December 11, 1997 Price: $36.00

Division of Geological & Geophysical Surveys

PUBLIC-DATA FILE 97-28

AEROMAGNETIC SURVEY SOUTHEASTERN BETHEL BASIN, ALASKA

by

Stephan D. Sander, M.Sc.
Sander Geophysics Ltd.

December 1997

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794 University Avenue, Suite 200
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INTERPRETATION REPORT

AEROMAGNETIC SURVEY

SOUTHEASTERN BETHEL BASIN
Bethel, Alaska

1996

Contract #: 10-97-002 / Public Data File: 97-28

for

ALASKA DIVISION OF
GEOLOGICAL AND GEOPHYSICAL SURVEYS

Stephan D. Sander, M.Sc. August 1997

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EXPLORATION *RESEARCH* *INTERPRETATION*

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I. INTRODUCTION

Sander Geophysics Limited *(Appendix I)* conducted a high-sensitivity aeromagnetic survey of the Southeastern Bethel Basin in southwestern Alaska for the Alaska Division of Geological and Geophysical Surveys. The survey was flown in the October of 1996, in twenty-one production flights totalling 14,628 line kilometres. The survey expanded upon an area surveyed in 1994 by Geonex Aero Services. Aeromagnetic maps have been published as Public Data File (PDF): 97-27.

The interpretation was performed by Sander Geophysics Ltd. using an analysis of colour and grey scale shadow images of the total magnetic field, first vertical derivative of the magnetic field and the second vertical derivative. In addition depth modelling was performed using 2.5 dimensional forward modelling techniques.

The survey area consists of a very deep basin, filled with non magnetic and magnetic sedimentary and volcanic rocks, bounded on the east by igneous or volcanic rocks. Within the sedimentary rocks are several intrusions.

II. SURVEY AREA

The area surveyed by SGL is comprised of two blocks (*Figure 1*) north and south of a previous survey flown in 1994 centered on the town of Bethel. The larger block, South Block, is to the south of the town and extends to the coast. The North Block follows the Kuskoquim River inland approximately 30 nm. The following corner coordinates define the boundaries of each block in NAD-27:

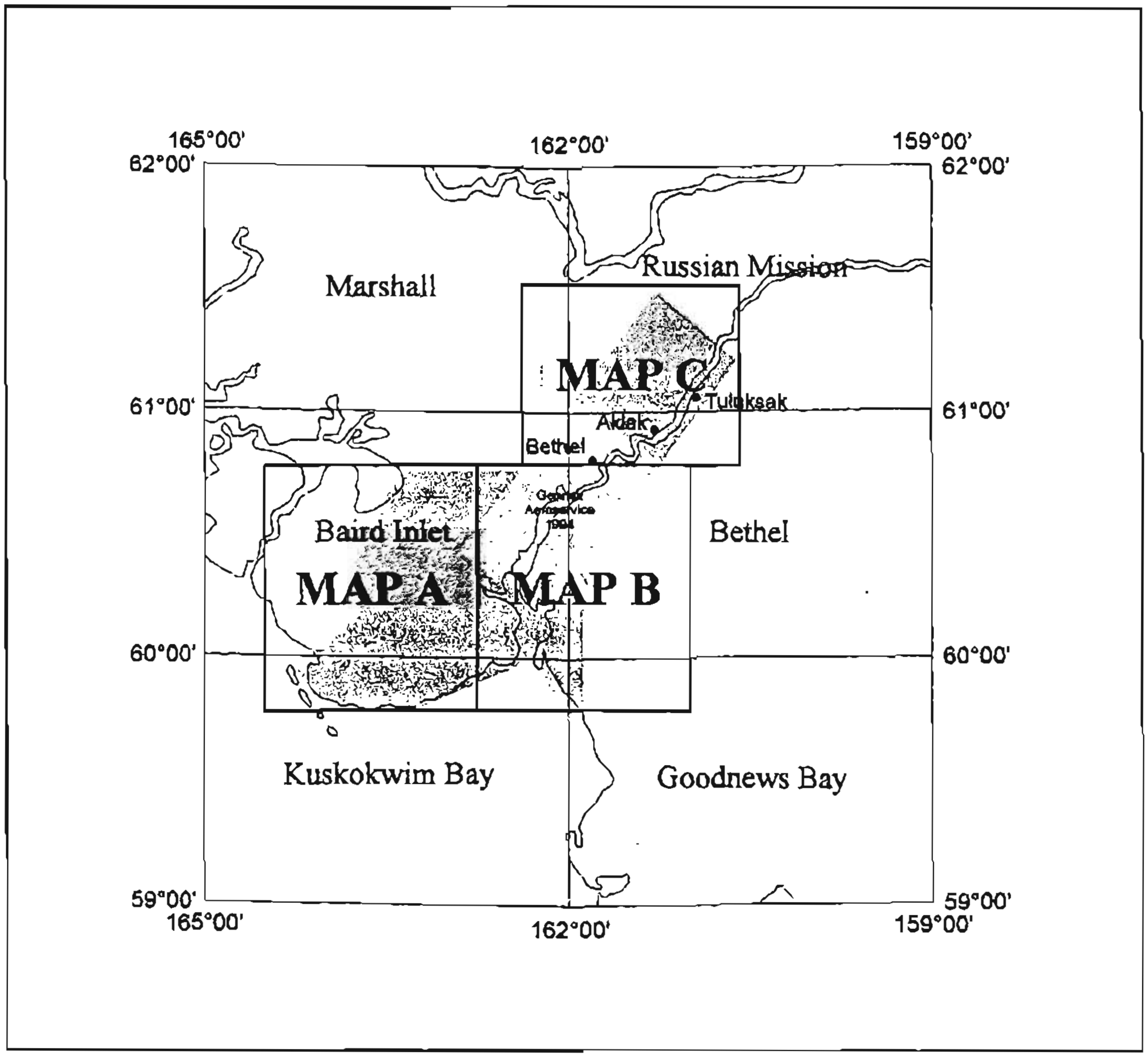
Block	Corner	Latitude	Longitude
SOUTH	1.	56°45'00"	119°56'00"
	2.	58°02'00"	119°56'00"
	3.	58°02'00"	122°00'00"
	4.	57°15'00"	122°00'00"
	5.	57°15'00"	122°30'00"
	6.	57°00'00"	122°30'00"
	7.	57°00'00'	122°00'00"
	8.	56°45'00"	120°00'00"
	9.	56°45'00"	119°56'00"

Block	Corner	Latitude	Longitude
NORTH	1.	56°58'00"	118°56'00"
	2.	57°32'00"	118°56'00"
	3.	57°32'00"	120°00'00"
	4.	56°58'00"	120°00'00"
	5.	56°58'00"	118°56'00"

The survey area extends from the Bering Sea inland along Kuskoquim River to north of Bethel. As it is part of the Kuskoquim River delta, the terrain is very flat with only occasional low relief. The area is dotted with numerous small lakes and streams with the only vegetation consisting of low shrubs and grasses. The area is populated with numerous small villages; Bethel serving as the major hub. Infrastructure, other than the villages, is very limited with no roads, powerlines or pipelines in the area. Transportation is restricted to watercraft or aircraft making the area very busy from an aviation point of view.

The aerial survey consisted of 287 traverse lines oriented N55W, and 25 orthogonal control lines.

Figure 1 : SURVEY AREA LOCATION



III. SURVEY EQUIPMENT

SGL provided the following instrumentation for the Southeastern Bethel Basin survey :

Figure 2: SURVEY EQUIPMENT AND INSTRUMENTS

Aircraft

BEECHCRAFT QUEENAIR	C-FWZG

Instruments - aircraft

1. Magnetometer sensor CS-2	s/n 9405005
2. Automatic Aeromagnetic Digital AADCII Compensator	s/n 9311629
3. GPS Navigation computer	s/n 003
4. NovAtel GPS card, model 3951R	s/n CGP 95080027
5. Video Camera, Panasonic DIGITAL-5100HS	s/n 42A00100
6. EM10 Video Monitor	s/n G50000412
7. VP10 video recorder	s/n L5HB00411
8. Sander ABAT II (with integrated BERNOULLI 230 disk drive)	
9. Radar Altimeter, TRT 5,000 ft.	s/n 8454
10. Barometric Altimeter,	S/N 462072

Instruments - ground station

1. Magnetometer sensor CS-2	s/n 9405005
2. Magnetometer coupler	s/n CMC 007
3. Computer system 486-66	s/n GND-01
4. NovAtel GPSCard model 3951R	s/n CGP 95080013
5. NovAtel GPS antenna Model 501	s/n CGA 95140231
6. Printer Citizen GSX-190	s/n ET075108
7. Uninterruptable Power Supply	s/n S93121466189

Instruments - office

1. Computer Pentium, 120 MHZ	s/n PENT-06
2. Computer Eurocom 9200D	s/n 40500562
3. Iomega Bernoulli 230 drive	s/n M515167007
4. Printer Fujitsu DL3800	s/n 193419
5. Video Cassette Recorder	s/n E6SAA0283

IV. INTERPRETATION TECHNIQUES

The interpretation was performed using interpretation tools including analysis of total magnetic field, first and second derivative and shadow maps, all presented with various colour and shading options. Line data was modelled using 2 ½ dimensional forward modelling for major cross sections of the survey area.

The survey area is a deep basin with sediments intermingled with igneous intrusions, and volcanic flows.

V. AEROMAGNETIC ANOMALIES

The north and western side of the area consists of high amplitude, high frequency anomalies, interpreted as igneous intrusions, volcanic flows and possibly basement rocks. The main part of the basin consists of very long wave length anomalies with low amplitude, and much lower amplitude high frequency anomalies superimposed. Within the basin are several high amplitude anomalies interpreted as intrusions. The basin has been divided into three zones (A, B and C), and the margins into a further seven zones (D to J) based on their aeromagnetic signatures. Chart 1 outlines the major aeromagnetic characteristics of each area. Chart 2 lists the major structural features interpreted from the aeromagnetic data:

Chart 1

Zone	Typical Wavelengths	Typical Amplitudes	Description and interpretation
A	very long	low	regional variations- thick section of non magnetic sediments
	medium high	high	very high amplitude anomalies (#1) - intrusion
	very high	low	small anomalies - slightly magnetic material near surface
B	medium	medium	broad regions of medium amplitude anomalies - volcanic ash, flows (#12,13,14,15)
	medium high	high	very high amplitude anomalies (#5,6,7,8,9,10,11) - intrusions, volcanic feeder pipes
	very high	low	small anomalies - slightly magnetic material near surface
C	very long	low	regional magnetic variations - thick section of non-magnetic sediments
	medium high	high	very high amplitude anomalies (#28, 29) - intrusions
	very high	low	small anomalies - slightly magnetic material near surface
D	high	very high	intrusions, volcanics
E	medium	medium	volcanics, flows
F	medium high	very high	intrusions, volcanics
G	very high	very high	intrusions, volcanics, flows
H	high	very high	intrusions, volcanics, flows
I	medium high	high	volcanics, intrusions
J	very high	very high	intrusions, volcanics

Chart 2

Structure	
A	very deep basement, some evidence of intra sedimentary faulting (#19,20,22)
B	large scale flow like features, minor small scale faulting, two dikes, intruded or mineralized faults (#16,17)
C	extensive evidence of small intra sedimentary faulting (#26,27,35,36,37,38,39,40,41,42,43, 44), a series of offset dikes, intruded or mineralized faults (#30,31,32,33)
F	some evidence of a large bounding fault on the western side
I	very large scale faulting, internally faulted and fault bounded on west
J	some evidence of internal faulting and fault bounded on the west

INDIVIDUAL AEROMAGNETIC FEATURES

Representative individual interpreted features on the aeromagnetic map are numbered, and described in Chart 3.

Chart 3

1	intrusion, possibly faulted, mineralized around edges
2	cultural effects
3	cultural effects
4	cultural effects
5	intrusion or volcanics
6	intrusion or volcanics
7	intrusion or volcanics
8	intrusion or volcanics
9	intrusion or volcanics
10	intrusion or volcanics
11	intrusion or volcanics
12	volcanic flow or shallow intruded sheet
13	volcanic flow or shallow intruded sheet
14	volcanic flow or shallow intruded sheet
15	volcanic flow or shallow intruded sheet
16	mineralized fault or dyke

17	mineralized fault or dyke
18	intrusion or volcanics
19	intra sedimentary near surface faulting
20	intra sedimentary near surface faulting
21	intra sedimentary near surface faulting
22	intra sedimentary near surface faulting
23	volcanic flow or shallow intruded sheet
24	volcanic flow or shallow intruded sheet
25	bounding fault
26	intra sedimentary near surface faulting
27	intra sedimentary near surface faulting
28	intrusion or volcanics
29	intrusion or volcanics
30	mineralized fault or dyke
31	mineralized fault or dyke
32	mineralized fault or dyke
33	mineralized fault or dyke
34	intrusion or volcanics
35	intra sedimentary near surface faulting
36	intra sedimentary near surface faulting
37	intra sedimentary near surface faulting
38	intra sedimentary near surface faulting
39	mineralized fault or dyke
40	intra sedimentary near surface faulting
41	intra sedimentary near surface faulting
42	intra sedimentary near surface faulting
43	intra sedimentary near surface faulting
44	intra sedimentary near surface faulting
45	intra sedimentary near surface faulting
46	intra sedimentary near surface faulting
47	intra sedimentary near surface faulting
48	intra sedimentary near surface faulting
49	intra sedimentary near surface faulting
50	intra sedimentary near surface faulting
51	intra sedimentary near surface faulting

VI. DESCRIPTION OF THE INTERPRETED FEATURES

Zone A

The sedimentary section of the survey area is divided into three zones, A, B, and C, based primarily on their surface aeromagnetic characteristics. Zone A has the most uniform aeromagnetic signature. It smoothly changes from a uniform magnetic low in the southeast to a magnetic high in the northwest side of the basin. This change could be the regional magnetic gradient, or the effects of the igneous and/or volcanic rocks to the north and southwest of zone A. There is no strong evidence of basement magnetic anomalies below the sediments in Zone A, probably due to the large depth of the sediments relative to width of the basin.

Feature 1 is interpreted as an intrusion into Zone A. The intrusion has a generally negative magnetic signature with smaller positive anomalies along its edge. This is interpreted as an intrusion with higher susceptibility rocks around its edge, due to mineralization around the intrusion. Faults are interpreted on the east and northwest sides of the intrusion. These could be pre-existing structure along which the intrusion was emplaced.

There are numerous small intra sedimentary faults interpreted throughout Zone A, for example features 19, 20, 21 and 22. These faults were selected for examples and easy reference only, they are of no more significance than the rest of the interpreted faults marked on the interpretation map. The faults are interpreted by the small linear aeromagnetic anomalies seen in the first and second derivative colour and shadow maps. There is no indication of their sense of motion. They trend north-south to south-southwest (#19), and south-west to north-northeast (#22) and are concave east (#19) and concave west (#20).

Zone B

Zone B stretches to the south of the town of Bethel, and is characterized by extensive coverage of sheet like aeromagnetic features, with moderate to low amplitudes and several moderately well defined higher amplitude features. The sheet features are interpreted as volcanic flows or sheet intrusions (#12,13,14,15,24), and the higher amplitude features are interpreted as intrusions or volcanic feeder tubes (#5,6,7,8,9,10,11).

The amplitudes of the sheet like features are low, with sharp edges, indicating that they are relatively shallow features with uniform magnetization and uniform narrow depth extent, and that they are relatively near to the surface. There is no clear evidence of deep basement anomalies below the sediment layer.

To the west of Bethel there is some evidence of intra sedimentary faulting (49, 50, 51), trending north-south. There are also several intra sedimentary curvilinear faults (45, 46, 47, 48) trending north northeast to north, and concave to the west.

The southeast corner of Zone B is bounded by a distinct curvilinear feature (25), which trends between northwest to northeast and is concave to the west. It appears to be a major bounding fault for this section of the basin.

Zone C

Zone C is the largest basin area covered by survey. It is largely free of the sheet like near surface anomalies which characterize Zone B, and, like Zones A and B, shows no clear evidence of basement faulting or other anomalies below the sediments. Zone C has a mottled appearance on the second derivative aeromagnetic maps, which indicates some magnetic material in the near surface. The mottling is probably due to minor changes in depth, thickness and susceptibility in the magnetic material in the soil or near surface.

There is a series of very large high amplitude features (29), interpreted as intrusions near the center of the zone. Like the other features interpreted as intrusions (1,8,9,10) the features are magnetic lows, bounded by a ring of high frequency anomalies. The positive anomalies around the edges of the bodies could be caused by mineralization around the edge of the intrusions.

There is a series of highly magnetic linear features (30,31,32,33). The features trend NNE-SSW, and are offset in a dextral manner. This feature probably represents dyke intrusion, or mineralization along a series of offset faults.

Zone C is extensively cut by small curvilinear anomalies, interpreted as intra sedimentary faults (26,27,35 - 44) which are primarily concave to the West (27,35 - 44), except 26, which is concave to the east. They range in direction from NW to North and cover virtually the entire zone.

Zone D

The northwest corner of the survey area is designated as Zone D, and is characterized by high amplitude, high wavelength anomalies, grading to a transitional area of lower wavelength anomalies towards the edge of Zone A. The northwestern part of Zone D appears to represent basement, or a substantial section of volcanic rocks, which reach to or near to the surface. The transitional area could be intermingled volcanic and sedimentary rocks, or basement rocks covered by a moderate layer of sediments.

There is a curved linear feature (21) in the zone, trending north-south and concave to the west, and which is interpreted as a mineralized fault trace.

Zone E

Zone E, in the northeast of the survey area, is similar to the transitional area of Zone D, as it consists of diffuse anomalies of moderately high amplitude. It is interpreted as intermingled volcanic and sedimentary rocks or basement covered by moderate depth of sediments.

Zones F, G, H, I, and J

Zones F, G, H, I and J comprise the entire southeastern edge of the survey area. All five zones are characterized by high frequency, high amplitude anomalies. The various zones are differentiated by characteristic amplitude, wavelength of anomalies, and aeromagnetic character, however all of them represent some type of basement or volcanic rocks.

Zone F has large scale diffuse anomalies. Zone G is roughly circular and has smaller very sharp sided anomalies. Zone H and J are similar, with very large amplitude changes along distinct boundaries from the high areas to the low areas. Zone I has a more diffuse anomaly pattern with some possible linearity, parallel to the interpreted large bounding fault (25). It is likely that the different zones represent different rock groups. Zones E and I are likely interspersed sediments and volcanic rocks, and F, H and J are different basement or volcanic units.

VII. REGIONAL SCALE FEATURES

Analysis of regional scale features is, by necessity, limited by the size of the survey area. It appears that the regional scale features evident on the aeromagnetic maps spill out of the survey area, so only a partial analysis is possible, yielding very tentative conclusions.

South Basin

On a regional scale the survey area has been interpreted to be divided into two basins, North and South, separated by a transitional zone. On a crude basis the North Basin corresponds to Zone A, the South Basin to Zone C, and the transition zone between the basins to Zone B. The South Basin appears to be bounded on the east by a large scale fault. The only significant features visible within the basin are the intrusions and intra sedimentary faults discussed for Zone C above. There are no anomalies which clearly relate to the basement below the sediments. This is an indication of the depth of the sedimentary layer, and possibly the relatively non-magnetic character of the basement rocks. For this reason it is difficult to make a definitive estimate of the depth of the basin, or to determine where the basin is deepest.

Transition Zone

The transition zone roughly corresponds to Zone B, and is characterized by intermediate scale aeromagnetic anomalies, interpreted as intrusions, volcanic feeder pipes and volcanic flows. As its name suggests it is the area between the North and South Basins. Although there is no definitive method to differentiate between the anomalies interpreted as intrusions or feeder pipes, and basement anomalies, we suggest that due to the large number of volcanic features, and the overall configuration of the basins that this could also be an area of relative basement high.

North Basin

The North Basin corresponds to Zone A. There is hint that it is bounded on the west by a fault between the basin and Zone D, however only a small part of the interpreted fault is within the survey area, so the existence of the fault is somewhat speculative.

VIII. 2.5 DIMENSIONAL MODELLING

Forward modelling was carried out on a series of lines within the survey area. Modelling was carried out using a standard 2.5 dimensional modelling package, and based on expected rock susceptibilities. An average value, and in some cases a sloping regional field was deducted from the profiles before modelling. The average magnetic field for the area is 54,230 nT. On the modelled profiles, the red line is the measured total magnetic field, and the black line is the calculated magnetic field. Sediments were assumed to have a susceptibility of zero.

Modelling of the near surface features is generally more accurate, as depths below the surface increase, so does the error levels of the modelling process. As an additional complication, in this survey area there are no clearly discernable basement anomalies to model, probably as a result of a combination of the thickness of the sedimentary layer, and the lack of high amplitude magnetic anomalies in the basement rocks. As a consequence the basement anomalies are modelled based on the overall orientation and very long wavelength variations along the flight lines. This is a less precise method of modelling basement, because there are only a few anomalies to be modelled, and in most cases some of the modelled anomaly is outside of the survey area. Four representative lines are described in detail below.

Line 3090

Line 3090, crosses though the middle of the South Basin, crossing the large intrusion (29) and the intruded fault (31). The western side of the line is within the sedimentary basin, so as a result this edge of the basin cannot be modelled. The western side of the basin is modelled as being very deep, over 6,000 m, however there is large margin of error with this figure.

We have modelled the intrusion as being two positive susceptibility features, sitting over higher basement. No roots or feeder tubes were modelled, however they may be present, but do not significantly affect the magnetic field because of their depth and relatively small size. The interpreted fault (31) is model an angular feature with a negative susceptibility. The part of the basin east of the intrusions is modelled as sloping up to the east, from 4,000 to 2,000 m in depth. Basement below this part of the basin, and below the western side of the basin is modelled as being of moderately varying susceptibility (from 0.00050 to 0.00080). There are no medium wavelength anomalies from within the basement material evident in the magnetic profiles. The eastern part of the line is modelled as a series of very high susceptibility bodies, which create the high amplitude anomalies outside of the sedimentary basin. Only some representative anomalies have been modelled outside of the basin, because of their complexity, and the unlikelihood of finding hydrocarbons in this area. It is not possible to accurately model the lower susceptibility basement in this area.

Line 5078 and 3148

This line is located just to the south of the transition zone, in the northern part of the South Basin. Basement below the line is modelled as varying in susceptibility and depth, but lacks significant medium wavelength anomalies. The basin is thickest in the east (more than 6,000 m) and slopes up to about 5,000 m in the west. Again there is a high degree of error associated with these numbers. There are two major intrusions interpreted in the middle of the basin (9), one with a susceptibility of 0.001 and one with -0.001.

The eastern side of the basin is interpreted as consisting of a series of closely spaced high susceptibility bodies.

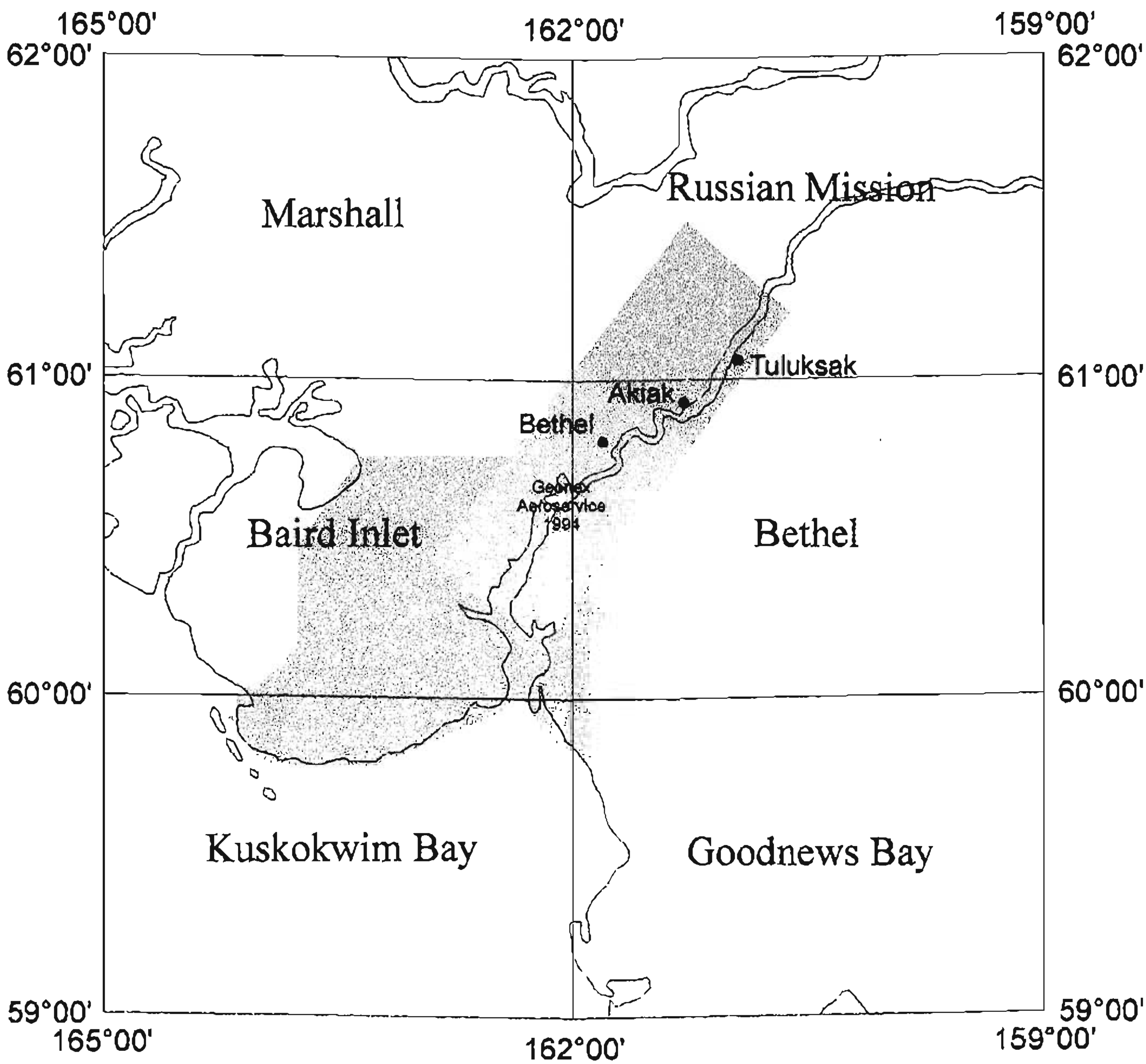
Line 5026-1

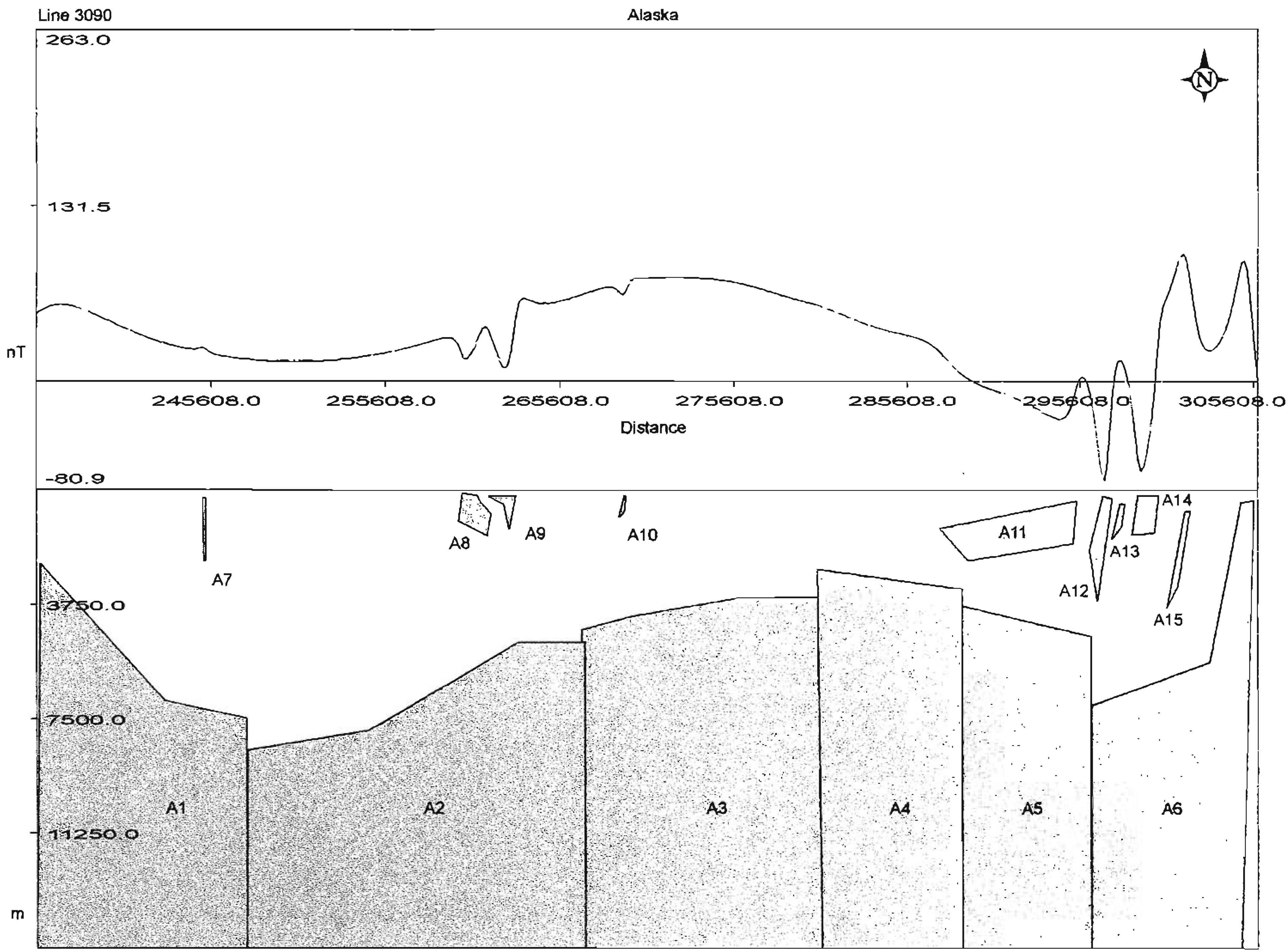
This is one of the lines extended to the east of the survey area, and which crosses the Transition zone. The magnetic basement is depicted as being of constant susceptibility, with the only significant basin being the northern part of the South Basin, which occurs in the western side of the line. Within the South Basin are a series of high frequency anomalies, interpreted as mineralized, or intruded faults, or dikes. The line also crosses the town of Bethel, which was not modelled. In the central part of the basin the transition zone is modelled as a large basement high, which reaches to within 1,500 meters of the surface. To the west of the transition zone is a small area of basin, followed by many very high amplitude anomalies, modelled as a series of high susceptibility bodies, and interpreted to be magnetic basement very close to the surface. Not all of the anomalies have been modelled.

Line 2025

This line crosses the North Basin, and is characterized by basement depths to around 2,000 m, and extensive intrusions near the center of the line. The eastern side of the basin contains some high susceptibility intrusions, which may be contained in the sedimentary section.

LOCATION INDEX





Line 3090
Alaska
263.0
131.5
nT
-80.9
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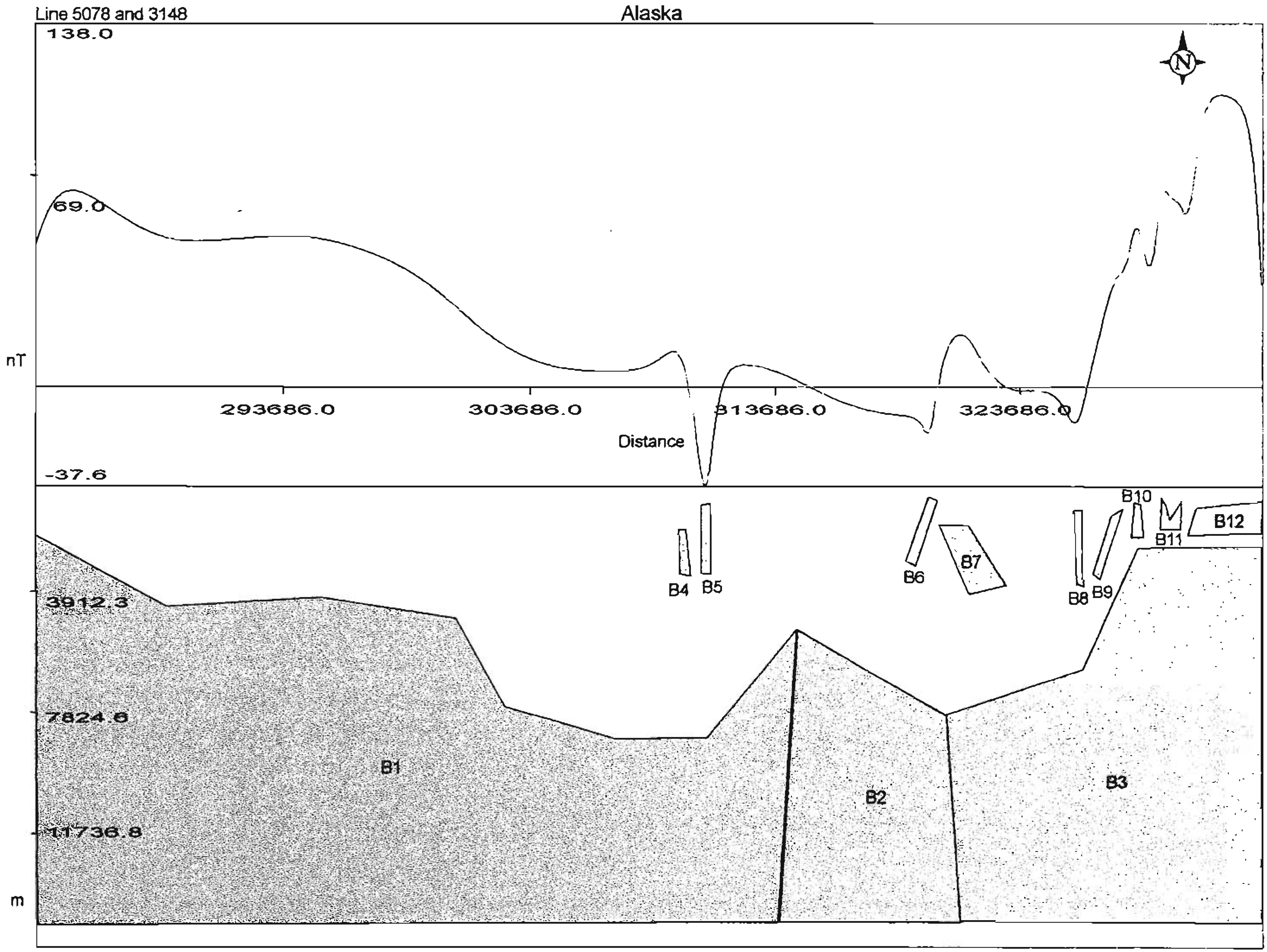
255608.0
265608.0
275608.0
285608.0
295608.0
305608.0
Distance
3750.0
7500.0
11250.0
m
A1
A2
A3
A4
A5
A6
A7
A8
A9
A10
A11
A12
A13
A14
A15

Line 3090

Block Number	Susceptibility (cgs)/cm^3	Strike Length (m)
A1	0.0006	100000
A2	0.0058	100000
A3	0.0008	100000
A4	0.0005	100000
A5	0.00058	100000
A6	0.0007	10000
A7	0.0001	500
A8	0.00012	10000
A9	0.00044	1000
A10	-0.00025	10000
A11	-0.0004	1000
A12	-0.0007	1000
A13	0.0001	500
A14	-0.0009	1000
A15	0.003	800


Line 5078 and 3148
Alaska
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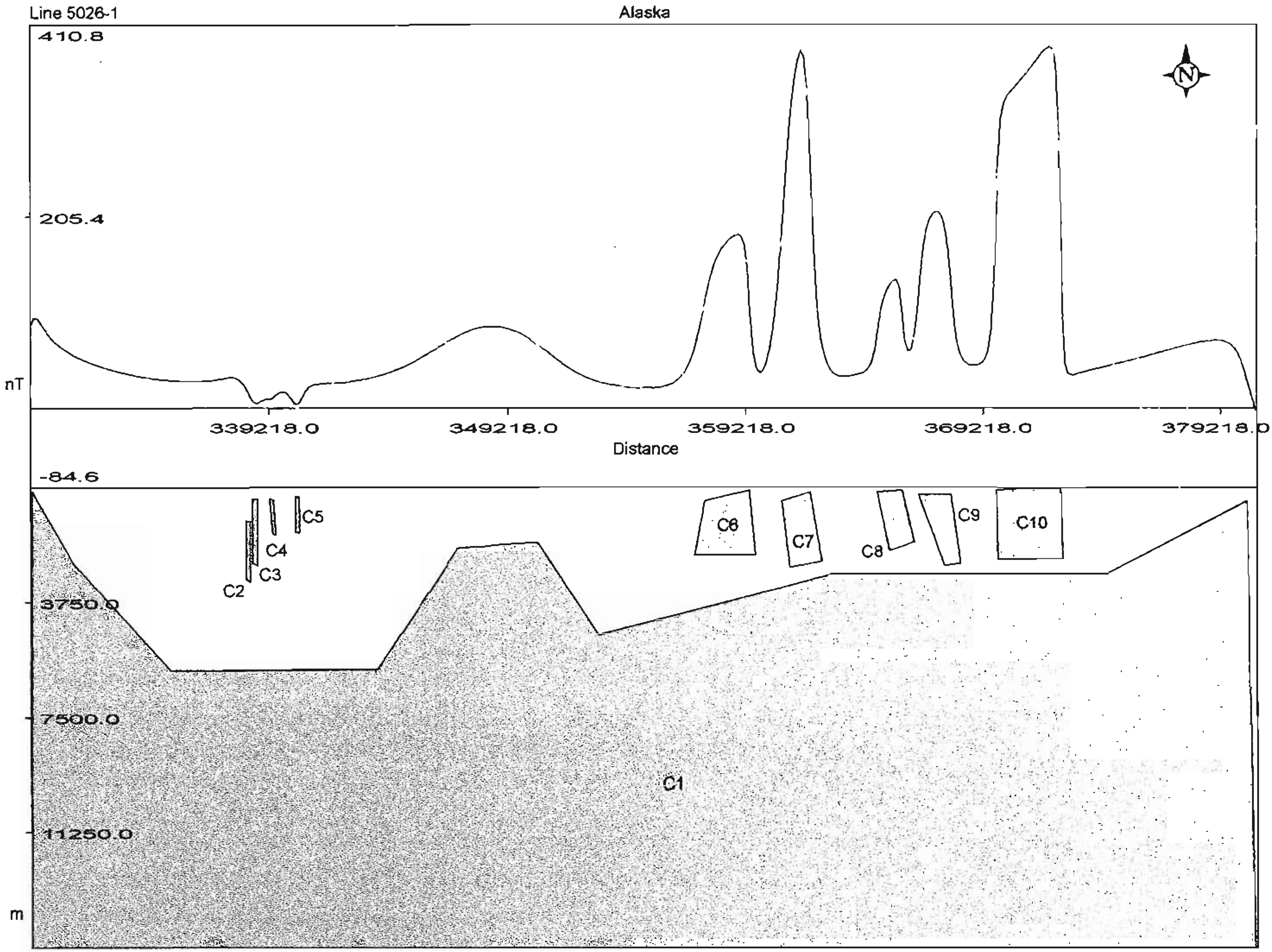
69.0
nT
293686.0
303686.0
313686.0
323686.0
Distance
-37.6
3912.3
7824.6
11736.8
m
B1
B2
B3
B4
B5
B6
B7
B8
B9
B10
B11
B12
N

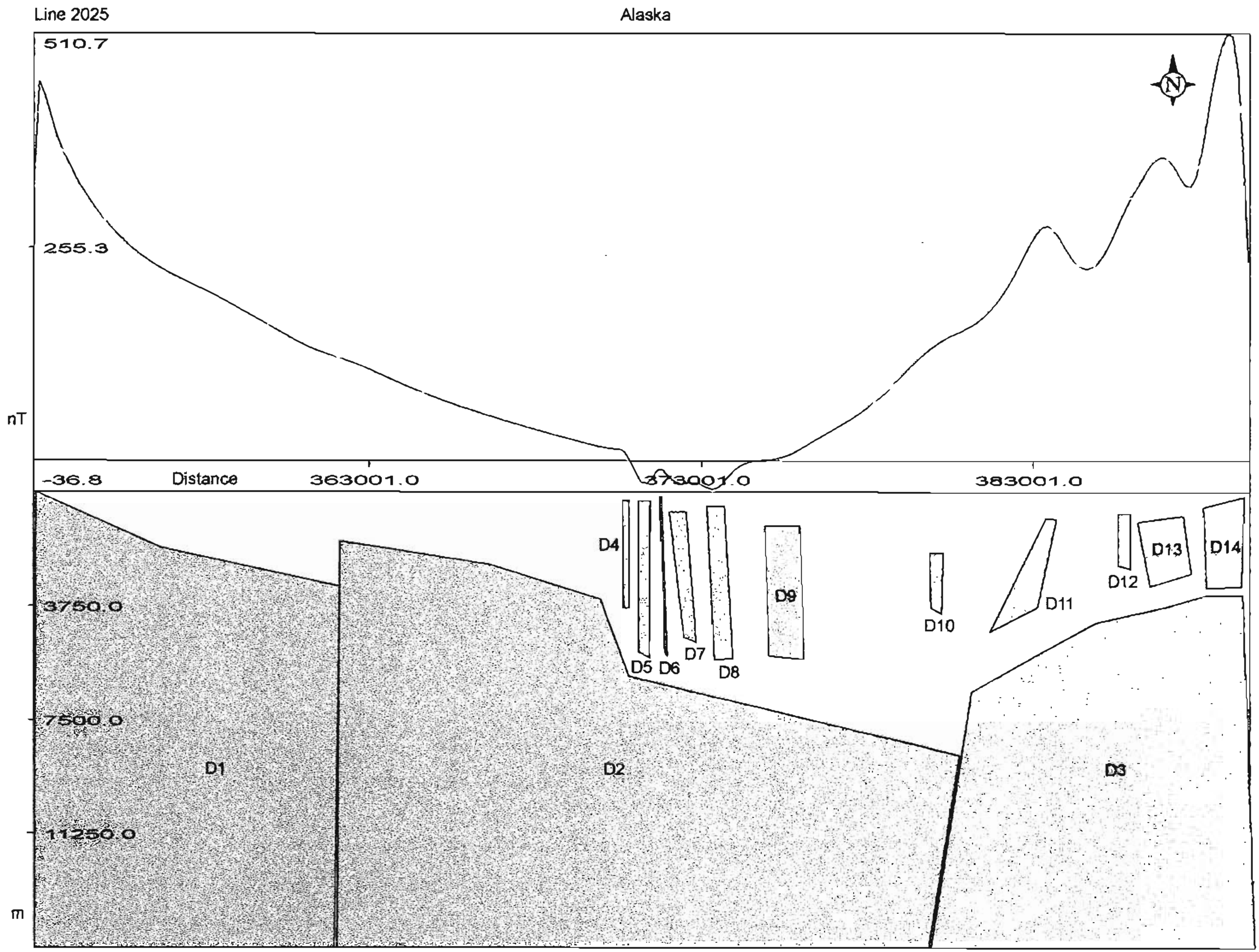
Line 5078 (+3148)

Block	Susceptibility (cgs)/cm^3	Strike Length (m)
B1	0.00058	100000
B2	0.00009	100000
B3	0.00026	100000
B4	0.001	1000
B5	-0.001	1000
B6	-0.001	100
B7	0.0006	1000
B8	-0.0006	2000
B9	0.001	600
B10	0.001	600
B11	0.001	1000
B12	0.001	1500


Line 5026-1
Alaska
410.8
205.4
nT
339218.0
349218.0
359218.0
369218.0
379218.0
Distance
-84.6
3750.0
7500.0
11250.0
m
C1
C2
C3
C4
C5
C6
C7
C8
C9
C10

Line 2025

Block	Susceptibility (cgs)/cm^3	Strike Length (m)
D1	0.0015	10000
D2	0.00058	100000
D3	0.0023	100000
D4	0.0004	300
D5	-0.0005	500
D6	0.0006	500
D7	-0.0013	300
D8	-0.00051	1000
D9	-0.0006	500
D10	0.0075	1000
D11	0.0035	1000
D12	0.0018	500
D13	0.0036	500
D14	0.003	500



Line 2025
Alaska
510.7
255.3
nT
-36.8
Distance
363001.0
373001.0
383001.0
3750.0
7500.0
11250.0
m
D1
D2
D3
D4
D5
D6
D7
D8
D9
D10
D11
D12
D13
D14
N

Line 5026-1

Block Number	Susceptibility (cgs)/cm^3	Strike Length (m)
C1	0.00058	100000
C2	0.002	1500
C3	-0.0008	2000
C4	-0.0008	500
C5	-0.0009	400
C6	0.0008	2000
C7	0.002	1000
C8	0.0012	100
C9	0.0035	100
C10	0.0013	100

APPENDIX

APPENDIX I

COMPANY PROFILE

SANDER GEOPHYSICS LIMITED

COMPANY PROFILE

Sander Geophysics Limited (SGL) specializes in high resolution airborne surveys for the oil and mining industries. The company carries out airborne magnetic, and radiometric surveys using fixed-wing aircraft and helicopters.

HISTORY

SGL was founded in 1956. The first airborne surveys were performed as early as 1958, and by 1967 airborne geophysical surveying had become the mainstay of the company. Operations have continued and expanded under the same ownership and management since 1956.

SERVICES

The company currently specializes in surveys using one or more of the following methods:

- Magnetic total field
- Magnetic gradient
- Radiometric
- VLF-EM

All surveys are performed using SGL's specially modified fixed-wing aircraft and helicopter.

The company has extensive experience in working in diverse geographical environments. Surveys have been flown in high mountains, offshore, over deserts and tropical jungle, from the Pampas of Argentina to the tundra of the Canadian Arctic, and to the South China sea.

Each field party is under the direction of a graduate geophysicist. Field offices are equipped to provide flight path maps as well as contour and colour maps of the geophysical data. Immediate data processing is part of our standard quality control procedure, and provides our clients with rapid results for evaluation while the survey is in progress.

Among airborne geophysical surveying companies, SGL has long been in the lead in making optimal use of the Global Positioning System. We are now offering a flight management system based on Real Time Differential GPS (RDGPS) to provide steering information to the pilot to an accuracy of 3 m in all three dimensions. This system allows us to produce a drape flying surface which is unique. It assures that adjacent flight lines and control lines are at the same level resulting in better geophysical maps.

INTERPRETIVE PRODUCTS

SGL offers a full range of data enhancement programs and provides complete interpretational services by experienced geoscientists.

- Vertical gradient contour and colour maps
- Shaded relief maps of any parameter
- Frequency slices - high-pass, low-pass or band-pass filtered total magnetic intensity
- Directional high-pass, low-pass or band-pass filtering
- Amplitude of the analytic signal
- Reduced-to-the-pole maps
- Upward or downward continued maps
- Three-dimensional modelling of magnetic grid data
- Processed gamma-ray spectrometer data

SANDER GEOPHYSICS LIMITED
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Phone: (613) 521-9626 Fax: (613) 521-0215 E-mail: info@sgl.com Website: www.sgl.com

SGL AIRCRAFT

SGL owns and operates the following geophysical aircraft.

Aircraft	Endurance in Survey Mode (hrs with reserves)	Maximum Gross Weight (kg)
Cessna 208B Grand Caravan	5	3,977
Cessna 402B	6	2,864
Cessna 404 Titan	8	3,818
Queenair B80	6	4,000
BN Islander	8	3,000
AS 350D Astar	5	1,950

All our aircraft are equipped for magnetic and radiometric surveys. Extensive modifications have been made to the fixed-wing aircraft to reduce their magnetic effect. Typical Figures of Merit for SGL's fixed-wing aircraft are near 1 nT.

FACILITIES

The company's head office is located in Ottawa, Canada. SGL maintains a complete electronics workshop with test equipment consistent with the research and development, and production of geophysical instruments.

SGL has successfully processed all data acquired during the past 25 years. The company has an ongoing program of researching, developing, and refining a full suite of software for geophysical data processing.

SGL's cartographic department is now fully digital with a 36" wide drum colour scanner, raster/vector editing software, several colour plotters and a laminator.

R & D

SGL is dedicated to research and development. Nearly one-third of the company's resources are devoted to developing new and more efficient instrumentation for airborne geophysical surveying.

In recent years, SGL has been engaged in an R & D project to design an airborne gravimetry system which will offer much better resolution and stability than the existing systems.

SGL SURVEY EQUIPMENT

<u>Magnetometers</u>

Sensors: **Scintrex** CS-2 & H8 optically-pumped, cesium split beam
Geometrics G-822A

Compensator: **RMS**
27-term automatic airborne digital compensator

<u>Gamma-ray Spectrometers</u>

Detectors: **Bicron**
NaI parallelepipedic crystals, 60 litres total

Spectrometer: **Exploranium** GR-820
dual 256-channel analyzers

<u>Data Acquisition</u>

Computer: **Sander** ADAC
micro computer based system with **Bernoulli** drives

<u>Navigation & Flight Path Recovery</u>

GPS: **NovAtel 951R**
12-channel receiver
post-flight or real-time DGPS

Video tracking: **Panasonic**
CCD video camera

KEY PERSONNEL

President:
George W. Sander, Ph.D., P.Eng.

Chief Geophysicist:
Stephan Sander, M.Sc.

Operations Manager:
Reed Archer, B.Sc.

Data Processing Manager:
Luise Archer, M.Sc.

Chief, R & D:
Stephen Ferguson, M.Sc.

Aeronautical Operations:
Malcolm Imray, M.Sc.

Cartography:
Yves Collins, DEC