

KOYUKUK ELECTROMAGNETIC AND MAGNETIC AIRBORNE GEOPHYSICAL SURVEY DATA COMPILATION

L.E. Burns, G.R.C. Graham, J.D. Barefoot, SIAL Geosciences, Inc., and On-line Exploration
Services, Inc.

Geophysical Report 2020-9

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DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS



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KOYUKUK ELECTROMAGNETIC AND MAGNETIC AIRBORNE GEOPHYSICAL SURVEY DATA COMPILATION

L.E. Burns¹, G.R.C. Graham¹, J.D. Barefoot¹, SIAL Geosciences, Inc., and On-line Exploration Services, Inc.

ABSTRACT

The Koyukuk geophysical survey is located in interior Alaska in the Koyukuk mining district, about 300 kilometers north of Fairbanks, Alaska. Frequency domain electromagnetic and magnetic data were collected with the SIGHEM-5 system from August to October 1997. A total of 4223.4 line kilometers were collected covering 533 square kilometers. Line spacing was 400 meters (m). Data were collected 30 m above the ground surface from a helicopter towed sensor platform (“bird”) on a 30-m-long line.

PURPOSE

This airborne geophysical survey is part of a program to acquire data on Alaska’s most promising mineral belts and districts. The information acquired is aimed at catalyzing new private-sector exploration, discovery, and ultimate development and production. The purpose of the survey was to map the magnetic and conductive properties of the survey area. The Koyukuk mining district has many historic and current placer gold mines, as well as copper skarn prospects. Other gold and base-metal anomalies, altered zones, favorable lithologies, and structural zones are known to exist throughout the survey area.

SURVEY OVERVIEW DESCRIPTION

This document provides an overview of the survey and includes text and figures of select primary and derivative products of this survey. A table of digital data packages available for download is provided to assist users in data selection. For reference, a catalog of the available maps is presented in reduced resolution. Please consult the metadata, project report, and digital data packages for more information and data.

KNOWN ISSUES

Apparent resistivity data is only present in gridded data.

ACKNOWLEDGMENTS

Funding was provided by the Department of the Interior Bureau of Land Management (BLM).

¹ Alaska Division of Geological & Geophysical Surveys, 3354 College Road, Fairbanks, Alaska 99709-3707

AVAILABLE DATA

Data Type	Provider	Description
ascii_data	contractor	ASCII format line data, other ASCII data
databases_geosoft	contractor	Geosoft format database of final line data, other Geosoft format databases
documents	contractor and DGGS	Project and field reports, survey background information, gridded data explanations, other documentation
grids_ermapper	contractor and DGGS	Geographically registered gridded data, ER Mapper ERS format
grids_geosoft	contractor and DGGS	Geosoft-format grids, these grids can be viewed in ESRI ArcMap using a free plugin from Geosoft or the free viewer available from Geosoft
images_registered	DGGS	GeoTiff format images of all gridded data
kmz	DGGS	keyhole markup language (kml) kmz archive files of project data. Viewable in Google Earth and other compatible programs
maps_pdf_format	contractor and DGGS	Printable maps in pdf format. Includes a geographically registered pdf (GeoPDF) for use with mobile devices such as GPS enabled smartphones and tablets, other devices, and programs
vector_data	contractor and DGGS	Line path, data contours, and survey boundary in ESRI shapefile (SHP) format, ESRI Geodatabase format, and/or AutoCAD dxf format
video_flightpath	contractor	Survey flight path downward-facing video

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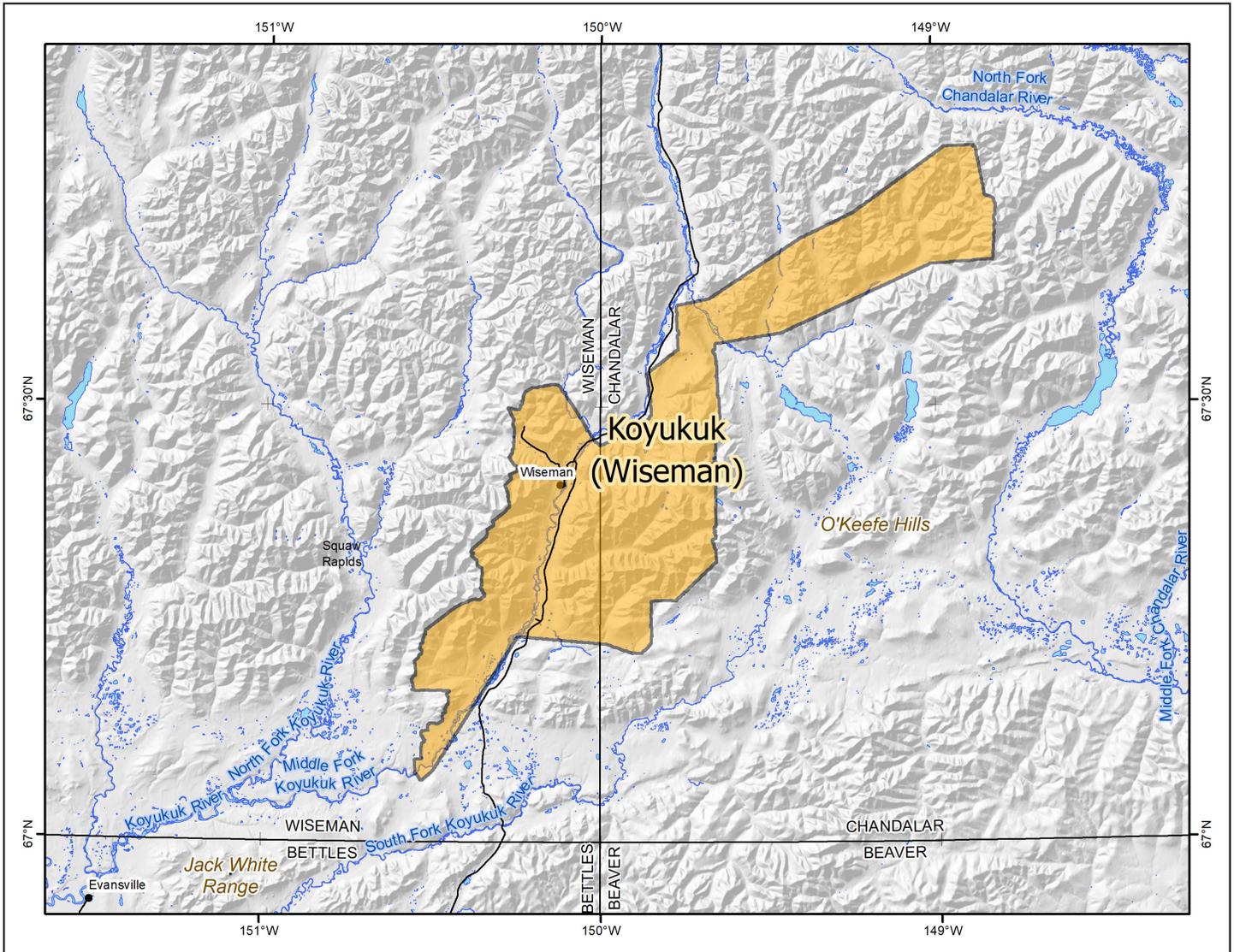


Figure 1. Koyukuk electromagnetic and magnetic airborne geophysical survey location shown in interior Alaska (inset). Koyukuk survey area shown with adjacent DGGs geophysical surveys, landmarks, relevant 1:250,000-scale quadrangle boundaries, mountain ranges, rivers, and elevation hillshade.

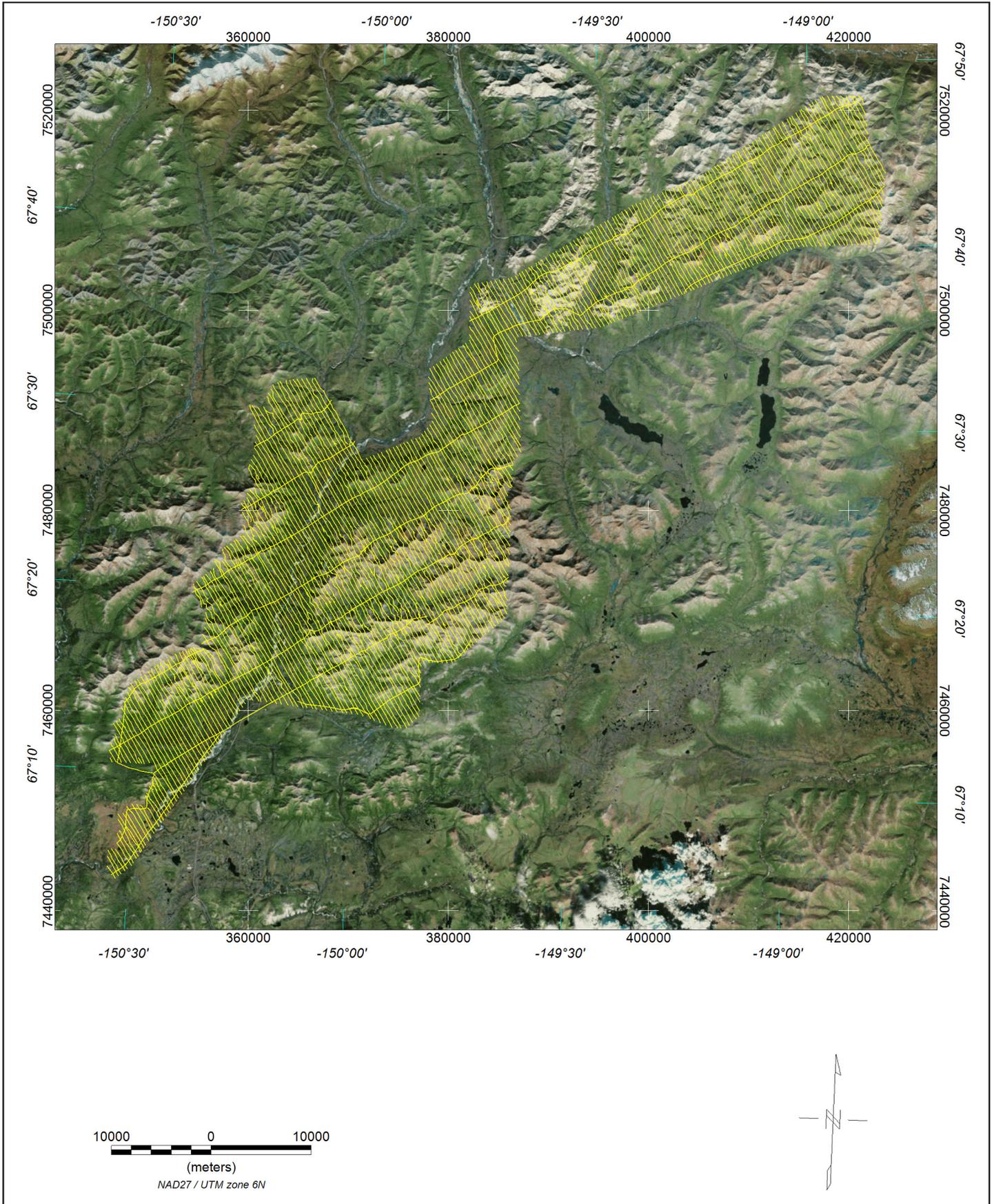


Figure 2. Flight path with orthometric image.

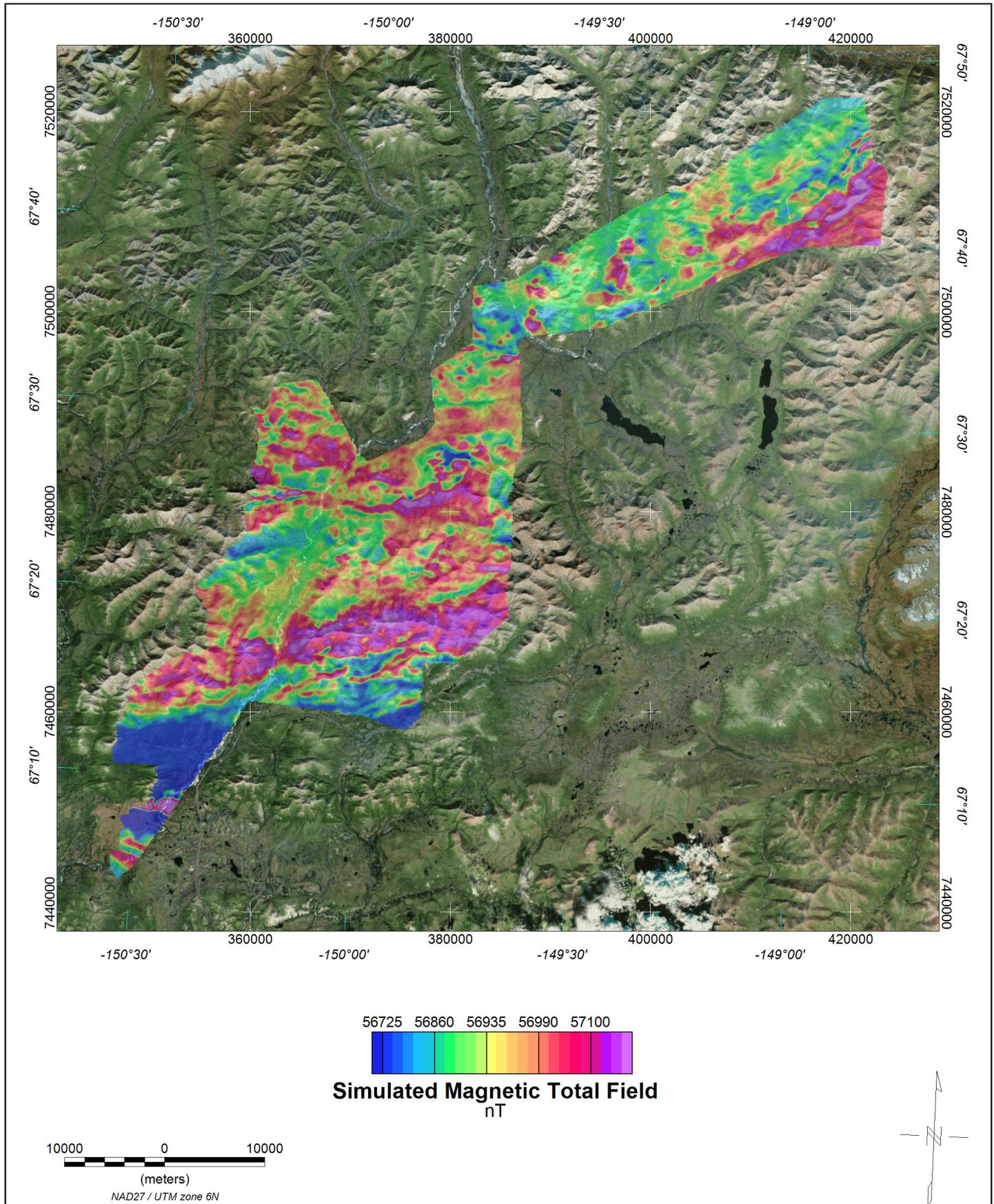


Figure 3. Simulated magnetic total field grid with orthometric image. The magnetic total field data were processed using digitally recorded data from a Scintrex CS2 cesium magnetometer. Data were collected at a sampling interval of 0.1 seconds. The magnetic data were (1) corrected for diurnal variations by subtracting the digitally recorded base station magnetic data, (2) IGRF corrected (IGRF model 1995, updated to August, 1997), (3) leveled to the tie line data, (4) a constant value of approximately 57,000 nT was added to all data, and (5) interpolated onto a regular 80 m grid using a modified Akima (1970) technique.

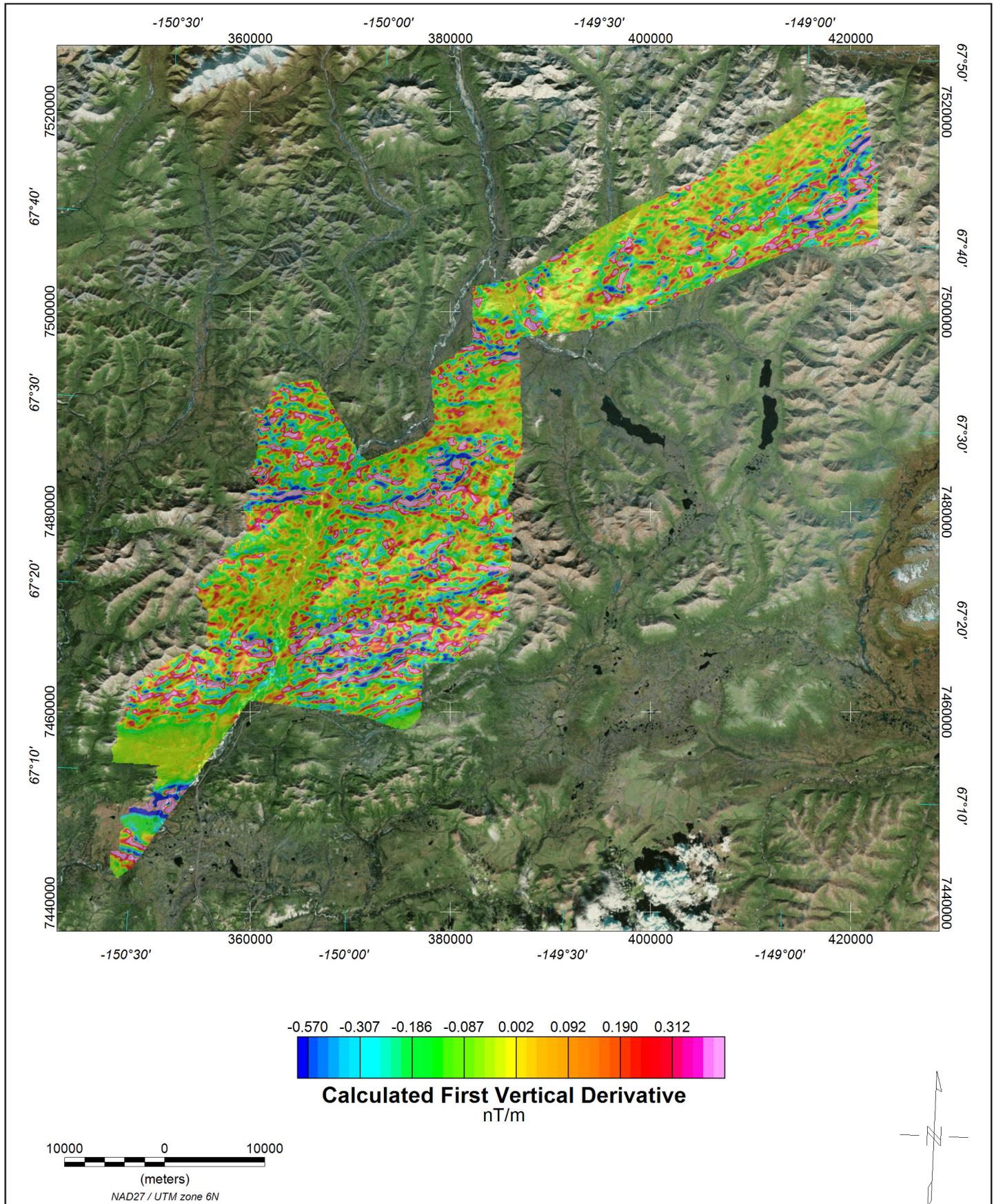


Figure 4. Calculated first vertical derivative grid with orthometric image. The first vertical derivative grid was calculated from the diurnally-corrected, IGRF-corrected total magnetic field grid using a FFT base frequency domain filtering algorithm. The resulting first vertical derivative grid provides better definition and resolution of near-surface magnetic units and helps to identify weak magnetic features that may not be evident on the total field data.

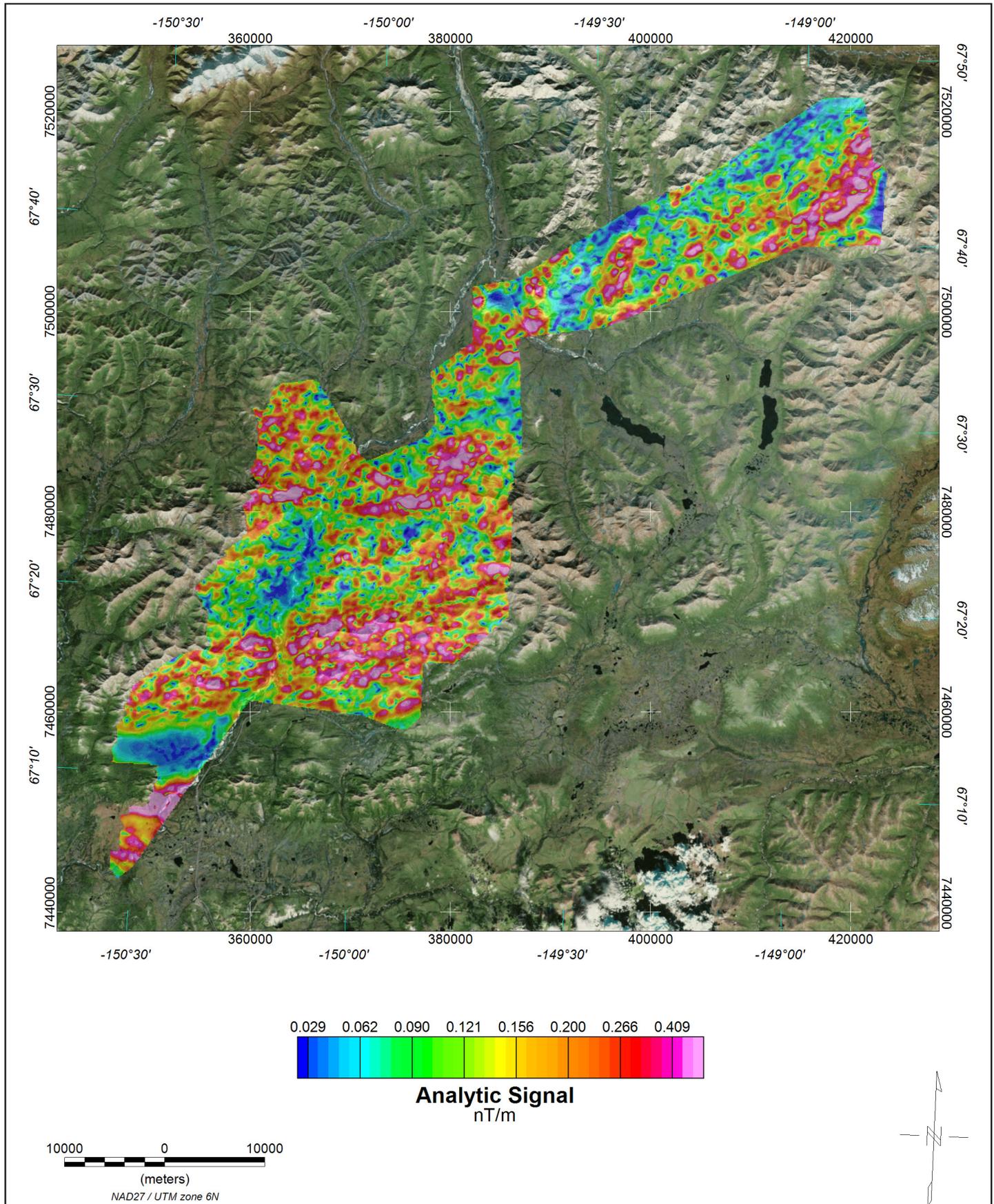


Figure 5. Analytic signal grid with orthometric image. Analytic signal is the total amplitude of all directions of magnetic gradient calculated from the sum of the squares of the three orthogonal gradients. Mapped highs in the calculated analytic signal of magnetic parameter locate the anomalous source body edges and corners (such as contacts, fault/shear zones, etc.). Analytic signal maxima are located directly over faults and contacts, regardless of structural dip, and independent of the direction of the induced and/or remanent magnetizations.

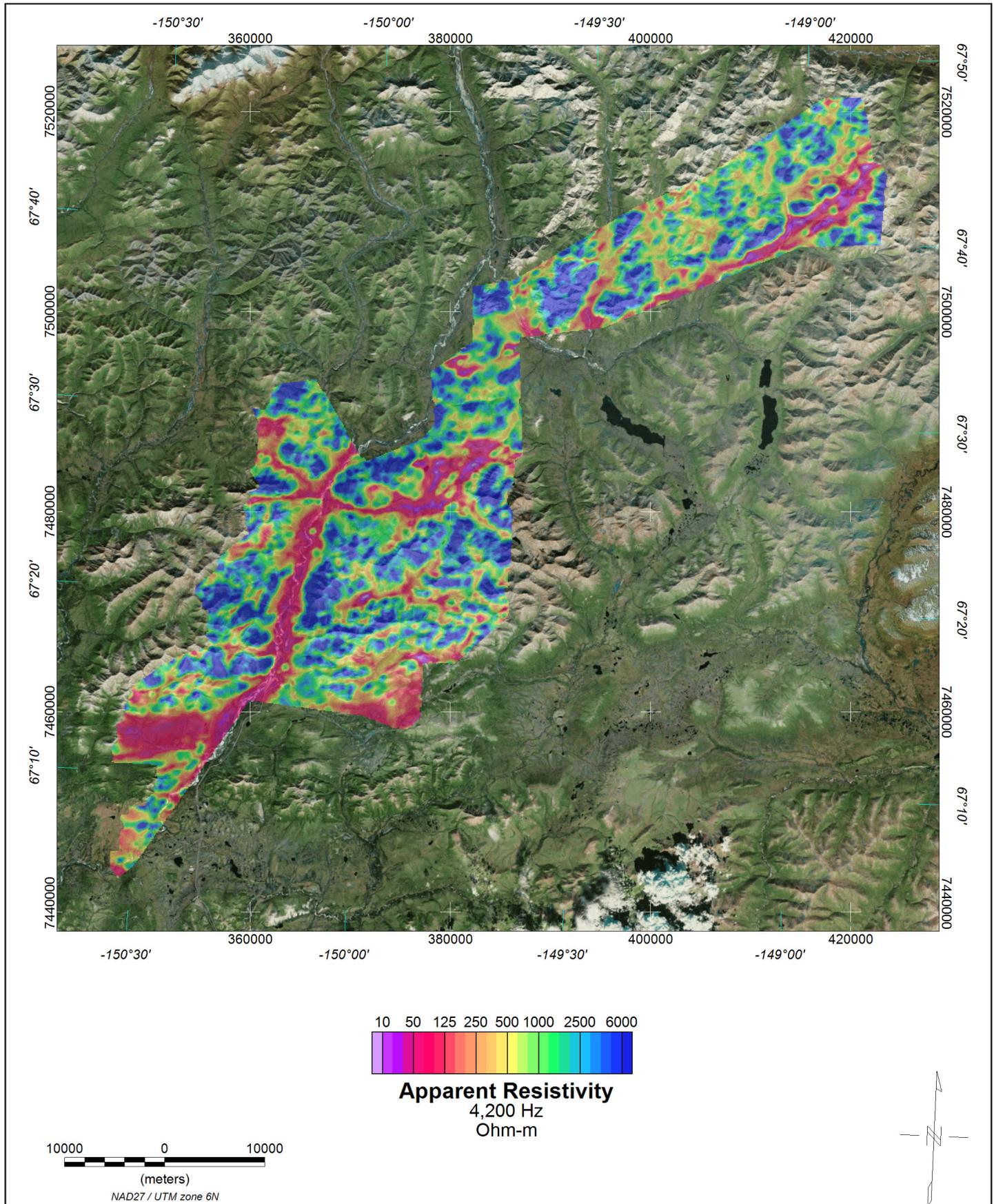


Figure 6. 4,200 Hz coplanar apparent resistivity grid with orthometric image. The SIGHEM-5 EM system measured inphase and quadrature components at five frequencies. Two vertical coaxial coil-pairs operated at 870 and 4785 Hz while three horizontal coplanar coil-pairs operated at 945, 4,212, and 36,360 Hz. EM data were sampled at 0.1 second intervals. The EM system responds to bedrock conductors, conductive overburden, and cultural sources. Apparent resistivity, calculated with leveled inphase and quadrature components, was (1) gridded with bi-directional method using a grid of 100 m, and (2) filtered with a low pass directional filter (decorrugation; Keating, 1994).

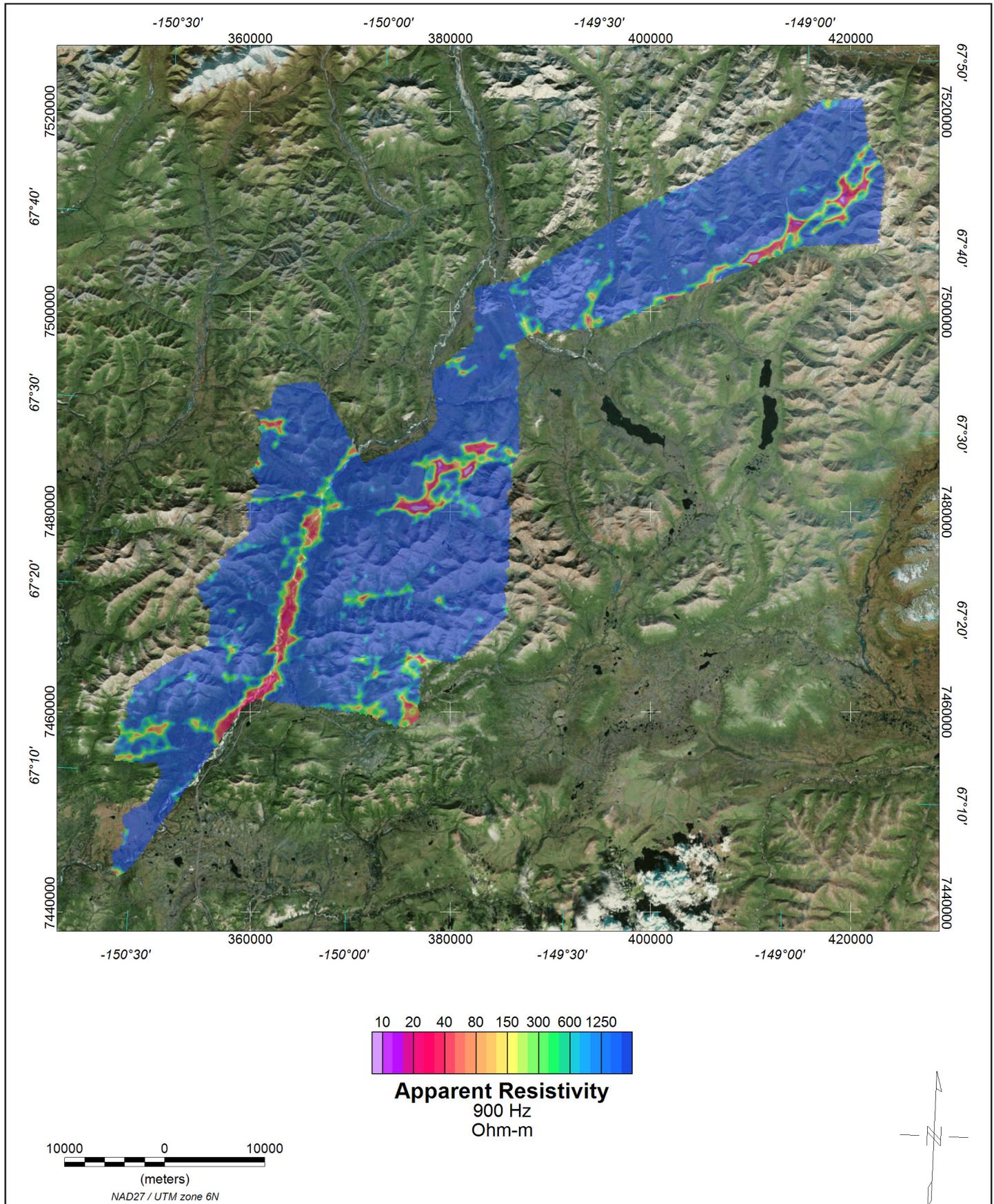
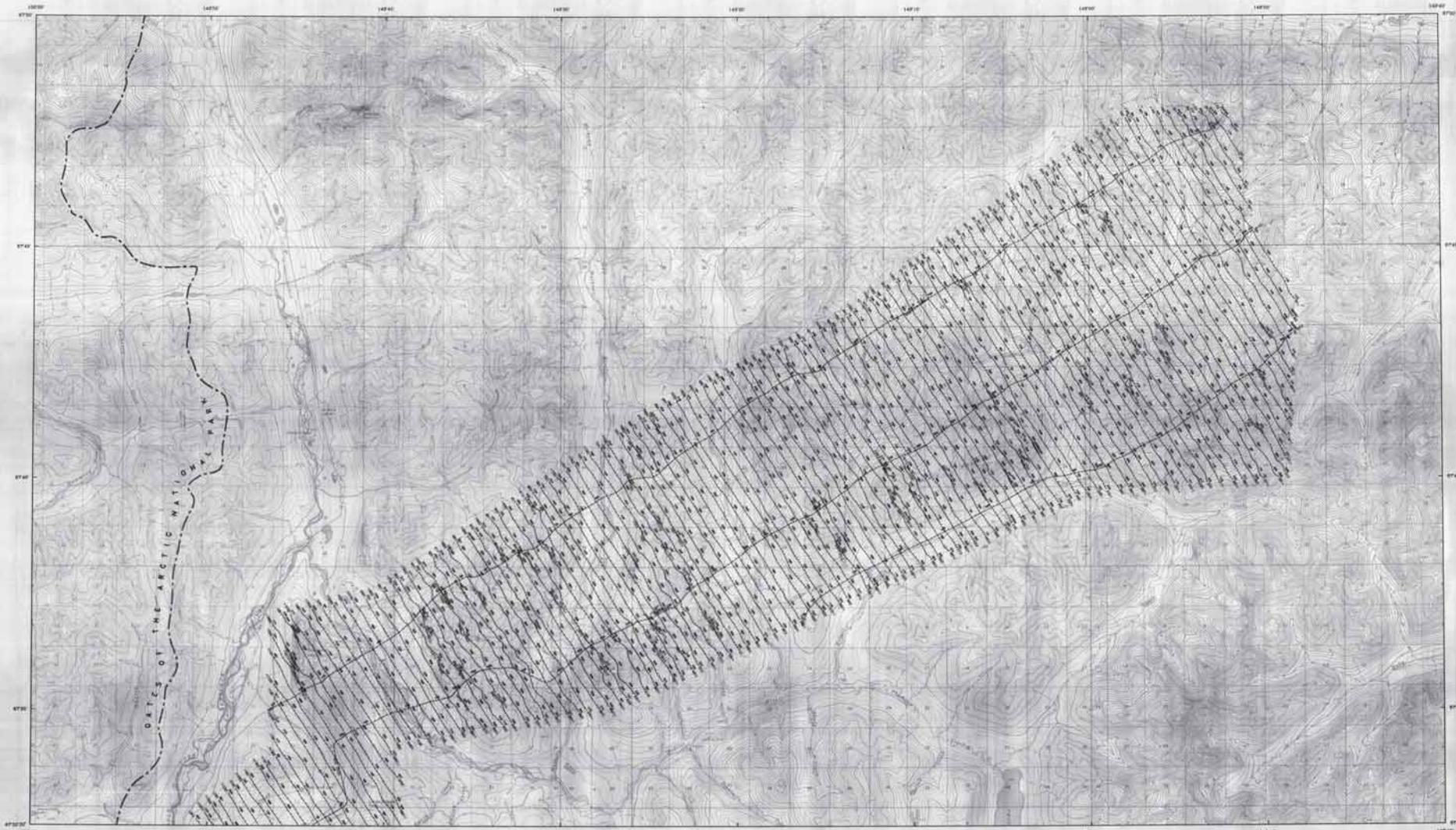


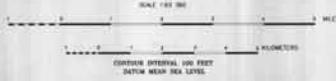
Figure 7. 900 Hz coplanar apparent resistivity grid with orthometric image. The SIGHEM-5 EM system measured inphase and quadrature components at five frequencies. Two vertical coaxial coil-pairs operated at 870 and 4785 Hz while three horizontal coplanar coil-pairs operated at 945, 4,212, and 36,360 Hz. EM data were sampled at 0.1 second intervals. The EM system responds to bedrock conductors, conductive overburden, and cultural sources. Apparent resistivity, calculated with leveled inphase and quadrature components, was (1) gridded with bi-directional method using a grid of 100 m, and (2) filtered with a low pass directional filter (decorrugation; Keating, 1994).

Table 1. Copies of the following maps are included at the end of this booklet. The low-resolution, page-size maps included in this booklet are intended to be used as a search tool and are not the final product. Large-scale, full-resolution versions of each map are available to download on this publication's citation page: <http://doi.org/10.14509/30434>

Map Title	Description
koyukuk_flightpath_topo_map_1of2.pdf	flight lines with topographic base map
koyukuk_flightpath_topo_map_2of2.pdf	flight lines with topographic base map
koyukuk_emanomalies_sim_magtf_bw_contours_topo_map_1of2.pdf	black and white electromagnetic anomaly map with simulated magnetic total field grid contours and topographic base map
koyukuk_emanomalies_sim_magtf_bw_contours_topo_map_2of2.pdf	black and white electromagnetic anomaly map with simulated magnetic total field grid contours and topographic base map
koyukuk_emanomalies_res900hz_contours_plss_map_1of2.pdf	electromagnetic anomaly map with 900 Hz apparent resistivity grid contours and public land survey system base layer
koyukuk_emanomalies_res900hz_contours_plss_map_2of2.pdf	electromagnetic anomaly map with 900 Hz apparent resistivity grid contours and public land survey system base layer
koyukuk_emanomalies_res4200hz_contours_plss_map_1of2.pdf	electromagnetic anomaly map with 4,200 Hz apparent resistivity grid contours and public land survey system base layer
koyukuk_emanomalies_res4200hz_contours_plss_map_2of2.pdf	electromagnetic anomaly map with 4,200 Hz apparent resistivity grid contours and public land survey system base layer
koyukuk_intepretation_map_1of2.pdf	interpretation based on geophysical data
koyukuk_intepretation_map_2of2.pdf	interpretation based on geophysical data
koyukuk_emanomalies_sim_magtf_contours_detailed_topo_map_1of5.pdf	detailed electromagnetic anomaly map with simulated magnetic total field grid contours and topographic base map
koyukuk_emanomalies_sim_magtf_contours_detailed_topo_map_2of5.pdf	detailed electromagnetic anomaly map with simulated magnetic total field grid contours and topographic base map
koyukuk_emanomalies_sim_magtf_contours_detailed_topo_map_3of5.pdf	detailed electromagnetic anomaly map with simulated magnetic total field grid contours and topographic base map
koyukuk_emanomalies_sim_magtf_contours_detailed_topo_map_4of5.pdf	detailed electromagnetic anomaly map with simulated magnetic total field grid contours and topographic base map
koyukuk_emanomalies_sim_magtf_contours_detailed_topo_map_5of5.pdf	detailed electromagnetic anomaly map with simulated magnetic total field grid contours and topographic base map
koyukuk_emanomalies_sim_magtf_contours_topo_map_1of2.pdf	electromagnetic anomaly map with simulated magnetic total field grid contours and topographic base map
koyukuk_emanomalies_sim_magtf_contours_topo_map_2of2.pdf	electromagnetic anomaly map with simulated magnetic total field grid contours and topographic base map
koyukuk_sim_magtf_contours_plss_map_1of2.pdf	simulated magnetic total field grid with public land survey system base layer
koyukuk_sim_magtf_contours_plss_map_2of2.pdf	simulated magnetic total field grid with public land survey system base layer
koyukuk_res900hz_contours_plss_map_1of2.pdf	900 Hz apparent resistivity grid with contours and public land survey system base layer
koyukuk_res900hz_contours_plss_map_2of2.pdf	900 Hz apparent resistivity grid with contours and public land survey system base layer
koyukuk_res4200hz_contours_plss_map_1of2.pdf	4,200 Hz apparent resistivity grid with contours and public land survey system base layer
koyukuk_res4200hz_contours_plss_map_2of2.pdf	4,200 Hz apparent resistivity grid with contours and public land survey system base layer



Map Date: 12/15/98
 Revision: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10
 Prepared by: [unreadable]



DESCRIPTIVE NOTES

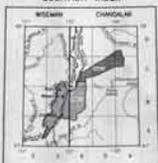
The geophysical data were acquired with a SIGEM-5 Electromagnetic (EM) system, a Scherzer 6000 CS2 magnetometer, and a real-time system, including a Janitrus 10000 Terminal Recorder. The system also recorded data from a radar altimeter (1000A), GPS navigation system, 50/50 Hz monitors, and other sensors. Flights were performed at a mean terrain altitude of 200 ft using survey flight lines with a spacing of a quarter of a mile. The lines were flown perpendicular to the flight lines at intervals of approximately 1000 feet.

Two Trimble 4000 SE Differential Post-processing Global Positioning Systems were used for both navigation and flight path recovery. The helicopter position was determined every one second to a relative accuracy of better than 10 m. Flight path positions were projected onto the Clarke 1866 (ITM) spheroid, 1927 North American datum using a Clarke spheroid (CS) of 1:27,000, a north component of 0 and an east constant of 500,000. Positional accuracy of the projected data is better than 10 m with respect to the ITM grid.

**FLIGHT LINE PATH OF THE 1997 GEOPHYSICAL SURVEY
 FOR THE NORTHEASTERN PORTION OF THE KOYUKUK MINING DISTRICT,
 EASTERN BROOKS RANGE, ALASKA**

1998

LOCATION INDEX



FLIGHT PATH INFORMATION



SURVEY HISTORY

This map has been compiled and drawn under contract between the State of Alaska, Department of Natural Resources, Division of Geological & Geophysical Surveys, and On-Line Exploration Services, Inc. Airborne geophysical data for this area were acquired by Son Corporation, Inc. in 1997. Funding for the project was provided by the U.S. Department of Interior Bureau of Land Management (BLM).

This map and other products from this survey are available from the Alaska Division of Geological & Geophysical Surveys, 794 University Ave., Suite 200, Fairbanks, Alaska, 99709.



Red line is magnetic contour
Scale 1:50,000
Datum: NAD 83
Projection: UTM
Zone: 18N
Units: Meters



DESCRIPTIVE NOTES

The aeromagnetic data were collected with a GEOMAG-5 Transverse Earth Magnetic System (TEMS) in Survey Section 212 (approximately 60° 30' N, 147° 30' W) using a Sikorski HO4S helicopter. In addition, the survey recorded data from a magnetometer (EM-31) and a magnetometer system (EM-30) to monitor and check corners. Flight paths were performed on a regular basis (approximately 1000 ft) to ensure accuracy. The flight paths were perpendicular to the flight lines at intervals of approximately three miles.

Two Trimble-6000 SE Differential Positioning Global Positioning Systems were used for both navigation and flight path control. The horizontal distance was measured with a laser ranging system. The vertical distance was measured with a laser ranging system. The flight paths were projected onto the Coast and Geodetic Survey (CGS) North American datum using a Central Meridian (CM) of 147° 30' W, a north-south distance of 0 and an east-west distance of 600,000. Horizontal accuracy of the aeromagnetic data is better than 10 m with respect to the CGS datum.

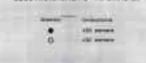
ELECTROMAGNETICS

To determine the location of EM anomalies or their intensity, the GEOMAG-5 TEMS system was used. The TEMS system consists of a magnetometer and a magnetometer system. The TEMS system records in radio frequency, continuous, real-time, and digital data. The TEMS system and the flight paths were used to locate the anomalies. The TEMS system data are contained on magnetic tape.

TOTAL FIELD MAGNETICS AND ELECTROMAGNETIC ANOMALIES FOR THE NORTHEASTERN PORTION OF THE KOYUKUK MINING DISTRICT, EASTERN BROOKS RANGE, ALASKA

1998

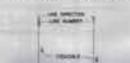
ELECTROMAGNETIC ANOMALIES



MAGNETIC CONTOURS



FLIGHT PATH INFORMATION



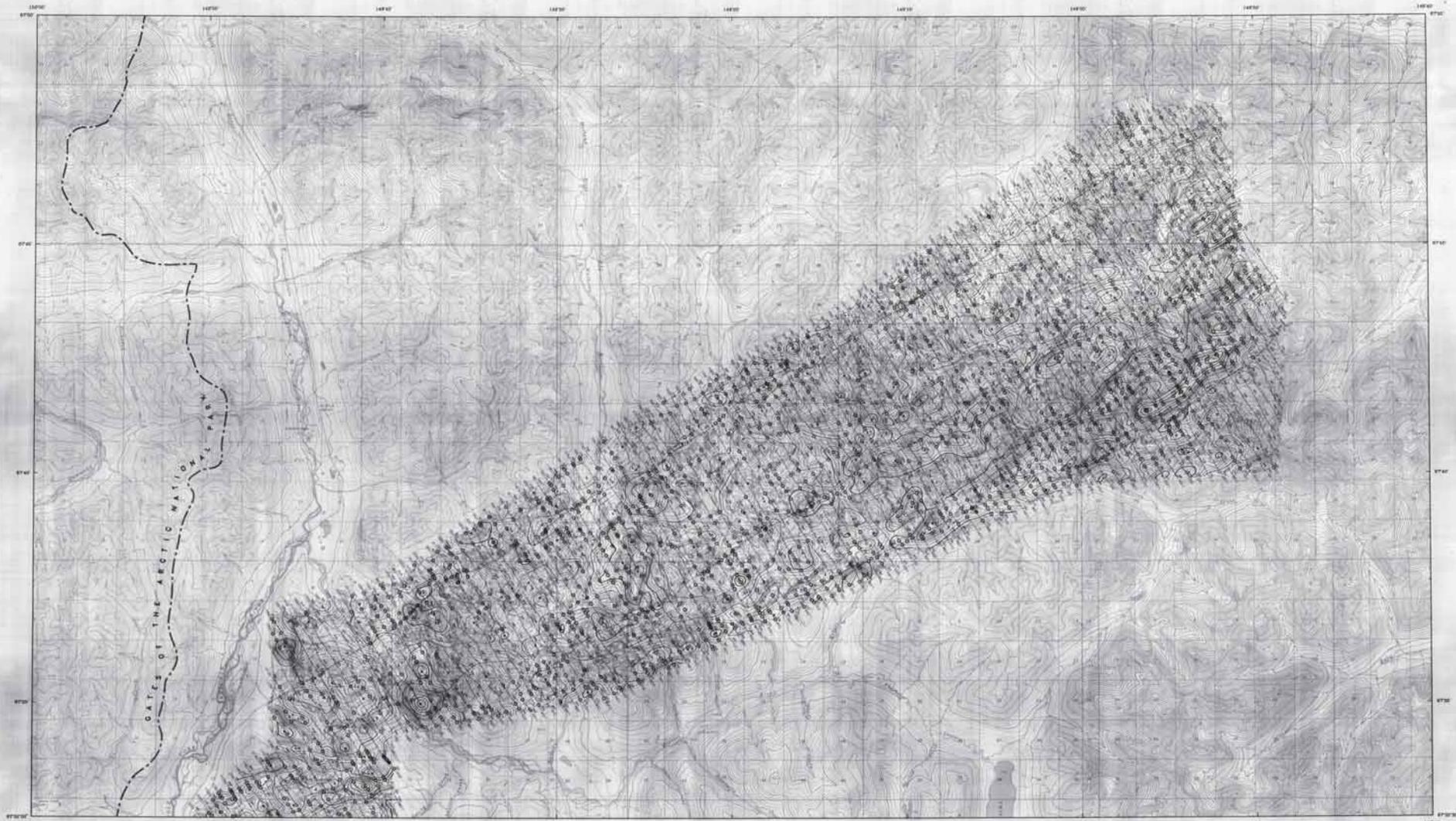
SURVEY HISTORY

This map has been compiled and drawn under contract between the State of Alaska, Department of Natural Resources, Division of Geological Survey, and On-Line Exploration Services, Inc. Aerial photographs for this map were provided by the Department of Natural Resources, Division of Geological Survey, and On-Line Exploration Services, Inc. The map was prepared by the U.S. Department of Interior, Bureau of Land Management (BLM).

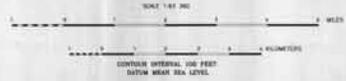
TOTAL FIELD MAGNETICS

The total field magnetic data were collected with a magnetometer system (EM-30) and a magnetometer system (EM-31) in Survey Section 212 (approximately 60° 30' N, 147° 30' W) using a Sikorski HO4S helicopter. The flight paths were performed on a regular basis (approximately 1000 ft) to ensure accuracy. The flight paths were perpendicular to the flight lines at intervals of approximately three miles.

Alaska, N. 1975. A new method of determining and showing magnetic field strength. U.S. Geological Survey Bulletin 1475-A, 1-10.



Scale 1:62,500
 0 1 2 3 4 5 6 7 8 9 10
 METERS
 0 1 2 3 4 5 6 7 8 9 10
 FEET



DESCRIPTIVE NOTES

The geophysical data were acquired with a SQUID-5 Electromagnetic (EM) system, a Scintrex cesium CZU magnetometer, and a fixed VLF system connected to a LAM-14800F Scanner Magnetometer in operation. The survey recorded data from a total station (TSR), GPS positioning system, 3000 ft barometer, and video camera. Flights were performed at a mean barometric altitude of 200 ft above survey flight lines with a spacing of 1/4 mile and an east-west line spacing perpendicular to the flight lines of approximately three miles. Fairbanks-4000 SE Differential Post-processing Geodetic Positioning Systems were used for both navigation and flight path recovery. The receiver position was derived every one second to a relative accuracy of better than 10 m. Flight path positions were projected onto the Clarke 1886 (LTM) spheroid, 1927 North American Datum using a Clarke Meridian (CM) of 147° W, a north constant of 0 and an east constant of 300,000. Positional accuracy of the projected data is better than 10 m with respect to the LTM grid.

ELECTROMAGNETICS

To determine the location of EM anomalies or their boundaries, the SQUID-5 EM system measured in-phase and quadrature components of five frequencies. Two vertical coplanar coil-pairs separated at 800 and 4700 Hz and three horizontal coplanar coil-pairs operated at 840, 8712 and 26,060 Hz. EM data were sampled at 0.1 second intervals. The EM system responds to bedrock conductors, conductive overburden, and cultural sources. The ground line monitor and the flight track video were examined to locate the cultural sources. The EM anomalies that are indicated are classified by conductance.

TOTAL FIELD MAGNETICS AND ELECTROMAGNETIC ANOMALIES FOR THE NORTHEASTERN PORTION OF THE KOYUKUK MINING DISTRICT, EASTERN BROOKS RANGE, ALASKA

1998

ELECTROMAGNETIC ANOMALIES



MAGNETIC CONTOURS



FLIGHT PATH INFORMATION

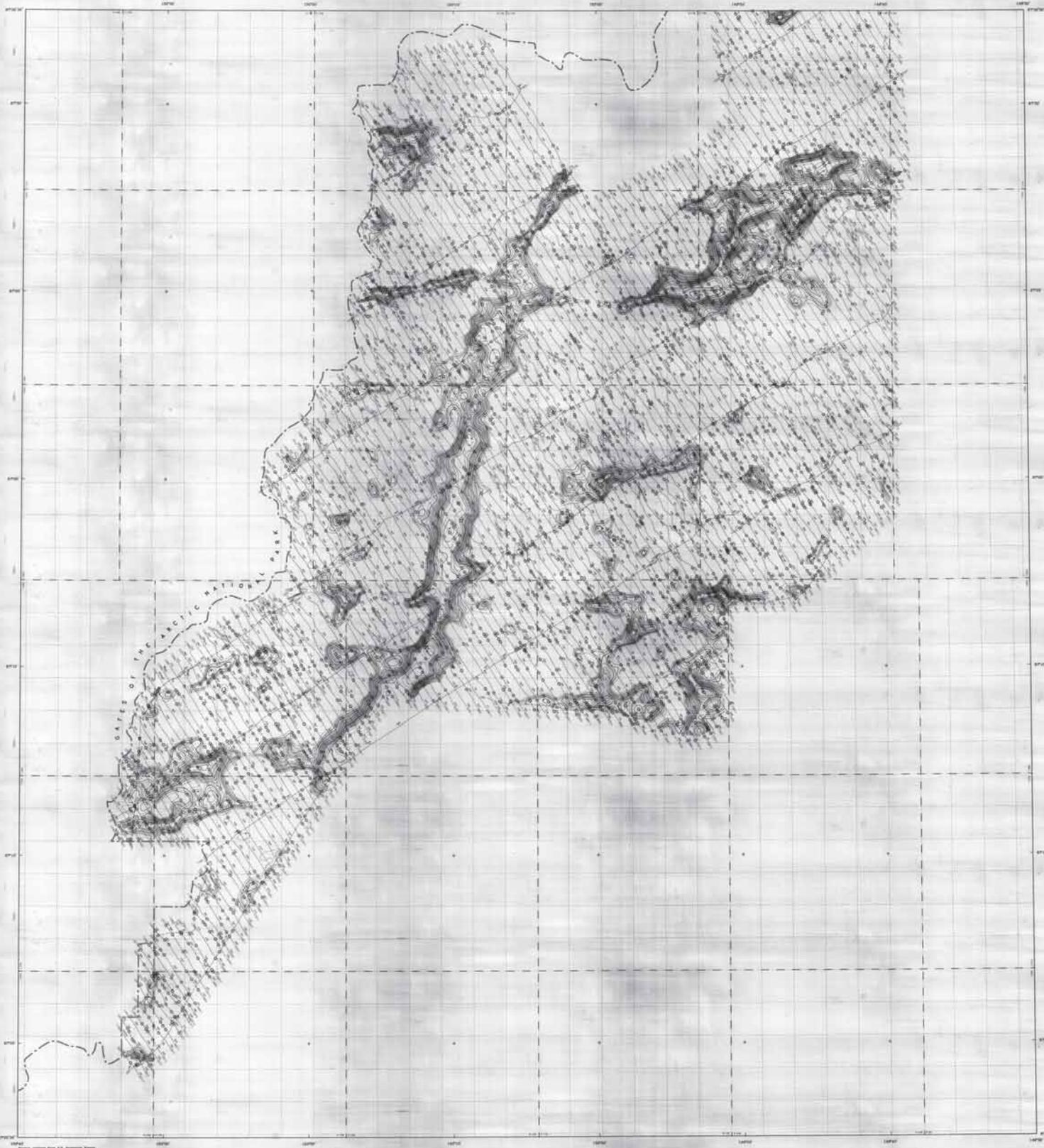


SURVEY HISTORY

This map has been compiled and drawn under contract between the State of Alaska, Department of Natural Resources, Division of Geological & Geophysical Survey, and Civil Engineering Services, Inc. Aerial geophysical data for the area were acquired by Neil Geoscience, Inc. in 1991. Funding for the project was provided by the U.S. Department of Interior Bureau of Land Management (BLM).

TOTAL FIELD MAGNETICS

The total field magnetic data were acquired with a sampling interval of 0.1 seconds and were (1) corrected for diurnal variations by subtraction of the digitally recorded base station magnetic data, (2) leveled to the line data, and (3) interspersed onto a regular 100 m grid using a modified sigma (1970) technique. A regional trend (GNF 1995, updated to August 1997) was then removed from the leveled magnetic data.



Source: Alaska Division of Geological & Geophysical Surveys
 Date: 1998
 Scale: 1:50,000
 Projection: UTM
 Datum: NAD 83
 Contour Interval: 100 ohm-meters

DESCRIPTIVE NOTES

The geophysical data were acquired with a 500W-5 Electromagnetics, Inc. (EMI) 900 Hz coplanar resistivity system installed in a Cessna 441B twin-engine aircraft. The system consists of a 100 m long towed cable with a 100 m long electrode array. The system was operated from a base station (BS) and a control station (CS). The BS was located at the end of the towed cable and the CS was located in the aircraft. The system was operated at a frequency of 900 Hz and a current of 10 A. The system was operated in a 100 m grid pattern. The data were collected in a 100 m grid pattern. The data were collected in a 100 m grid pattern. The data were collected in a 100 m grid pattern.



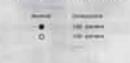
LOCATION INDEX



**900 Hz COPLANAR RESISTIVITY CONTOURS
 FOR THE NORTHEASTERN PORTION OF THE KOYUKUK MINING DISTRICT,
 EASTERN BROOKS RANGE, ALASKA**

1998

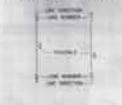
ELECTROMAGNETIC ANOMALIES



RESISTIVITY CONTOURS

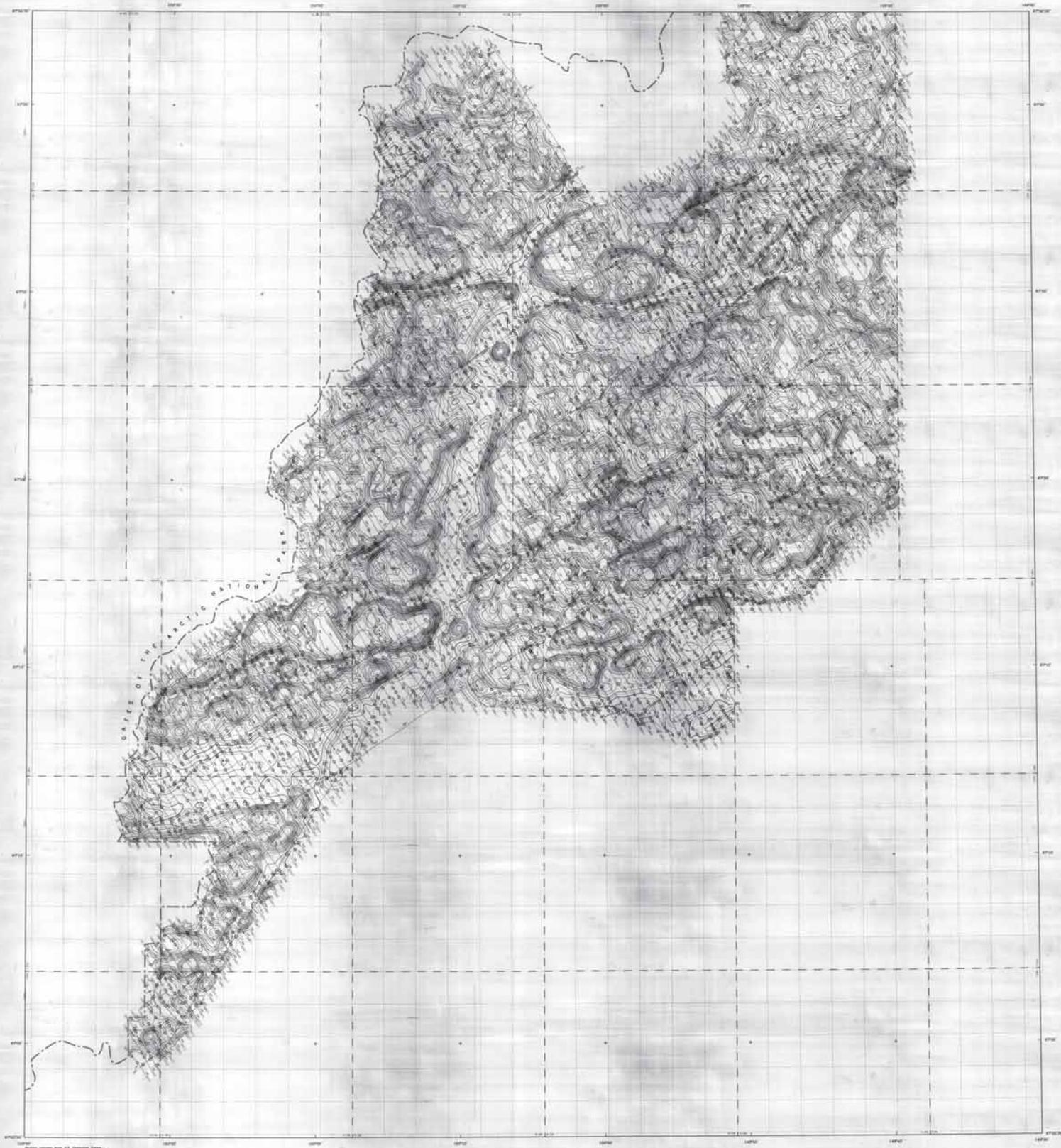


FLIGHT PATH INFORMATION



SURVEY HISTORY

This map and other products from this survey were produced from the Alaska Division of Geological & Geophysical Surveys, 2100 University Ave., Suite 200, Fairbanks, Alaska 99709.



Scale: 1:50,000
 Projection: UTM
 Datum: NAD 83
 Contour Interval: 20 feet

DESCRIPTIVE NOTES

The geophysical data were acquired with a SENSI-5 Electromagnetics and a SENS-5C system installed in a 1987 modified General Motors - Chevrolet pickup truck equipped with a radio altimeter (RTRM), GPS navigation system, 500/50 Hz magnetic and time correct flight gear, and a mass terrain elevation of 100 ft. along survey flight lines with a maximum of a 100 ft. high rise on the line over the terrain. Three lines were flown.

Two Konica-4000 III Differential Plotting/Processing Global Positioning Systems were used for both navigation and flight path recording. The helicopter position was derived from GPS ground station at a maximum accuracy of better than 10 ft. Three modified magnetic compasses were used for 1987 (2000) and 1987 North American datum using a Geacal Model 104 or 147 or a north constant of 0.9 and an east constant of 300,000. Position accuracy of the acquired data is better than 10 m with respect to the UTM grid.

ELECTROMAGNETICS

To determine the location of EM anomalies in their respective the SENSI-5 EM system measured apparent and quadrature components of the magnetic field. The EM system response to bedrock structures, sedimentary basins, and cultural features. The ground line number and the flight track were used to locate the cultural features. The EM anomalies that are indicated are identified by contouring.

Apparent resistivity, calculated with bedrock resistivity and sedimentary components, was 17 plotted with 10-directional method using a grid of 100 m. and 200 m. with a line width distance (line) (contouring) 1000 ft.



**4200 Hz COPLANAR RESISTIVITY CONTOURS
 FOR THE NORTHEASTERN PORTION OF THE KOYUKUK MINING DISTRICT,
 EASTERN BROOKS RANGE, ALASKA**

1998

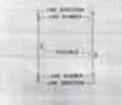
ELECTROMAGNETIC ANOMALIES



RESISTIVITY CONTOURS



FLIGHT PATH INFORMATION



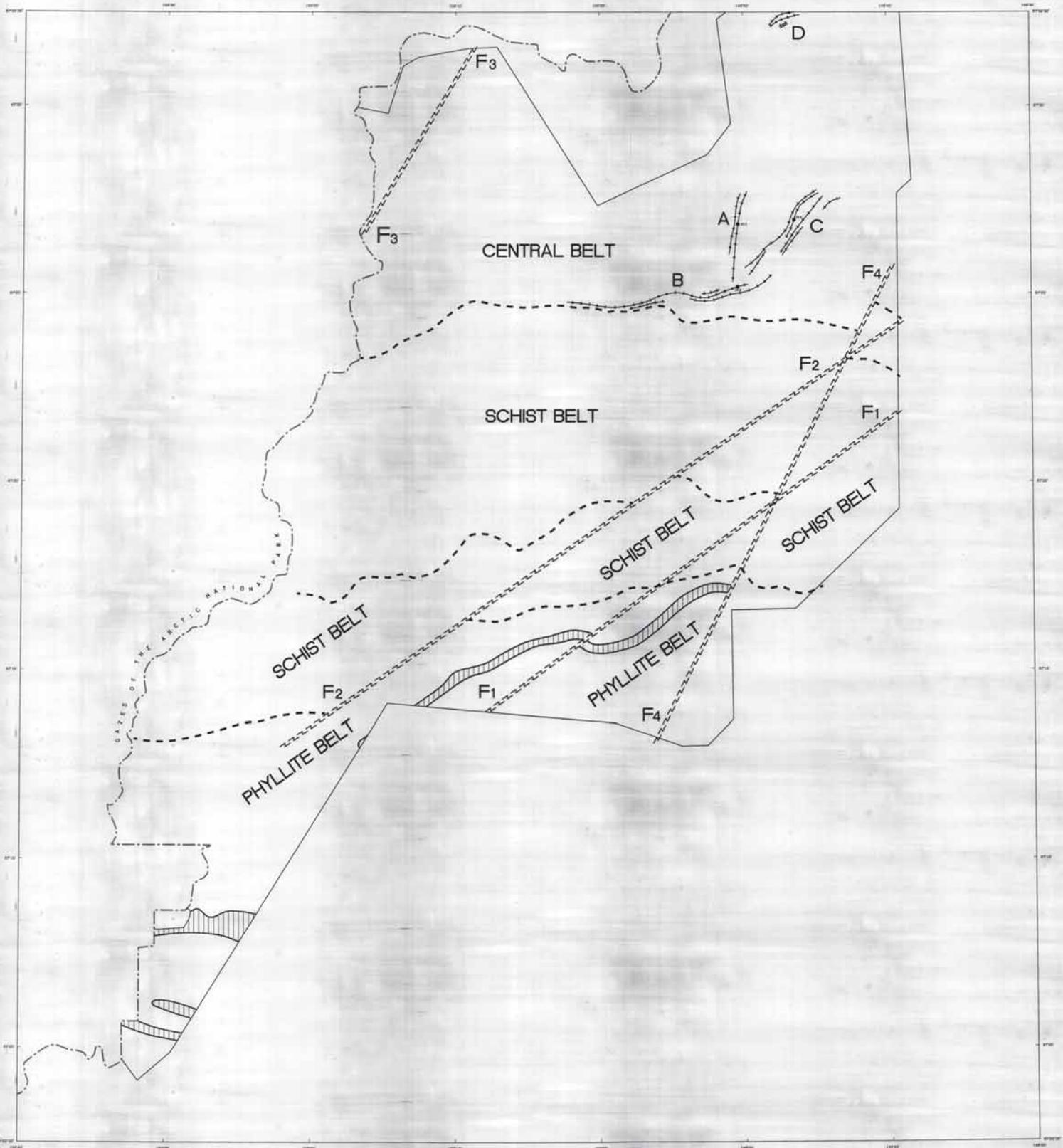
LOCATION INDEX



SURVEY HISTORY

This area has been surveyed and flown under contract between the State of Alaska - Department of Natural Resources, Section of Geology & Geophysical Survey and the U.S. Geological Survey, Inc. Alaska geophysical data for the area were acquired by GSI, Geophysical Survey, in 1987. Funding for the project was provided by the U.S. Department of Interior Bureau of Land Management.

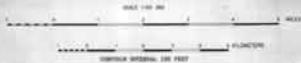
This area was also surveyed from 1984 survey by geophysicists from the Alaska Division of Geological & Geophysical Survey, 201 University Ave., Suite 200, Fairbanks, Alaska, 99709.



Map from U.S. Geological Survey
 Date: 1988
 Author: J. A. Miller, A. W. Miller, P. A. Miller
 Editor: J. A. Miller, A. W. Miller, P. A. Miller
 Draftsman: J. A. Miller, A. W. Miller, P. A. Miller
 Printer: J. A. Miller, A. W. Miller, P. A. Miller

DESCRIPTIVE NOTES

The geophysical data were acquired with a SODAS-5 (Schist) system, a SODAS-5 (Phyllite) system, and a SODAS-5 (Schist) system. The SODAS-5 system consists of a 1000-foot long magnetic tape, a 1000-foot long magnetic tape, and a 1000-foot long magnetic tape. The SODAS-5 system consists of a 1000-foot long magnetic tape, a 1000-foot long magnetic tape, and a 1000-foot long magnetic tape. The SODAS-5 system consists of a 1000-foot long magnetic tape, a 1000-foot long magnetic tape, and a 1000-foot long magnetic tape.



**INTERPRETATION SKETCH MAP
 FOR THE NORTHEASTERN PORTION OF THE KOYUKUK MINING DISTRICT,
 EASTERN BROOKS RANGE, ALASKA**



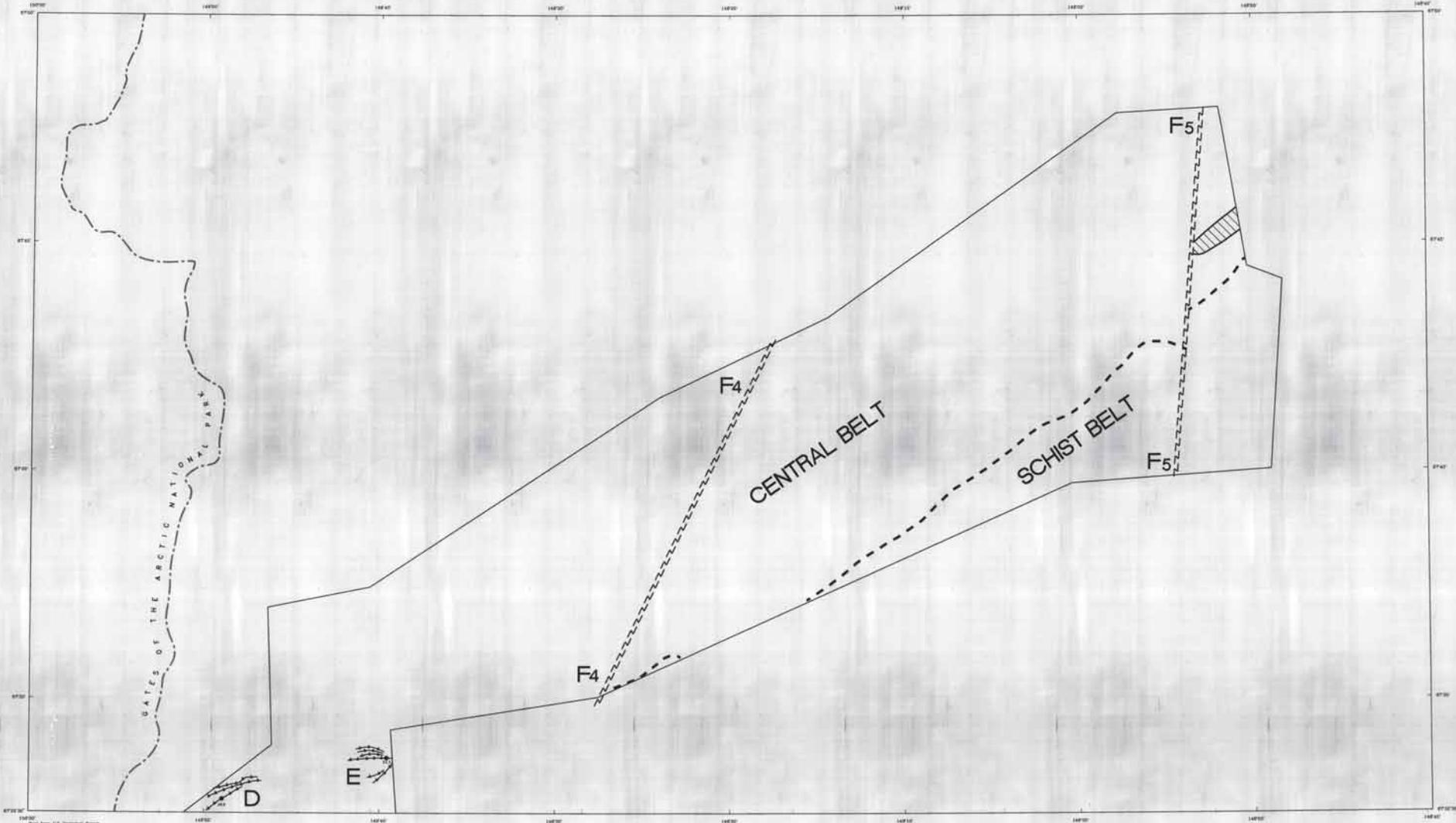
LEGEND FOR GEOPHYSICAL INTERPRETATION

--- Schist Contact
 F₂ Faulted Zone
 D Schist / Phyllite
 --- Schist / Phyllite
 --- Schist / Phyllite

SURVEY HISTORY

This map has been compiled and drawn under contract between the State of Alaska Department of Natural Resources, Division of Geology & Geophysical Survey and the U.S. Geological Survey. The geophysical data for this map were acquired by the U.S. Geological Survey in 1981. Funding for the project was provided by the U.S. Department of Interior Bureau of Land Management (BLM).

This map and other products from this survey are available from the Office of Geology & Geophysical Survey, 400 University Ave., Suite 200, Fairbanks, Alaska, 99775.



Map from U.S. Geological Survey
 Original: 1:62,500, 1:62,500, 1:62,500, 1:62,500
 Digitized by: [unclear]
 Scaled to: 1:62,500

DESCRIPTIVE NOTES

The geophysical data were acquired with a SAGEM-5 Electromagnetic (EM) system, a Scintrex cesium-132 magnetometer, and a Hera 347 system installed in a LAMAR-1000000 ground helicopter. In addition, the survey recorded data from a radar altimeter (TERNA), GPS receiver system, 50/500 Hz monitors, and video camera. Flights were performed at a mean terrain clearance of 200 ft along survey flight lines with a spacing of a quarter of a mile. The lines were flown perpendicular to the flight line at intervals of approximately three miles.

Two Trimble-4000 SE Differential Post-processing Global Positioning Systems were used for both navigation and flight path recovery. The helicopter position was derived every one second to a relative accuracy of better than 10 m. Flight path positions were projected onto the DORNA 1988 (NAD) system. 1987 North American datum using a Central Meridian (CM) of 147° W, 8 north-south of 0 and an east constant of 500,000. Positional accuracy of the projected data is better than 10 m with respect to the UTM grid.



**INTERPRETATION SKETCH MAP
 FOR THE NORTHEASTERN PORTION OF THE KOYUKUK MINING DISTRICT,
 EASTERN BROOKS RANGE, ALASKA**

1998

LEGEND FOR GEOPHYSICAL INTERPRETATION

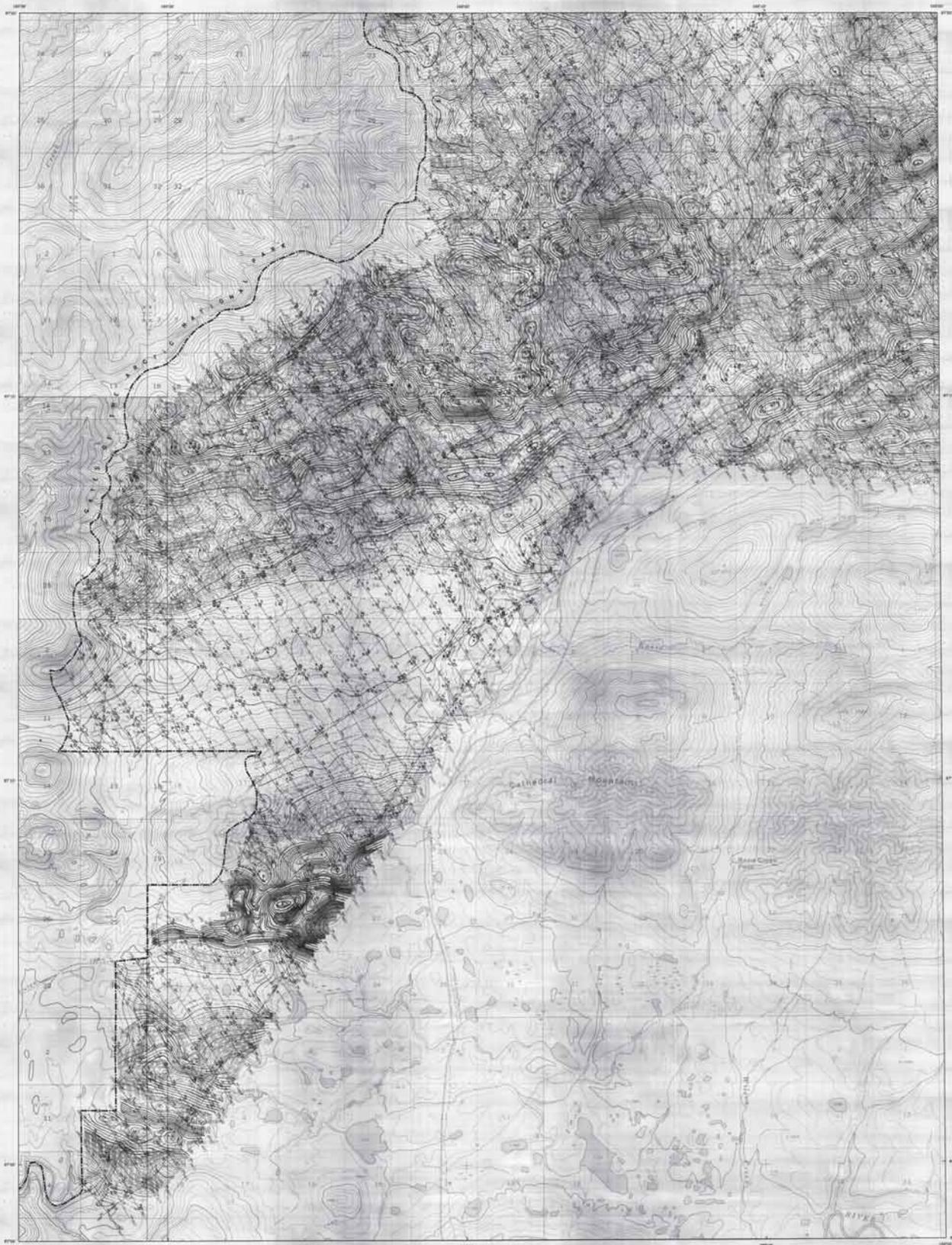
- F4 - Sample Contact
- F4 - Residual Fault
- D - Dike / Inflow
- D - EM Type 1 Contaminated Alluvium Containing Sphalerite



SURVEY HISTORY

This map has been compiled and drawn under contract between the State of Alaska, Department of Natural Resources, Division of Geological & Geophysical Survey, and On-Line Exploration Services, Inc. Airborne geophysical data for this area were acquired by Ion Geosciences, Inc., in 1997. Funding for the project was provided by the U.S. Department of Interior Bureau of Land Management (BLM).

This map and other products from this survey are available from the Alaska Division of Geological & Geophysical Surveys, 724 University Ave., Suite 200, Fairbanks, Alaska, 99709.



Scale 1:50,000
Vertical Datum: 1929
Horizontal Datum: 1929
Map Date: 1978



DESCRIPTIVE NOTES

The magnetic contours were derived with a SODAS-2 Electromagnetic (EM) system of surface current 210 magnetometers and a set of 1000 feet spaced at a 100-foot interval. The magnetic contours were derived from a 100-foot spaced grid of 1000 feet spaced at a 100-foot interval. The magnetic contours were derived from a 100-foot spaced grid of 1000 feet spaced at a 100-foot interval. The magnetic contours were derived from a 100-foot spaced grid of 1000 feet spaced at a 100-foot interval.

TOTAL FIELD MAGNETICS AND DETAILED ELECTROMAGNETIC ANOMALIES FOR THE NORTHEASTERN PORTION OF THE KOYUKUK MINING DISTRICT, EASTERN BROOKS RANGE, ALASKA

MAP A

1978
Parts of Weaman A-1, A-2 and B-1 Quadrangles

SURVEY HISTORY

This map has been compiled and drawn under contract to the Alaska Division of Geological & Geophysical Surveys, Department of Geological & Geophysical Surveys, State of Alaska, by the Alaska Division of Geological & Geophysical Surveys, Department of Geological & Geophysical Surveys, State of Alaska, by the Alaska Division of Geological & Geophysical Surveys, Department of Geological & Geophysical Surveys, State of Alaska.

ELECTROMAGNETICS

The electromagnetic (EM) system used in this survey was a SODAS-2 system of surface current 210 magnetometers and a set of 1000 feet spaced at a 100-foot interval. The magnetic contours were derived from a 100-foot spaced grid of 1000 feet spaced at a 100-foot interval. The magnetic contours were derived from a 100-foot spaced grid of 1000 feet spaced at a 100-foot interval.

ELECTROMAGNETIC ANOMALIES



FLIGHT PATH INFORMATION

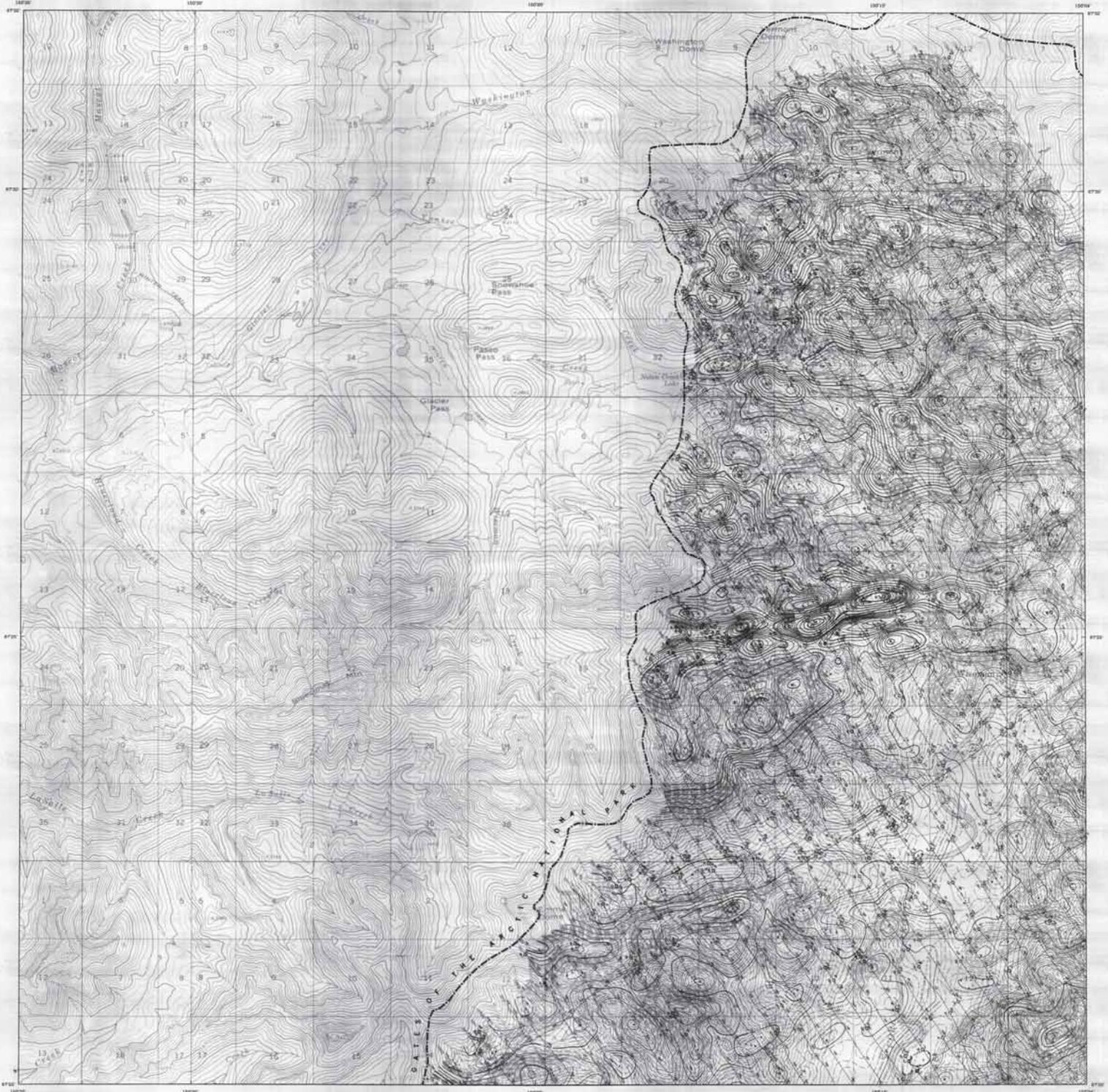


MAGNETIC CONTOURS

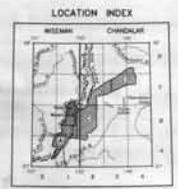


TOTAL FIELD MAGNETICS

The total field magnetic data were collected with a SODAS-2 system of surface current 210 magnetometers and a set of 1000 feet spaced at a 100-foot interval. The magnetic contours were derived from a 100-foot spaced grid of 1000 feet spaced at a 100-foot interval. The magnetic contours were derived from a 100-foot spaced grid of 1000 feet spaced at a 100-foot interval.



Map from U.S. Geological Survey, *Alaska*, 1:50,000, 1968.
Geographic Names
Proposed in USGS Form 8



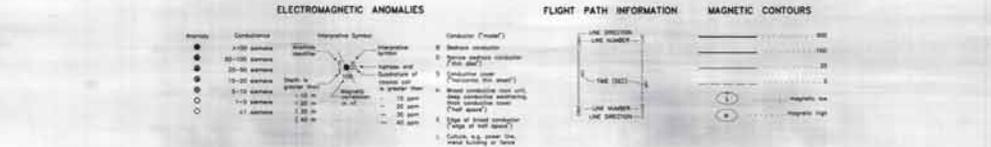
DESCRIPTIVE NOTES
The aeromagnetic data were acquired with a SICOEM-5 Electromagnetic (EM) system, a Sicores cesium CS2 magnetometer, and a Sicores 147 system installed in a LAM-4480B7 Sycamore helicopter. In addition, the survey recorded data from a radio altimeter (CENRA), GPS navigation system, 50/80 Hz monitors, and video camera. Flights were performed at a mean latitude of 66° 30' N, 200 ft above survey flight lines with a spacing of a quarter of a mile. The data were taken perpendicular to the flight lines at intervals of approximately three miles.
Two Trimble-4000 SE Differential Post-processing Global Positioning Systems were used for both navigation and flight path recovery. The helicopter position was derived every one second to a relative accuracy of better than 10 m. Flight path positions were projected onto the Clarke 1866 (1983) spheroid, 1927 North American datum using a Central Meridian (CM) of 147° W, a north constant of 0 and an east constant of 300,000. Horizontal accuracy of the projected data is better than 10 m with respect to the USGS grid.

TOTAL FIELD MAGNETICS AND DETAILED ELECTROMAGNETIC ANOMALIES FOR THE NORTHEASTERN PORTION OF THE KOYUKUK MINING DISTRICT, EASTERN BROOKS RANGE, ALASKA

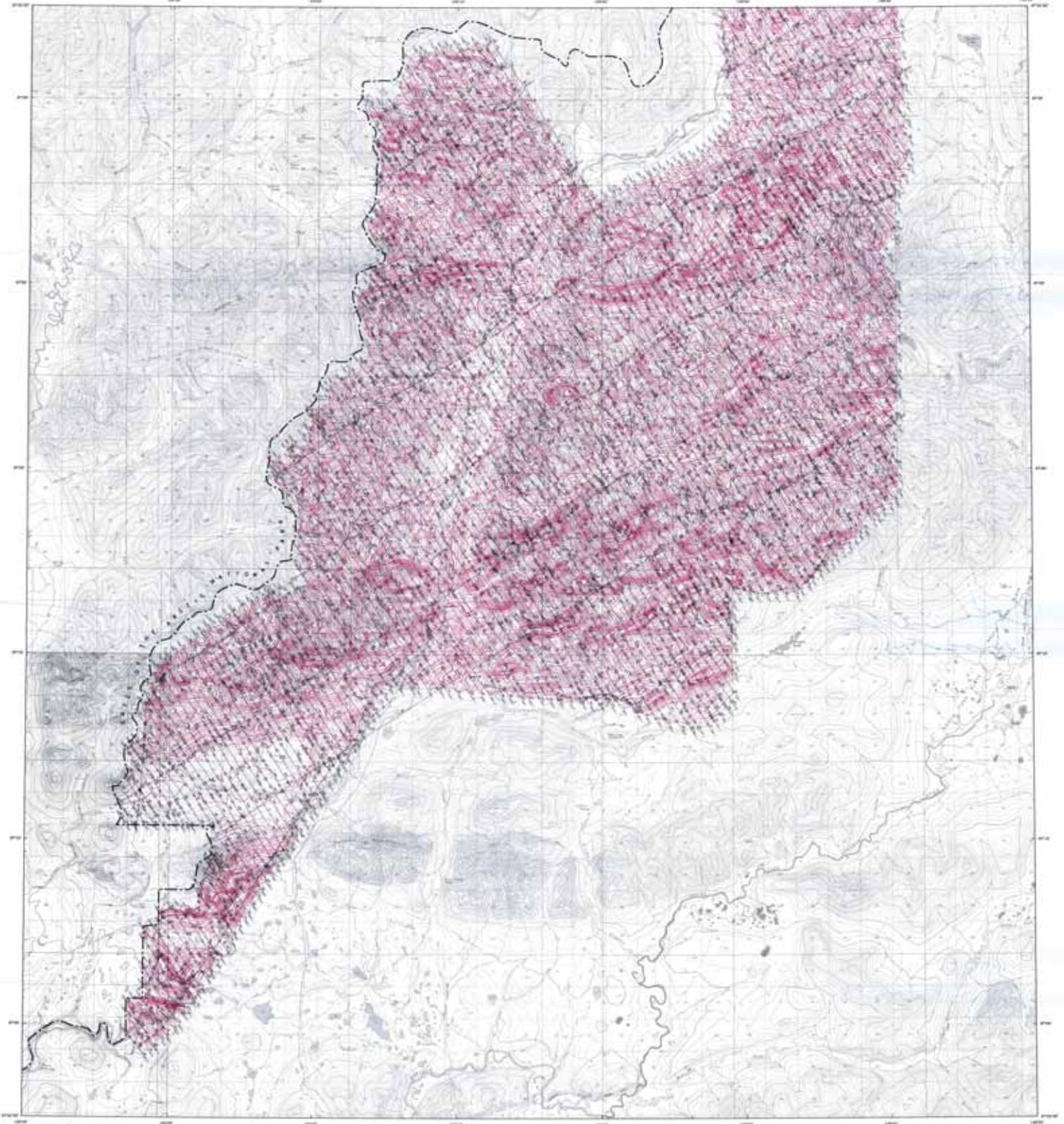
MAP B
1998
Parts of Wreaman B-1 and C-1 Quadrangles

LOCATION INDEX
SURVEY HISTORY
This map has been compiled and drawn under contract between the State of Alaska, Department of Natural Resources, Division of Geological & Geophysical Surveys, and On-Line Exploration Services, Inc. Airborne geophysical data for the area were acquired by Sicores, Inc., in 1997. Funding for the project was provided by the U.S. Department of Interior Bureau of Land Management (BLM).
This map and other products from this survey are available from the Alaska Division of Geological & Geophysical Surveys, 234 University Ave., Suite 200, Fairbanks, Alaska, 99701.

ELECTROMAGNETICS
To determine the location of EM anomalies or their boundaries, the SICOEM-5 EM system measured in-phase and quadrature components of the frequency. Two vertical magnetic coil-pairs separated at 600 and 4750 Hz were used. The coil-pairs were oriented at 0.1 second intervals. The EM system responds to buried conductors, conductive overburden, and cultural sources. The type of conductor is indicated on the aeromagnetic map by the interference pattern obtained. In each EM anomaly, determination of the type of conductor is based on EM geometry patterns of the apparent resistivity and the flight track video were examined to locate the cultural sources.

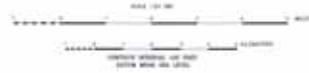


TOTAL FIELD MAGNETICS
The total field magnetic data were acquired with a Sicores cesium CS2 magnetometer and were collected at a spacing interval of 0.1 seconds and were (1) corrected for diurnal variations by subtracting the regularly recorded base station magnetic data, (2) leveled to the sea level datum, (3) reduced to regular 100 m grid with a 2 m vertical datum (1927 North American Datum (NAD 1927), updated to August 1977) were then removed from the leveled magnetic data.
Alaska, 1975. A new method of interpretation and anomaly curve fitting based on magnetic intensity and magnetic declination of the declination of Earth's magnetic field, U.S. Geological Survey, 1975.



Scale 1:50,000
 UTM Zone 18N
 Datum: NAD 83
 Projection: UTM

DESCRIPTIVE NOTES
 The aeromagnetic data were acquired with a GEOMAG-3000 magnetometer system...
 The data were collected on a flight track with a spacing of 200 m between lines...
 The data were processed using a 100 m grid spacing...
 The data were corrected for diurnal and seasonal variations...
 The data were reduced to magnetic north...
 The data were filtered to remove high-frequency noise...
 The data were gridded to a 100 m grid spacing...
 The data were plotted on a topographic map...
 The data were used to identify magnetic anomalies...
 The data were used to identify electromagnetic anomalies...
 The data were used to identify magnetic contours...
 The data were used to identify flight path information...



**TOTAL FIELD MAGNETICS AND ELECTROMAGNETIC ANOMALIES
 FOR THE NORTHEASTERN PORTION OF THE KOYUKUK MINING DISTRICT,
 EASTERN BROOKS RANGE, ALASKA**

1998

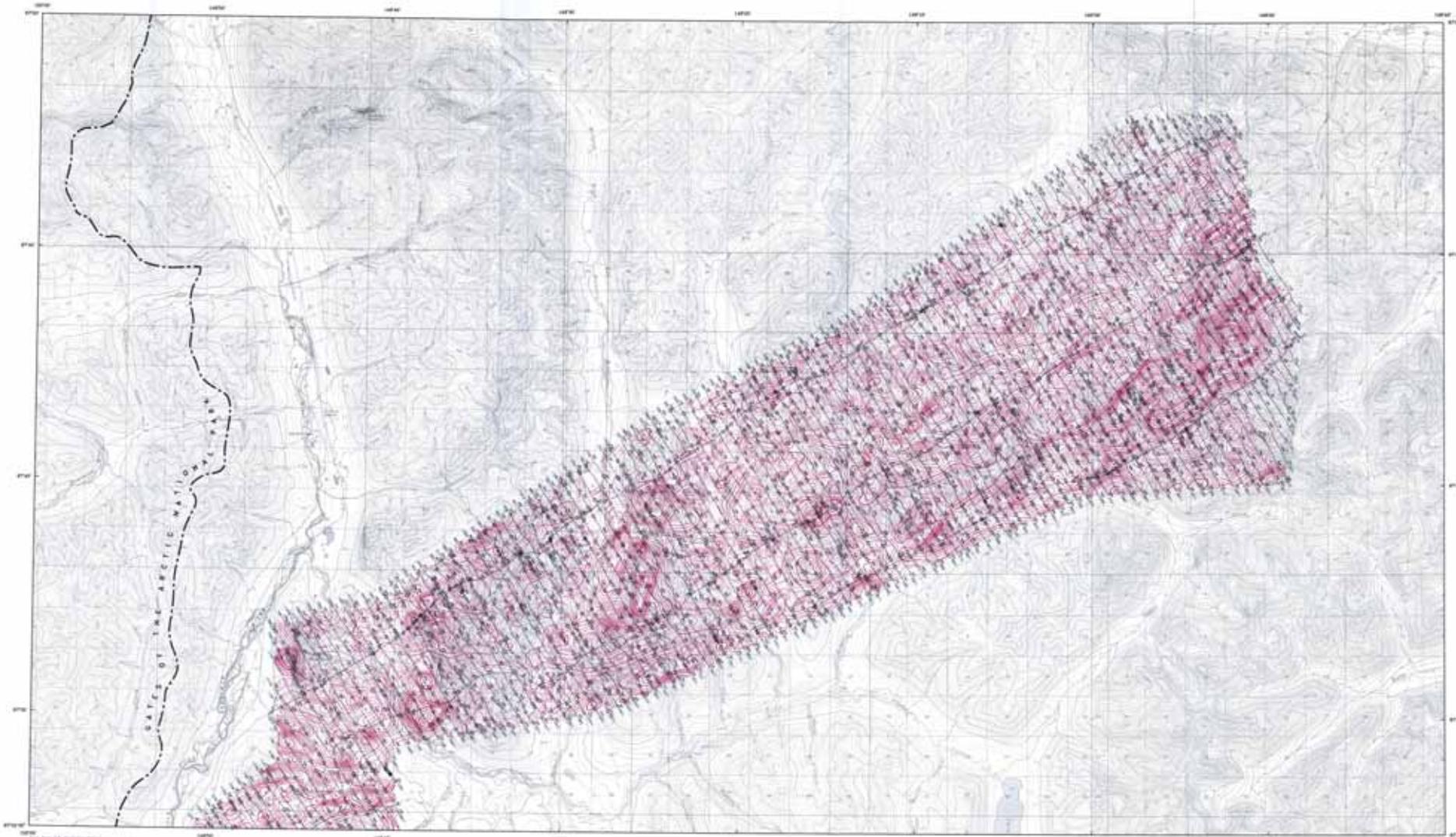
ELECTROMAGNETICS
 The aeromagnetic data were acquired with a GEOMAG-3000 magnetometer system...
 The data were collected on a flight track with a spacing of 200 m between lines...
 The data were processed using a 100 m grid spacing...
 The data were corrected for diurnal and seasonal variations...
 The data were reduced to magnetic north...
 The data were filtered to remove high-frequency noise...
 The data were gridded to a 100 m grid spacing...
 The data were plotted on a topographic map...
 The data were used to identify magnetic anomalies...
 The data were used to identify electromagnetic anomalies...
 The data were used to identify magnetic contours...
 The data were used to identify flight path information...



SURVEY HISTORY
 This area has been surveyed with aeromagnetic data...
 The data were collected on a flight track with a spacing of 200 m between lines...
 The data were processed using a 100 m grid spacing...
 The data were corrected for diurnal and seasonal variations...
 The data were reduced to magnetic north...
 The data were filtered to remove high-frequency noise...
 The data were gridded to a 100 m grid spacing...
 The data were plotted on a topographic map...
 The data were used to identify magnetic anomalies...
 The data were used to identify electromagnetic anomalies...
 The data were used to identify magnetic contours...
 The data were used to identify flight path information...

TOTAL FIELD MAGNETICS
 The aeromagnetic data were acquired with a GEOMAG-3000 magnetometer system...
 The data were collected on a flight track with a spacing of 200 m between lines...
 The data were processed using a 100 m grid spacing...
 The data were corrected for diurnal and seasonal variations...
 The data were reduced to magnetic north...
 The data were filtered to remove high-frequency noise...
 The data were gridded to a 100 m grid spacing...
 The data were plotted on a topographic map...
 The data were used to identify magnetic anomalies...
 The data were used to identify electromagnetic anomalies...
 The data were used to identify magnetic contours...
 The data were used to identify flight path information...

Scale 1:50,000. UTM Zone 18N. Datum: NAD 83. Projection: UTM.



Scale 1:50,000
NAD 83
Datum: NAD 83
Projection: UTM
Zone: 18N

This compilation is based on the collection of magnetic and electromagnetic data for the area shown on this map. The data were collected by the Alaska Division of Geological & Geophysical Surveys and the U.S. Bureau of Land Management. The data were collected between 1985 and 1998. The data were collected by the Alaska Division of Geological & Geophysical Surveys and the U.S. Bureau of Land Management. The data were collected between 1985 and 1998.

DESCRIPTIVE NOTES

The geophysical data were acquired with a GEOMAG-3 magnetometer (244 meters, 2 Surveys Section (2) magnetometer, and a total 247 meters) mounted in a 1980s-era aircraft. The aircraft was flown at an altitude of 100 meters above the ground. The data were collected between 1985 and 1998. The data were collected by the Alaska Division of Geological & Geophysical Surveys and the U.S. Bureau of Land Management. The data were collected between 1985 and 1998.

Two Trimble 4000 SE Differential GPS-capable Star Tracking Systems were used for position control. Flight path information was recorded on a 1000-foot grid. The data were collected between 1985 and 1998. The data were collected by the Alaska Division of Geological & Geophysical Surveys and the U.S. Bureau of Land Management. The data were collected between 1985 and 1998.

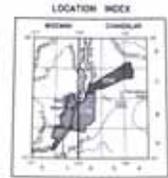
ELECTROMAGNETICS

To determine the location of EM anomalies on this map, the GEOMAG-3 EM system measured magnetic and electromagnetic data. The data were collected between 1985 and 1998. The data were collected by the Alaska Division of Geological & Geophysical Surveys and the U.S. Bureau of Land Management. The data were collected between 1985 and 1998.



TOTAL FIELD MAGNETICS AND ELECTROMAGNETIC ANOMALIES FOR THE NORTHEASTERN PORTION OF THE KOYUKUK MINING DISTRICT, EASTERN BROOKS RANGE, ALASKA

1998

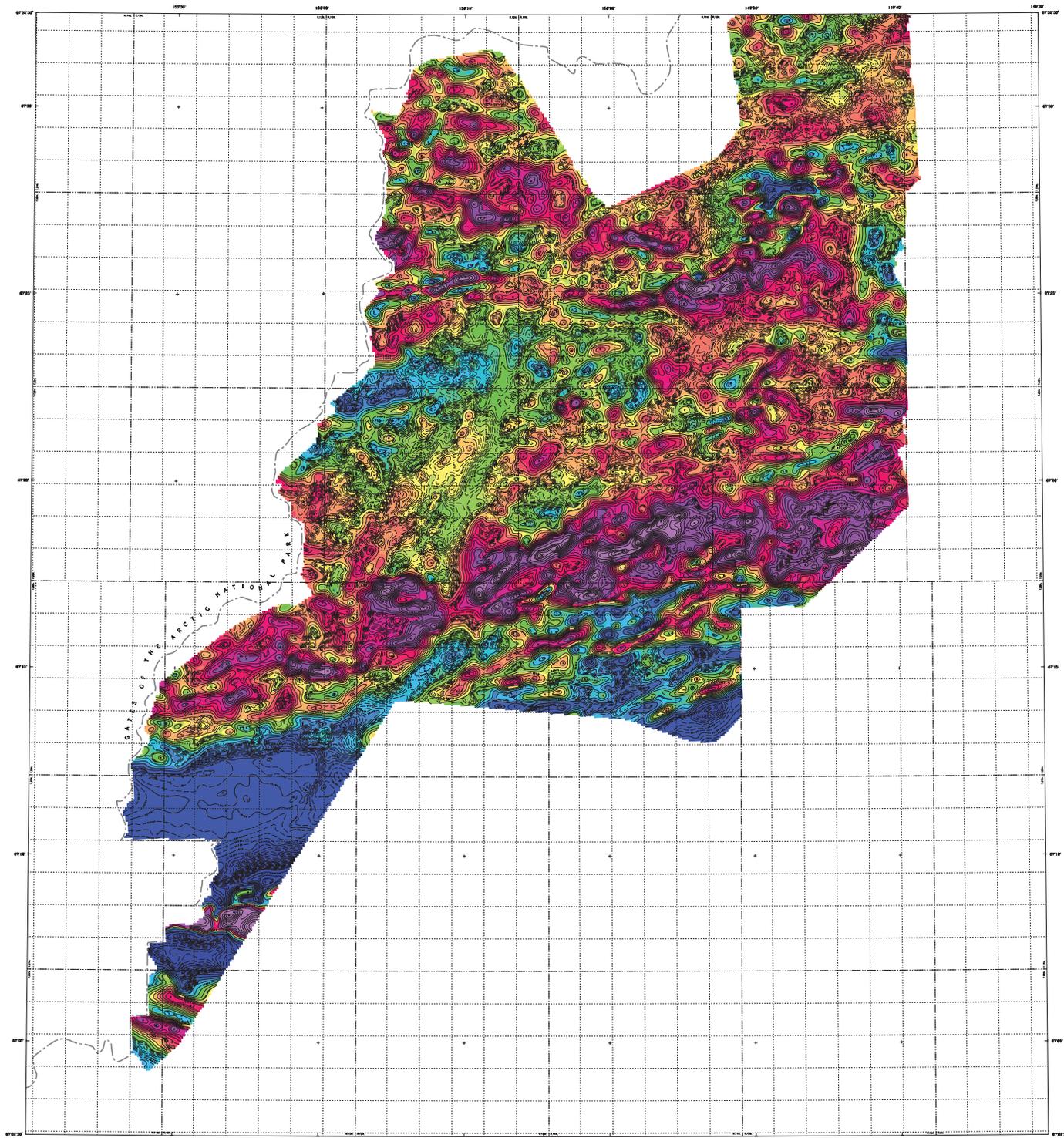


SURVEY HISTORY

This map has been compiled and shown under contract between the State of Alaska, Department of Natural Resources, Division of Geological & Geophysical Surveys and the U.S. Bureau of Land Management, Alaska Geophysical Unit. The data were collected by the Alaska Division of Geological & Geophysical Surveys and the U.S. Bureau of Land Management. The data were collected between 1985 and 1998.

TOTAL FIELD MAGNETICS

The total field magnetic data were acquired with a GEOMAG-3 magnetometer (244 meters, 2 Surveys Section (2) magnetometer, and a total 247 meters) mounted in a 1980s-era aircraft. The aircraft was flown at an altitude of 100 meters above the ground. The data were collected between 1985 and 1998. The data were collected by the Alaska Division of Geological & Geophysical Surveys and the U.S. Bureau of Land Management. The data were collected between 1985 and 1998.

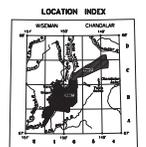


Source: Data from US Geological Survey
 Datum: North American 1983
 Projection: UTM, Zone 18N, Datum: NAD 83
 Contour Interval: 500 mT
 Contour Accuracy: ± 5 mT
 Contour Resolution: 10 m

DESCRIPTIVE NOTES

The aeromagnetic data were acquired with a GEOMAR-5 Electromagnetic (EM) System, a Scintrex cesium CS2 magnetometer, and a Honeywell system installed in a Learjet-440 aircraft. The aircraft was equipped with a Learjet-440 flight recorder in addition to the recorded data from a radio altimeter (RRA), GPS receiver system, SSI-100 Vx meters, and video camera. Flights were performed at a mean terrain clearance of 200 ft above ground level with a spacing of 1/4 degree of 1/4 mile. The lines were then perpendicular to the flight lines of intervals of approximately three miles.

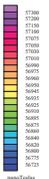
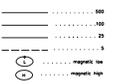
The Trimble-4000 SE Differential Post-processing Global Positioning System, was used for both navigation and flight track recovery. The accuracy of the location data was better than 10 m. The flight track was corrected to the datum of 1983. The data were processed with the GEOMAR-5 software. The data were then processed with the GEOMAR-5 software. The data were then processed with the GEOMAR-5 software. The data were then processed with the GEOMAR-5 software.



**TOTAL FIELD MAGNETICS
FOR THE NORTHEASTERN PORTION OF THE KOYUKUK MINING DISTRICT,
EASTERN BROOKS RANGE, ALASKA**

1998

MAGNETIC CONTOURS



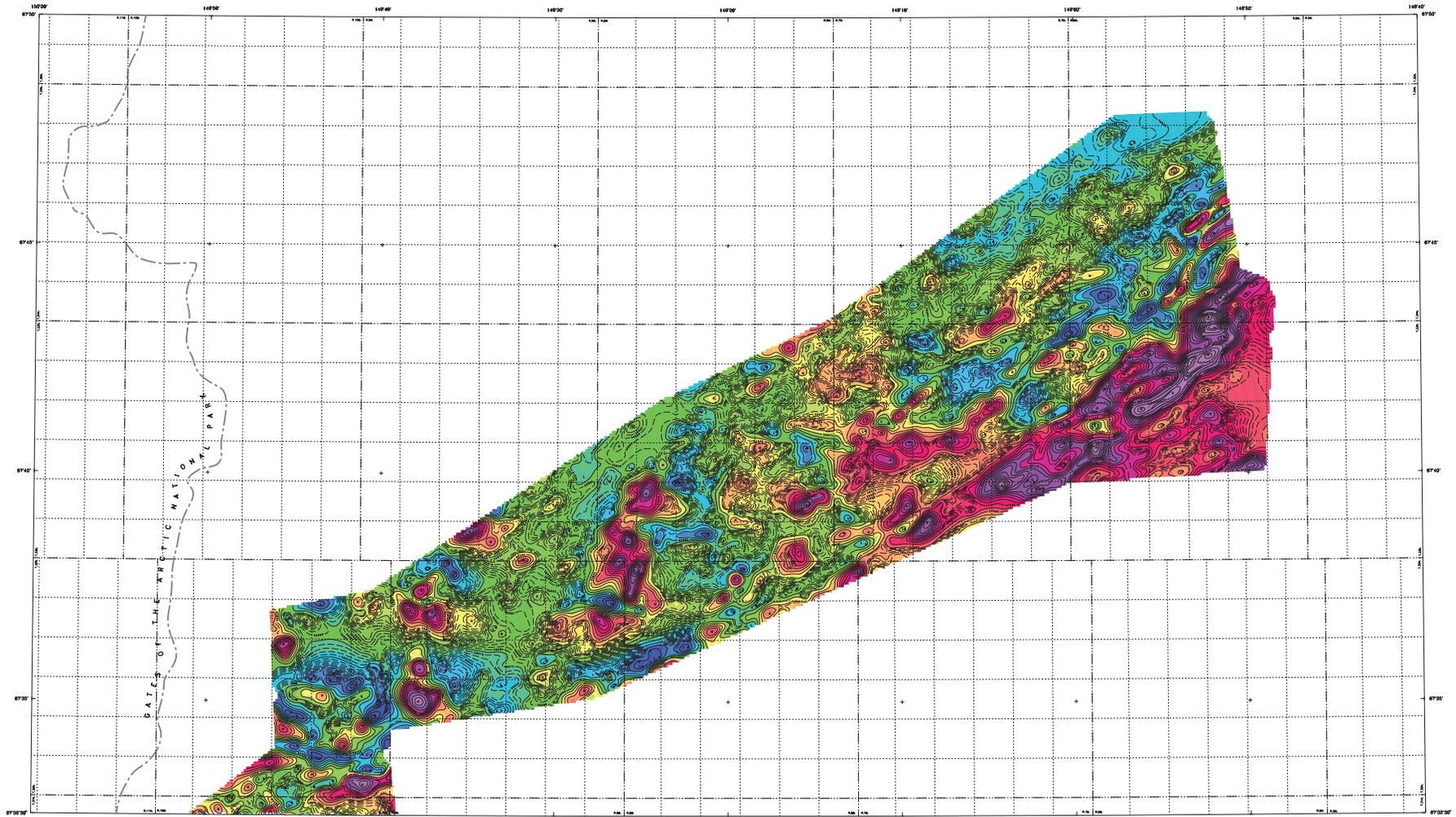
SURVEY HISTORY

This map has been compiled and shown under contract between the State of Alaska, Department of Natural Resources, Division of Geological & Geophysical Surveys, and On-Line Exploration Services, Inc. Airborne geophysical data for the area were acquired by On-Line Exploration Services, Inc. in 1997. Funding for the project was provided by the U.S. Department of Interior Bureau of Land Management (BLM).

TOTAL FIELD MAGNETICS

The total field magnetic data were processed with a computer program (FEL) developed and was (1) corrected for magnetic declination, (2) converted to the 1983 datum, and (3) interpolated onto a regular 100 m grid. The data were then processed with a computer program (FEL) developed and was (1) corrected for magnetic declination, (2) converted to the 1983 datum, and (3) interpolated onto a regular 100 m grid. The data were then processed with a computer program (FEL) developed and was (1) corrected for magnetic declination, (2) converted to the 1983 datum, and (3) interpolated onto a regular 100 m grid.

Alaska, 1976. A new method of interpolation and smooth curve fitting based on least squares adjustment of the residuals of computed magnetic, v. 17, no. 4, 489-493.

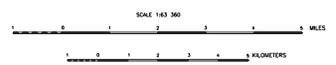


Source: Data from U.S. Geological Survey
December 1978; 1980; 1981; 1982; 1983
1984; 1985; 1986; 1987; 1988; 1989
Geographic Index
Prepared in 1998

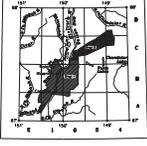
DESCRIPTIVE NOTES

The geophysical data were acquired with a SIGHEM-5 Electromagnetic (EM) system, a Sintered carbon GSE magnetometer, and a Herz VLF system installed in a LAM-14000000 Square helicopter. In addition, the survey recorded data from a radar altimeter (TERRA), GPS navigation system, 50/60 Hz monitors, and video camera. Flights were performed at a mean terrain clearance of 200 ft along survey flight lines with a spacing of a quarter of a mile. The lines were flown perpendicular to the flight lines at intervals of approximately three miles.

Two Trimble-4000 SE Differential Post-processing Global Positioning Systems were used for both helicopter and flight path recovery. The helicopter position was derived every one second to a relative accuracy of better than 10 m. Flight path positions were projected onto the Clarke 1866 (C.M.) spheroid, 1927 North American datum using a Central Meridian (CM) of 147° W, a north constant of 0 and an east constant of 500,000. Positional accuracy of the processed data is better than 10 m with respect to the UTM grid.



LOCATION INDEX



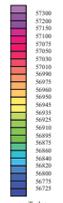
SURVEY HISTORY

This map has been compiled and drawn under contract between the State of Alaska, Department of Natural Resources, Division of Geology, and On-Line Exploration Services, Inc. Airborne geophysical data for this area were acquired by SIR Geoscience, Inc., in 1997. Funding for the project was provided by the U.S. Department of Interior Bureau of Land Management (BLM).

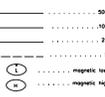
This map and other products from this survey are available from the Alaska Division of Geological & Geophysical Surveys, 794 University Ave., Suite 200, Fairbanks, Alaska, 99709.

TOTAL FIELD MAGNETICS

The total field magnetic data were acquired with a sampling interval of 0.1 seconds, and were (1) corrected for diurnal variations by subtraction of the digitally recorded base station magnetic data, (2) leveled to the sea level datum, and (3) interpolated onto a regular 100 m grid using a modified Akima 2-D interpolation algorithm. Trend (ICR) 1995, updated to August 1997) was then removed from the leveled magnetic data.



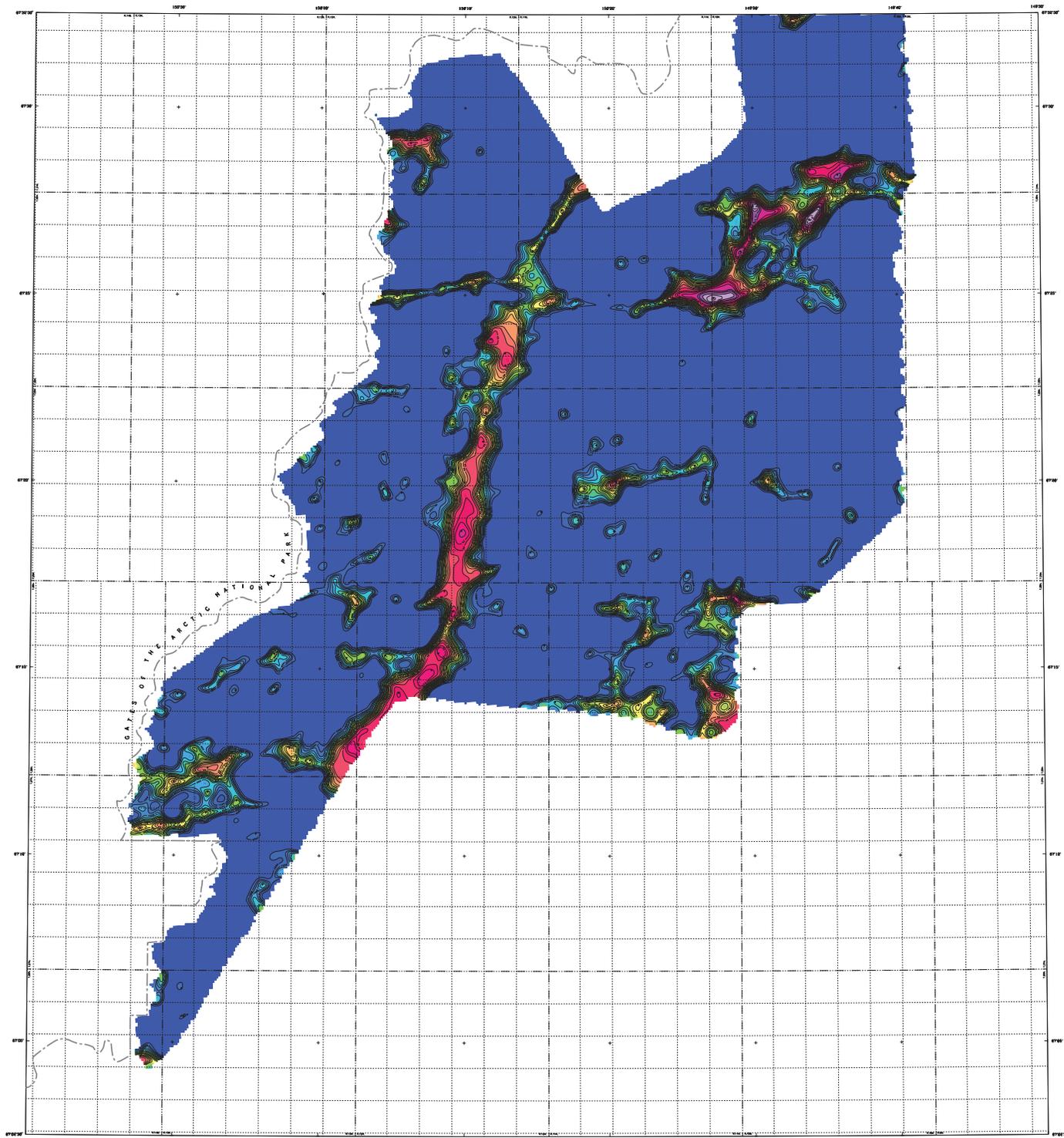
MAGNETIC CONTOURS



**TOTAL FIELD MAGNETICS
FOR THE NORTHEASTERN PORTION OF THE KOYUKUK MINING DISTRICT,
EASTERN BROOKS RANGE, ALASKA**

1998

Alaska, in 1970, A new method of interpolation and smooth curve fitting based on least squares. Journal of the Association of Computing Machinery, 17, no. 4, 809-820.



Scale: 1:63,000
 Date: 1998
 Project: 98-9
 Sheet: 1 of 2

DESCRIPTIVE NOTES

The geophysical data were acquired with a SCHLUMBERGER EM system, a Schlumberger CS2 magnetometer, and a 1000 Hz system installed in a Land-based Survey Vehicle. The data were recorded onto a tape recorder (TR-800), GPS receiver system, SC-1000, and video camera. Flights were performed at a mean terrain clearance of 200 ft above survey flight lines with a spacing of 1/4 mile. The lines were flown perpendicular to a quarter of a mile. The lines were flown perpendicular to a quarter of a mile.

Two Trimble 4000 SE Differential Post-processing Global Positioning Systems were used for both navigation and data collection. The data were collected every one second to a relative accuracy of better than 10 m. Flight path positions were provided on the CD-ROM. The data were processed with the CD-ROM. The data were processed with the CD-ROM. The data were processed with the CD-ROM.

ELECTROMAGNETICS

To determine the location of EM anomalies or their boundaries, the Schlumberger EM system measures in-phase and quadrature components of the magnetic field. Two vertical coplanar electrodes separated by 300 and 1500 ft with three horizontal counter coils were operated at 900 Hz and 3000 Hz. The data were corrected for terrain effects. The EM system measures in-phase components, conductive overburden, and cultural sources. The power line monitor and the flight track data were examined to locate cultural sources.

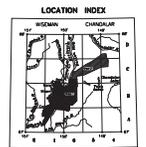
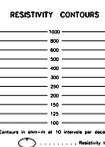
Apparent resistivity, calculated with in-phase and quadrature components, was (1) gridded with a 50-m grid method with a cell of 100 m, and (2) filtered with a low pass directional filter (deconvolution, Keating, 1994).

Keating, Peter, 1994. Frequency Domain Filtering Geophysical Survey of Canada, Unpublished Report Program.



**900 Hz COPLANAR RESISTIVITY CONTOURS
FOR THE NORTHEASTERN PORTION OF THE KOYUKUK MINING DISTRICT,
EASTERN BROOKS RANGE, ALASKA**

1998



SURVEY HISTORY

This map has been compiled and drawn under contract between the State of Alaska, Department of Natural Resources, Division of Geological & Geophysical Surveys, and Geologic Information Services, Inc. Geologic Information Services, Inc. is a private geophysical consulting firm. Funding for the project was provided by the U.S. Department of Interior Bureau of Land Management (BLM).

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