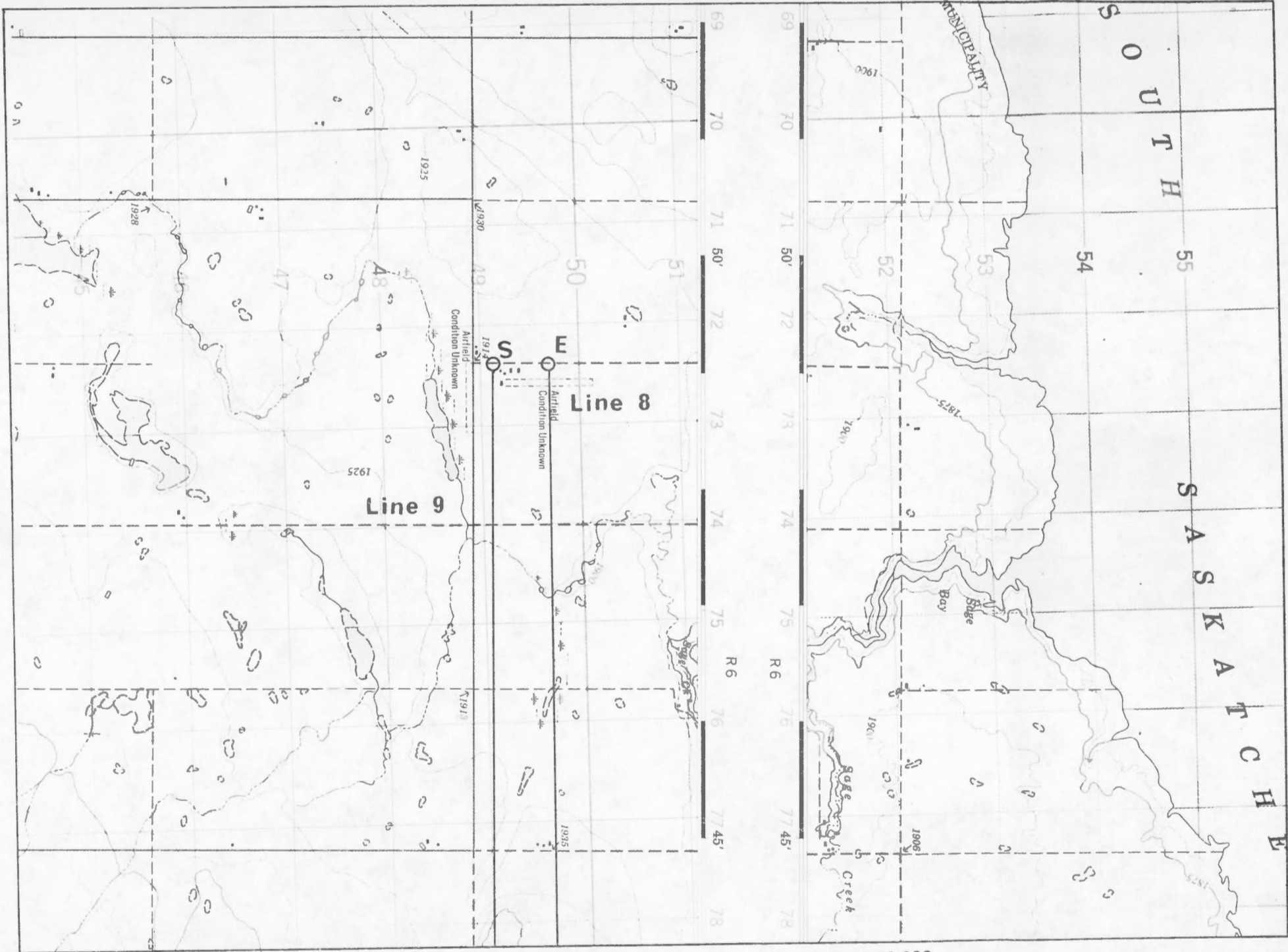


Line 4

2 km

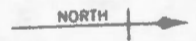
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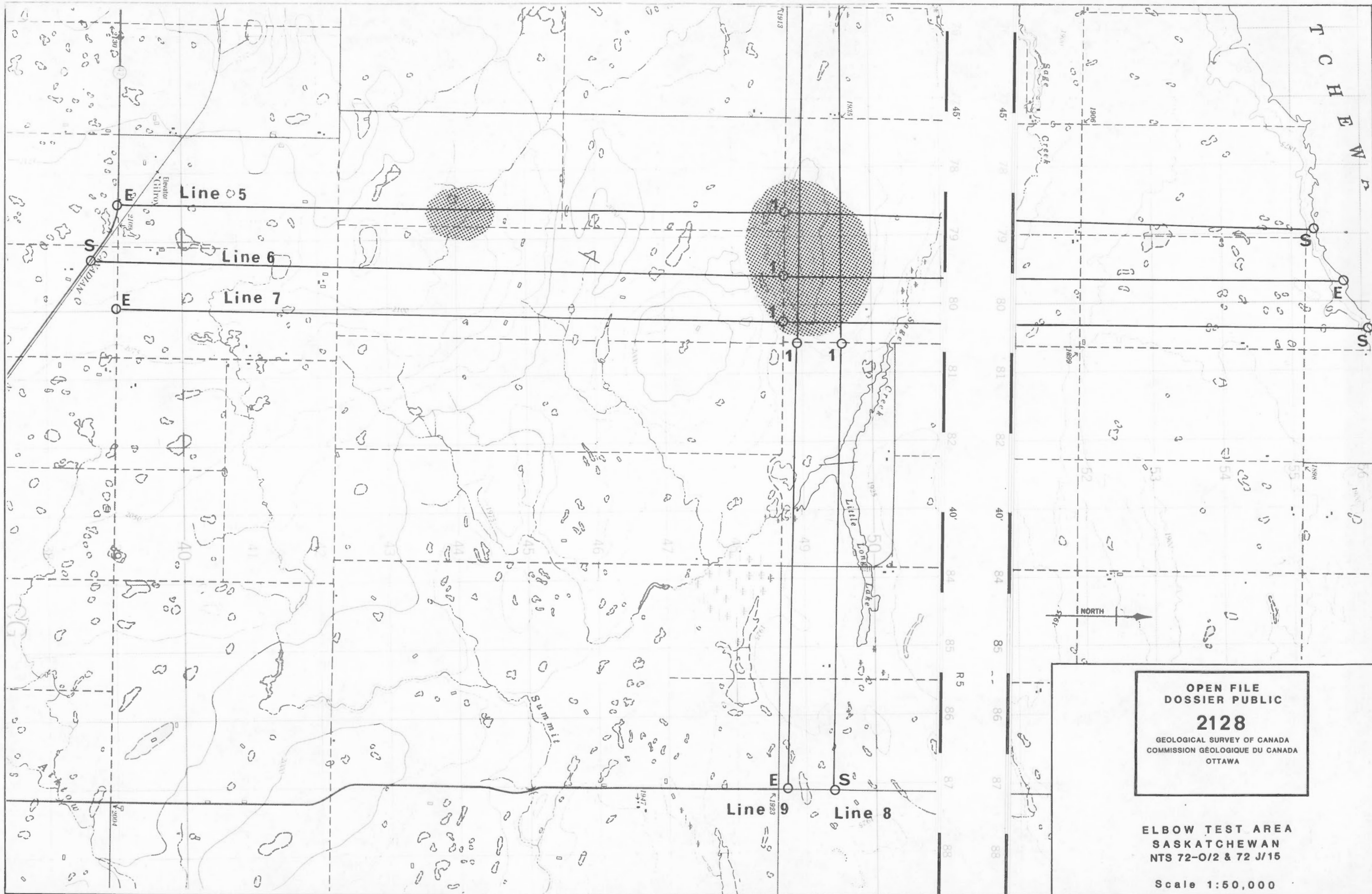




ELBOW TEST AREA SASKATCHEWAN  
NTS 72-O/2 & 72 J/15

Scale 1:50,000



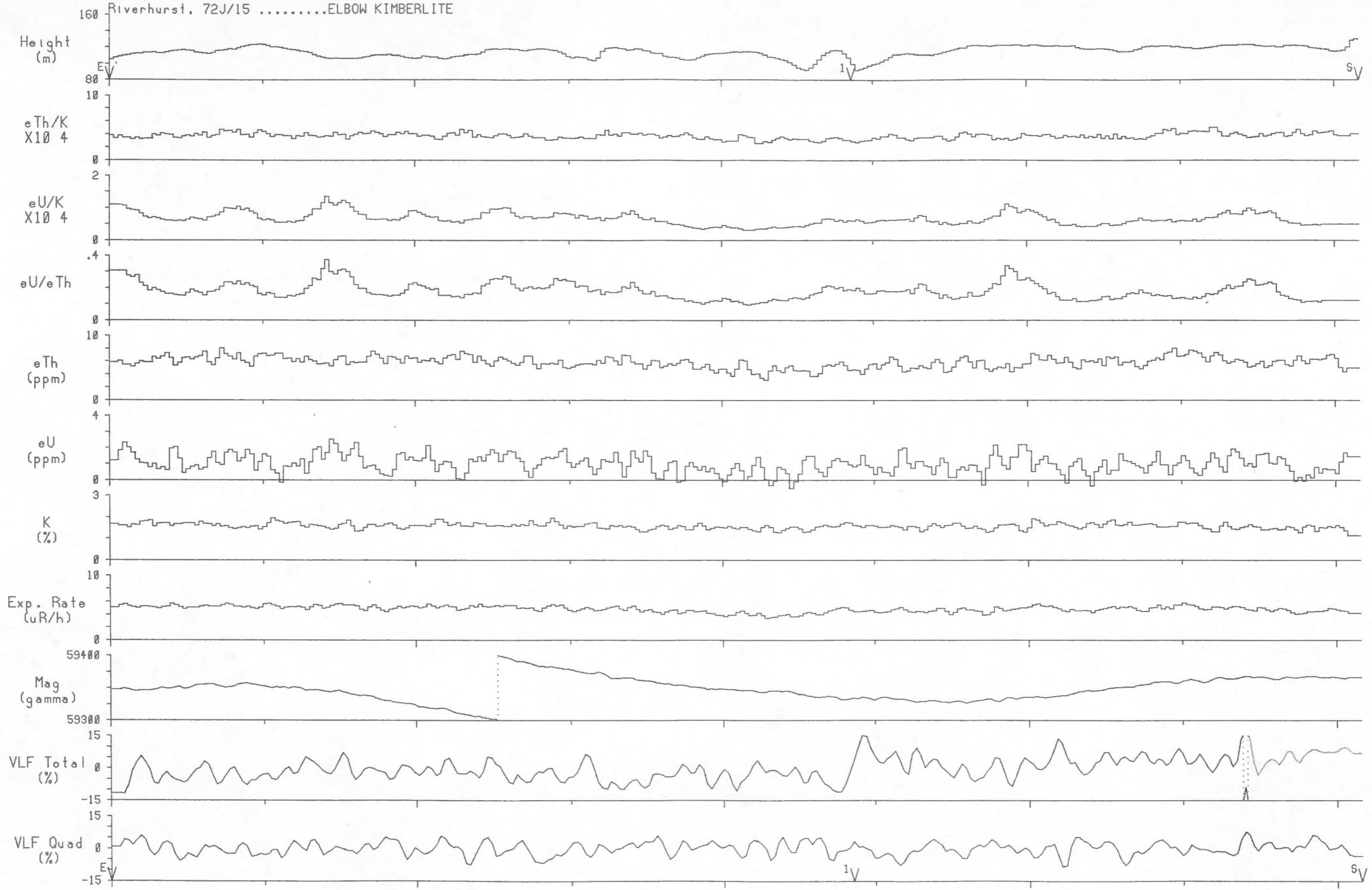


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ELBOW TEST AREA  
SASKATCHEWAN  
NTS 72-O/2 & 72 J/15

Scale 1:50,000

REGINA KIMBERLITES SASKATCHEWAN 1989  
Riverhurst, 72J/15 ..... ELBOW KIMBERLITE



Line 5

2 km

Scale 1:50000

have been collected to prove or disprove the merits of the gamma ray method.

The Geophysical survey results do not indicate any significant anomalies. Of particular interest are the two known kimberlites in the Sturgeon Lake area. The absence of significant gamma-ray anomalies here is either the result of little radioelement contrast between the kimberlite and the host rock, or because the overburden masks the kimberlite signature. The VLF data are incomplete in the vicinity of the two kimberlites. Only the most westerly kimberlite is mapped with VLF, and it does not appear to show a response. The most significant geophysical expression is shown by the magnetic total field profile on Line 27, where a 60 to 90 nanotesla anomaly coincides with the Sturgeon Lake kimberlite pipe. This anomaly suggests a very small body with a diameter in the order of a hundred metres.

#### References

- Dunn, C.E., 1989: The Sturgeon Lake Kimberlite - an investigation into the geochemical response exhibited by organic sample media; Geol. Surv. Can., Saskatchewan, Report of Investigations.
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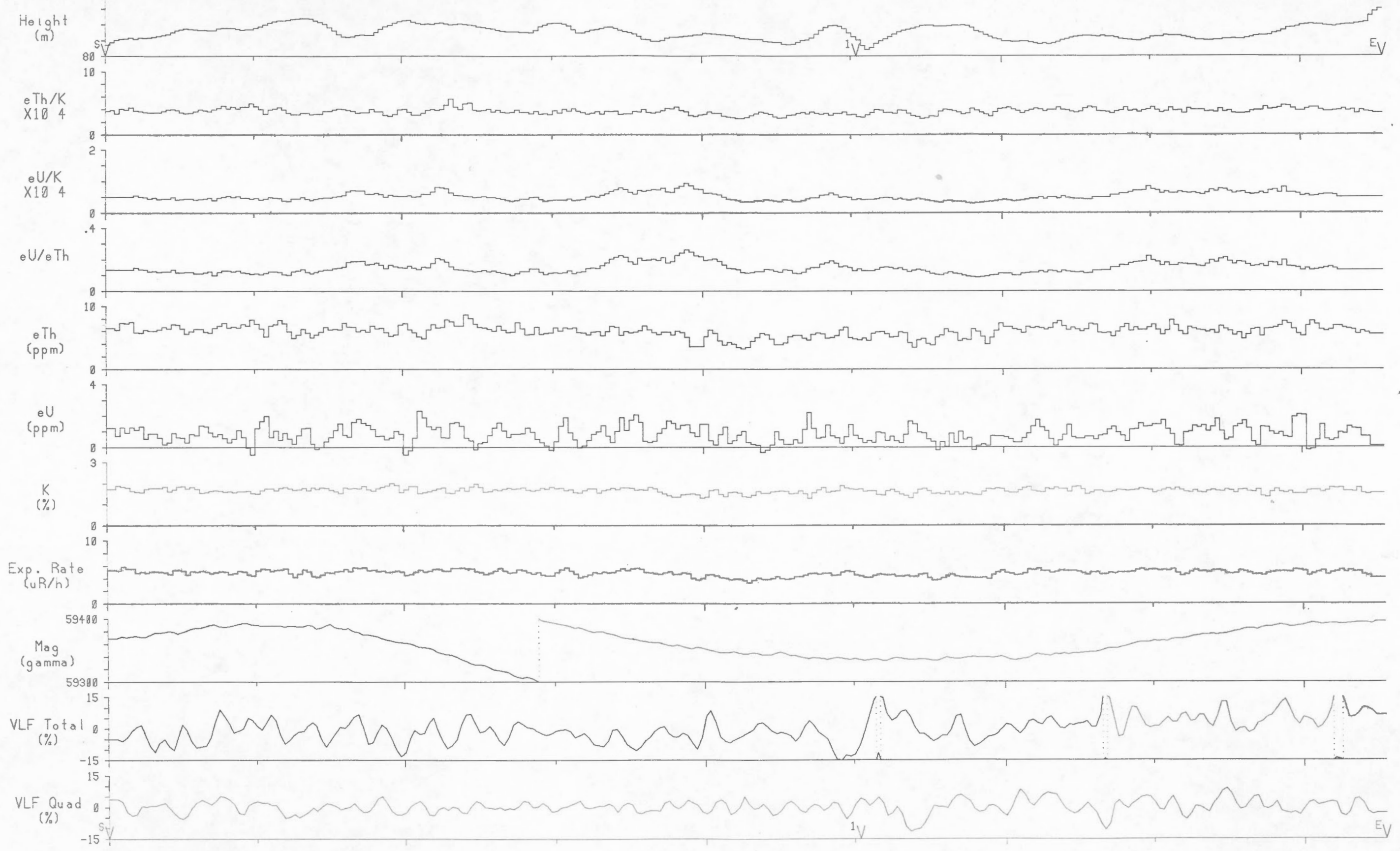
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REGINA KIMBERLITES SASKATCHEWAN 1989  
Riverhurst, 72J/15 ..... ELBOW KIMBERLITE

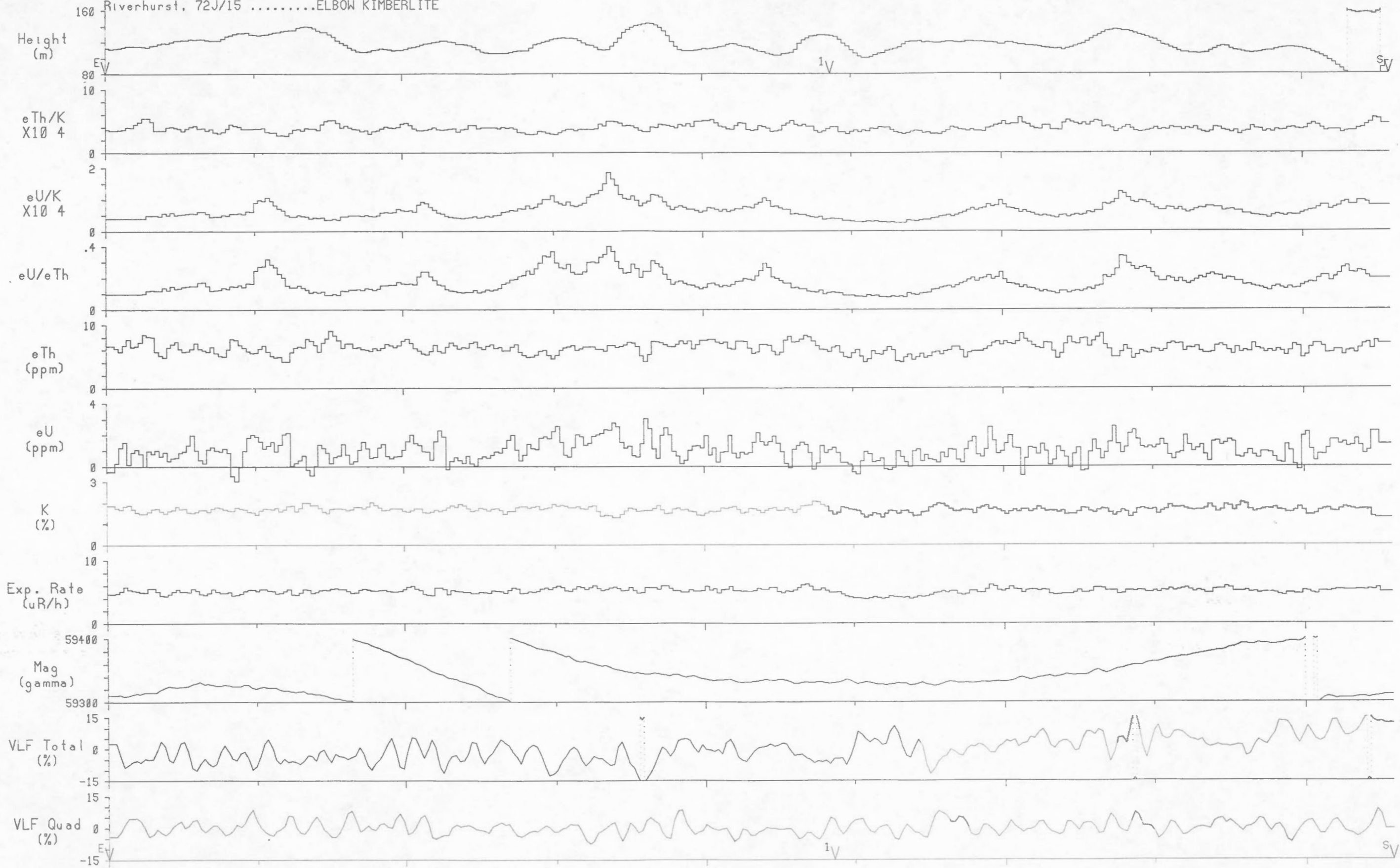


Line 6

2 km

Scale 1:50000

REGINA KIMBERLITES SASKATCHEWAN 1989  
Riverhurst, 72J/15 ..... ELBOW KIMBERLITE

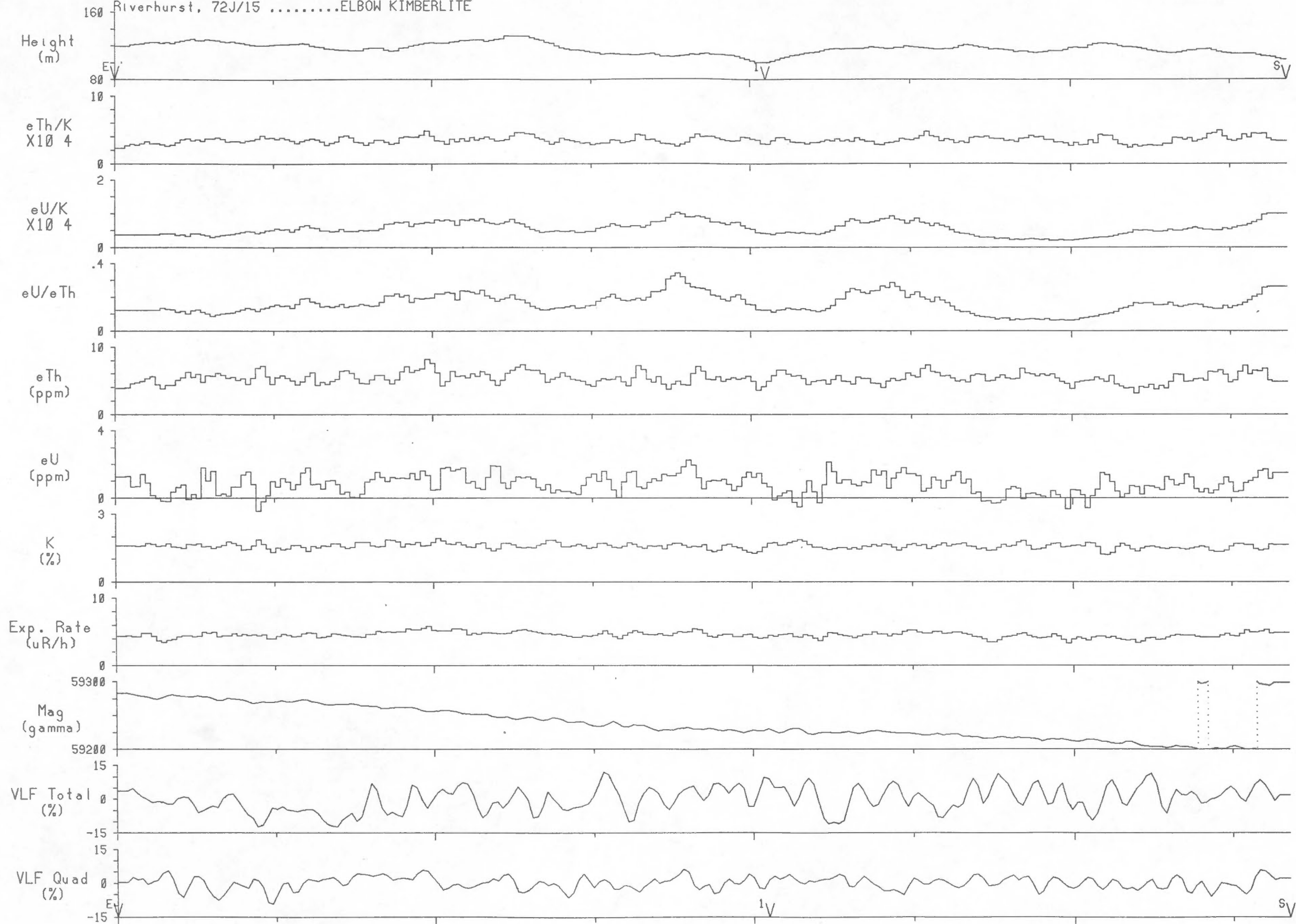


Line 7

2 km

Scale 1:50000

REGINA KIMBERLITES SASKATCHEWAN 1989  
Riverhurst, 72J/15 ..... ELBOW KIMBERLITE

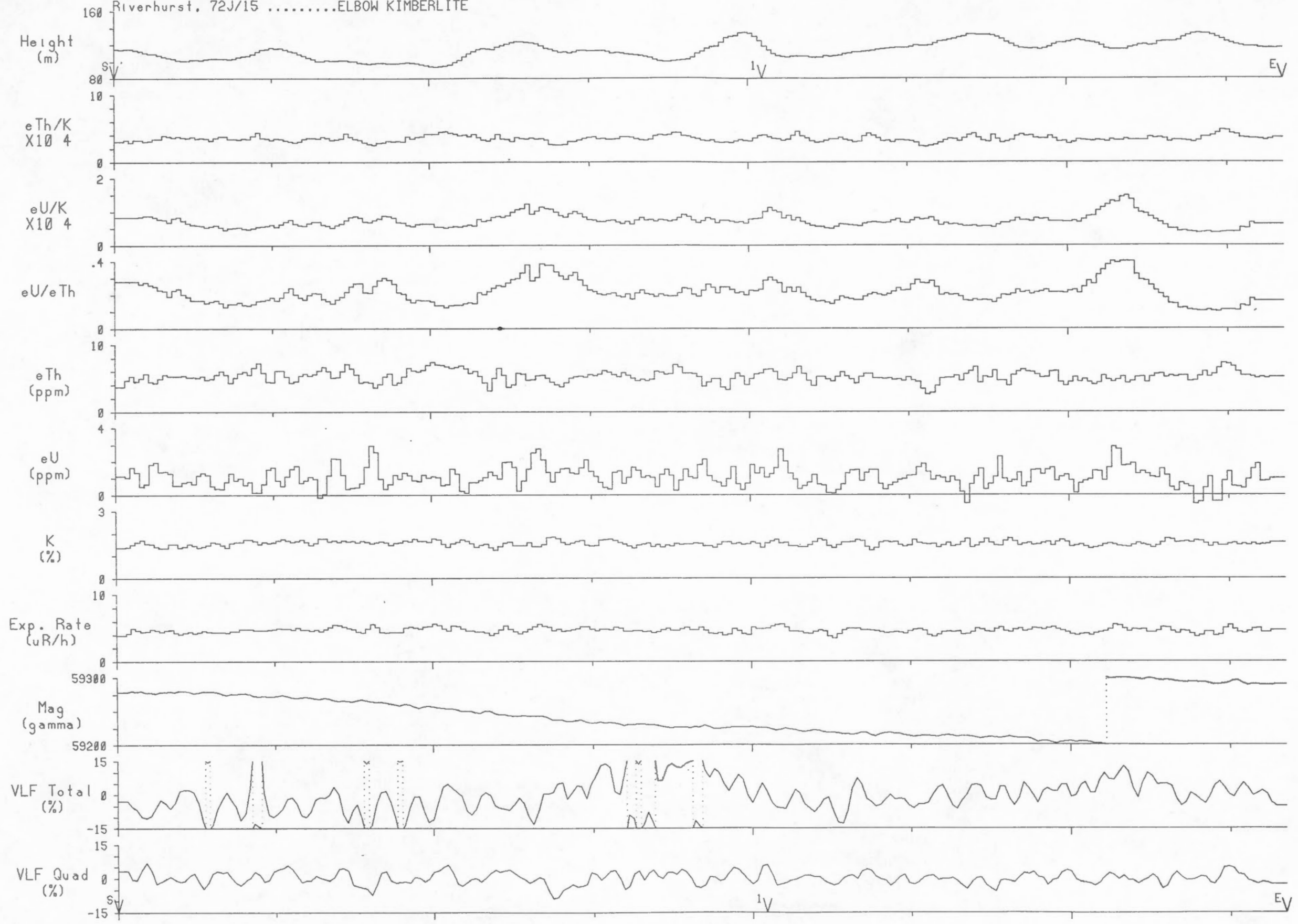


Line 8

2 km

Scale 1:50000

REGINA KIMBERLITES SASKATCHEWAN 1989  
Riverhurst, 72J/15 ..... ELBOW KIMBERLITE

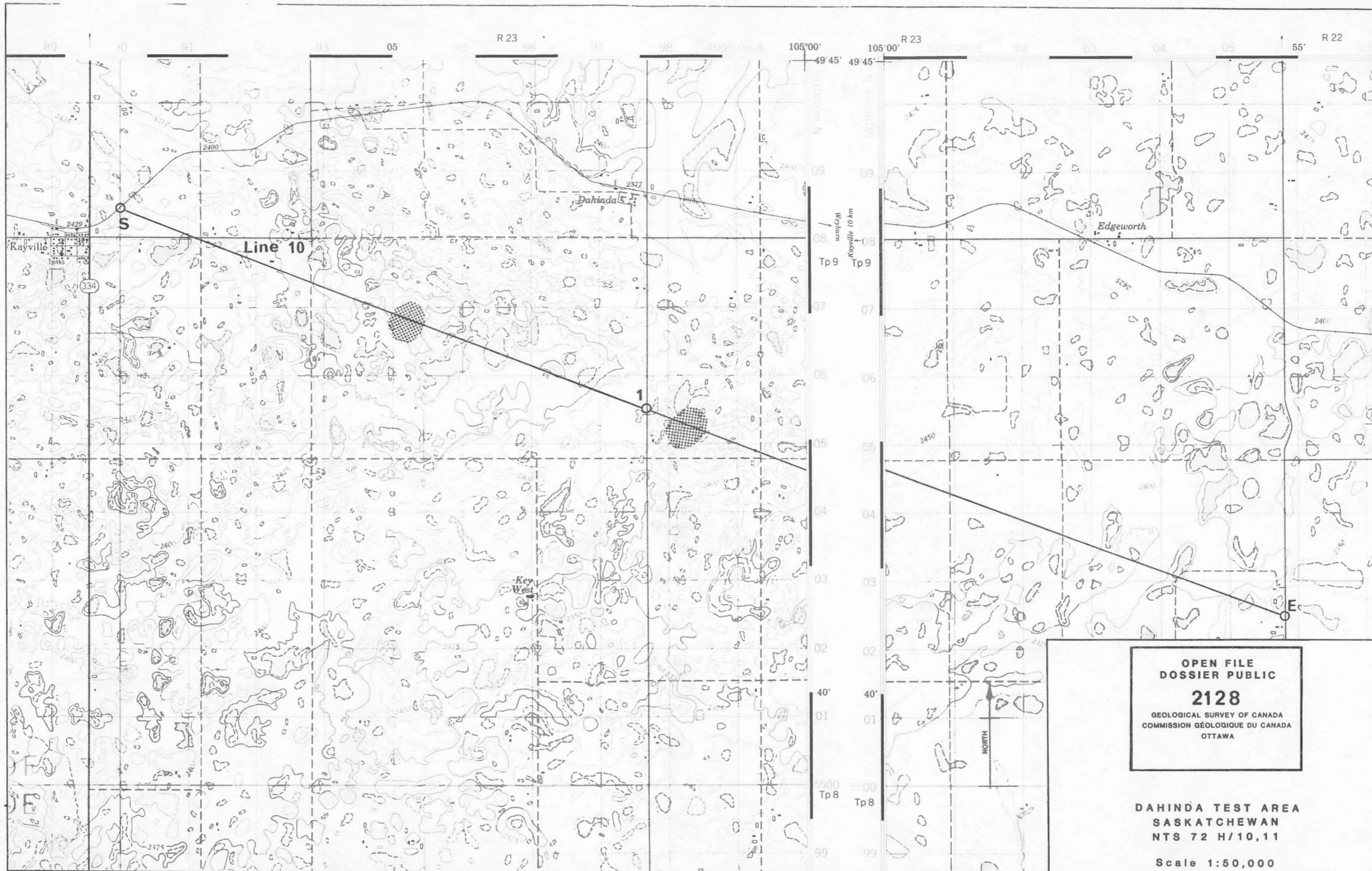


Line 9

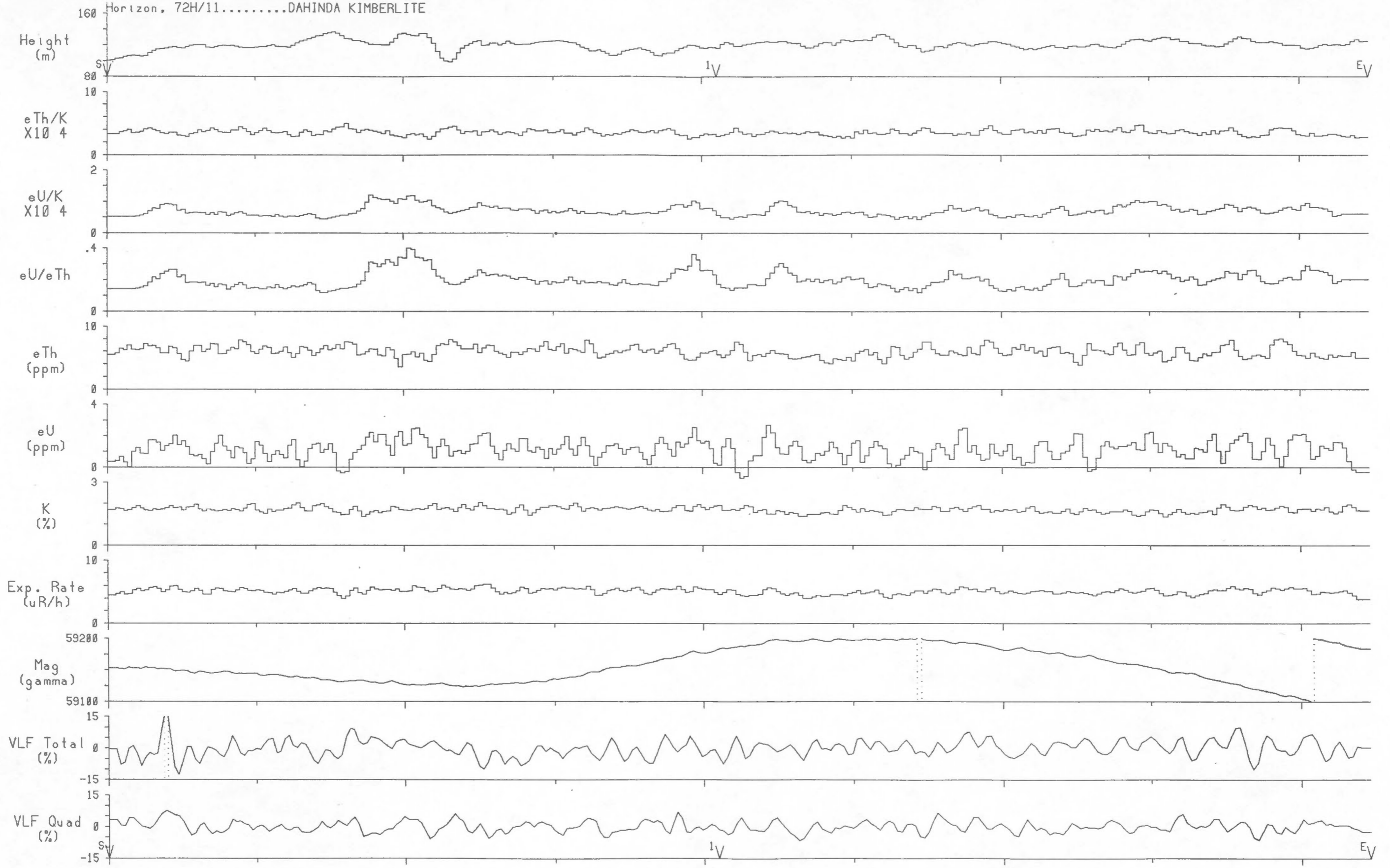
2 km

Scale 1:50000





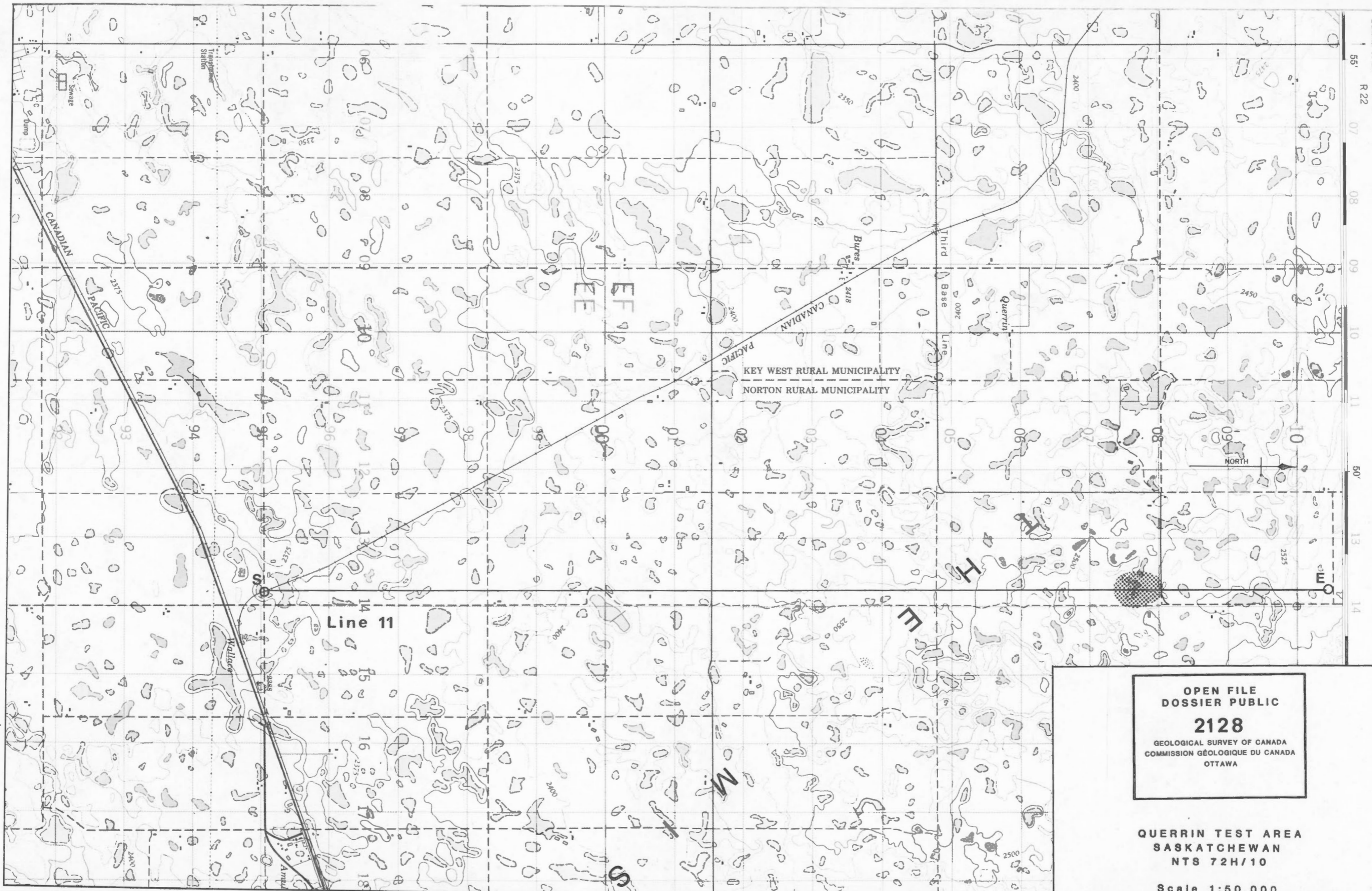
REGINA KIMBERLITES SASKATCHEWAN 1989  
Horizon, 72H/11.....DAHINDA KIMBERLITE



Line 10

2 km

Scale 1:50000



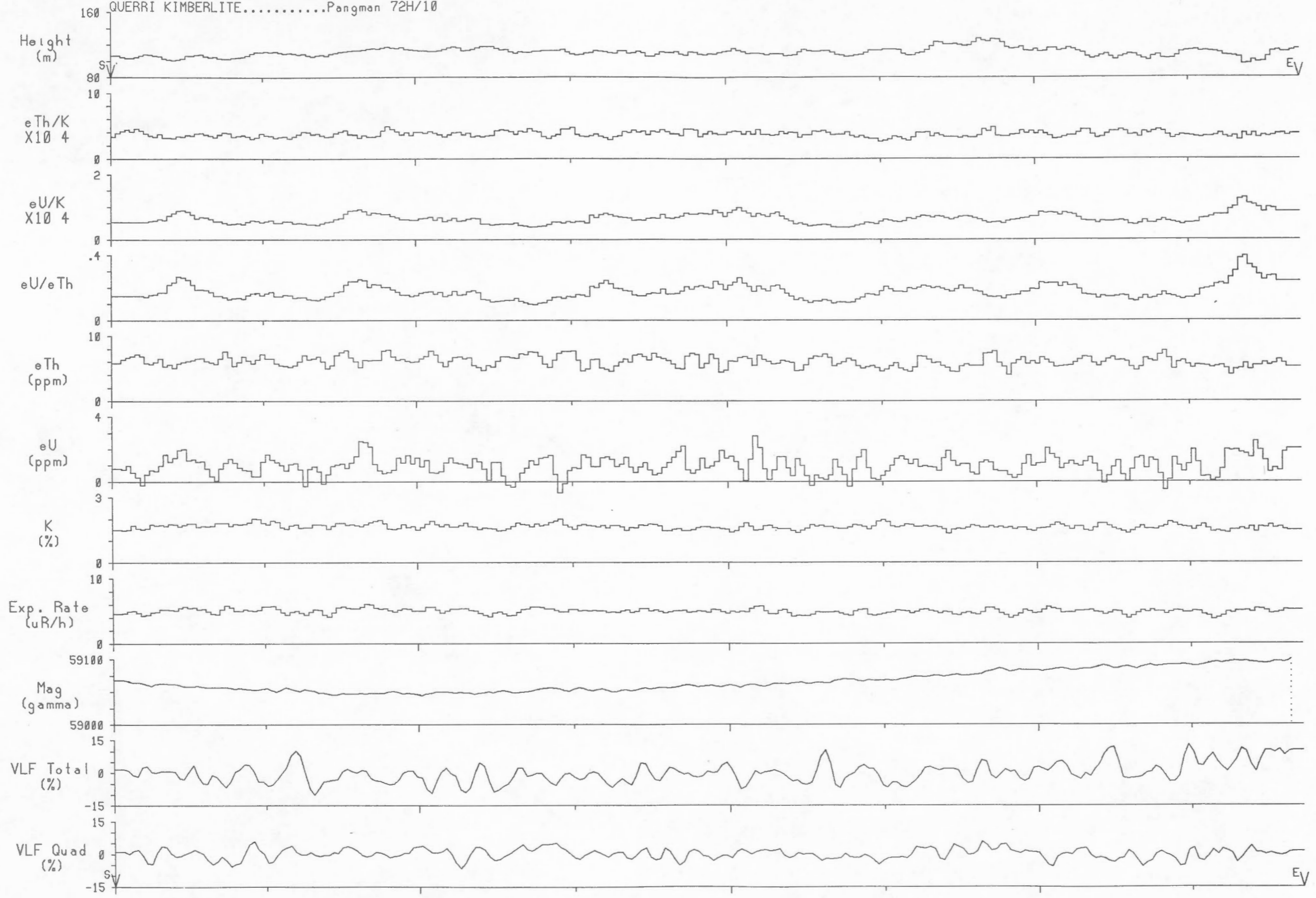
Dummer 16 km  
 55' R 22  
 07  
 08  
 09  
 10  
 11  
 13  
 14  
 50'

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QUERRIN TEST AREA  
 SASKATCHEWAN  
 NTS 72H/10

Scale 1:50,000

REGINA KIMBERLITES SASKATCHEWAN 1989  
QUERRI KIMBERLITE.....Pangman 72H/10



Line 11

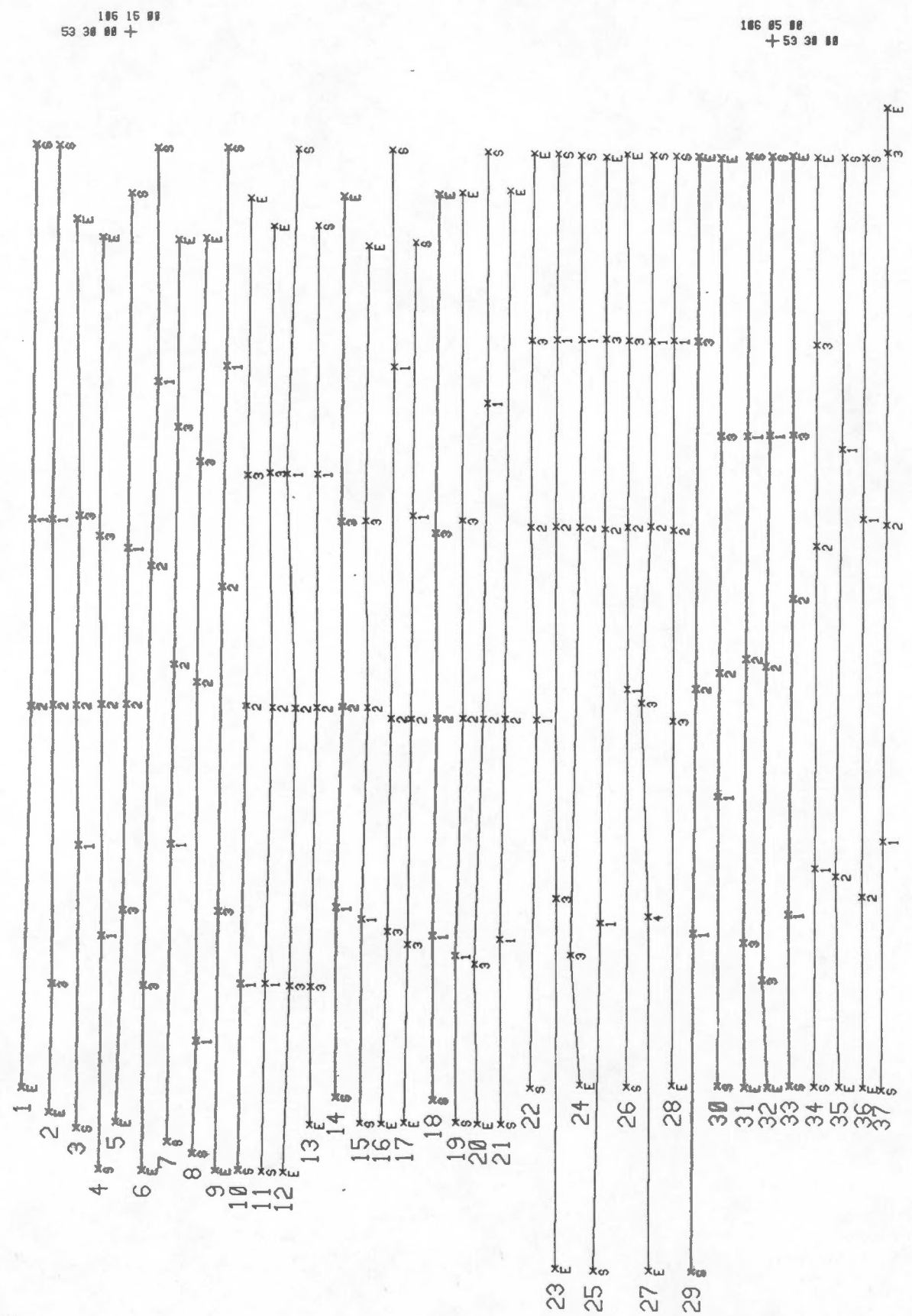
2 km

Scale 1:50000



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 STURGEON LAKE AREA, SASKATCHEWAN, 1989

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 compiled by R Hetu



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53 18 88 +  
 186 17 88

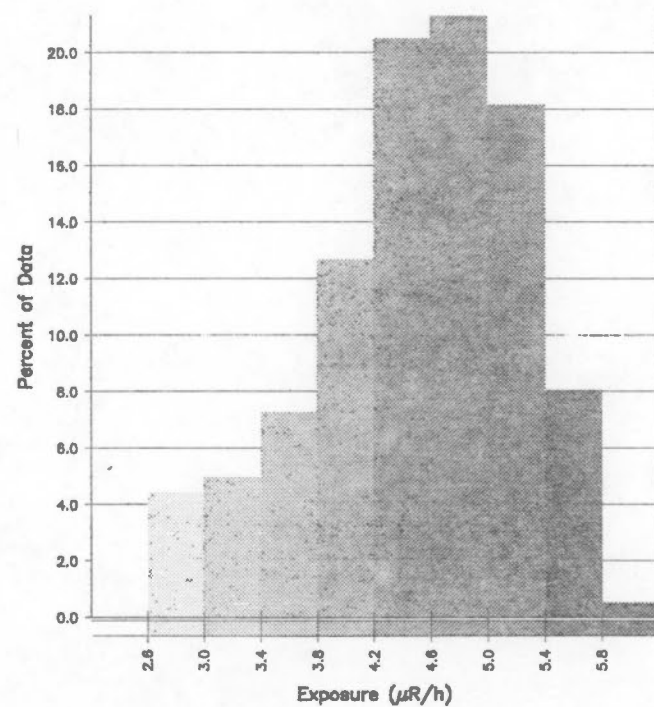
+ 53 18 88  
 186 82 88



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Scale = 1:100 000  
 Line spacing = 400 metres



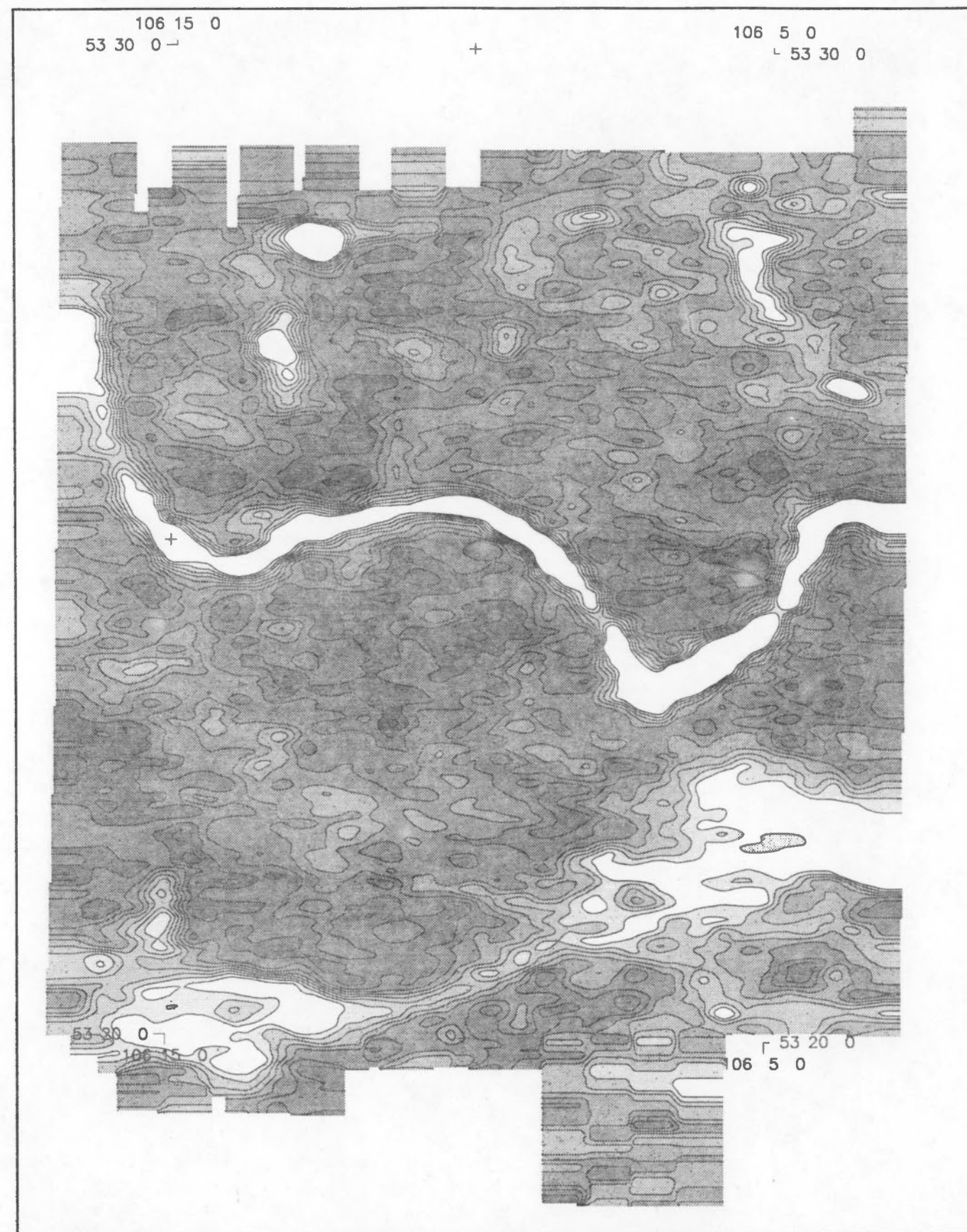
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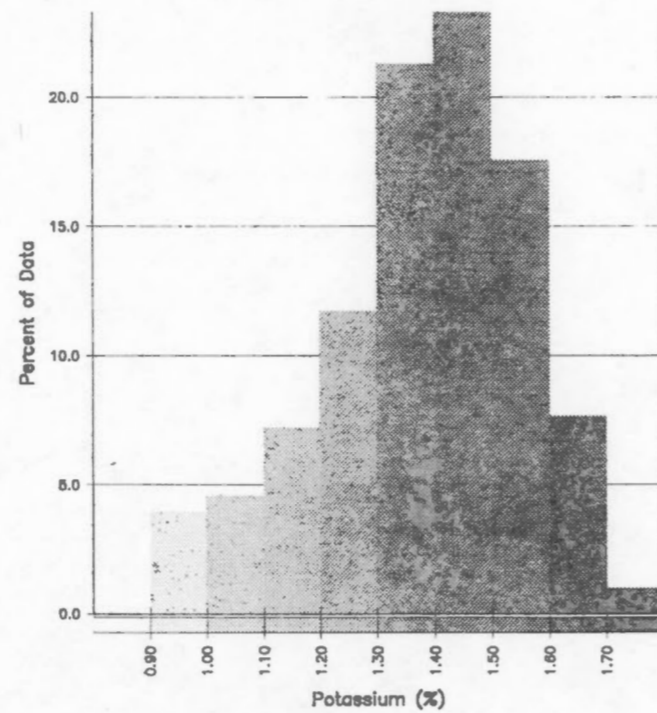
EXPOSURE (μR/H)



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 Line spacing = 400 metres



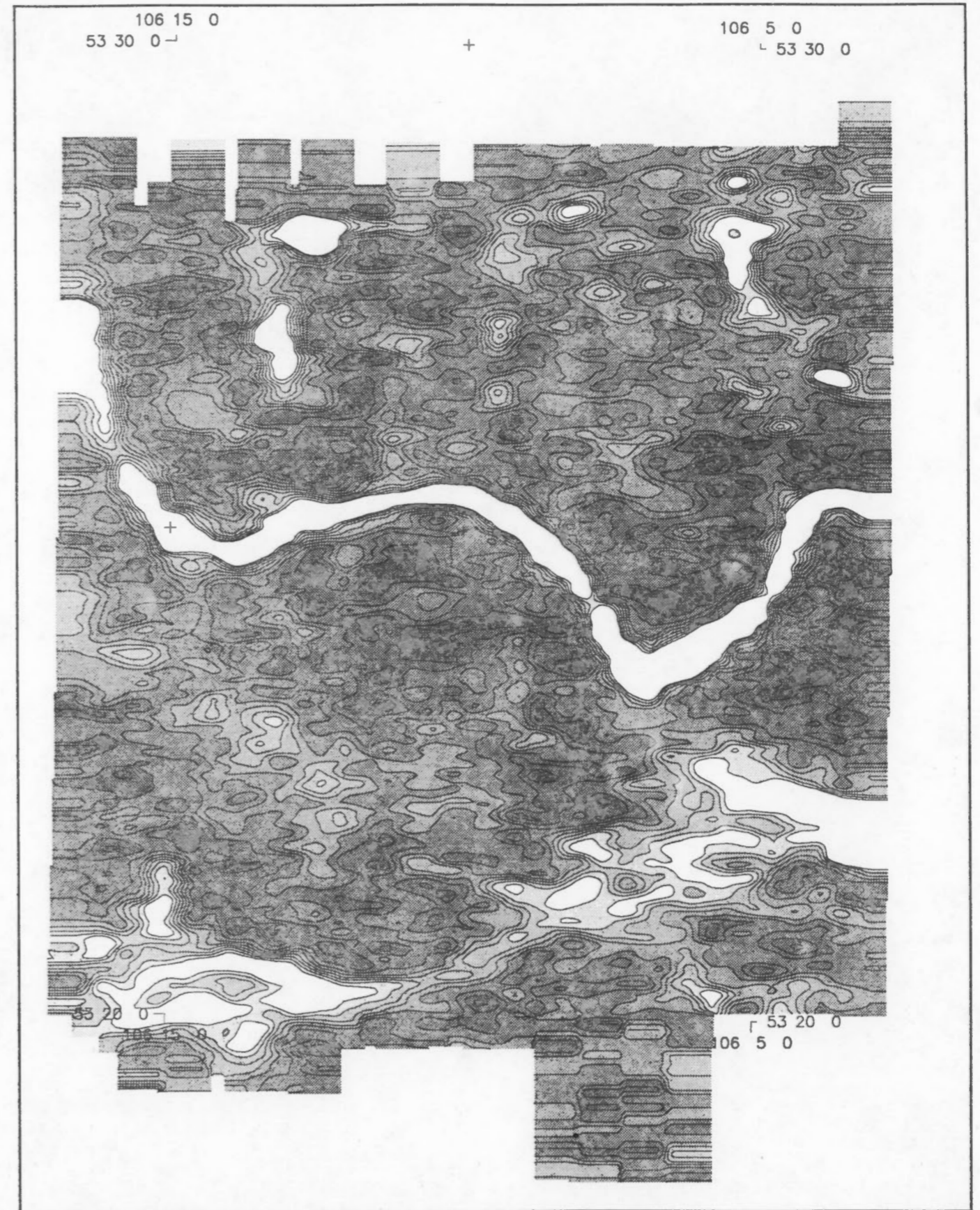
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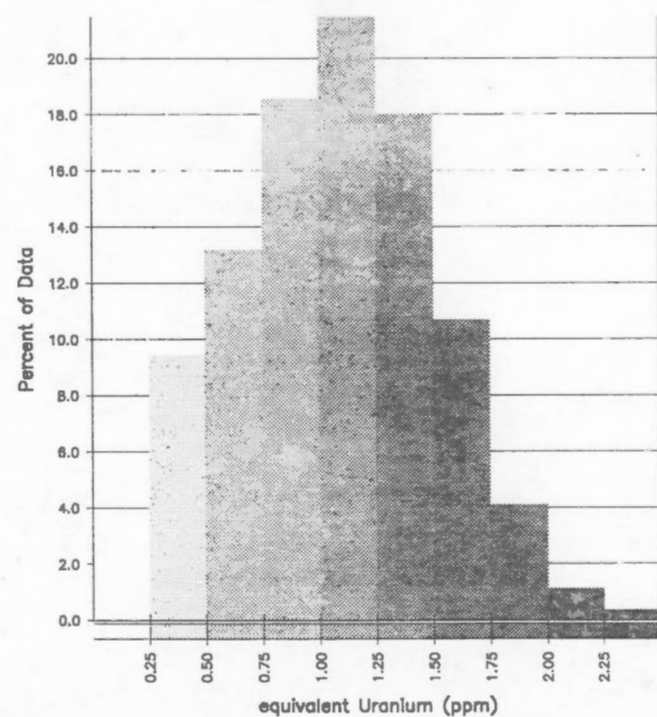
POTASSIUM (%)




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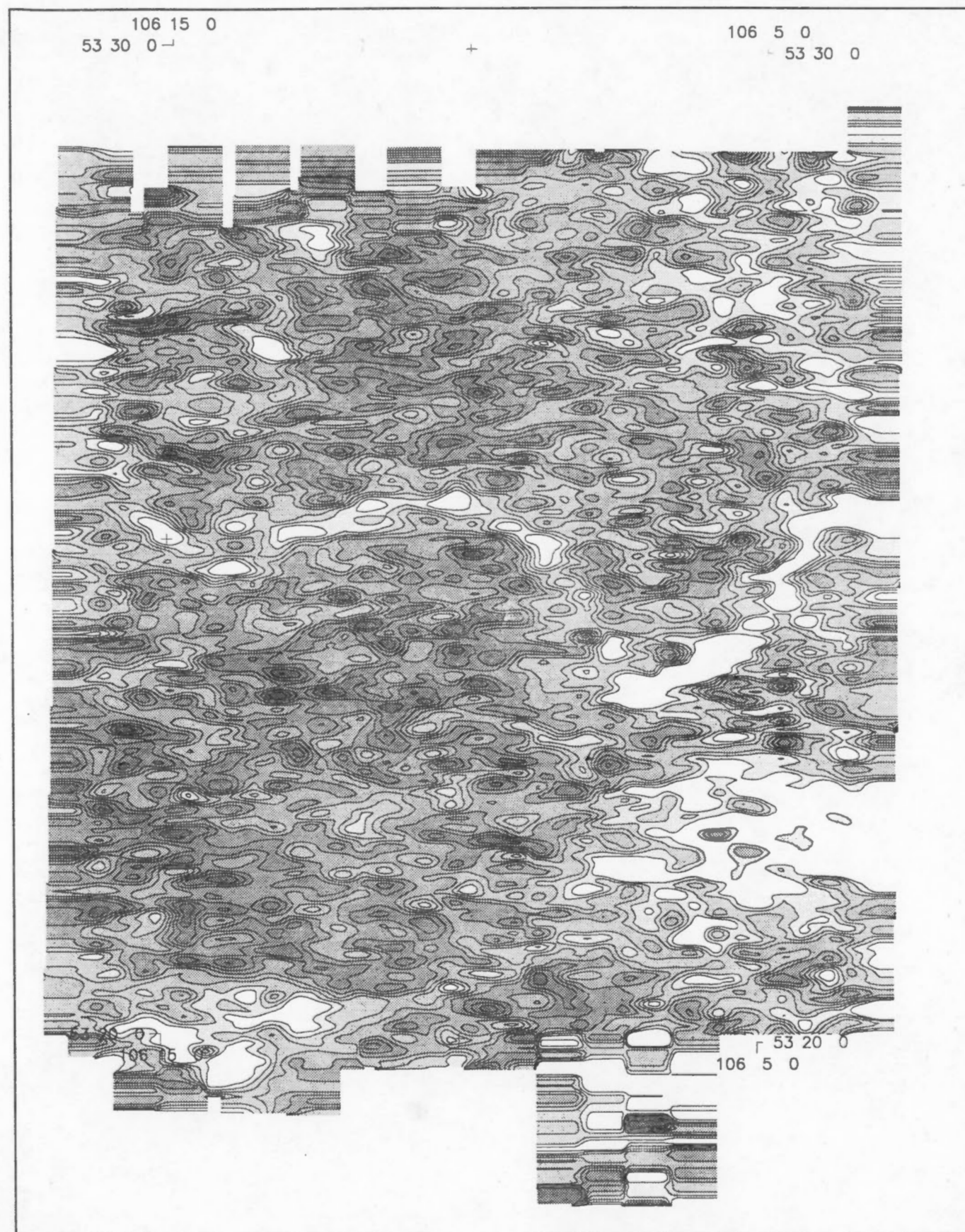
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EQUIVALENT URANIUM (PPM)

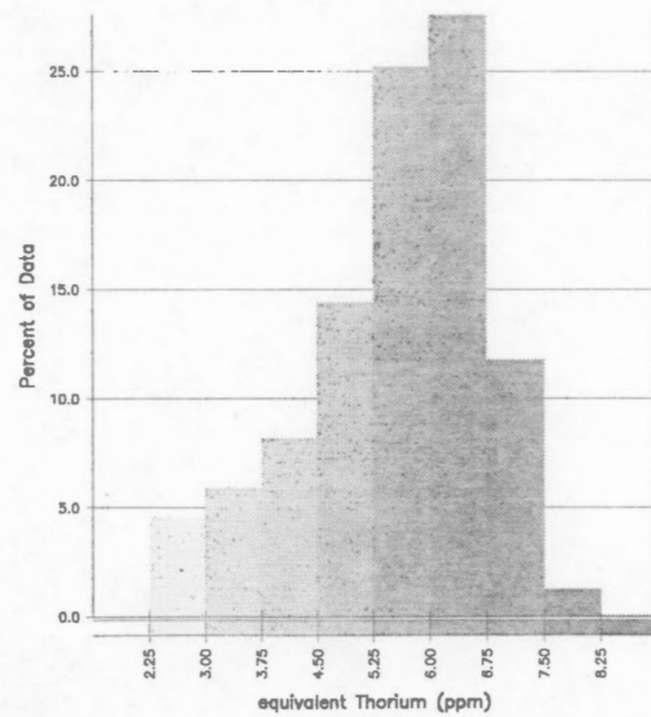




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Scale = 1:100 000  
 Line spacing = 400 metres



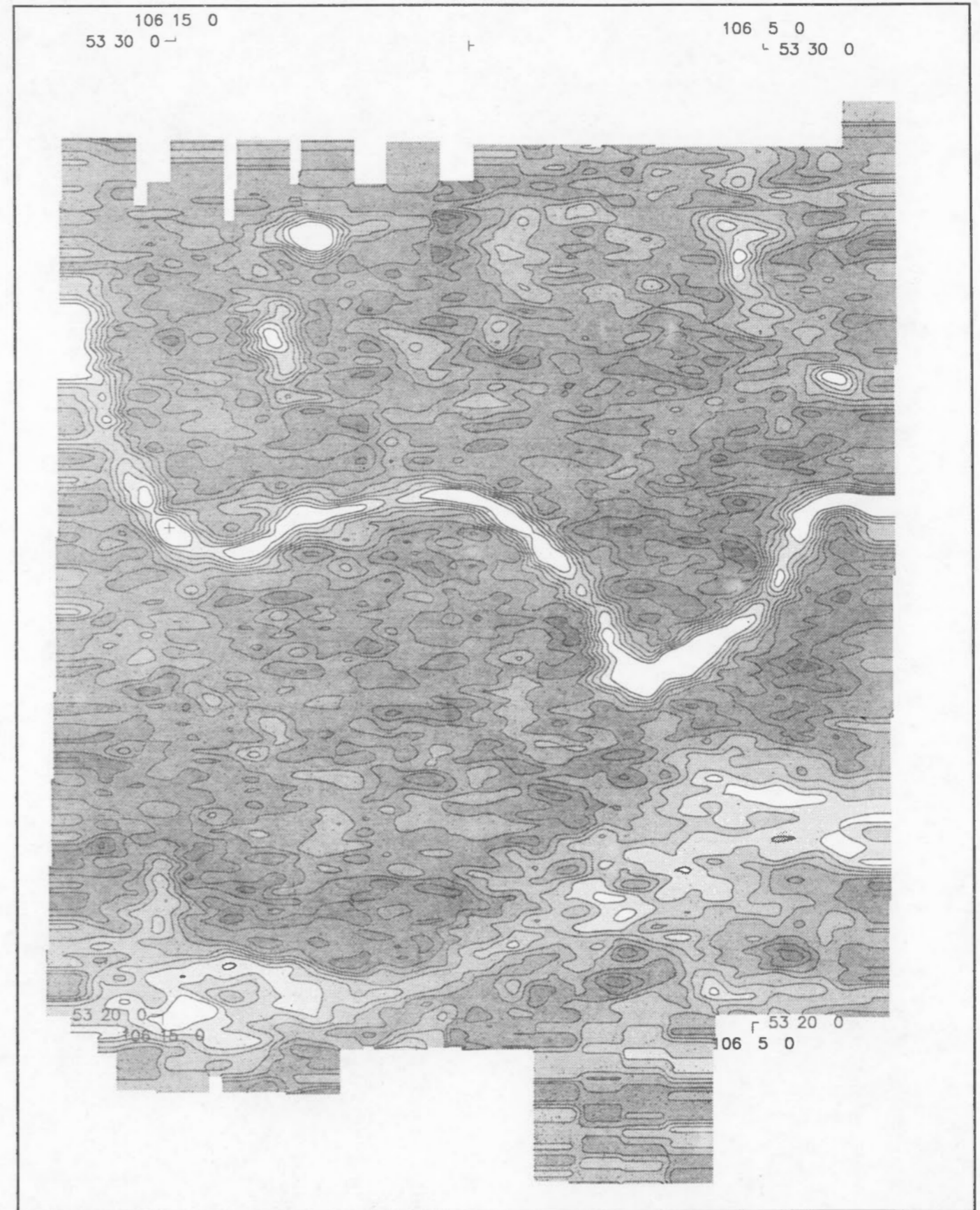
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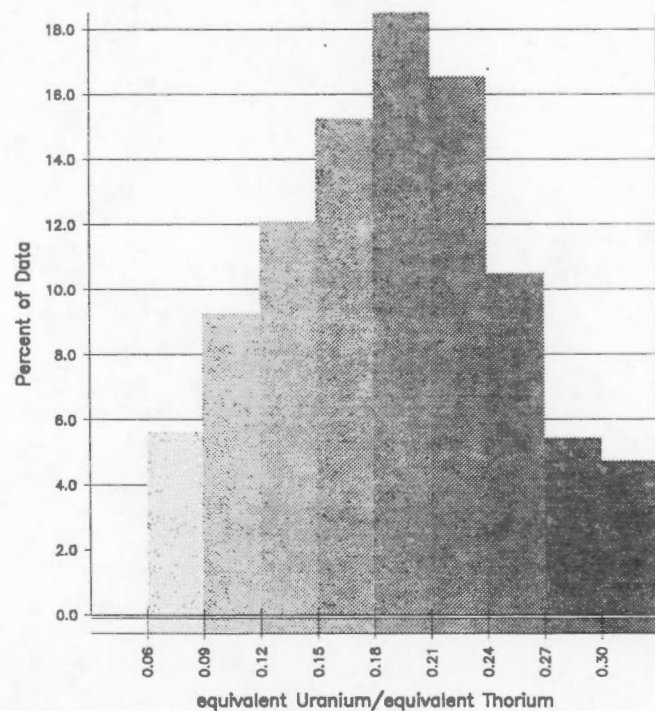
EQUIVALENT THORIUM (PPM)



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Scale = 1:100 000  
 Line spacing = 400 metres



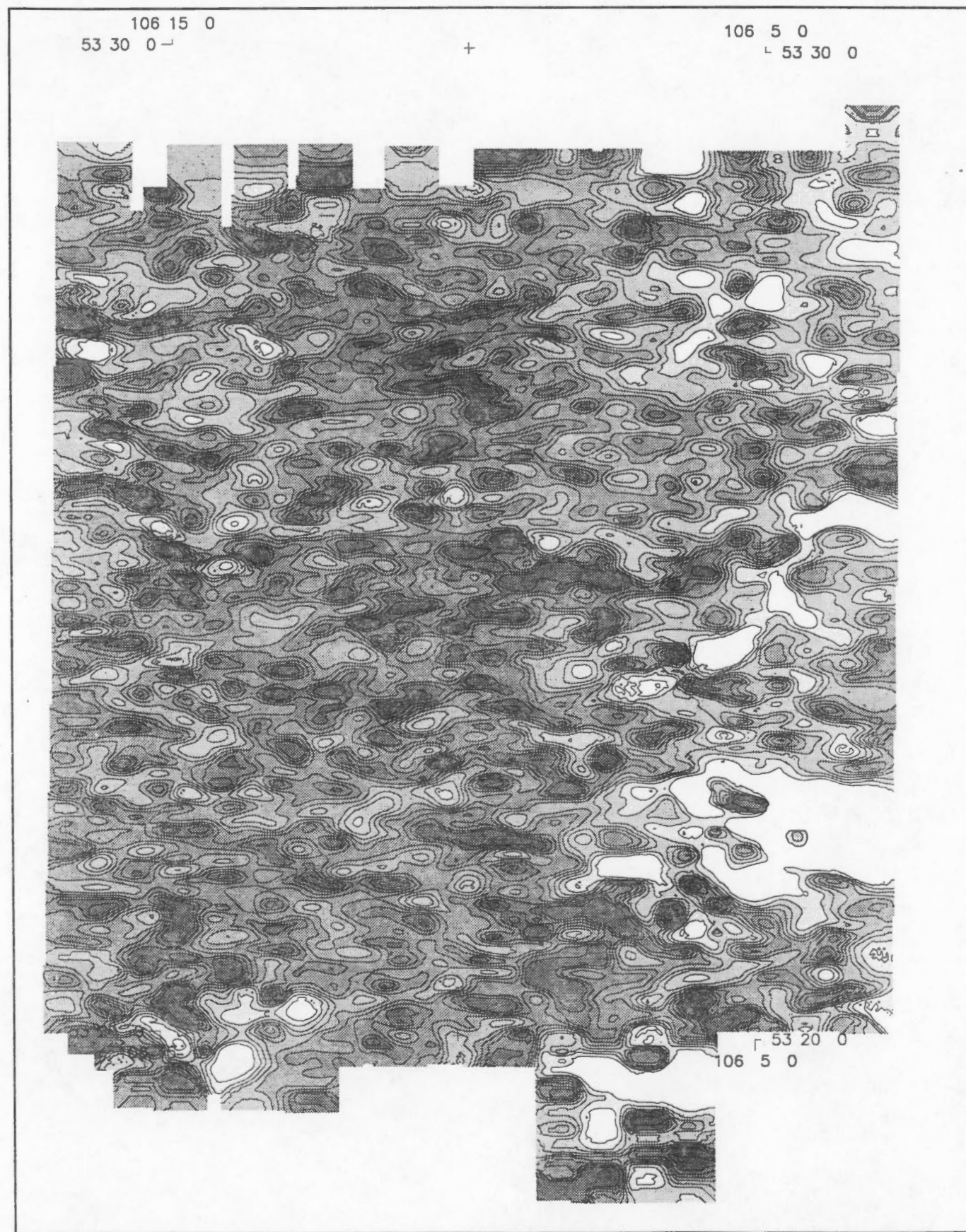
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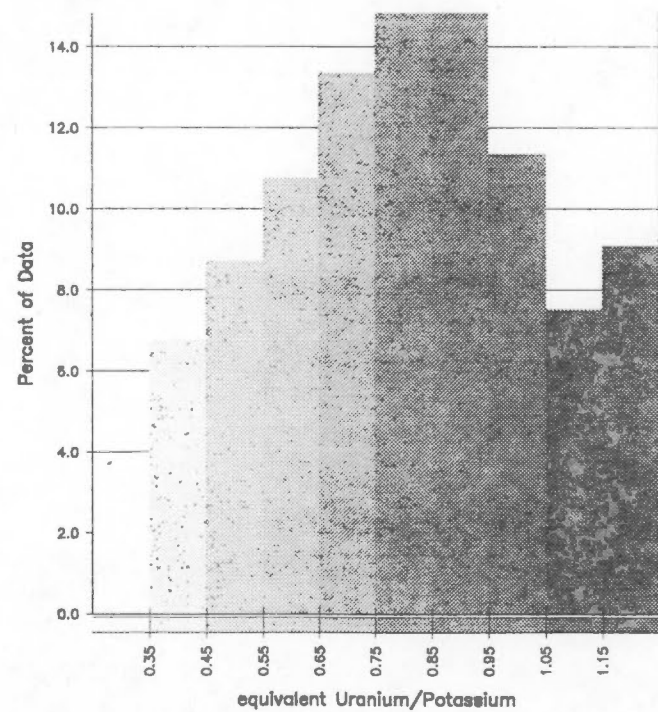
EQUIVALENT URANIUM/EQUIVALENT THORIUM



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Line spacing = 400 metres



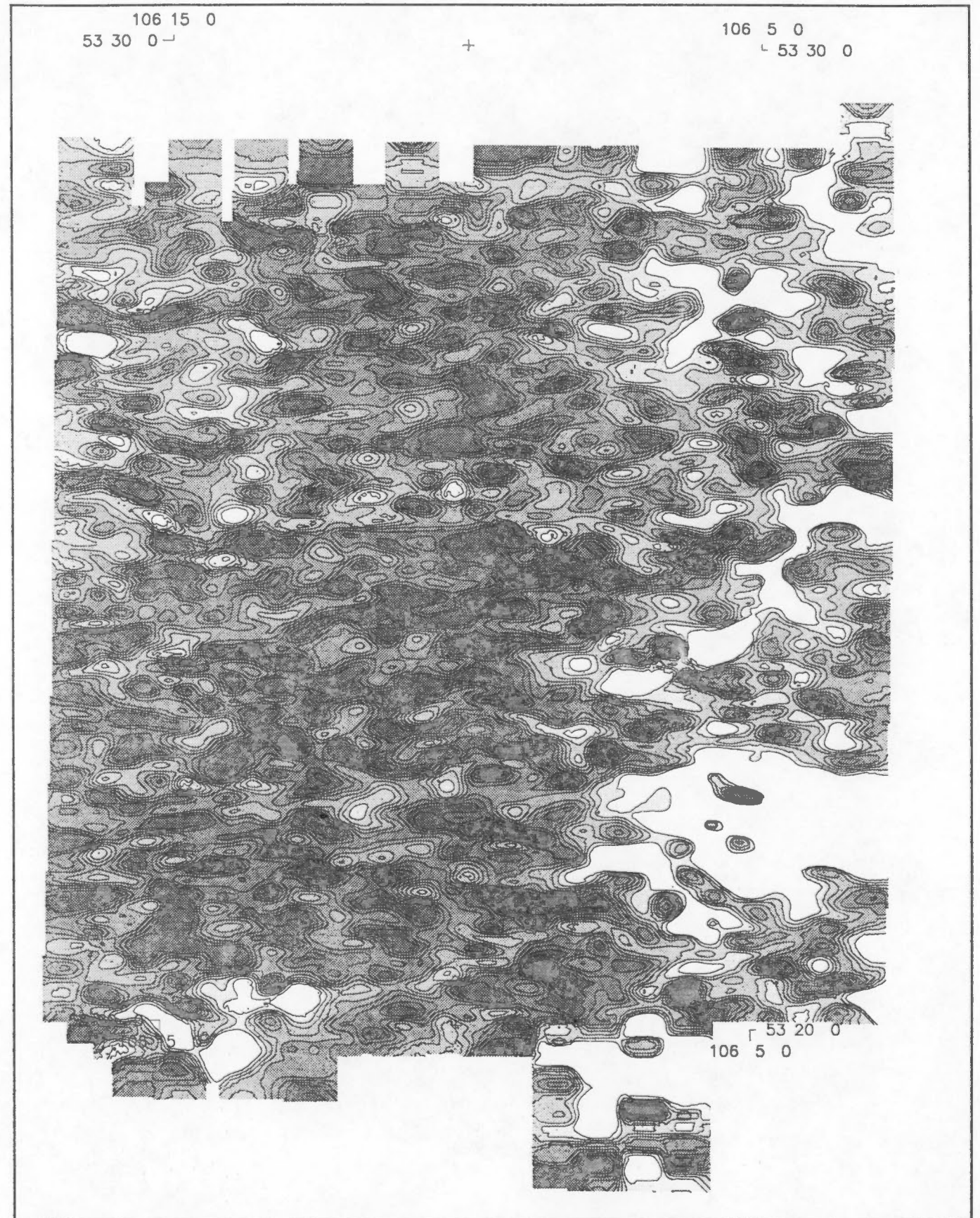
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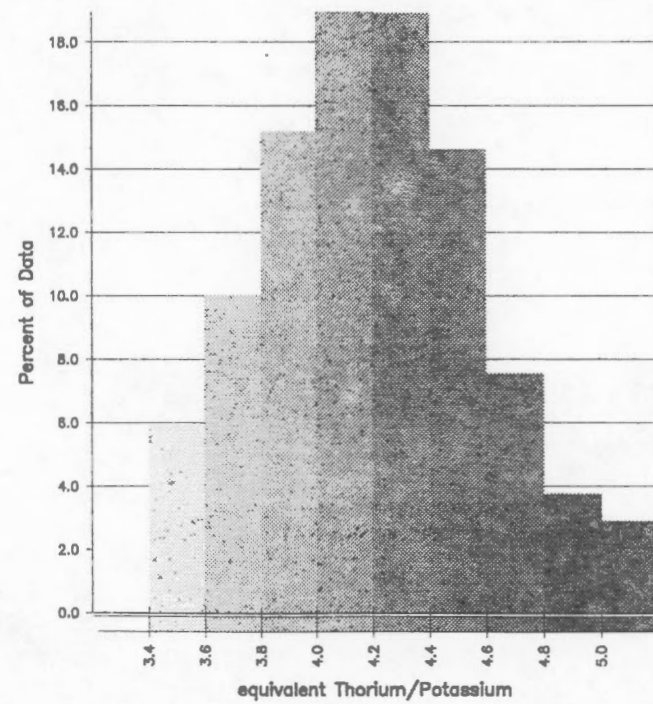
EQUIVALENT URANIUM/POTASSIUM




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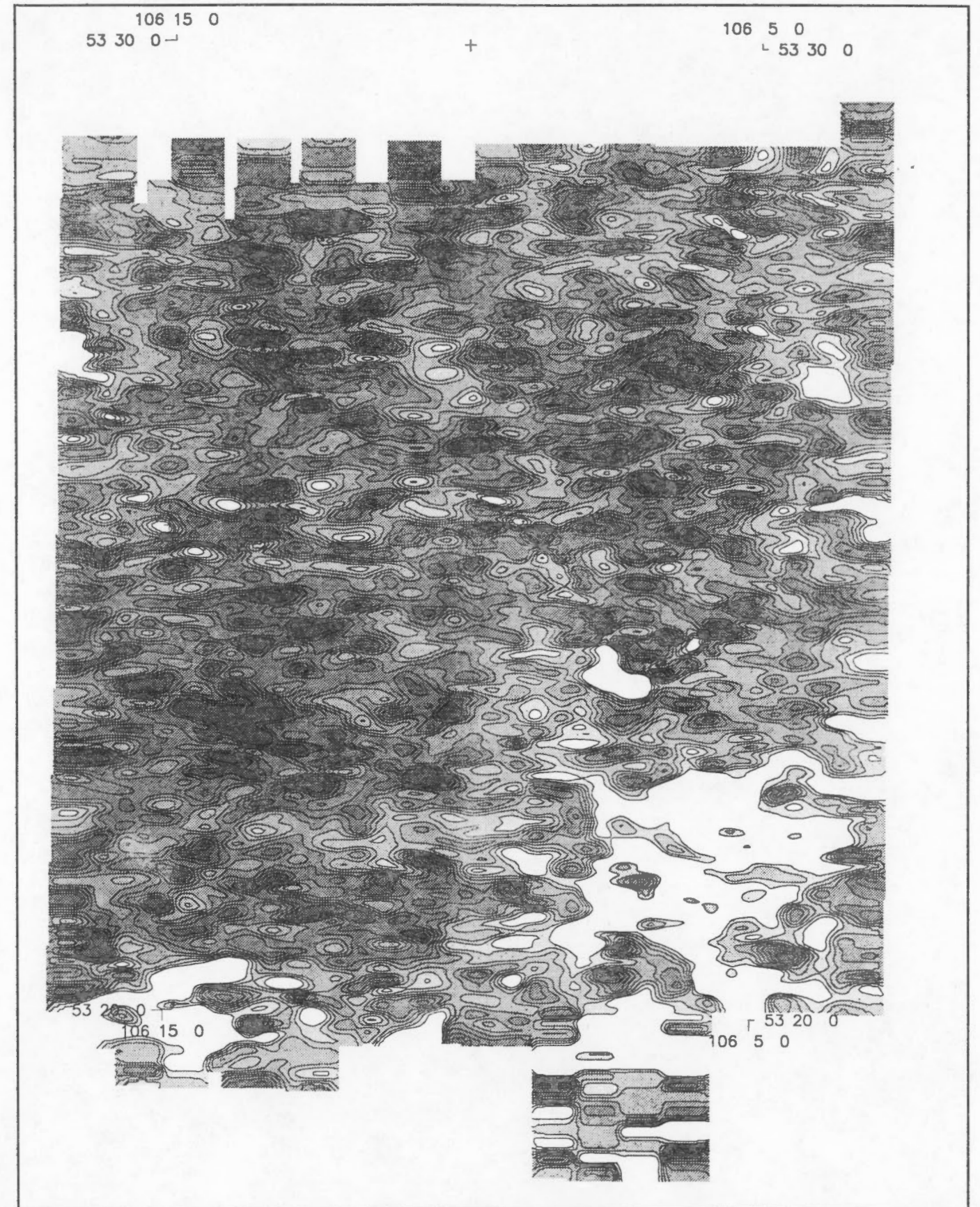
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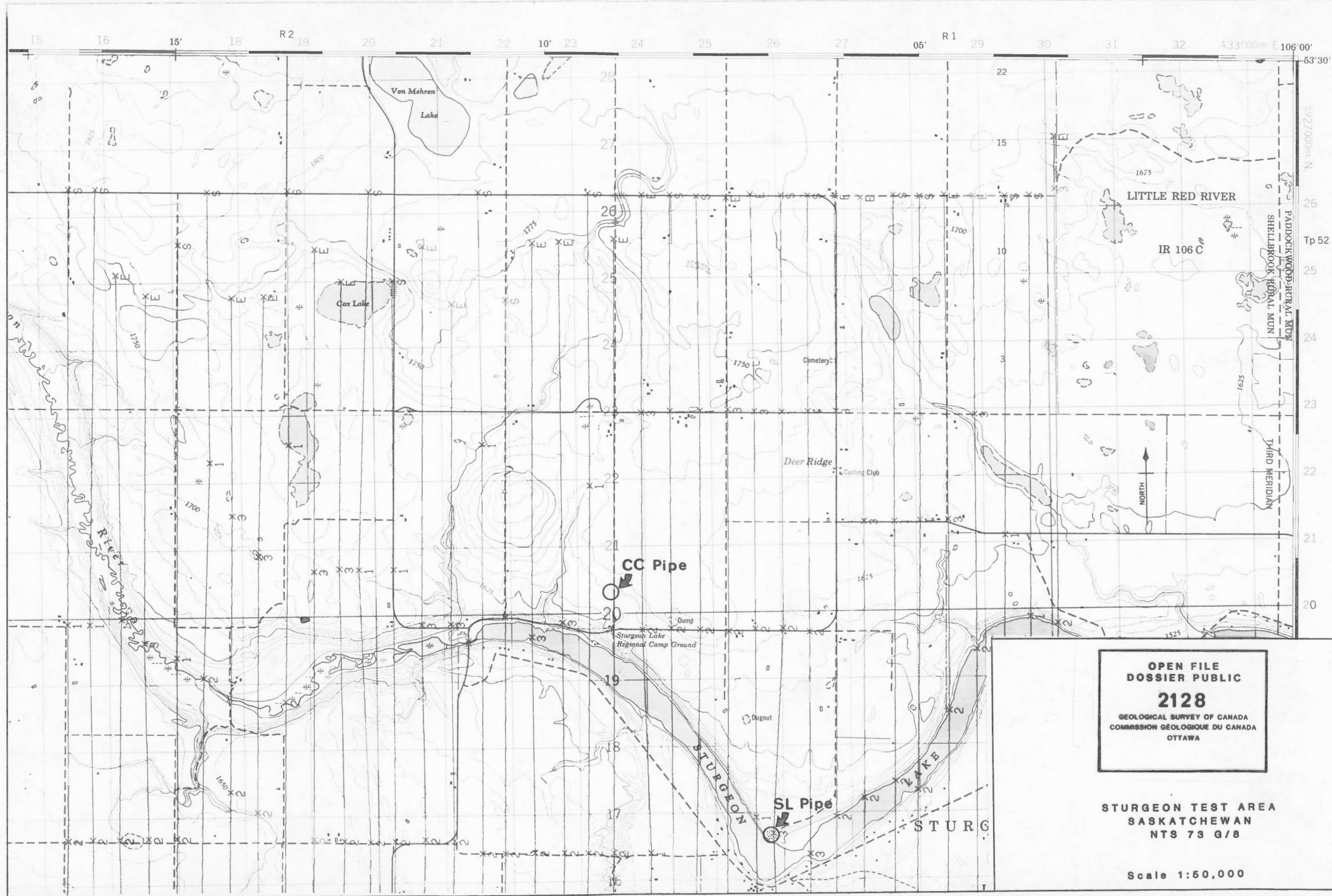
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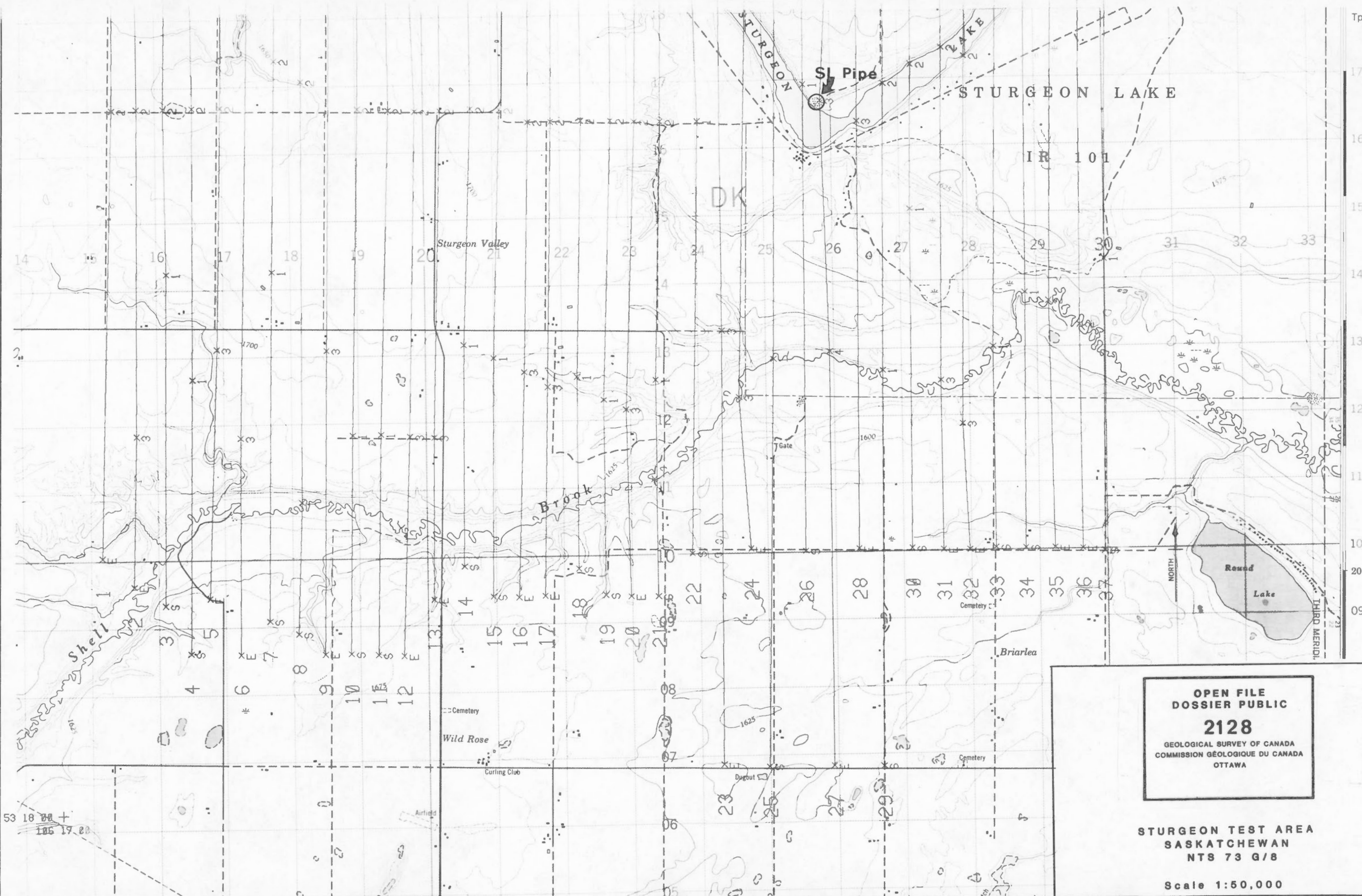
EQUIVALENT THORIUM/POTASSIUM



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**STURGEON TEST AREA**  
**SASKATCHEWAN**  
**NTS 73 G/8**

Scale 1:50,000



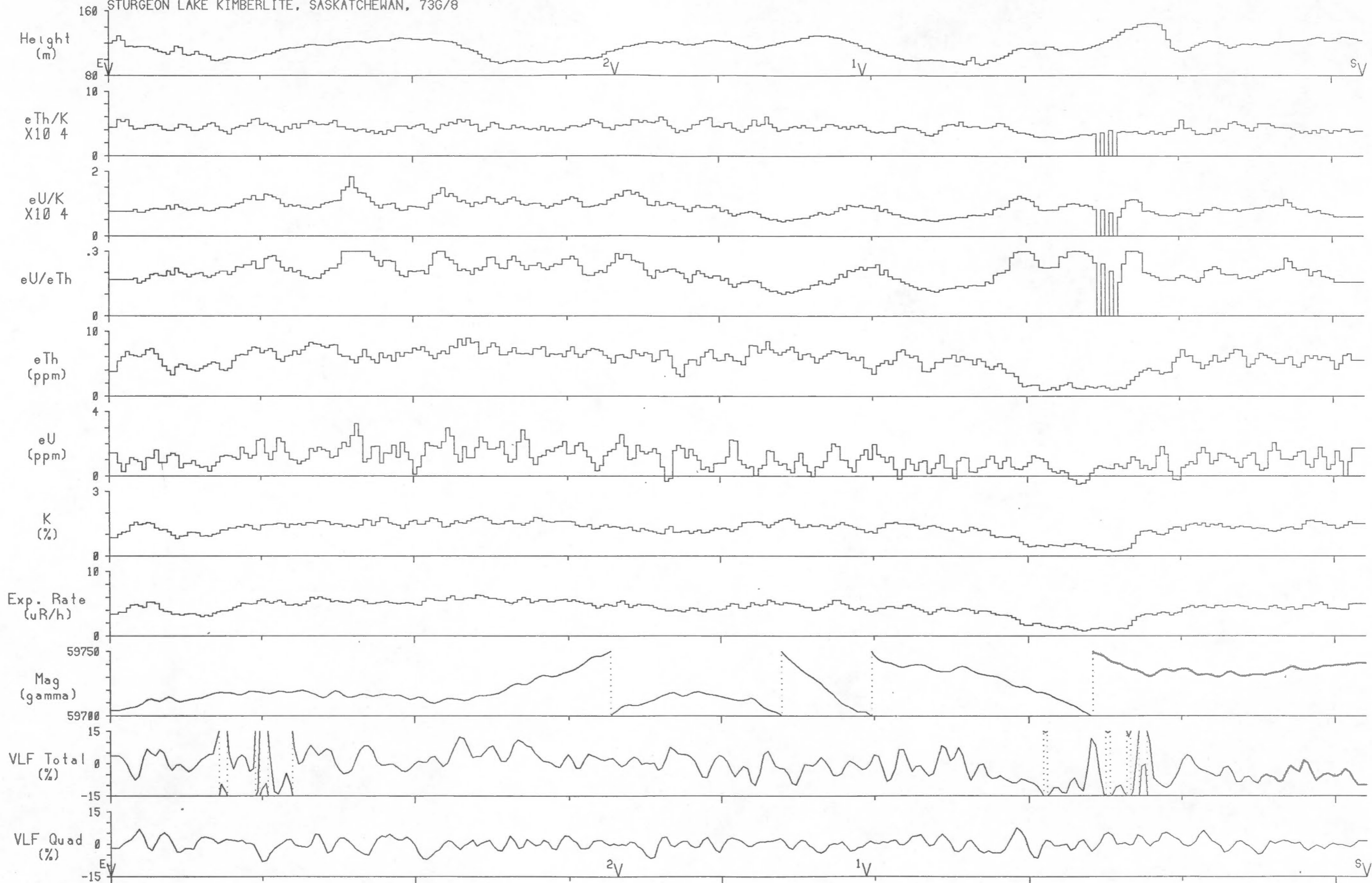
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STURGEON TEST AREA  
SASKATCHEWAN  
NTS 73 G/8

Scale 1:50,000

53 18 00 +  
106 19 00

STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 1989 (1/4 MILE)  
STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 73G/8

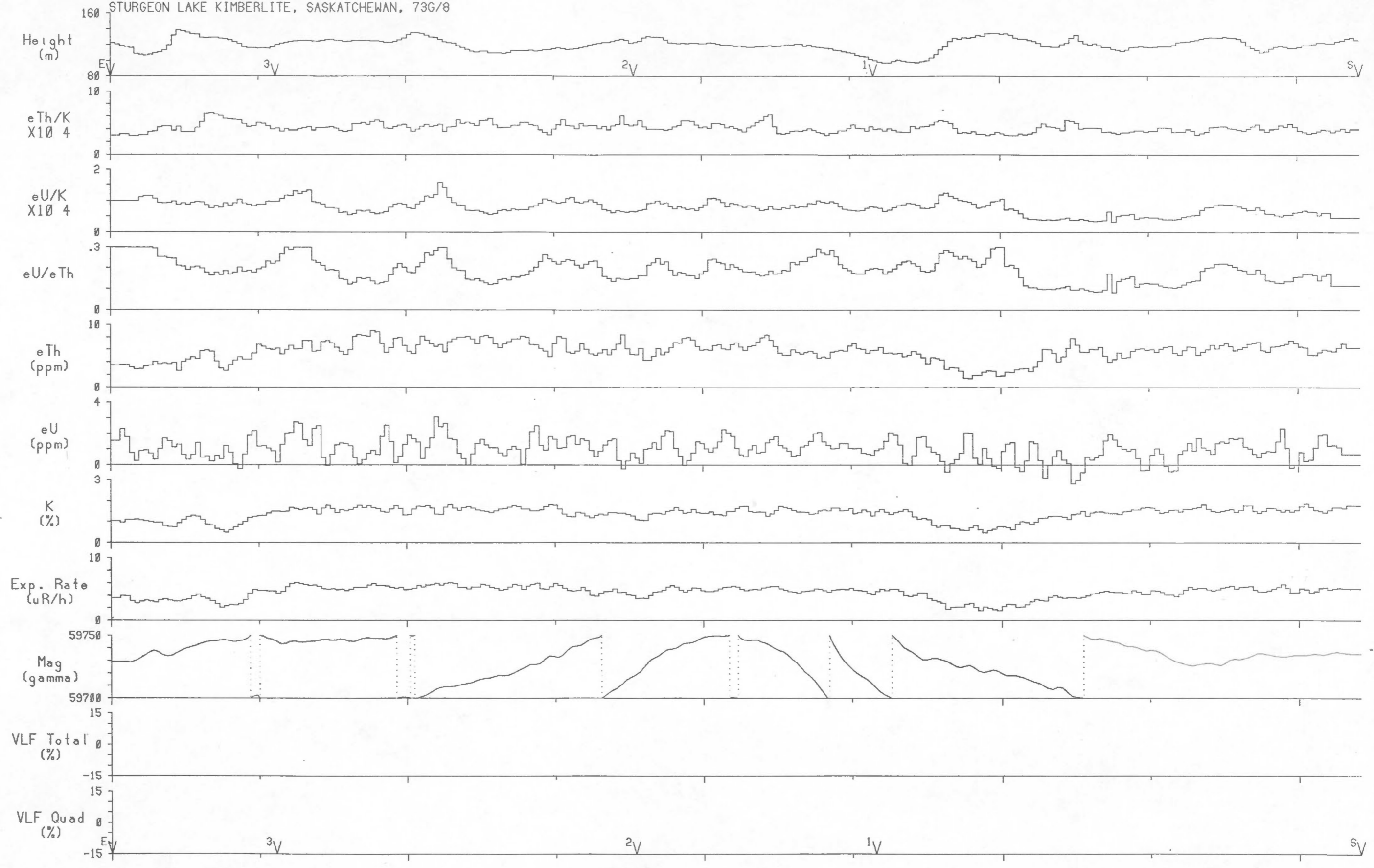


Line 1

2 km

Scale 1:50000

STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 1989 (1/4 MILE)  
STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 73G/8



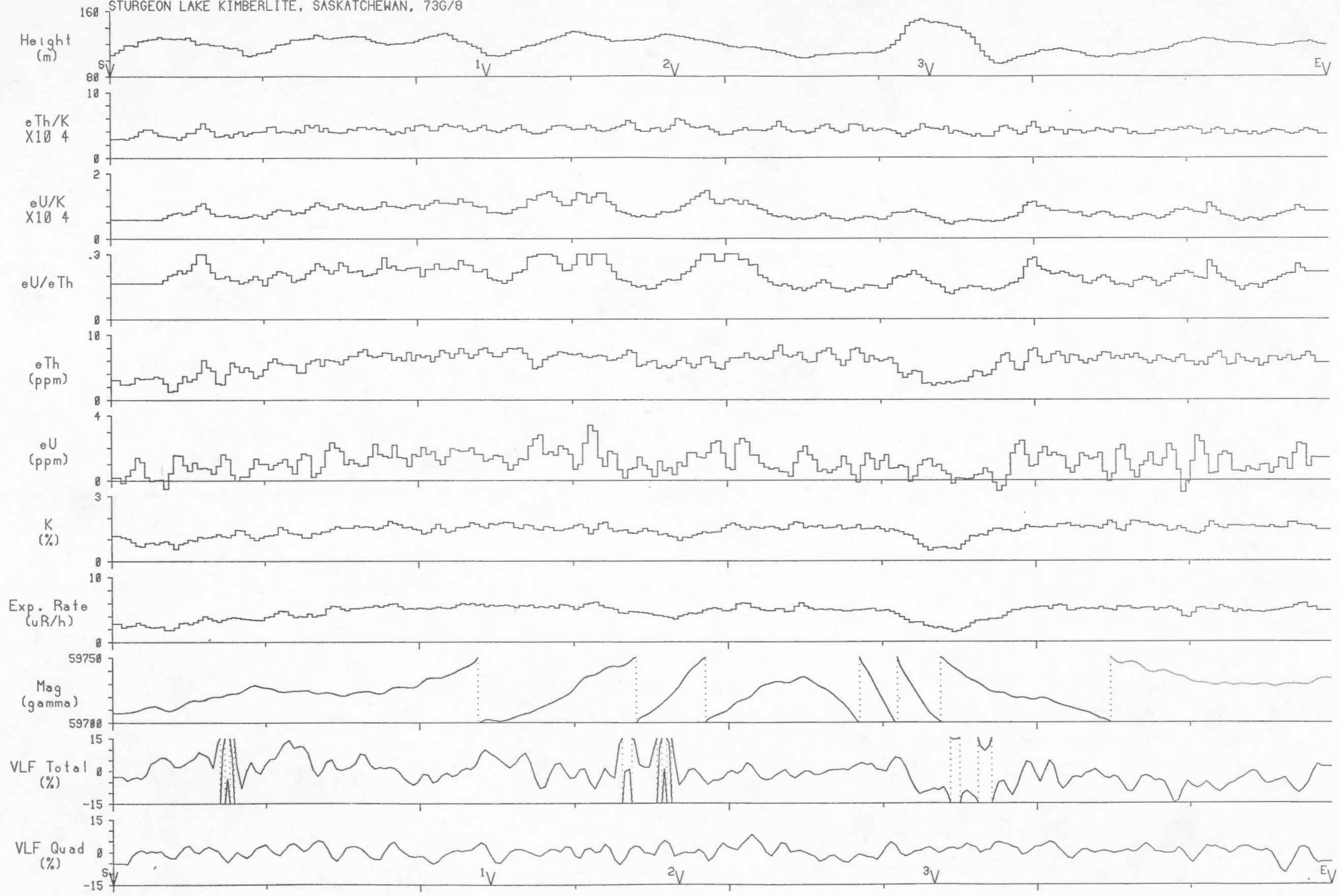
Line 2

2 km

Scale 1:50000



STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 1989 (1/4 MILE)  
STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 73G/8

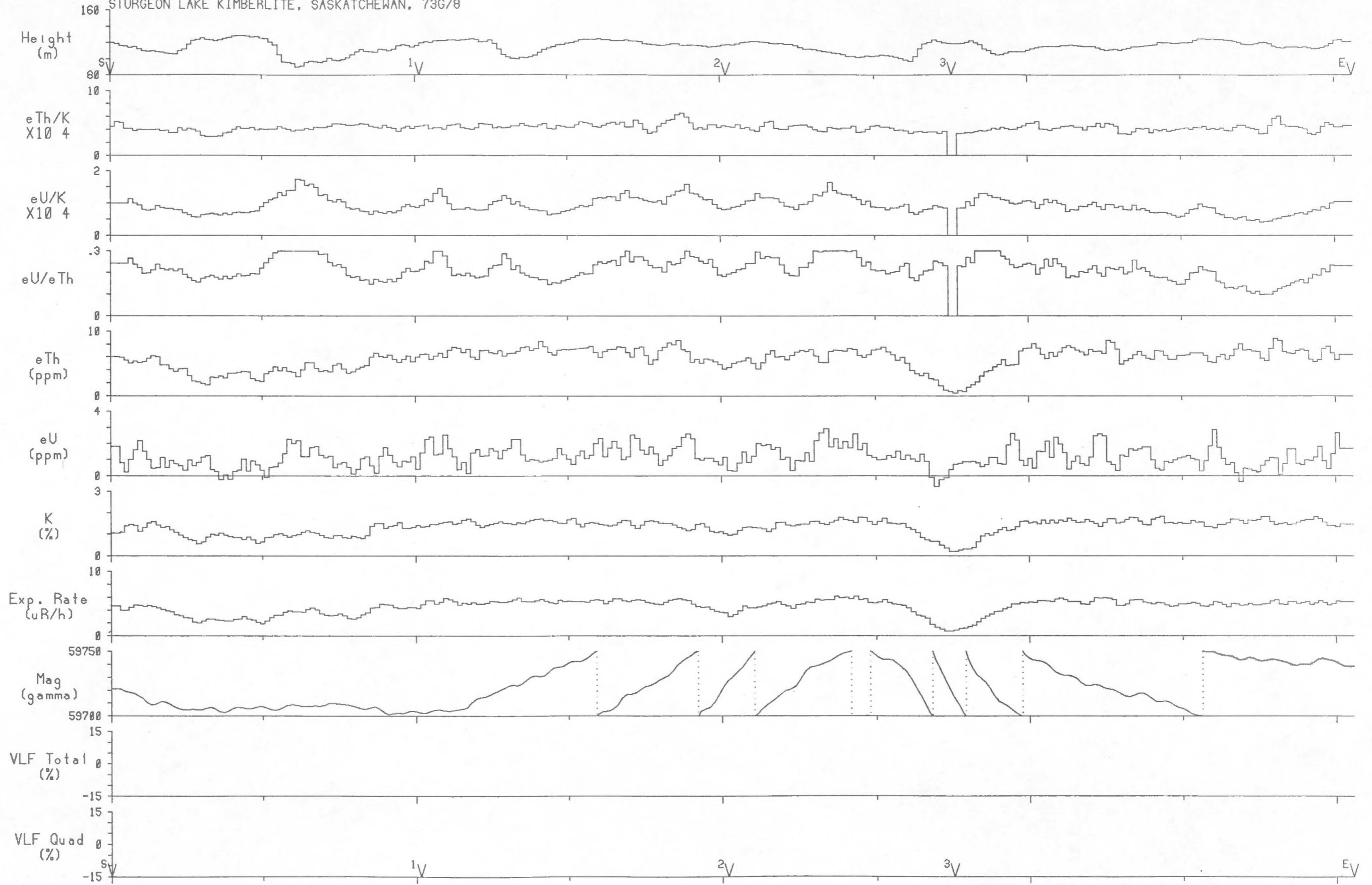


Line 3

2 km

Scale 1:50000

STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 1989 (1/4 MILE)  
 STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 73G/8

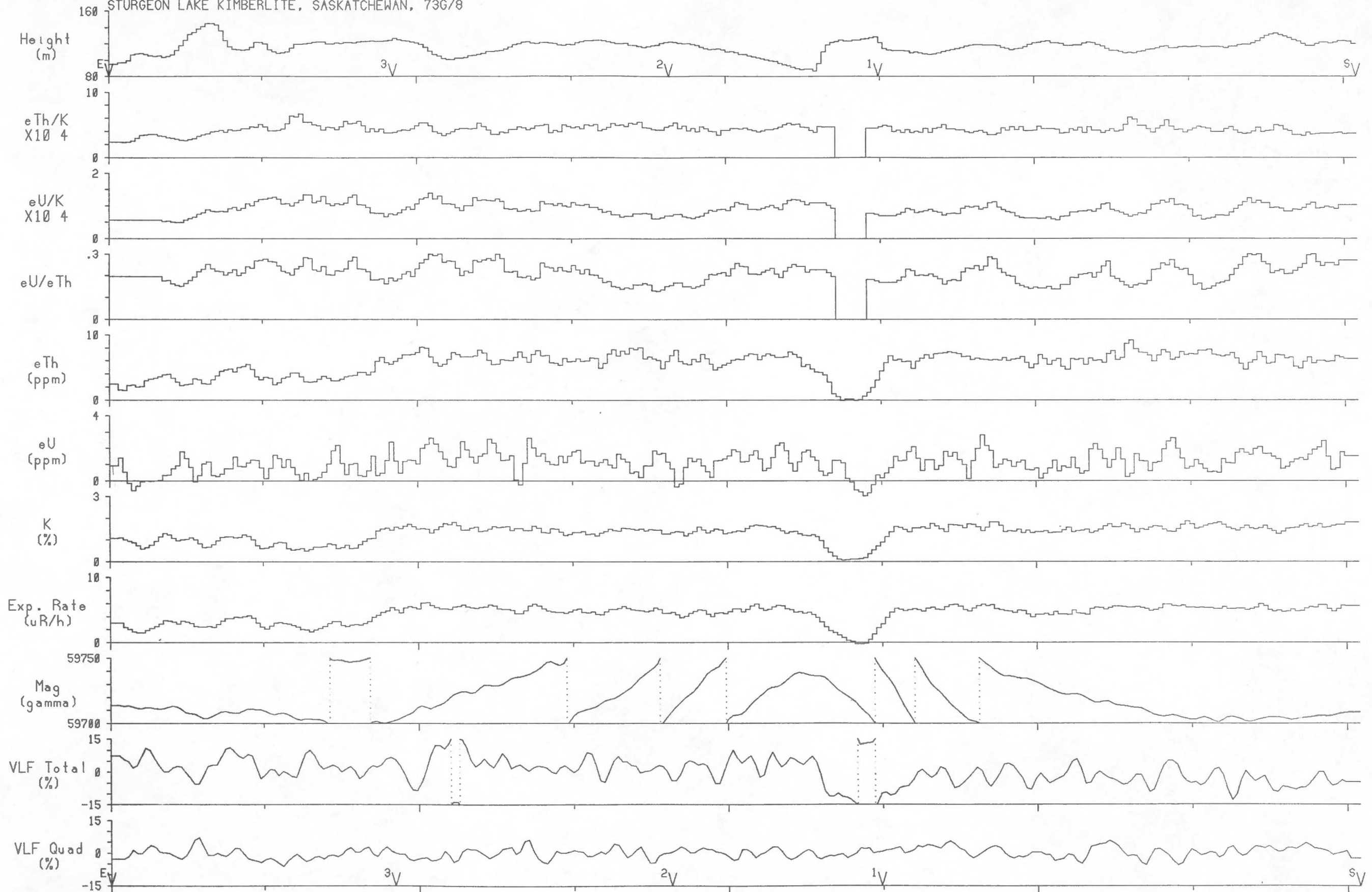


Line 4

2 km

Scale 1:50000

STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 1989 (1/4 MILE)  
STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 73G/8

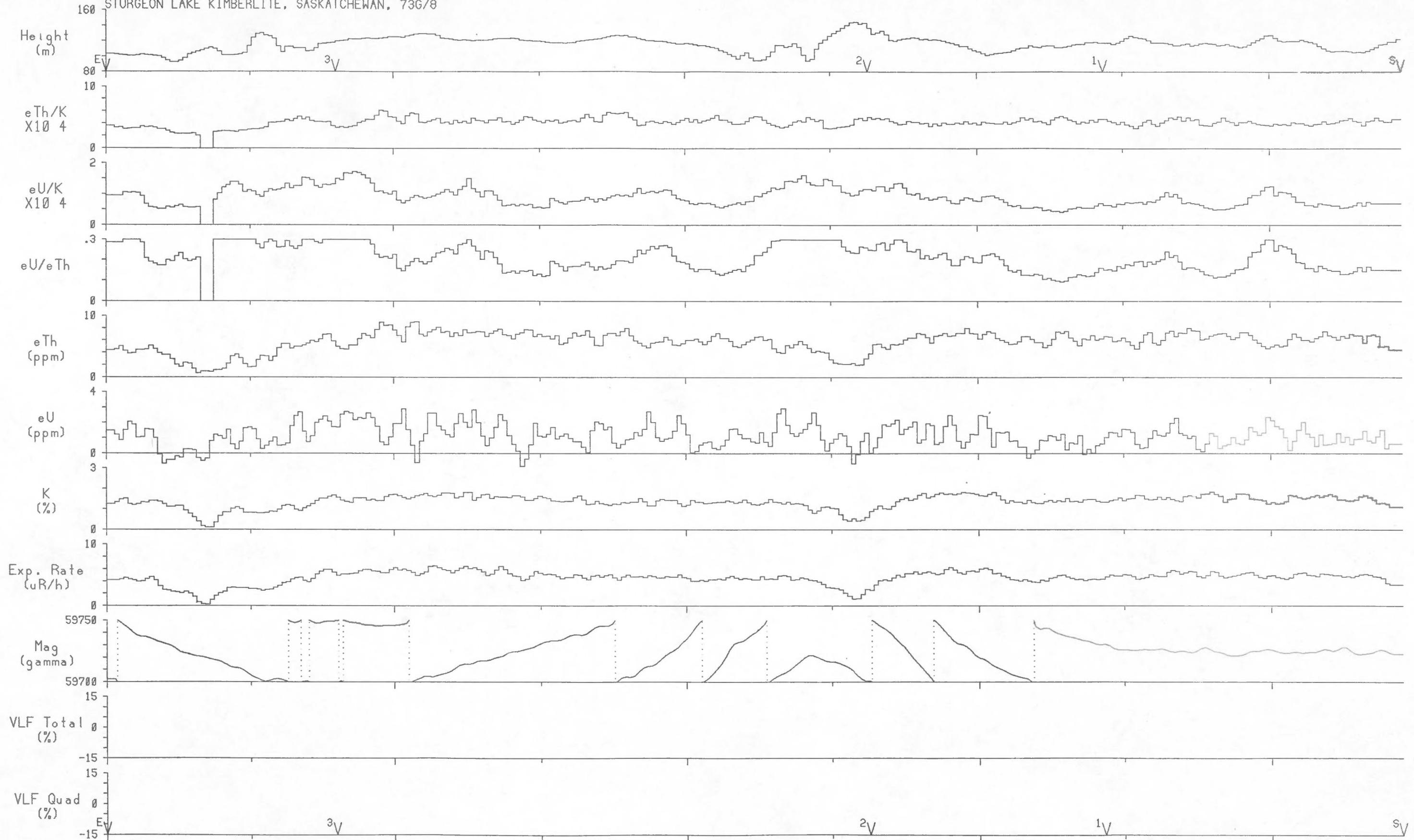


Line 5

2 km

Scale 1:50000

STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 1989 (1/4 MILE)  
STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 73G/8

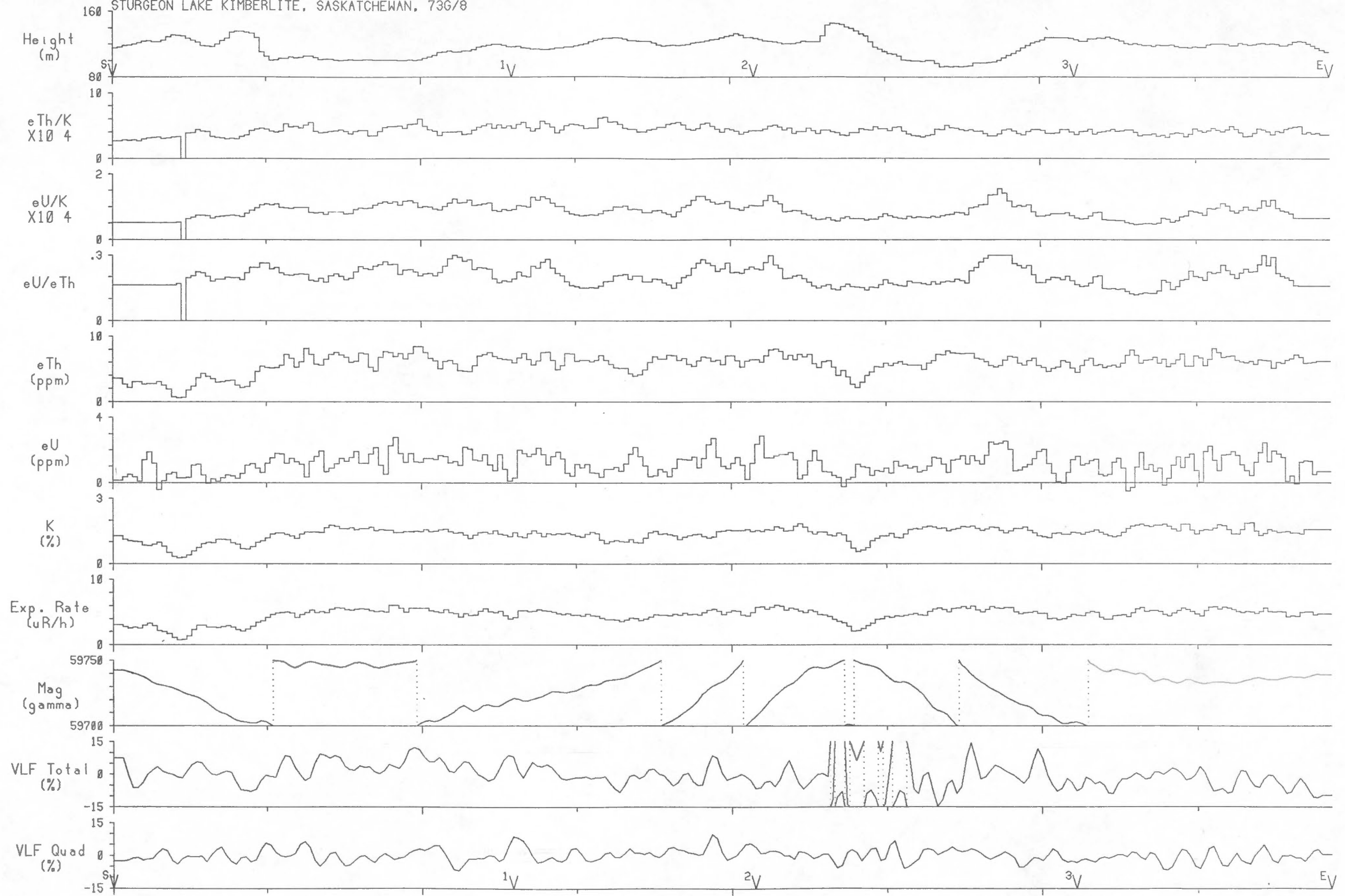


Line 6

2 km

Scale 1:50000

STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 1989 (1/4 MILE)  
STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 73G/8

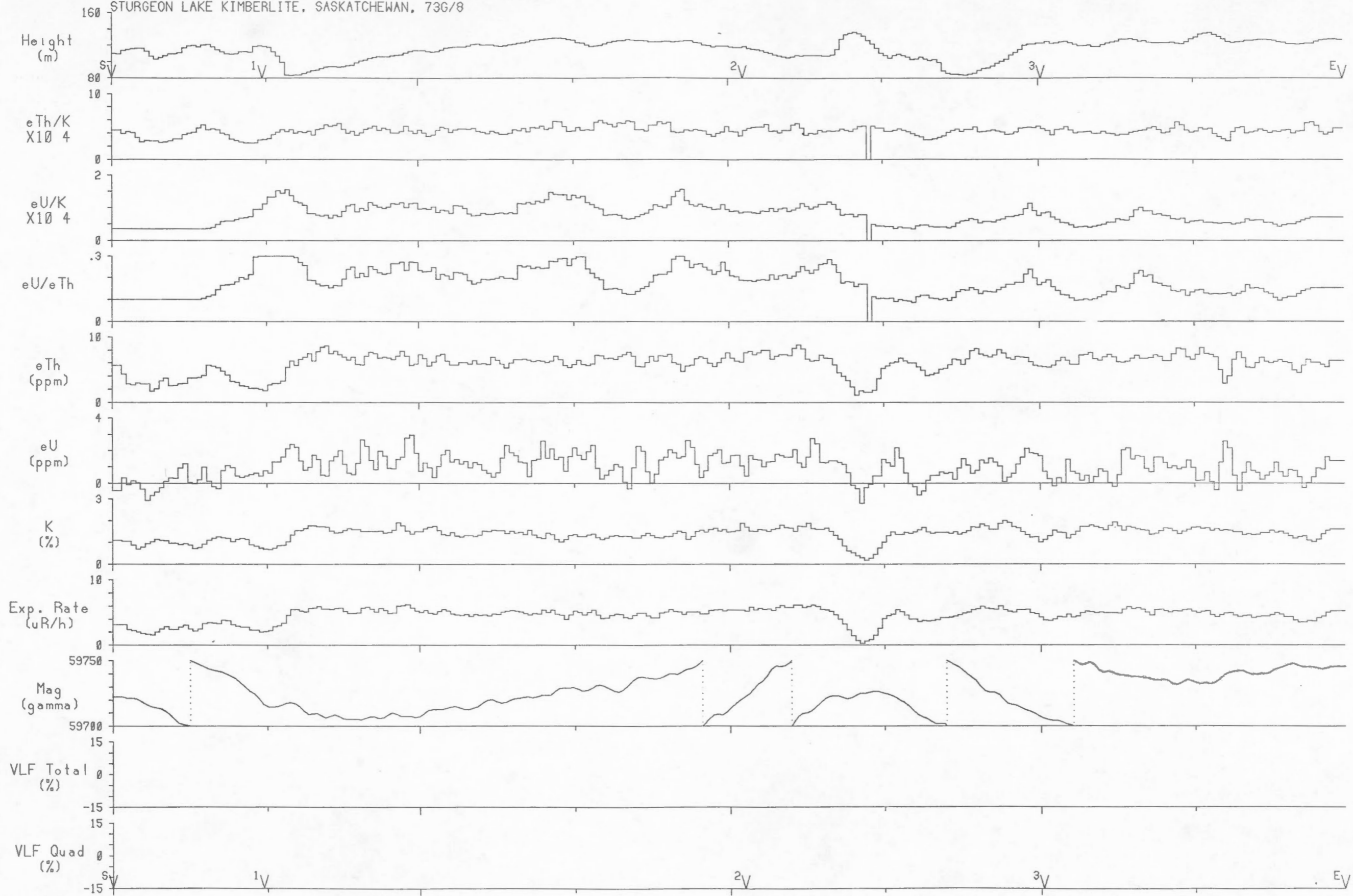


Line 7

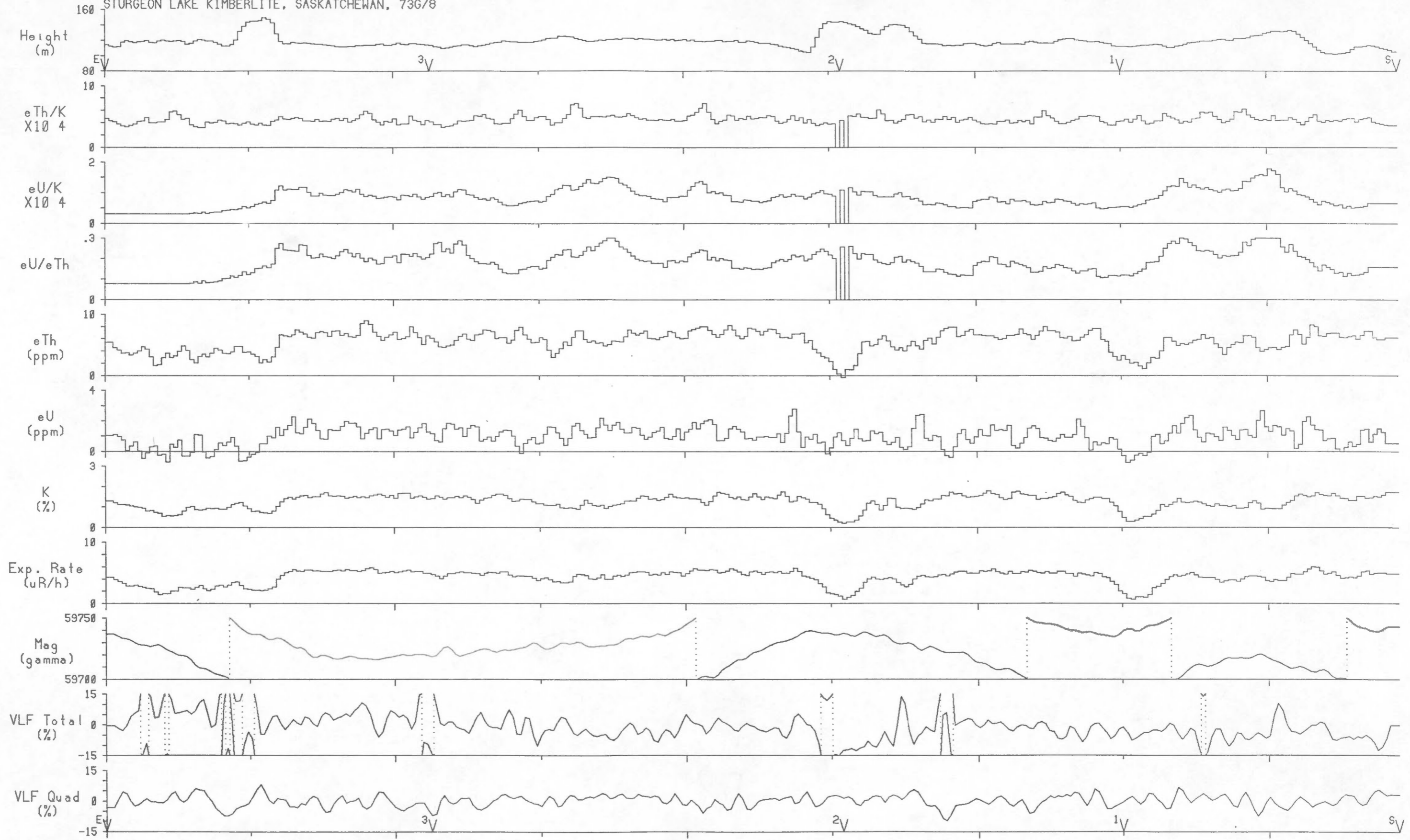
2 km

Scale 1:50000

STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 1989 (1/4 MILE)  
STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 73G/8



STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 1989 (1/4 MILE)  
STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 73G/8

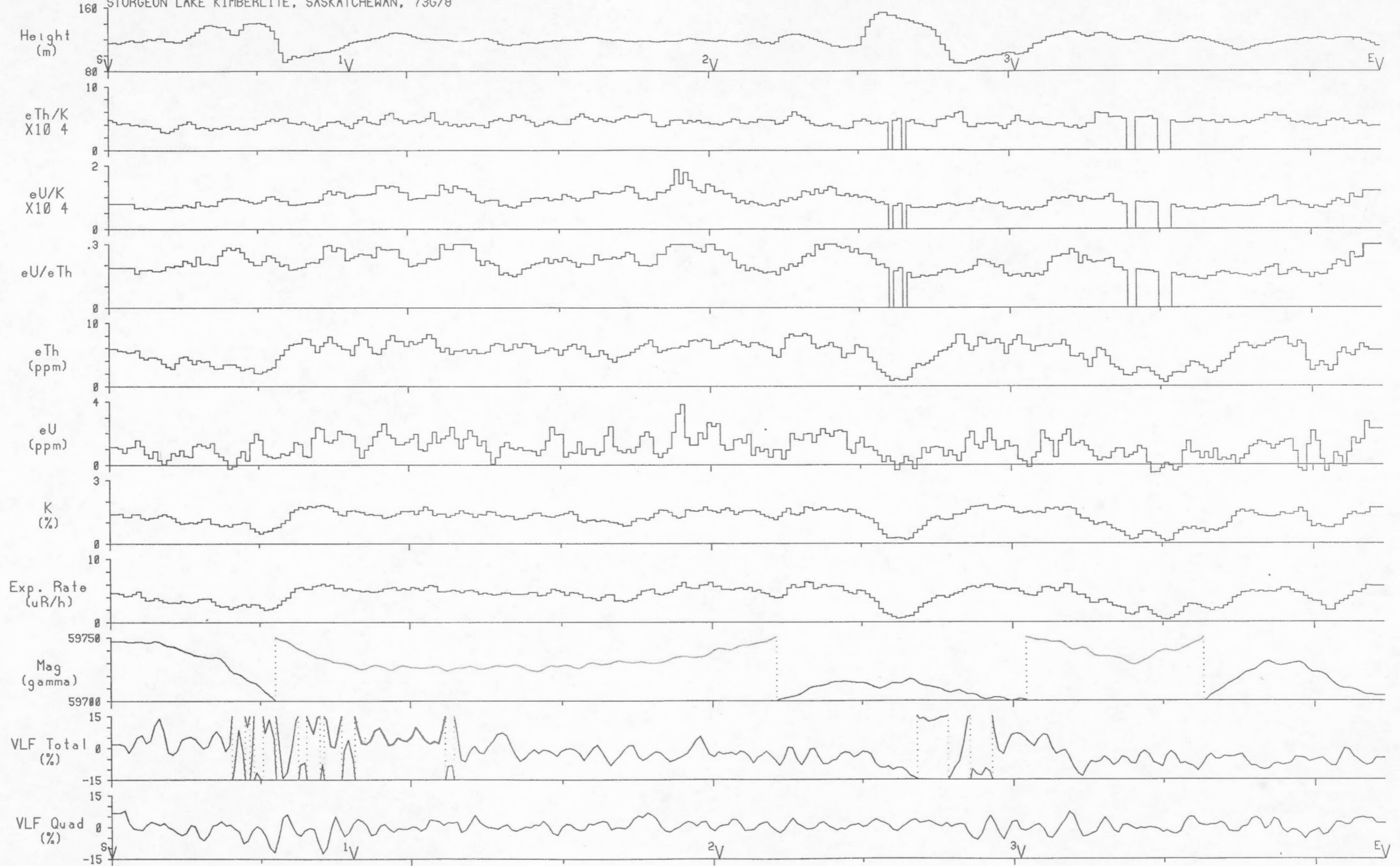


Line 9

2 km

Scale 1:50000

STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 1989 (1/4 MILE)  
STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 73G/8



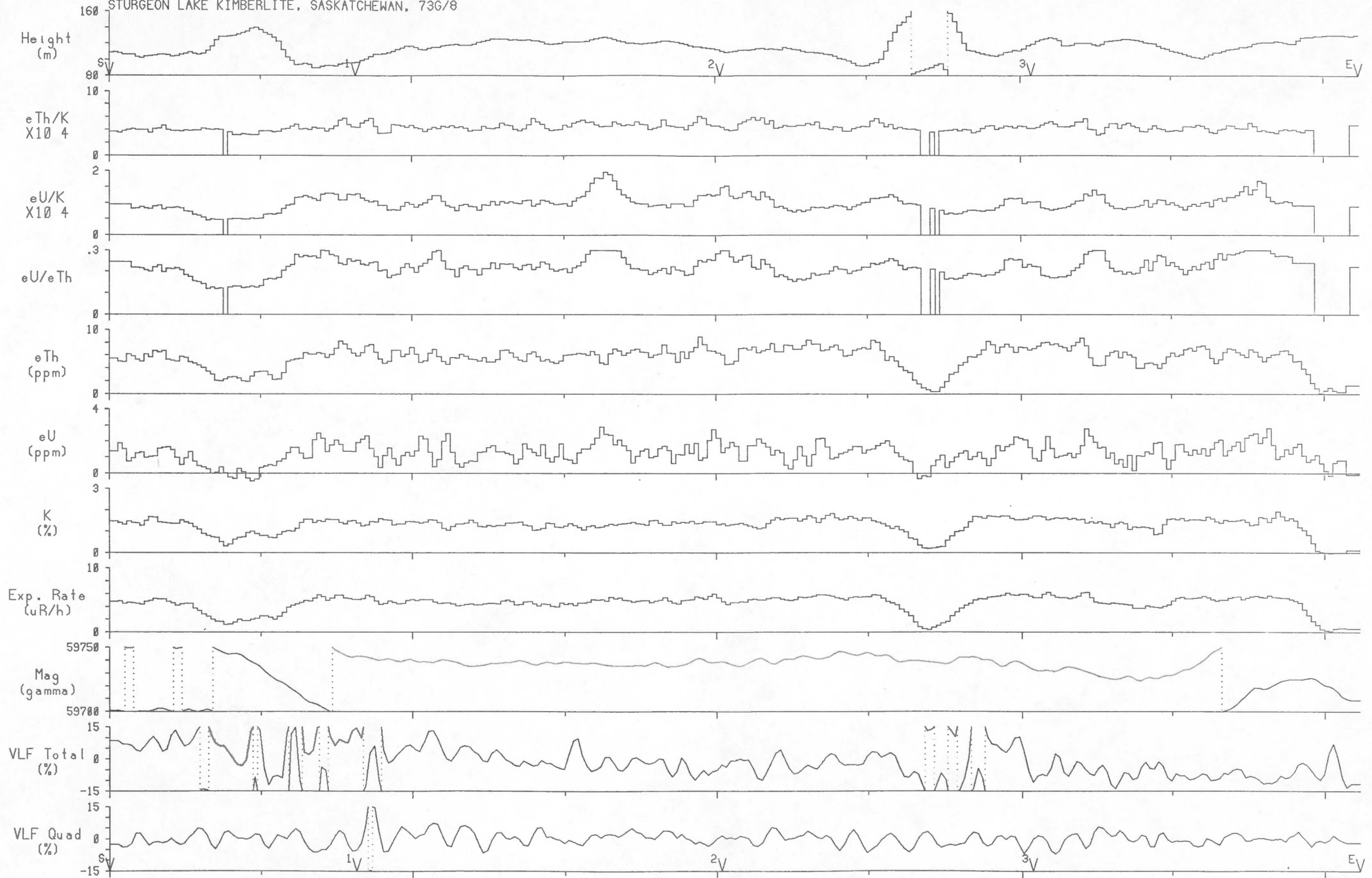
Line 10

2 km

Scale 1:50000



STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 1989 (1/4 MILE)  
 STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 73G/8

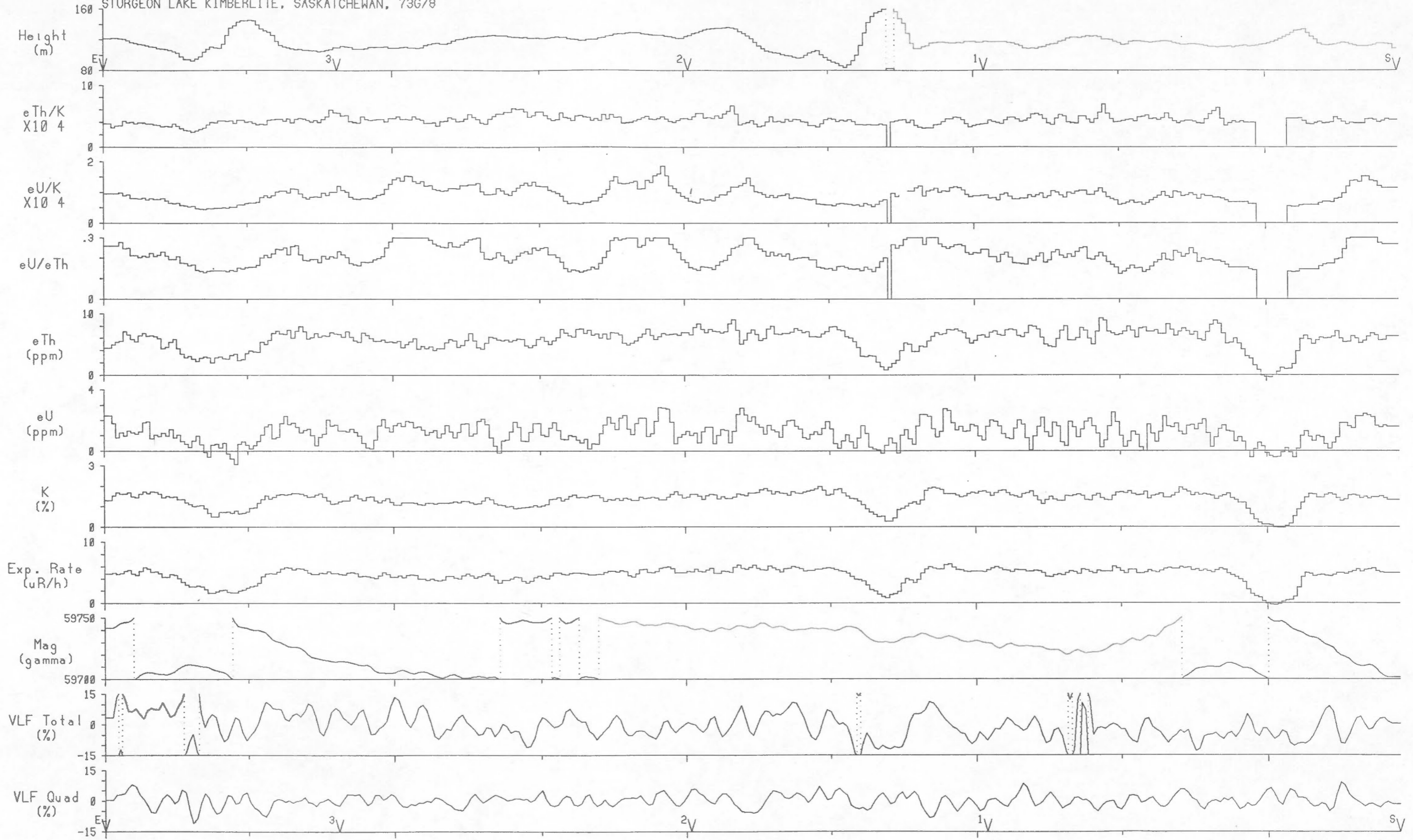


Line 11

2 km

Scale 1:50000

STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 1989 (1/4 MILE)  
STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 73G/8

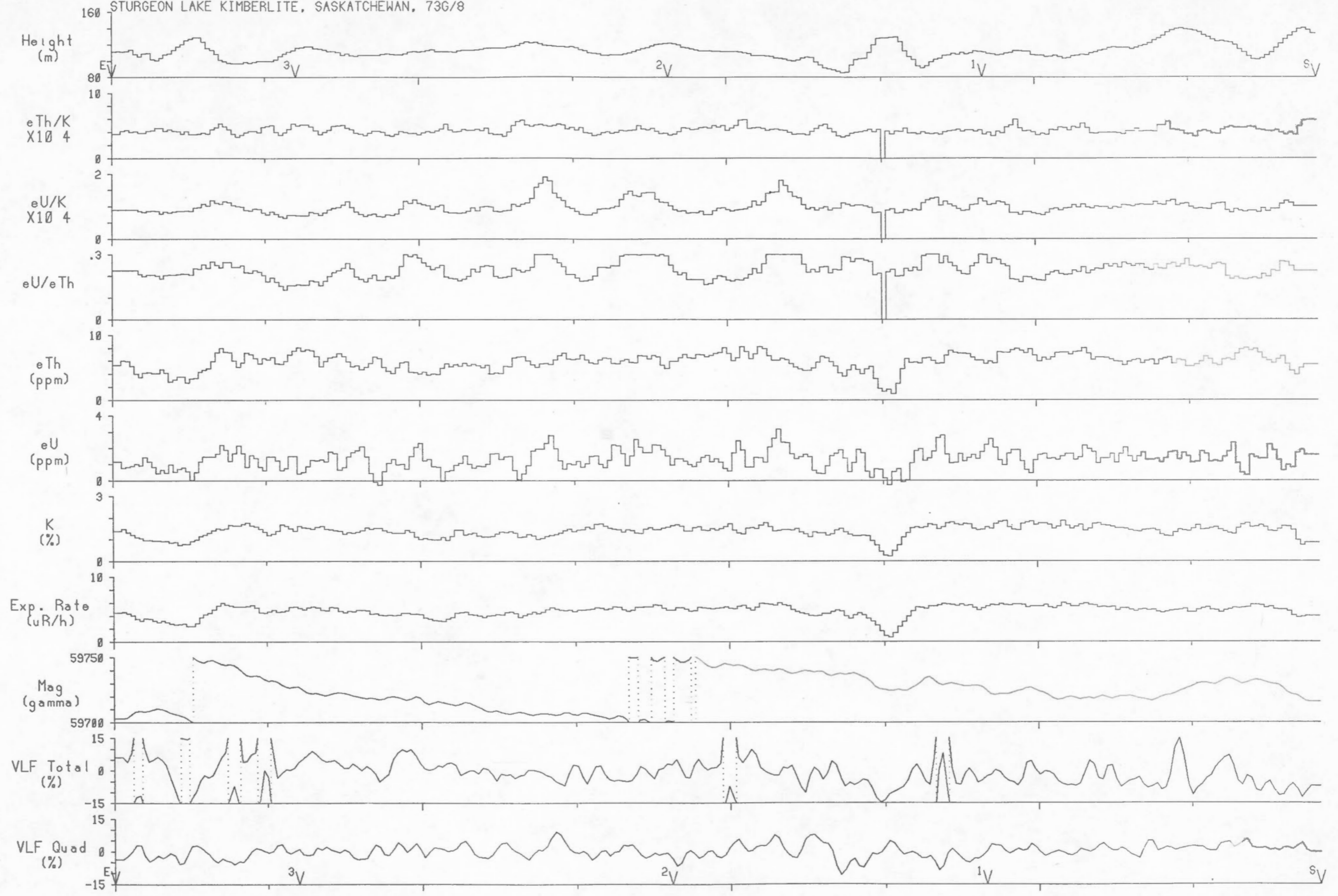


Line 12

2 km

Scale 1:50000

STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 1989 (1/4 MILE)  
STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 73G/8

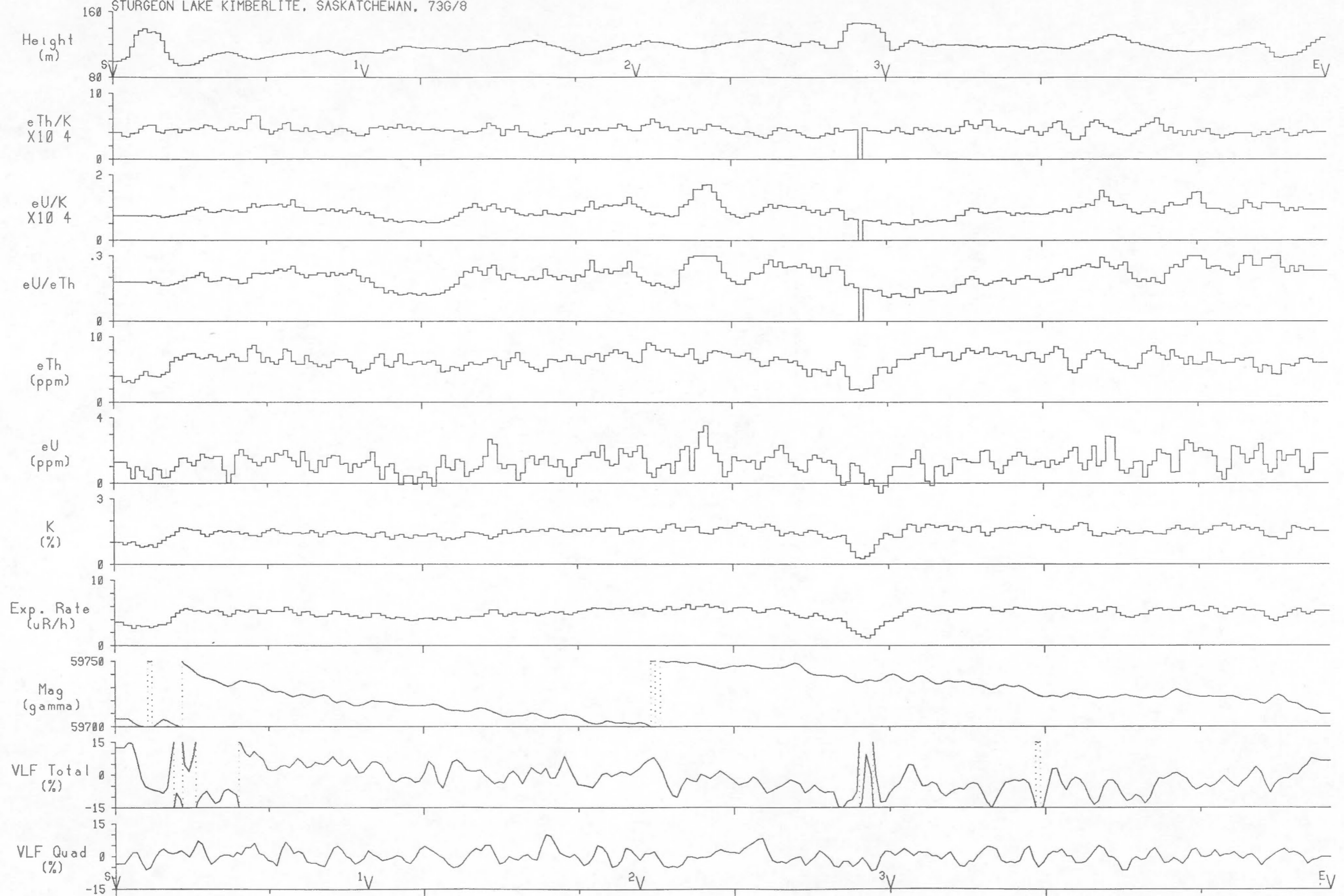


Line 13

2 km

Scale 1:50000

STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 1989 (1/4 MILE)  
STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 73G/8

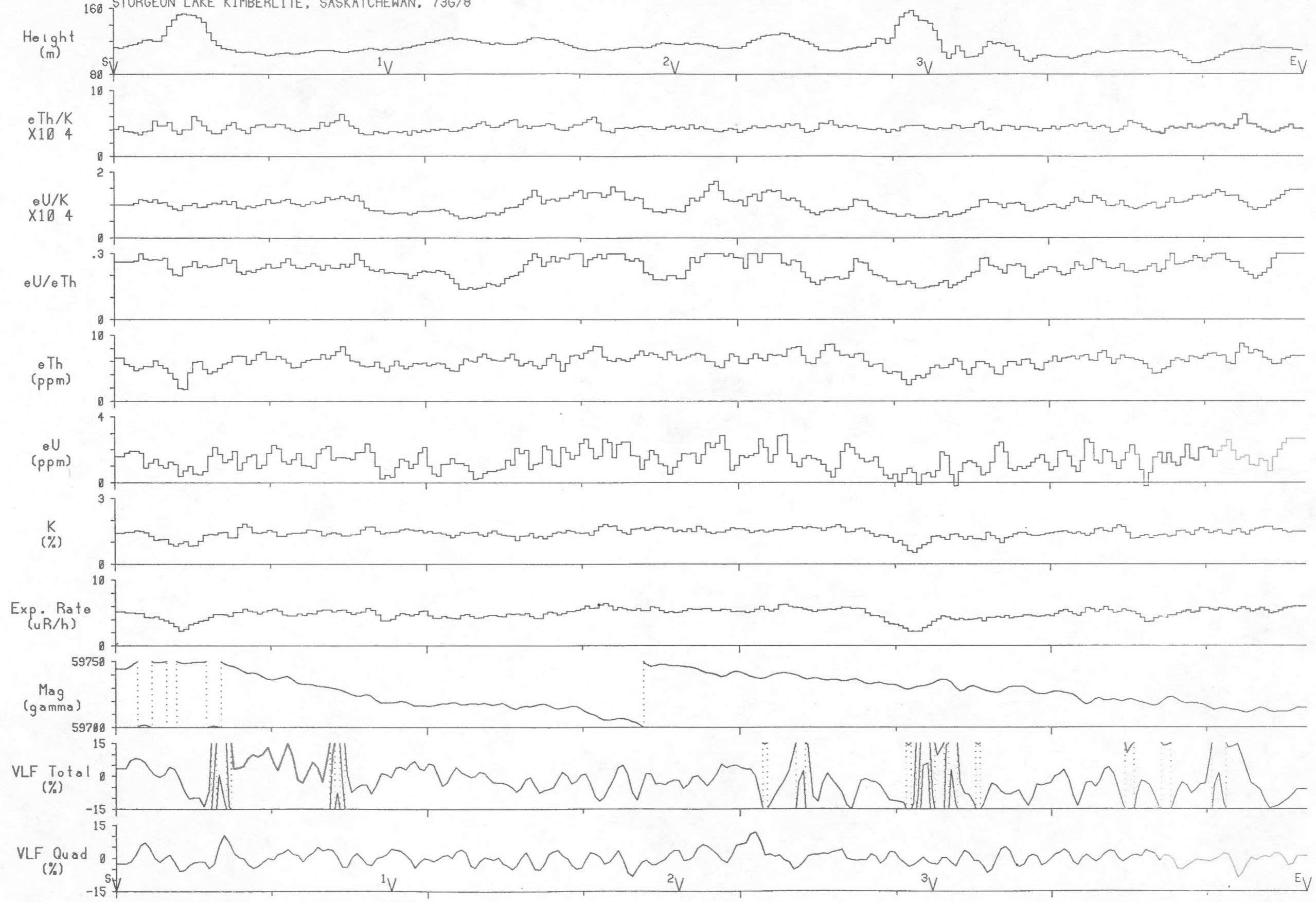


Line 14

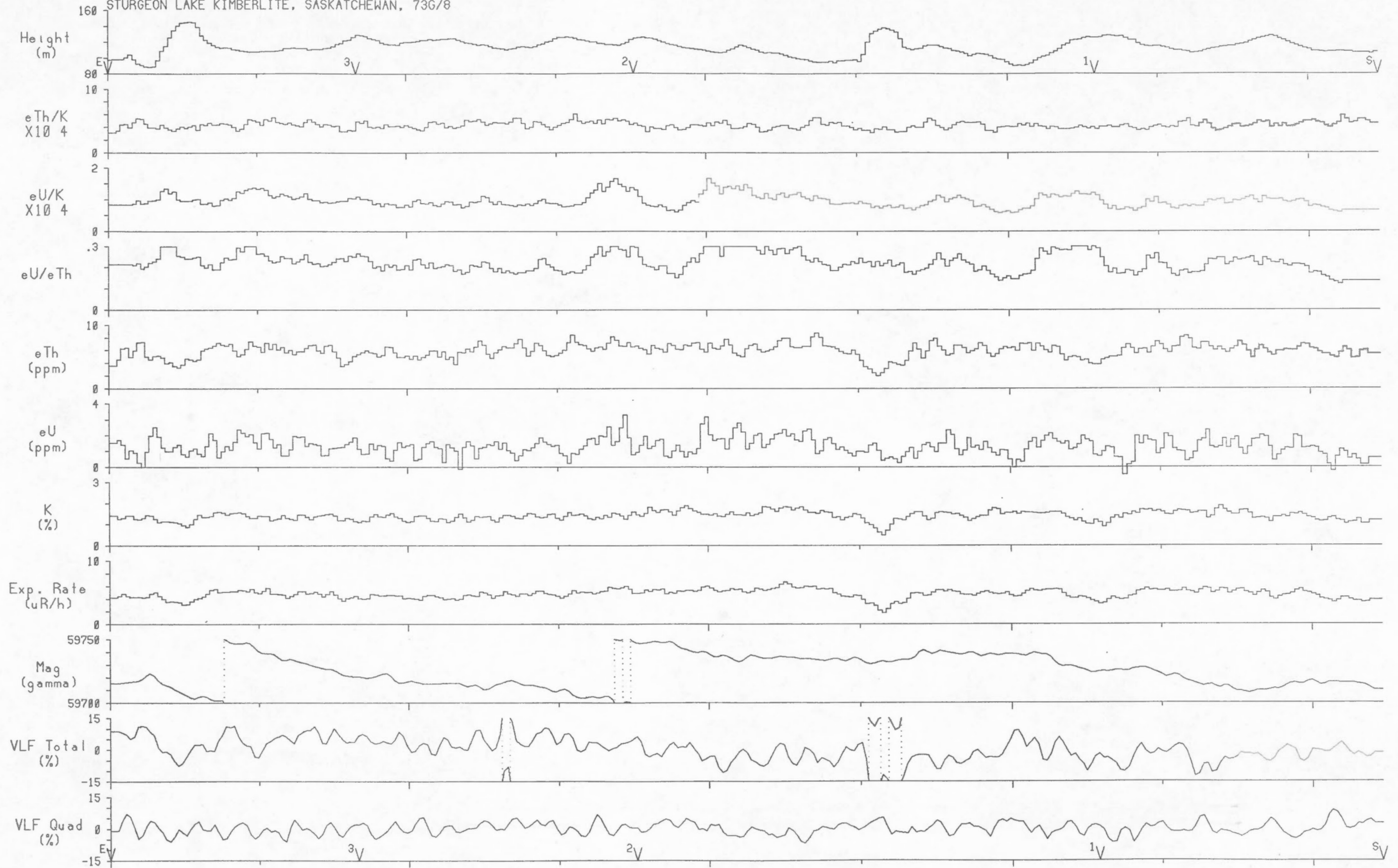
2 km

Scale 1:50000

STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 1989 (1/4 MILE)  
 STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 736/8



STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 1989 (1/4 MILE)  
 STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 73G/8

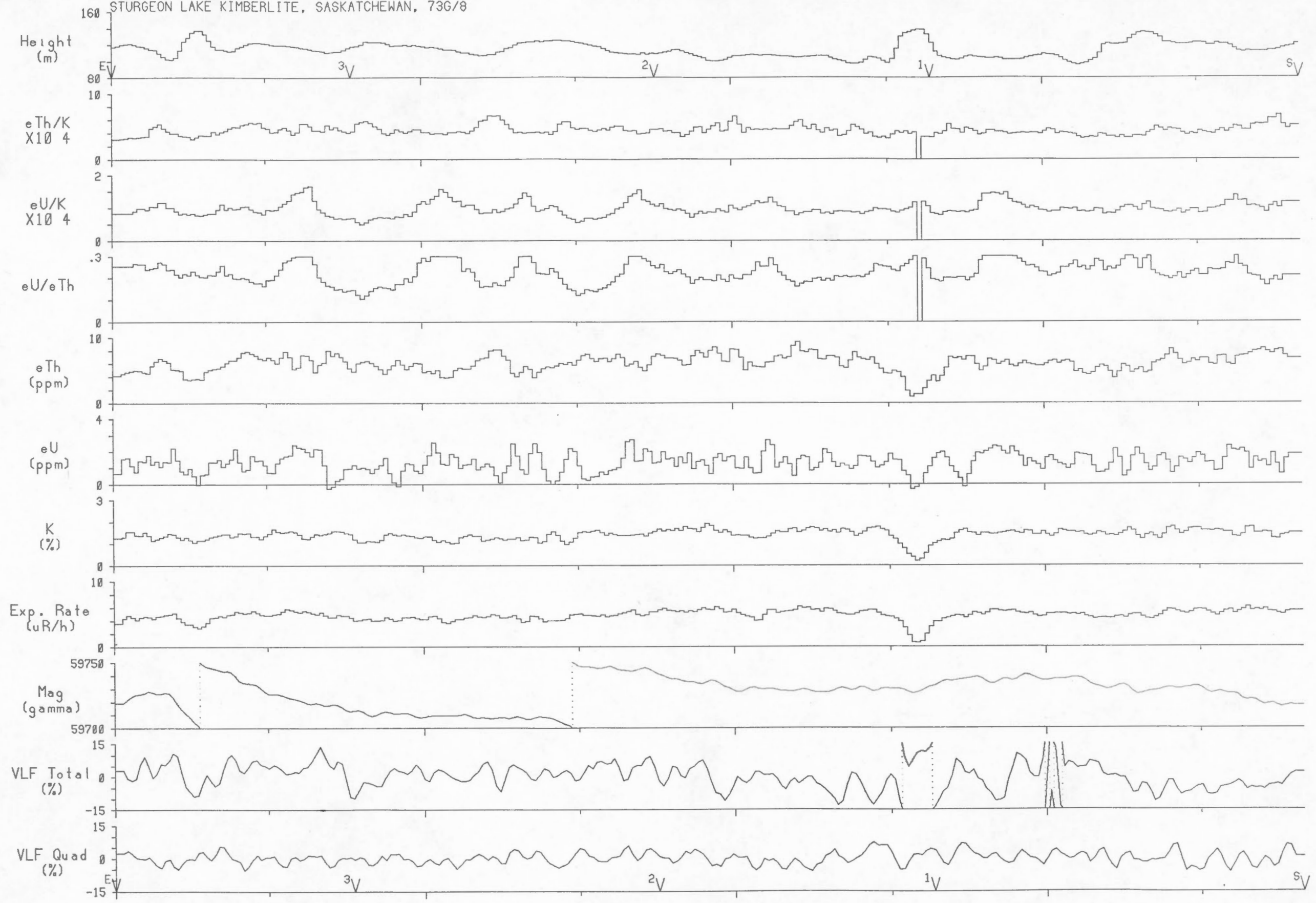


Line 16

2 km

Scale 1:50000

STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 1989 (1/4 MILE)  
STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 73G/8

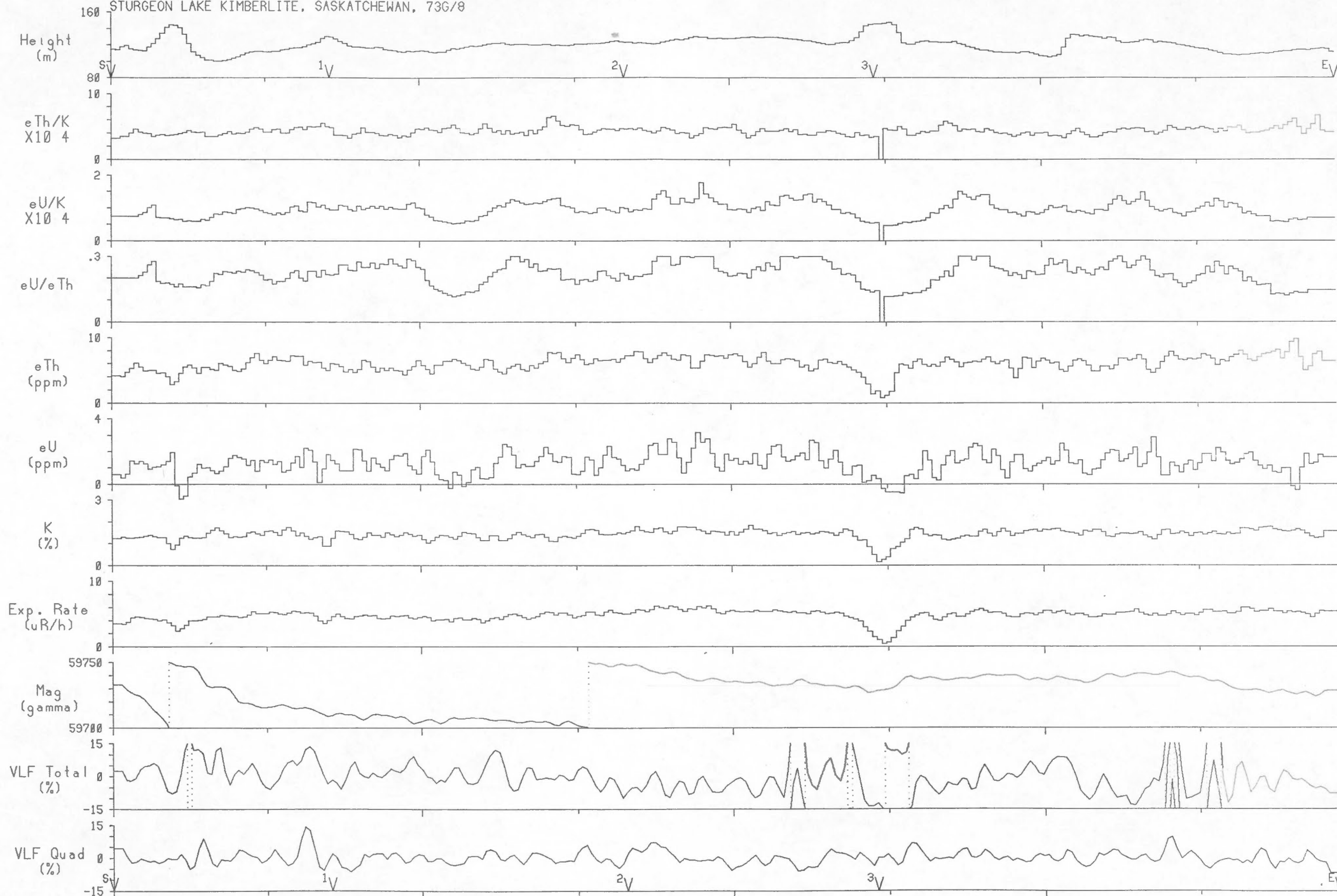


Line 17

2 km

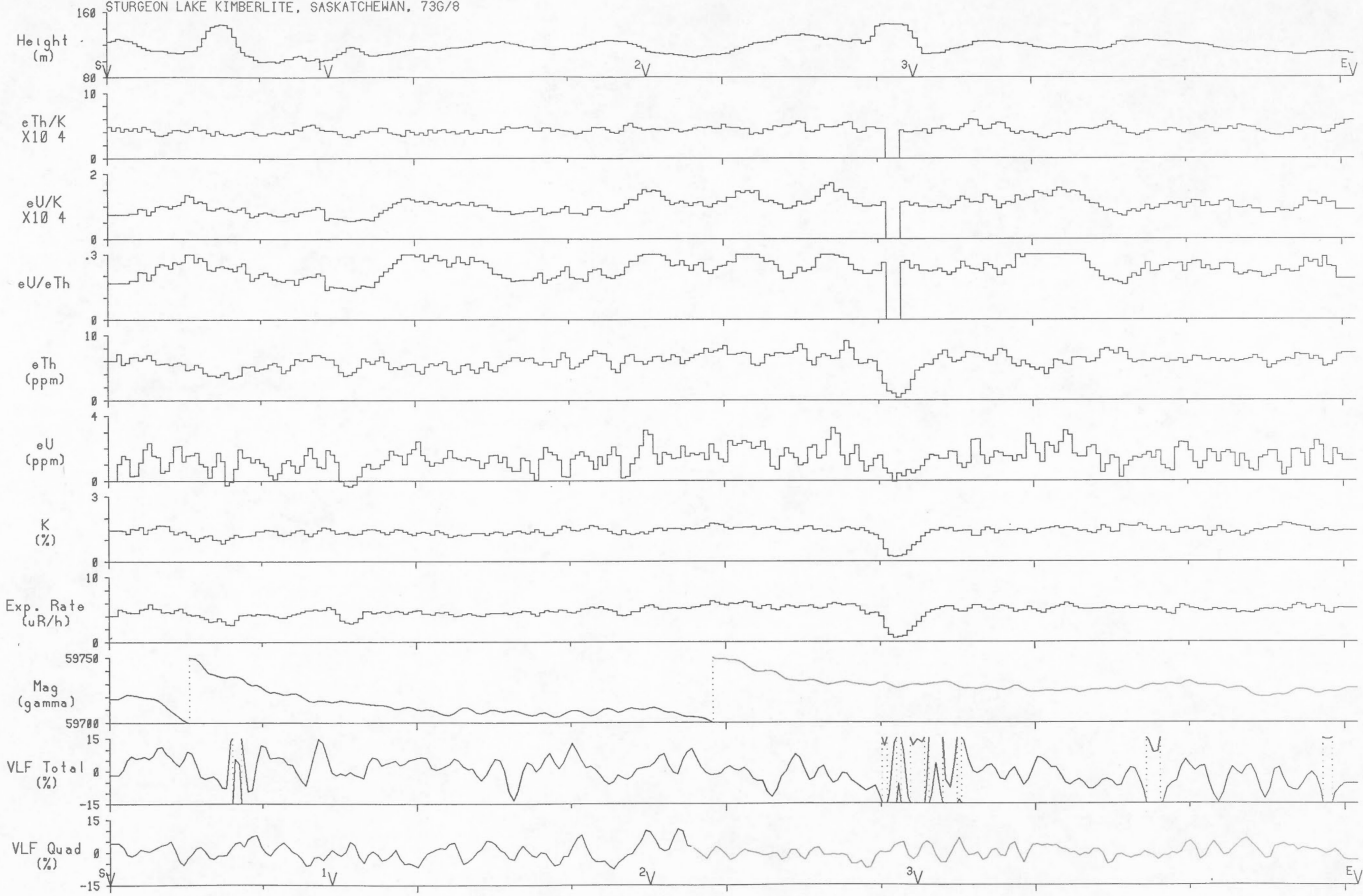
Scale 1:50000

STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 1989 (1/4 MILE)  
STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 73G/8





STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 1989 (1/4 MILE)  
 STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 73G/8

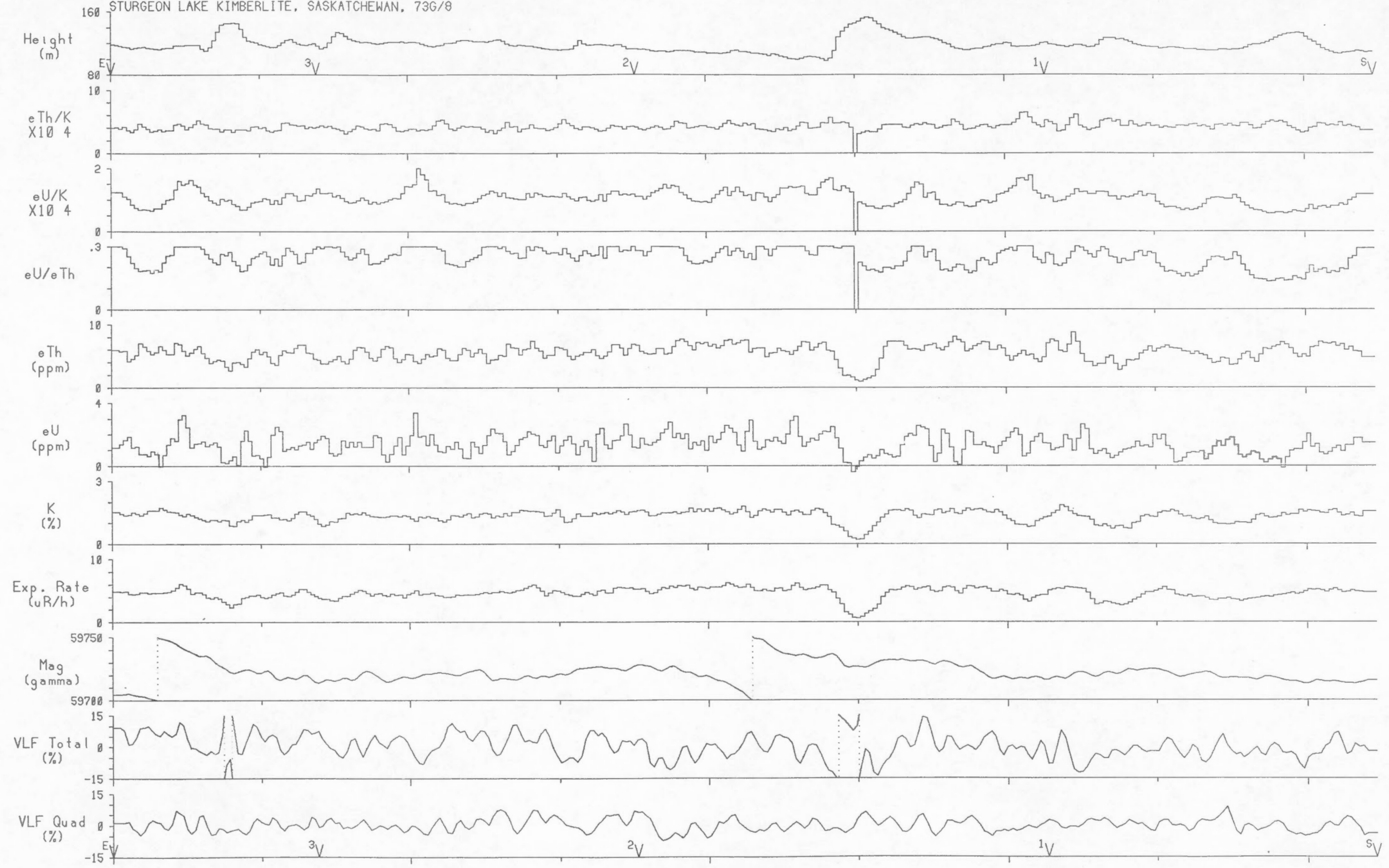


Line 19

2 km

Scale 1:50000

STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 1989 (1/4 MILE)  
STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 73G/8

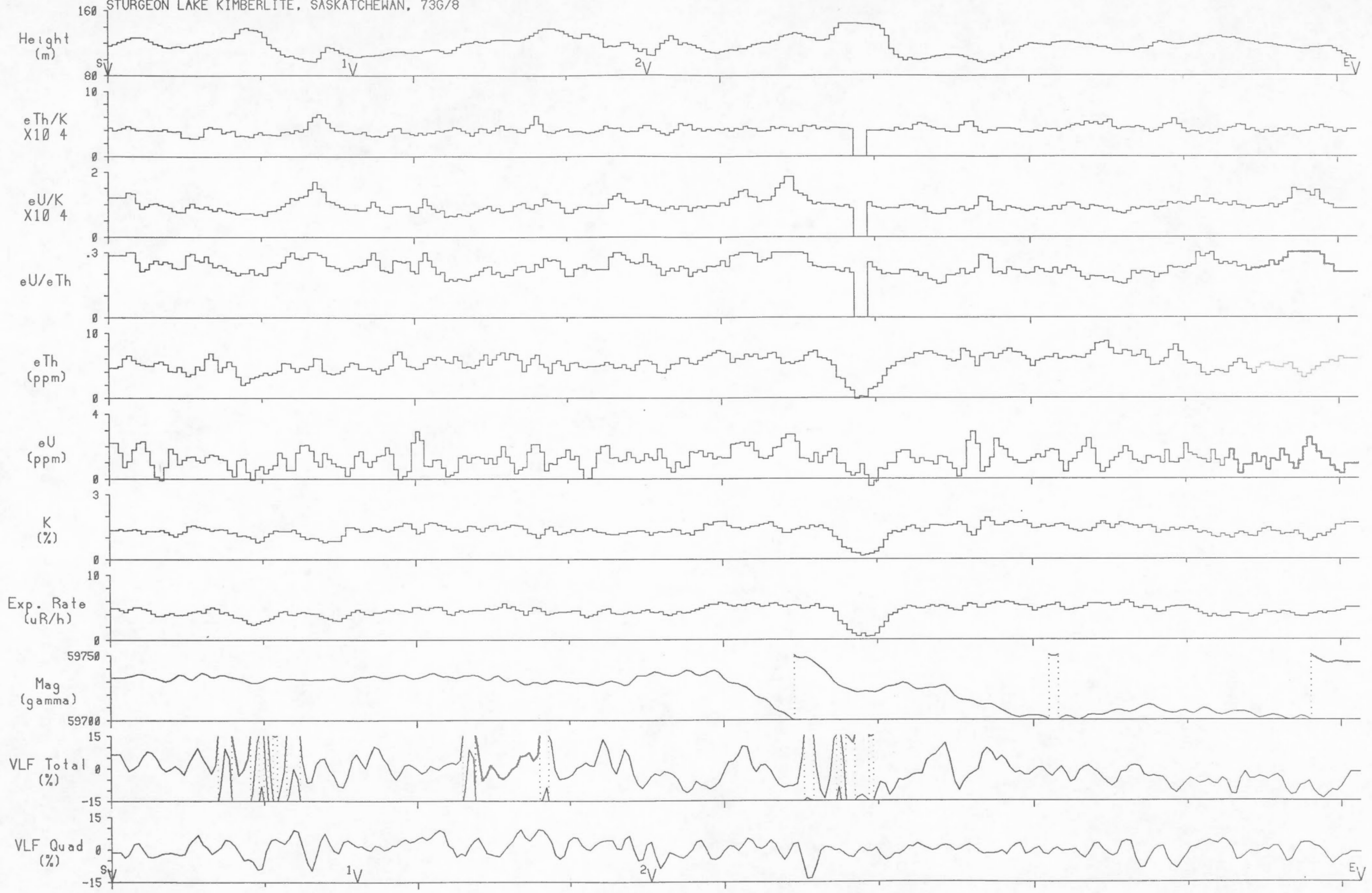


Line 20

2 km

Scale 1:50000

STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 1989 (1/4 MILE)  
STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 73G/8

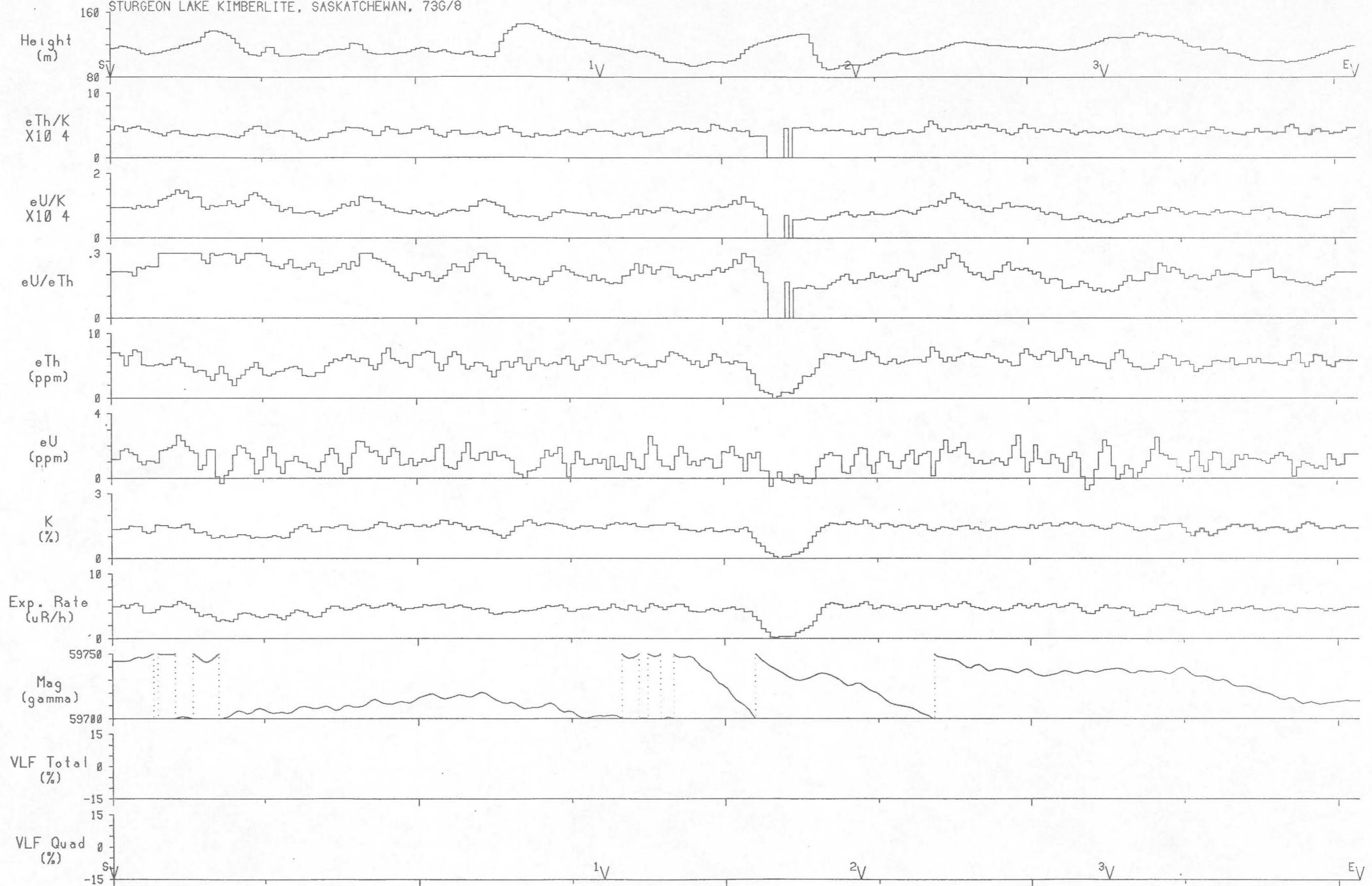


Line 21

2 km

Scale 1:50000

STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 1989 (1/4 MILE)  
STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 73G/8

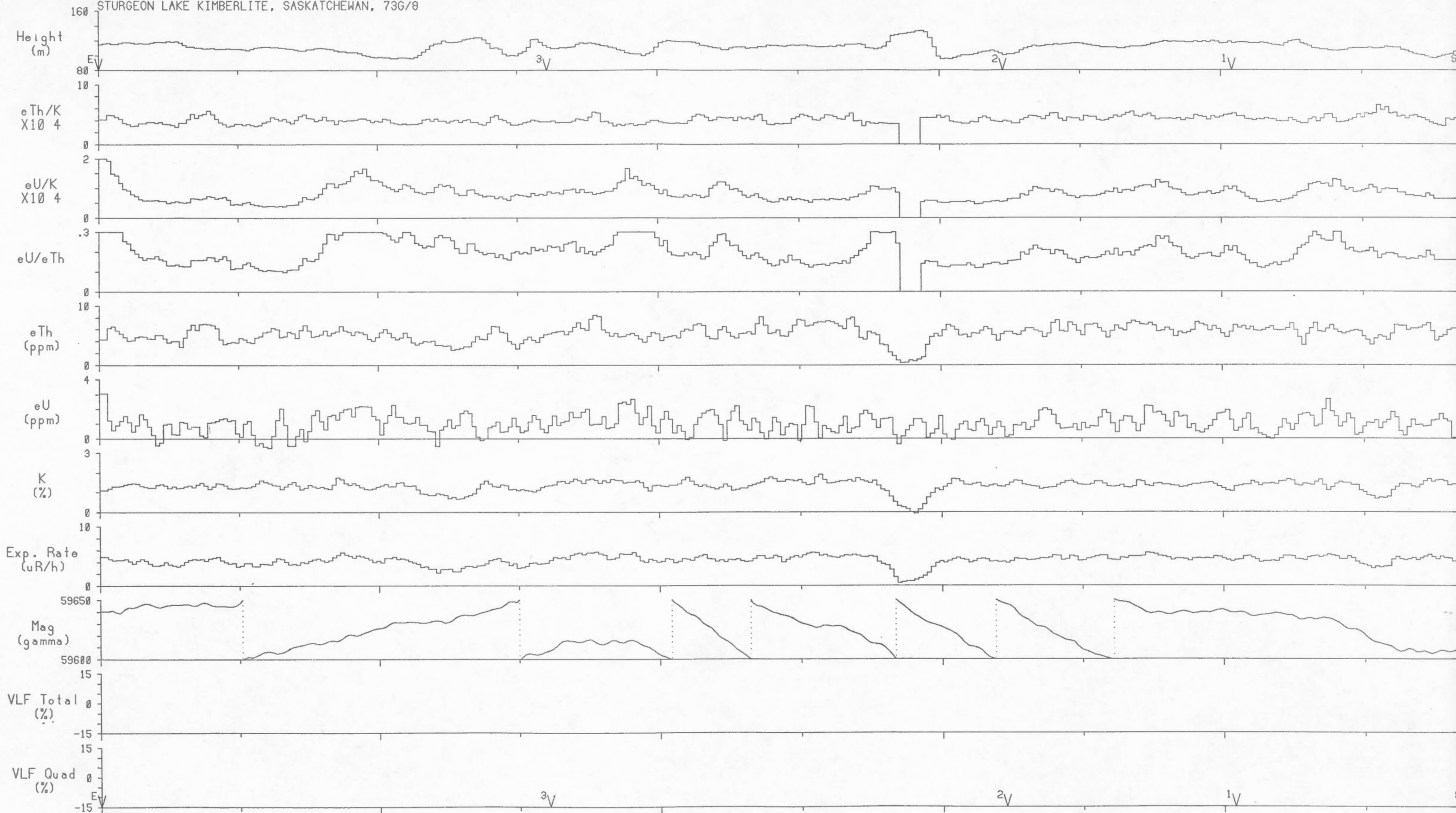


Line 22

2 km

Scale 1:50000

STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 1989 (1/4 MILE)  
STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 73G/8

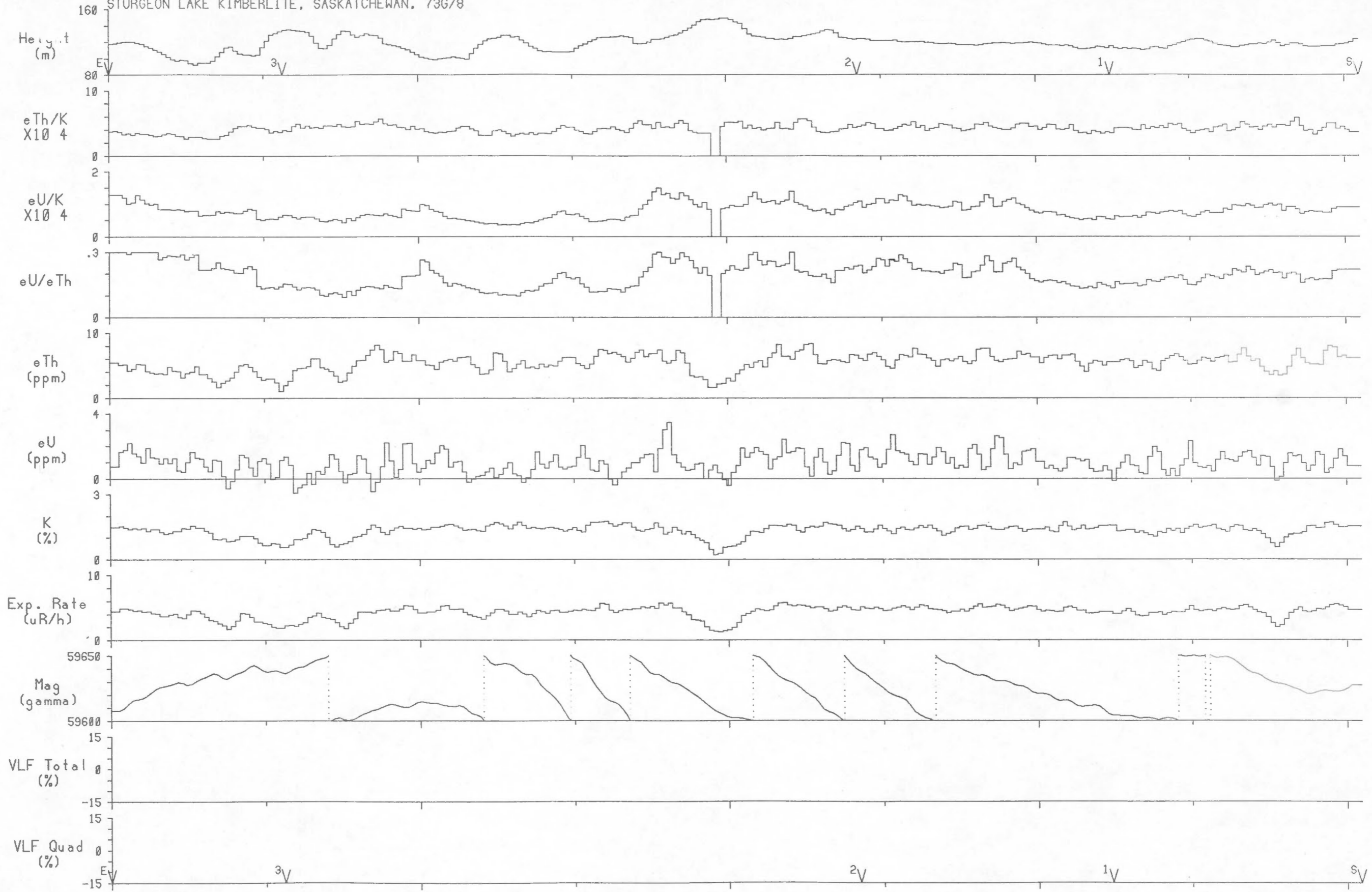


Line 23

2 km

Scale 1:50000

STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 1989 (1/4 MILE)  
 STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 736/8

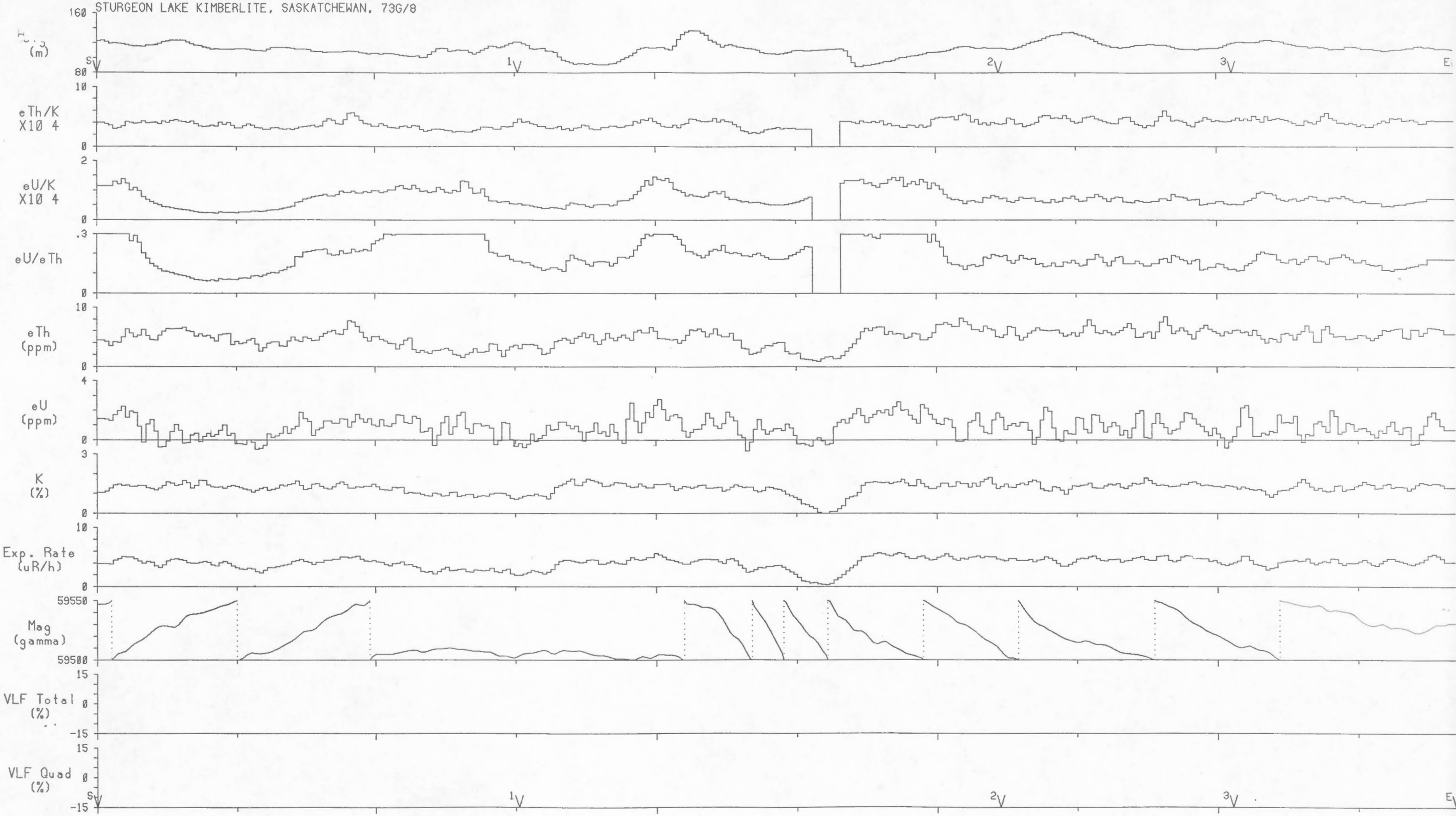


Line 24

2 km

Scale 1:50000

STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 1989 (1/4 MILE)  
STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 73G/8

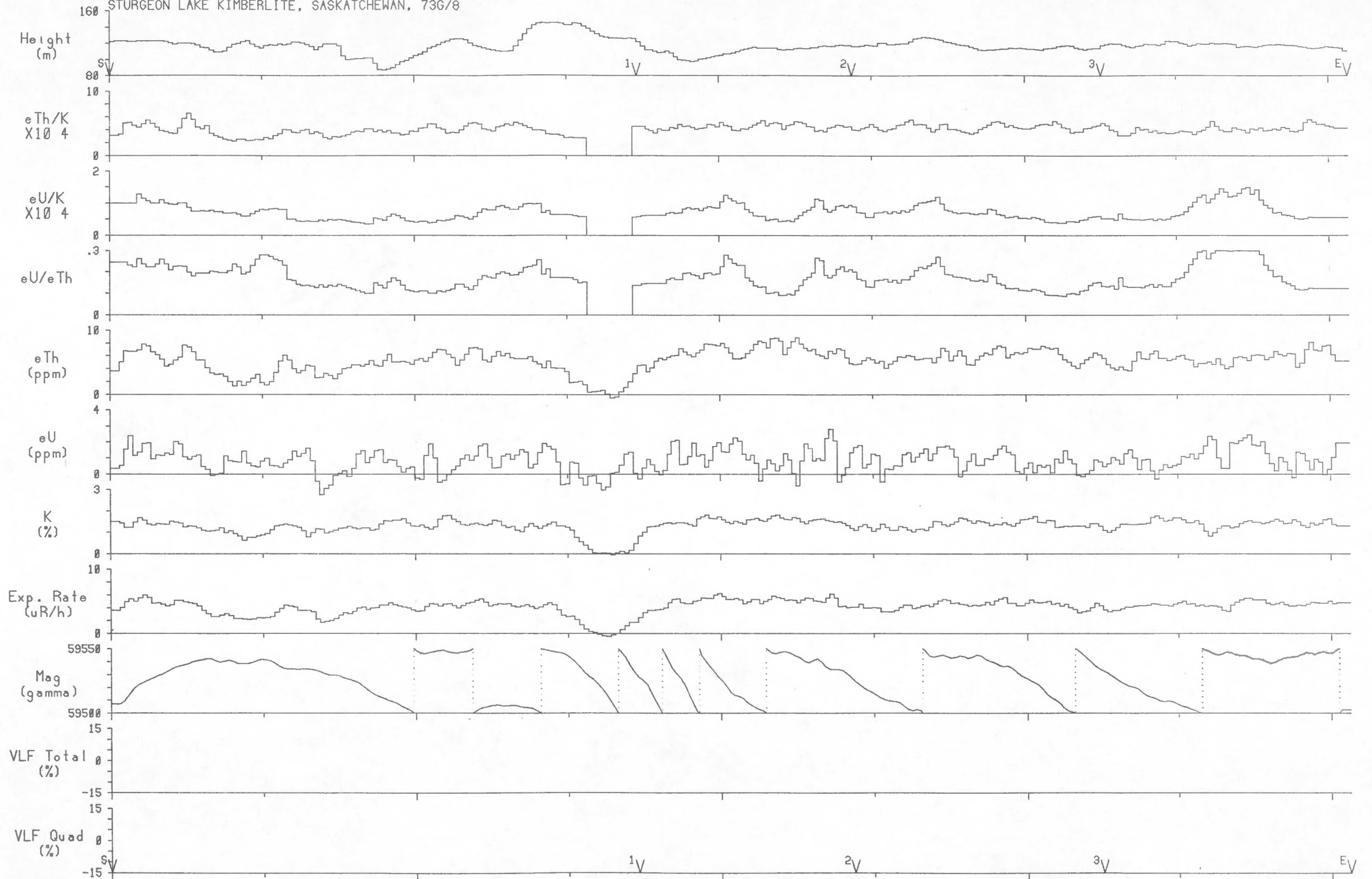


Line 25

2 km

Scale 1:50000

STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 1989 (1/4 MILE)  
 STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 73G/8



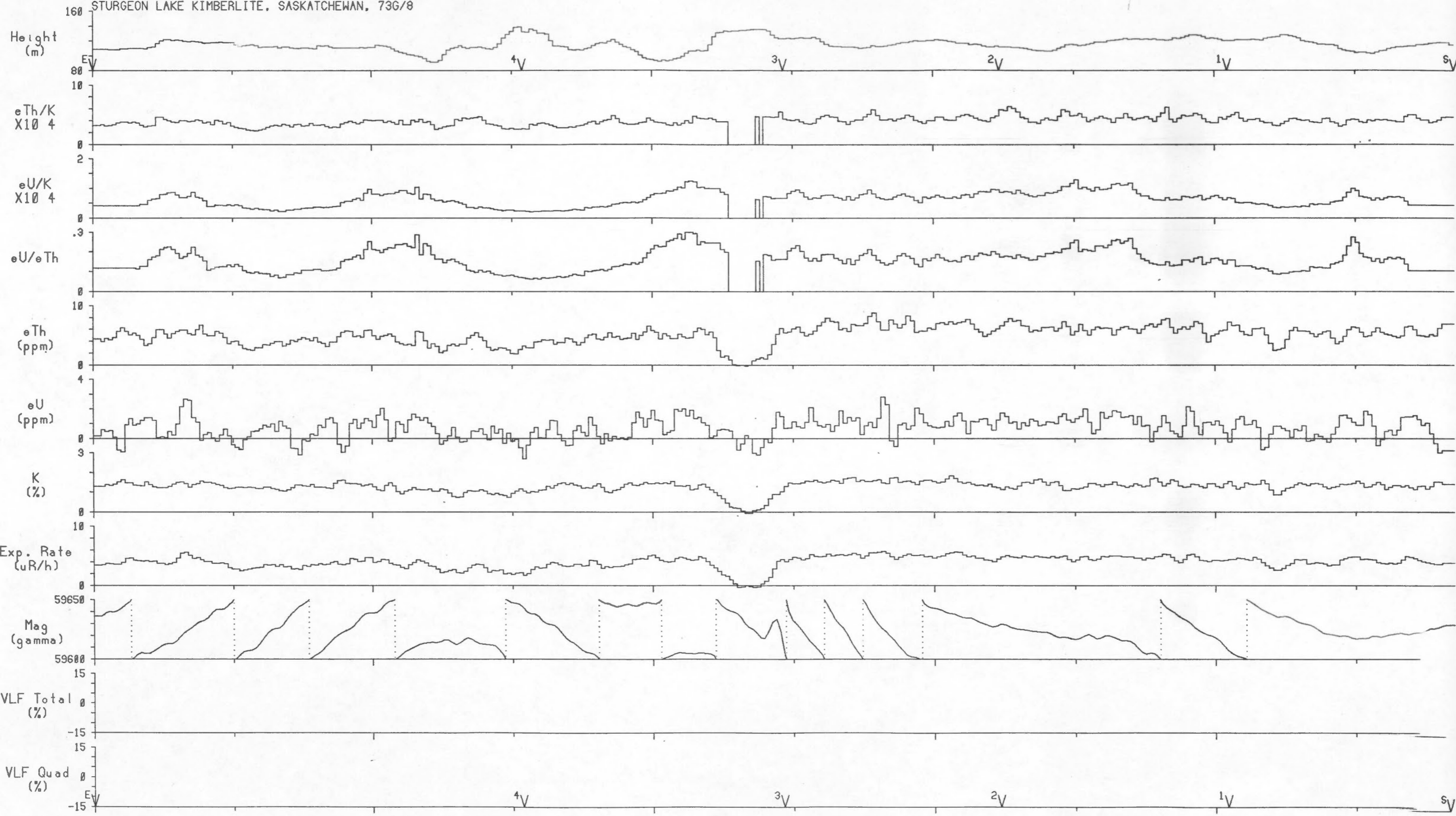
Line 26

2 km

Scale 1:50000



STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 1989 (1/4 MILE)  
STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 73G/8

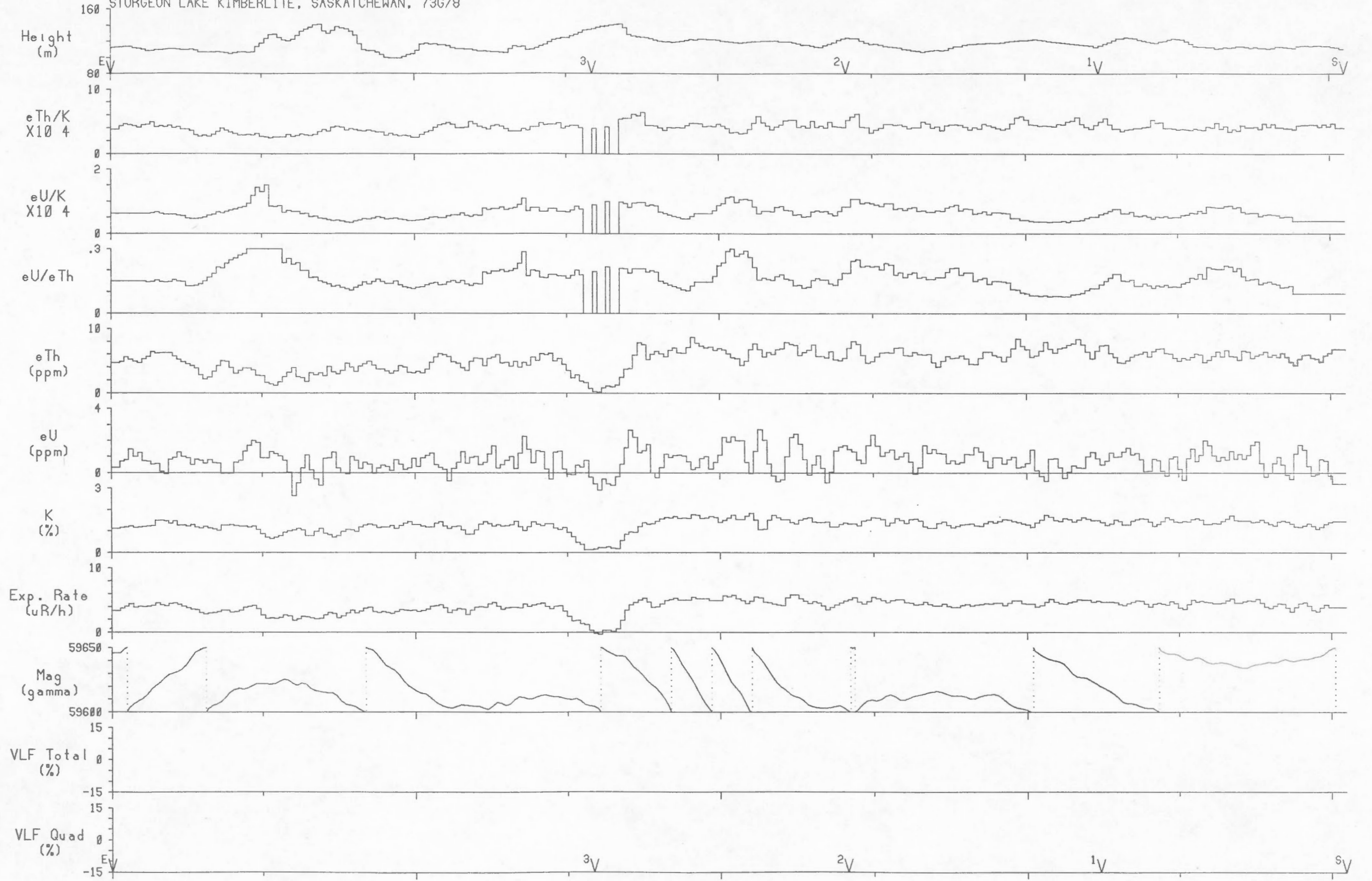


Line 27

2 km

Scale 1:50000

STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 1989 (1/4 MILE)  
 STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 73G/8

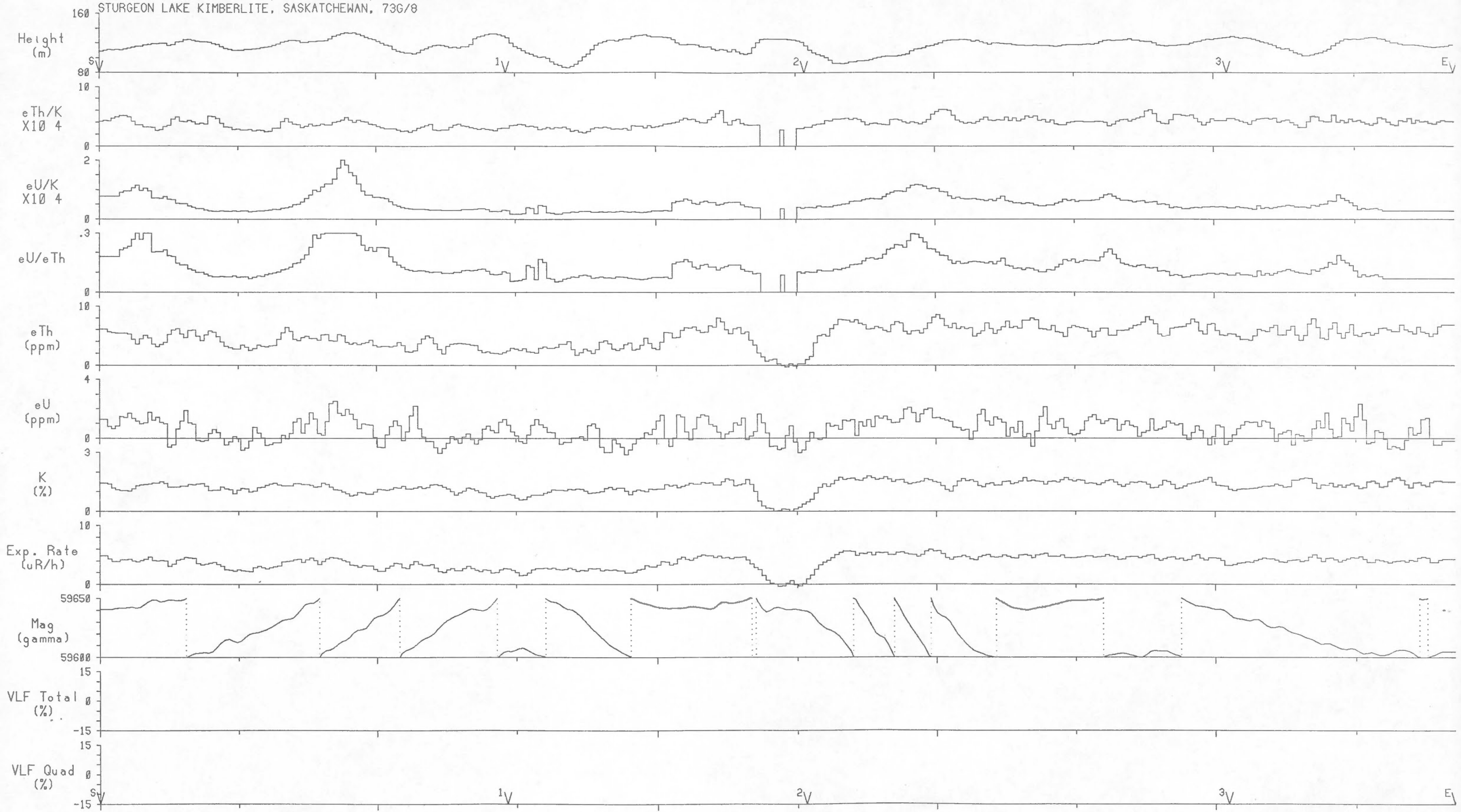


Line 28

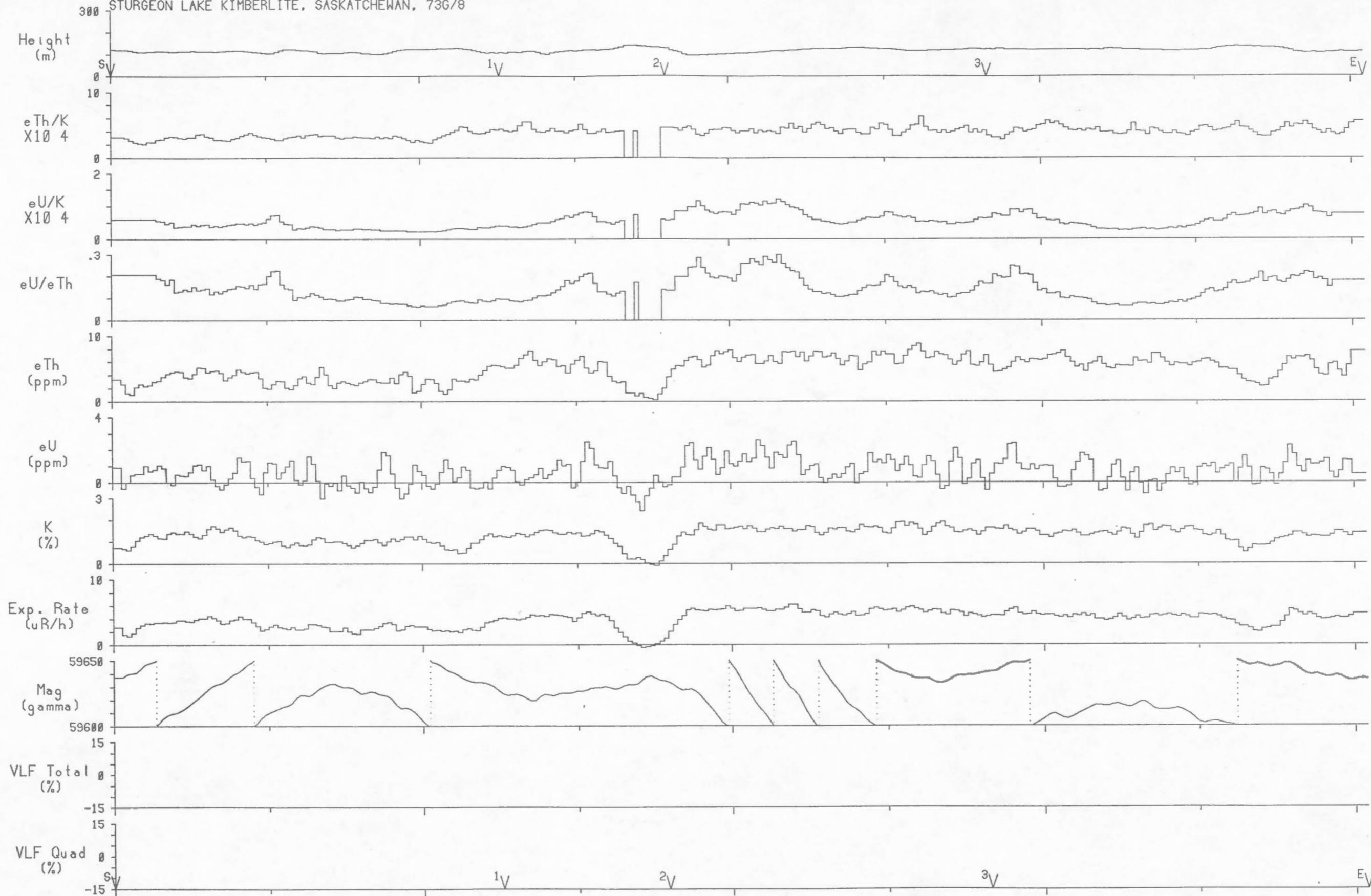
2 km

Scale 1:50000

STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 1989 (1/4 MILE)  
STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 73G/8



STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 1989 (1/4 MILE)  
 STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 73G/8

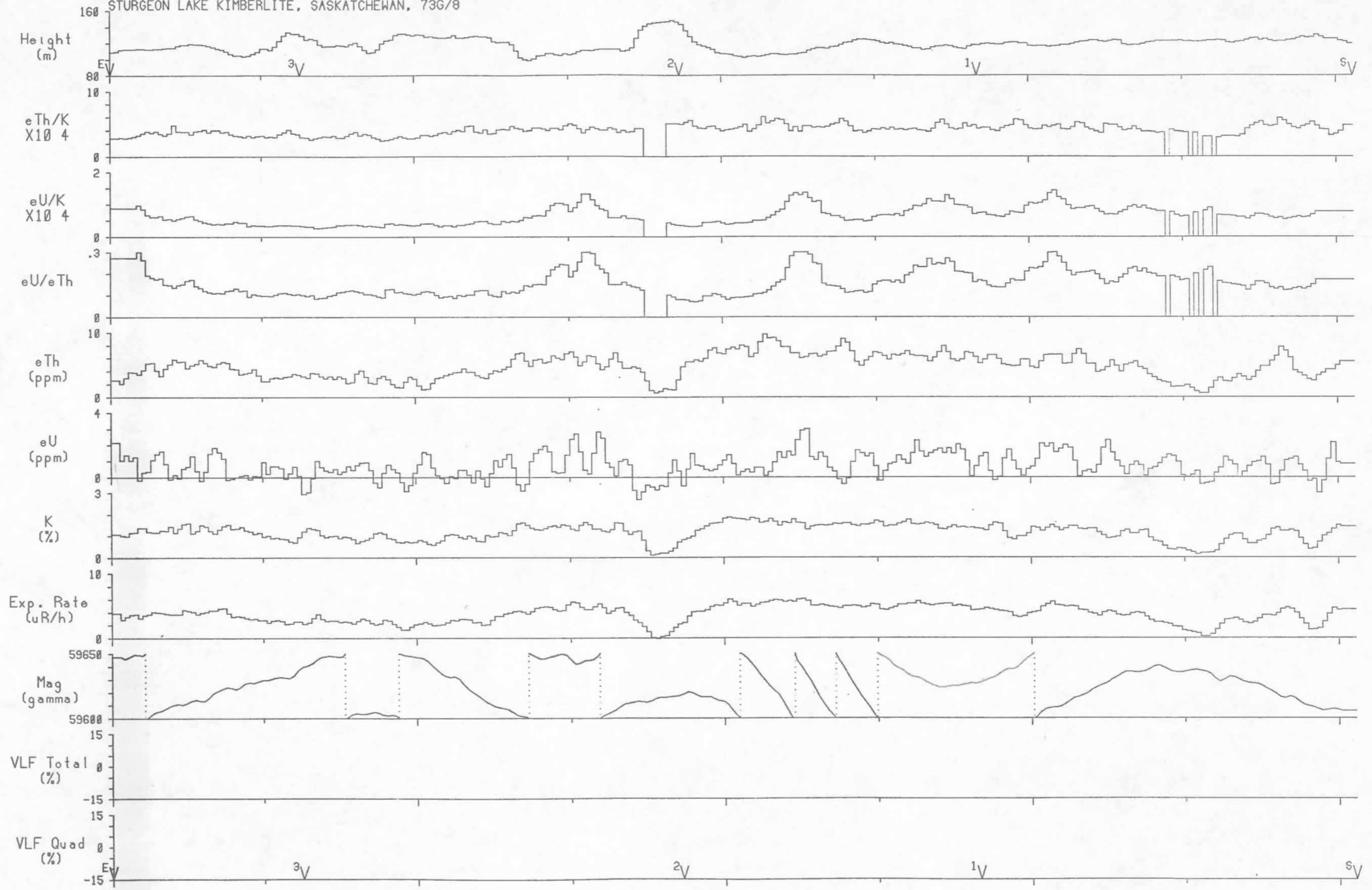


Line 30

2 km

Scale 1:50000

STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 1969 (1/4 MILE)  
 STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 73G/8

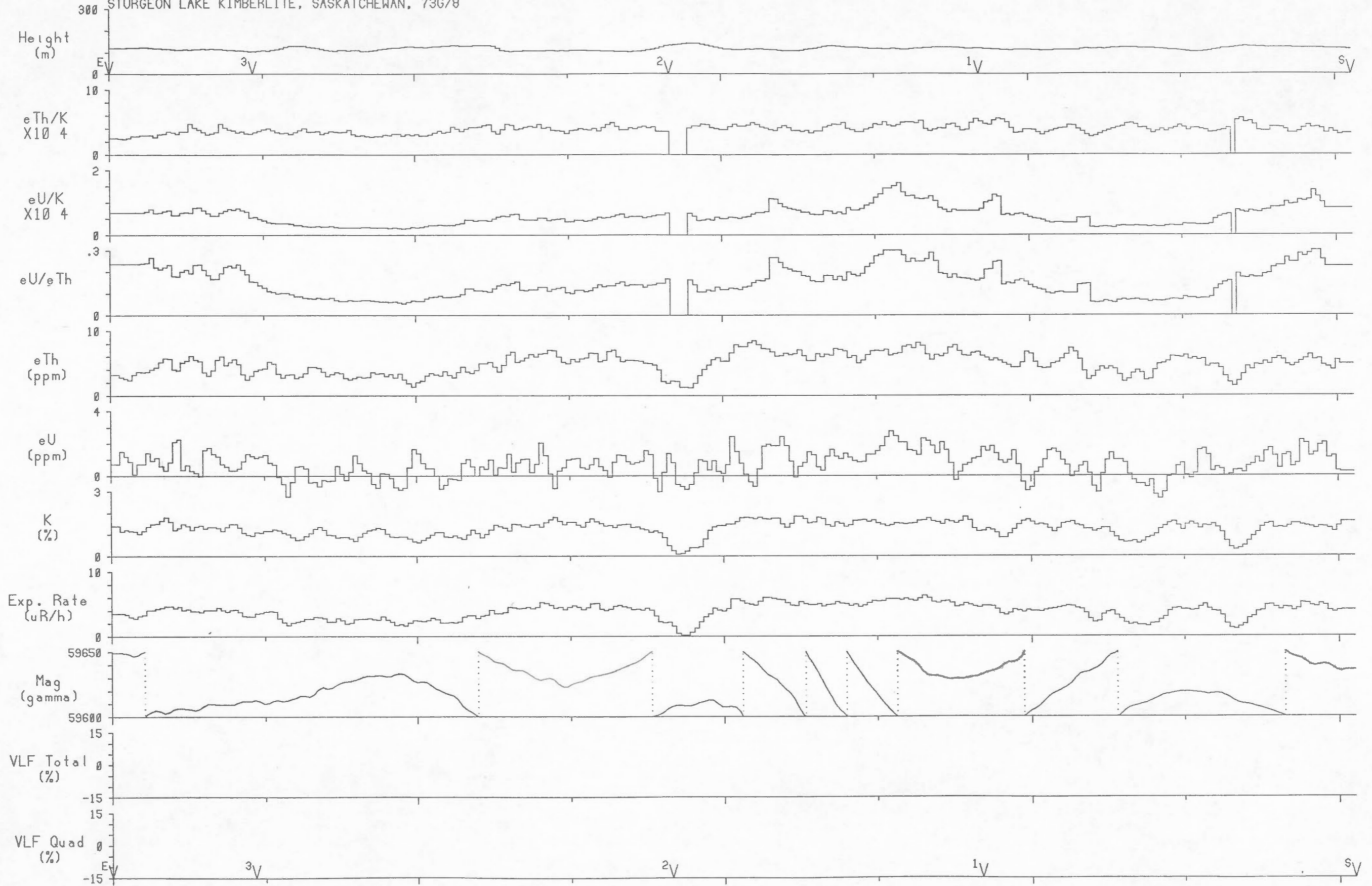


Line 31

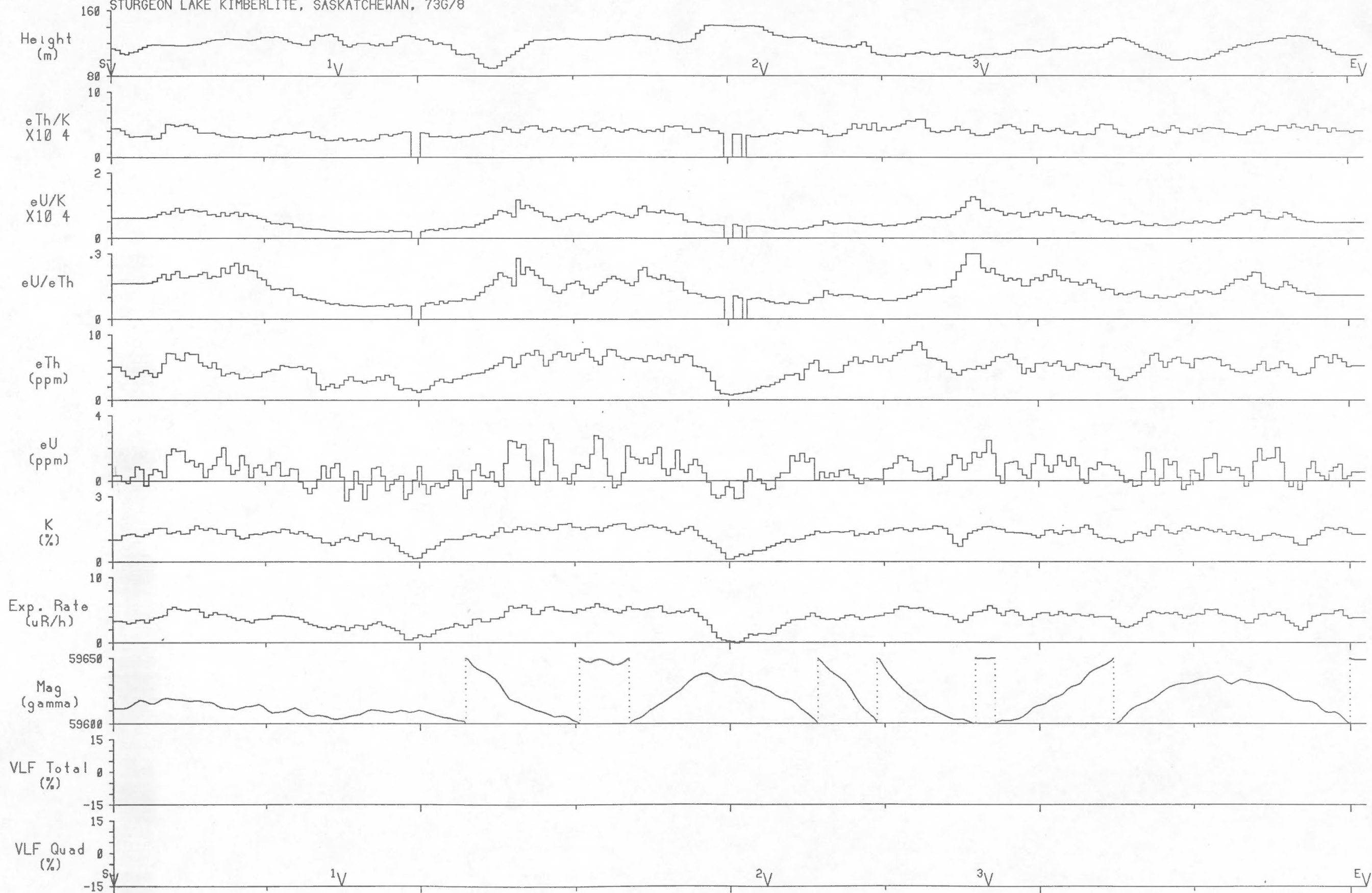
2 km

Scale 1:50000

STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 1989 (1/4 MILE)  
 STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 73G/8



STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 1989 (1/4 MILE)  
 STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 73G/8

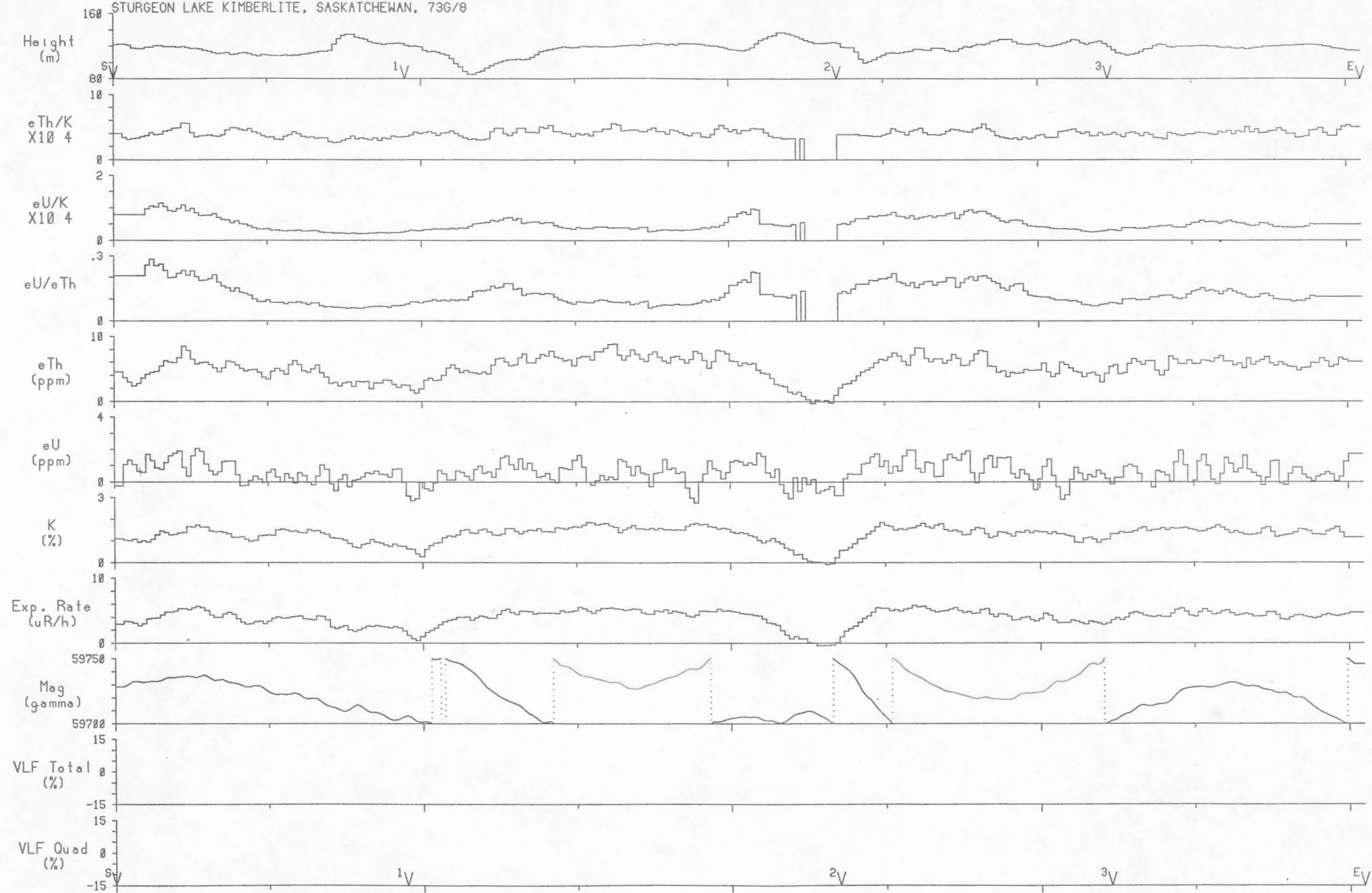


Line 33

2 km

Scale 1:50000

STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 1989 (1/4 MILE)  
STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 73G/8



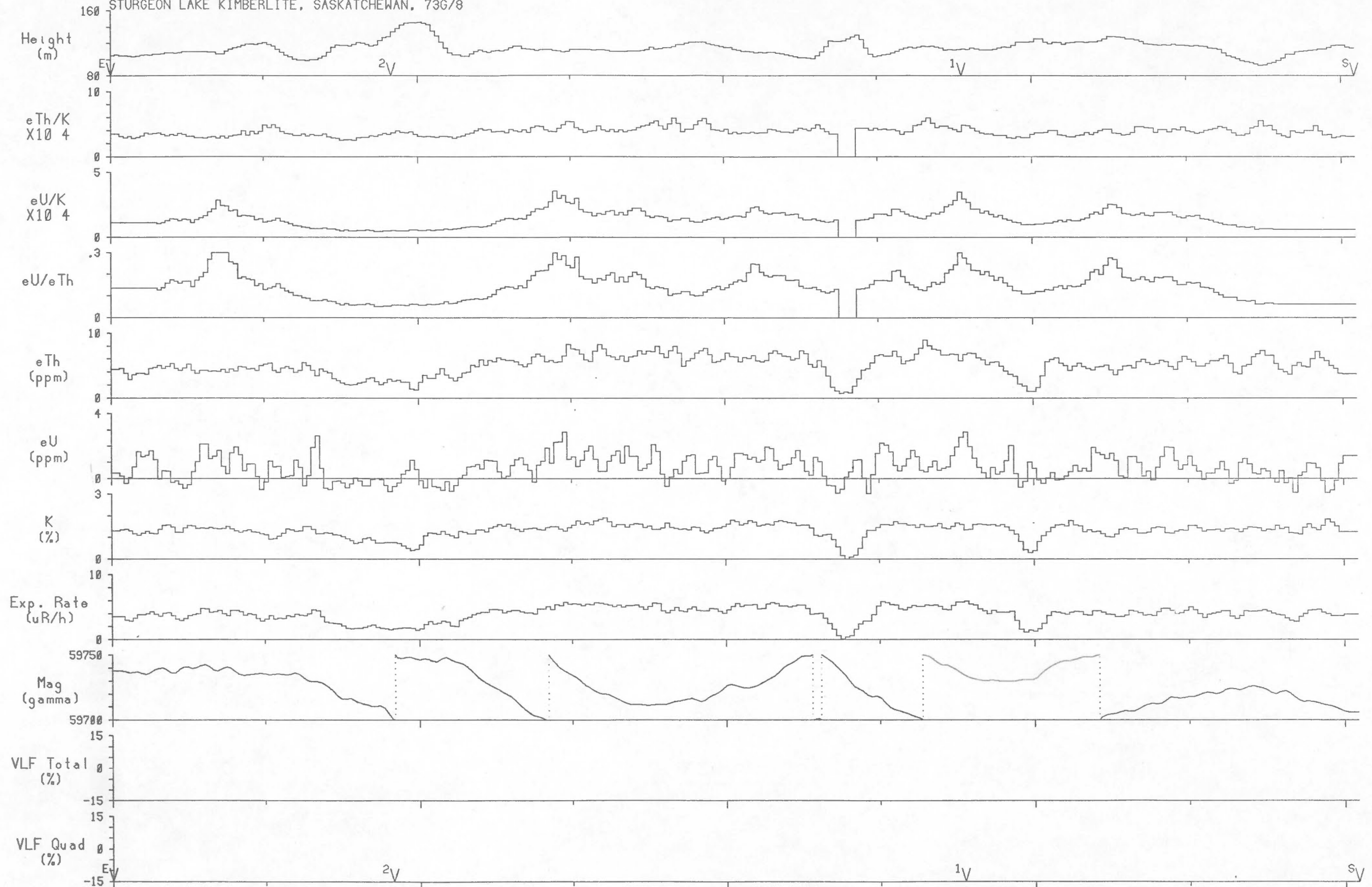
Line 34

2 km

Scale 1:50000



STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 1989 (1/4 MILE)  
 STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 73G/8

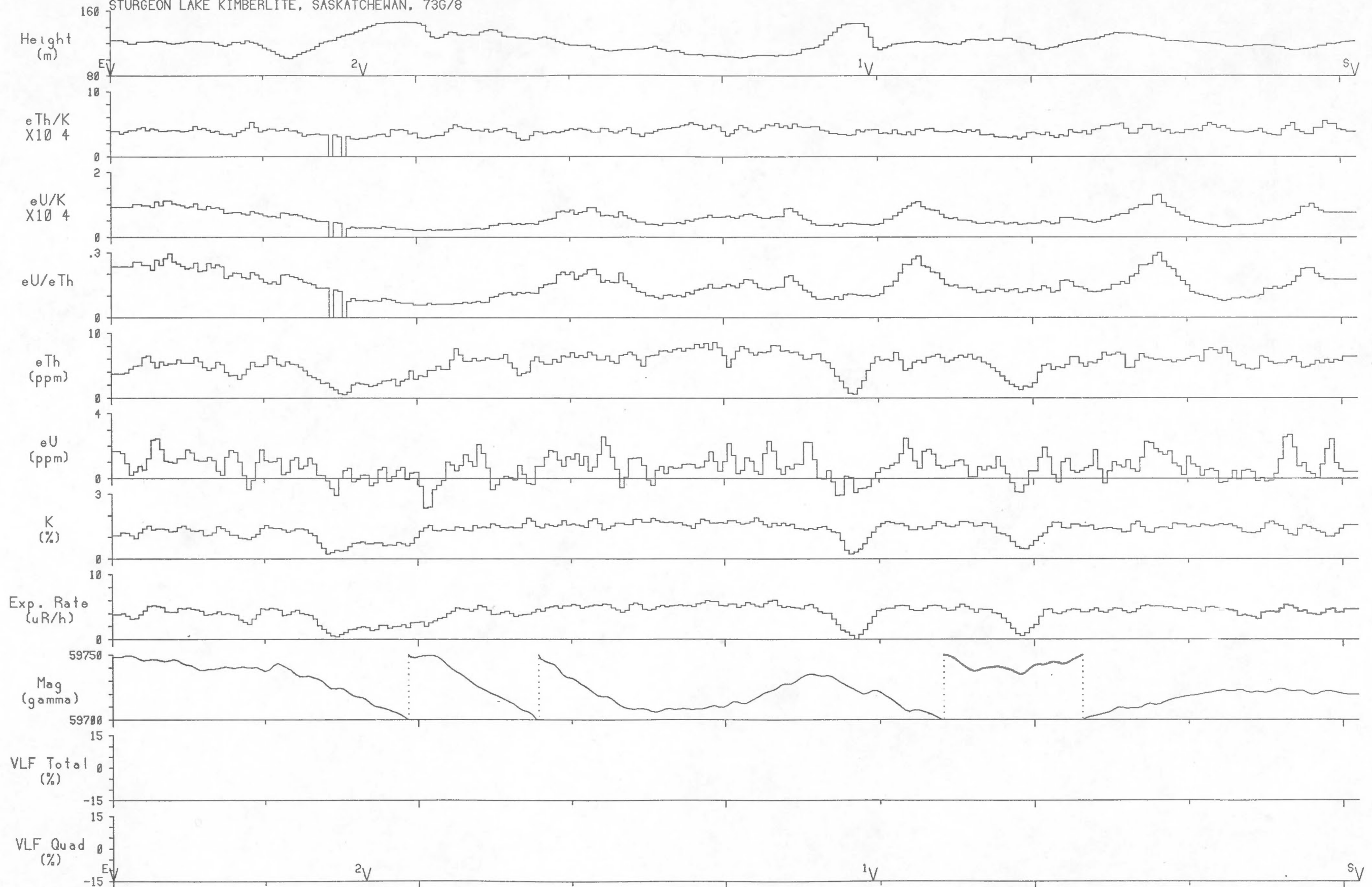


Line 35

2 km

Scale 1:50000

STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 1989 (1/4 MILE)  
 STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 73G/8



STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 1989 (1/4 MILE)  
 STURGEON LAKE KIMBERLITE, SASKATCHEWAN, 73G/8

