

NIKOLAI ELECTROMAGNETIC AND MAGNETIC AIRBORNE GEOPHYSICAL SURVEY DATA COMPILATION

Burns, L.E., Graham, G.R.C., Barefoot, J.D., and Aerodat Inc.

Geophysical Report 2019-21

2020
STATE OF ALASKA
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS



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Suggested citation:

Burns, L.E., Graham, G.R.C., Barefoot, J.D., and Aerodat Inc.,
2020, Nikolai electromagnetic and magnetic airborne
geophysical survey data compilation: Alaska Division of
Geological & Geophysical Surveys
Geophysical Report 2019-21. <http://doi.org/10.14509/30262>



NIKOLAI ELECTROMAGNETIC AND MAGNETIC AIRBORNE GEOPHYSICAL SURVEY DATA COMPILATION

Burns, L.E.¹, Graham, G.R.C.¹, Barefoot, J.D.¹, and Aerodat Inc.

ABSTRACT

The Nikolai electromagnetic and magnetic airborne geophysical survey is located in interior Alaska in the Delta River mining district, about 200 kilometers southeast of Fairbanks. Frequency domain electromagnetic and magnetic data were collected with the Aerodat Condor system in 1995. A total of 3412.8 line kilometers were collected covering 660.1 square kilometers. Line spacing was 200 meters (m). Data were collected on a helicopter towed sensor platform (“bird”) on a 30 m long line. The electromagnetic equipment recorded data slightly above 30 m above ground level (AGL), and the magnetometer recorded data slightly above 45 m AGL due to safety considerations. The Nikolai data were provided to DGGS by the U.S. Department of Interior Bureau of Land Management (BLM) and were merged with the Southern Delta River survey (2002) as a contract deliverable. The 2003 release of the Southern Delta River survey included map sheets of the merged data.

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 survey area contains prospects for lode gold, placer gold, and Ni-Cu-PGE deposits. 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.

ACKNOWLEDGMENTS

This survey was provided by the U.S. Department of Interior Bureau of Land Management (BLM) for publication with the 2002 Southern Delta River airborne geophysical survey.

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
maps_prn_format	contractor	Printable maps in HPGL/2 printer file format with extension .prn
profiles_stacked	contractor	Distance-based profiles of the digitally recorded geophysical data are generated and plotted at an appropriate scale. The profiles display electromagnetic anomalies with their respective interpretive symbols. Printable in pdf format
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

REFERENCES

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- Burns, L.E., U.S. Bureau of Land Management, Fugro Airborne Surveys, and Stevens Exploration Management Corp., 2003, Plot files of the airborne geophysical survey data of the southern Delta River area, east-central Alaska: Alaska Division of Geological & Geophysical Surveys Geophysical Report 2003-5, 1 DVD. <http://doi.org/10.14509/2904>
- Burns, L.E., and Clautice, K.H., 2003, Portfolio of aeromagnetic and resistivity maps of the southern Delta River area, east-central Alaska: Alaska Division of Geological & Geophysical Surveys Geophysical Report 2003-8, 15 p. <http://doi.org/10.14509/2975>
- Fraser, D.C., 1978, Resistivity mapping with an airborne multicoil electromagnetic system: *Geophysics*, v. 43, p. 144-172.
- Pritchard, R.A., and Fugro Airborne Surveys, 2003, Project report of the airborne geophysical survey for the southern Delta River area, east-central Alaska: Alaska Division of Geological & Geophysical Surveys Geophysical Report 2003-7, 252 p., 2 sheets, scale 1:63,360. <http://doi.org/10.14509/2974>

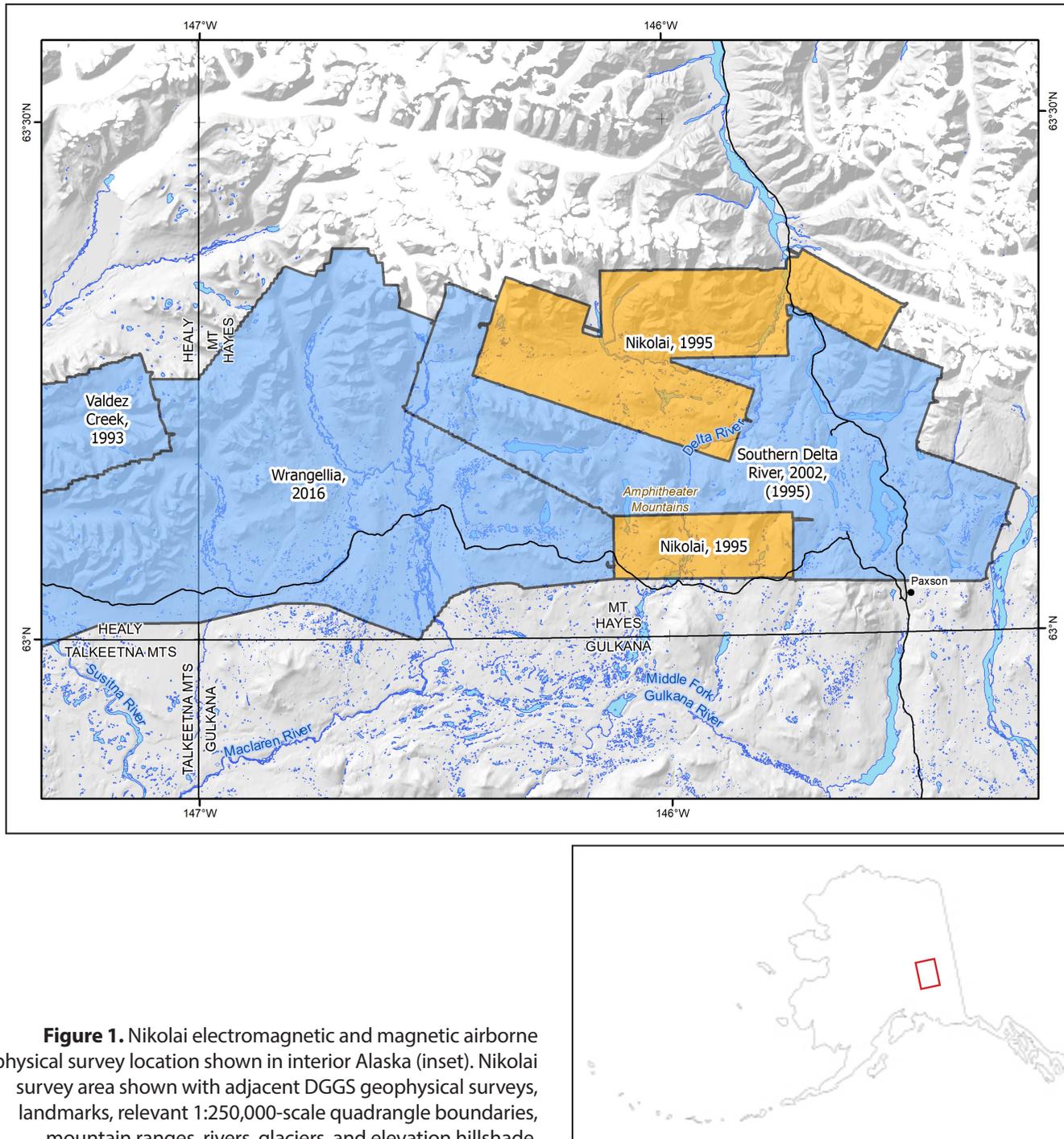


Figure 1. Nikolai electromagnetic and magnetic airborne geophysical survey location shown in interior Alaska (inset). Nikolai survey area shown with adjacent DGGs geophysical surveys, landmarks, relevant 1:250,000-scale quadrangle boundaries, mountain ranges, rivers, glaciers, and elevation hillshade.

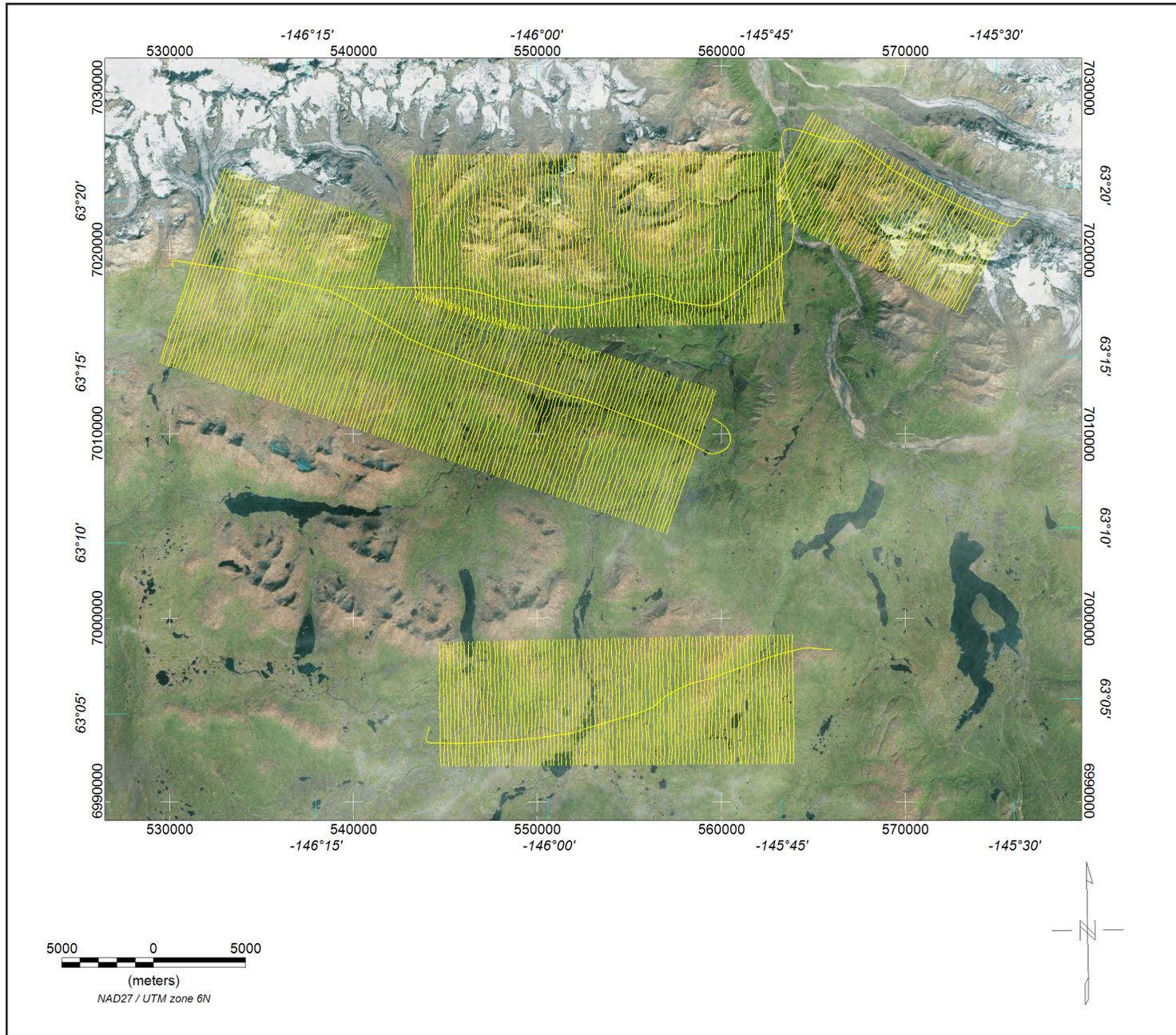


Figure 2. Flight path with orthometric image.

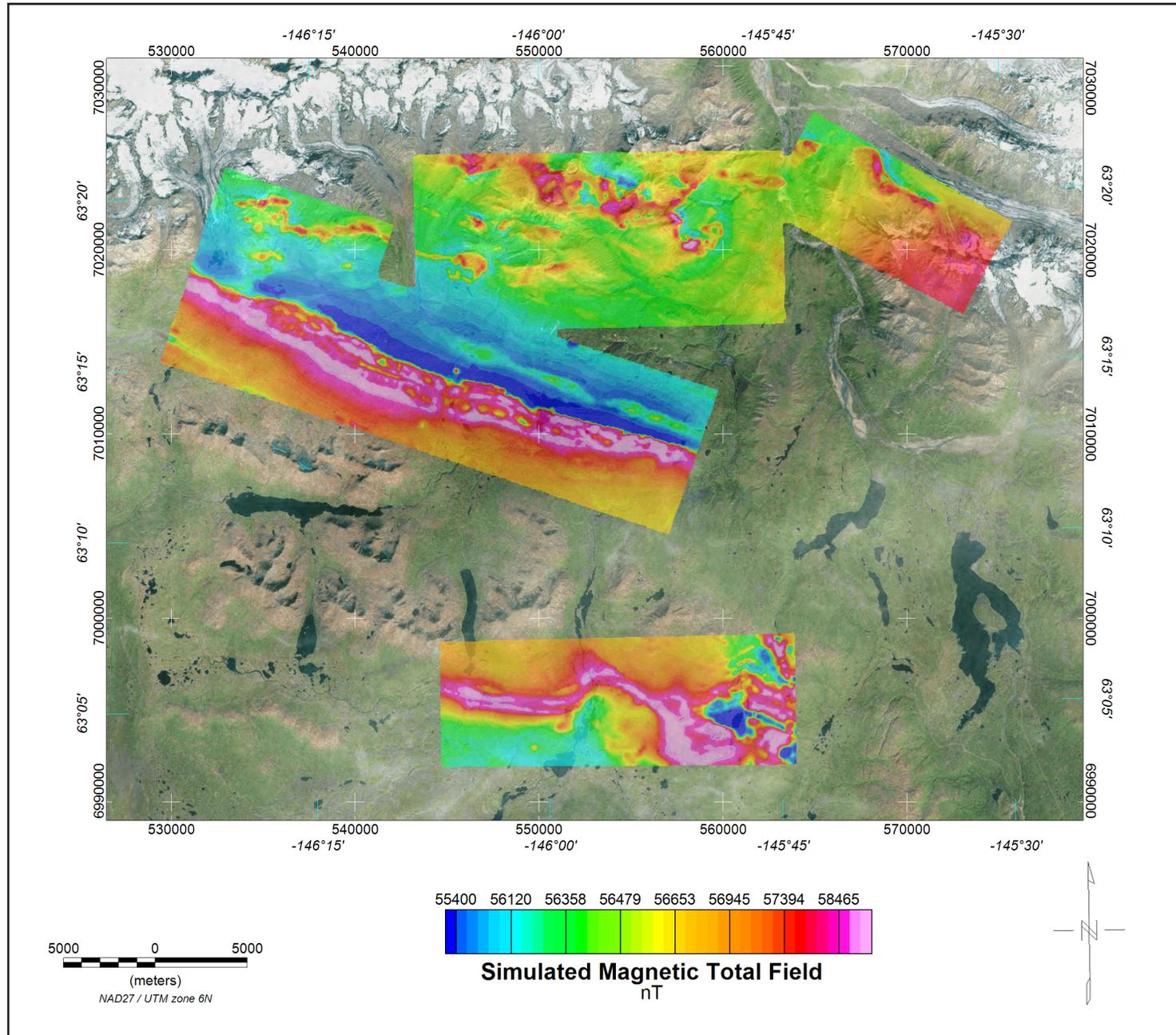


Figure 3. Simulated magnetic total field grid with orthometric image. The simulated magnetic total field data were created using digitally recorded data from a Scintrex cesium magnetometer. Data were collected at a sampling interval of 0.1 seconds. The magnetic data were (1) corrected for diurnal variations by subtracting the digitally recorded base station magnetic data, (2) IGRF corrected (IGRF model 2000, updated for date of flight and altimeter variations), (3) leveled to the tie line data, and (4) a constant value of approximately 57,000 nT was added to all data.

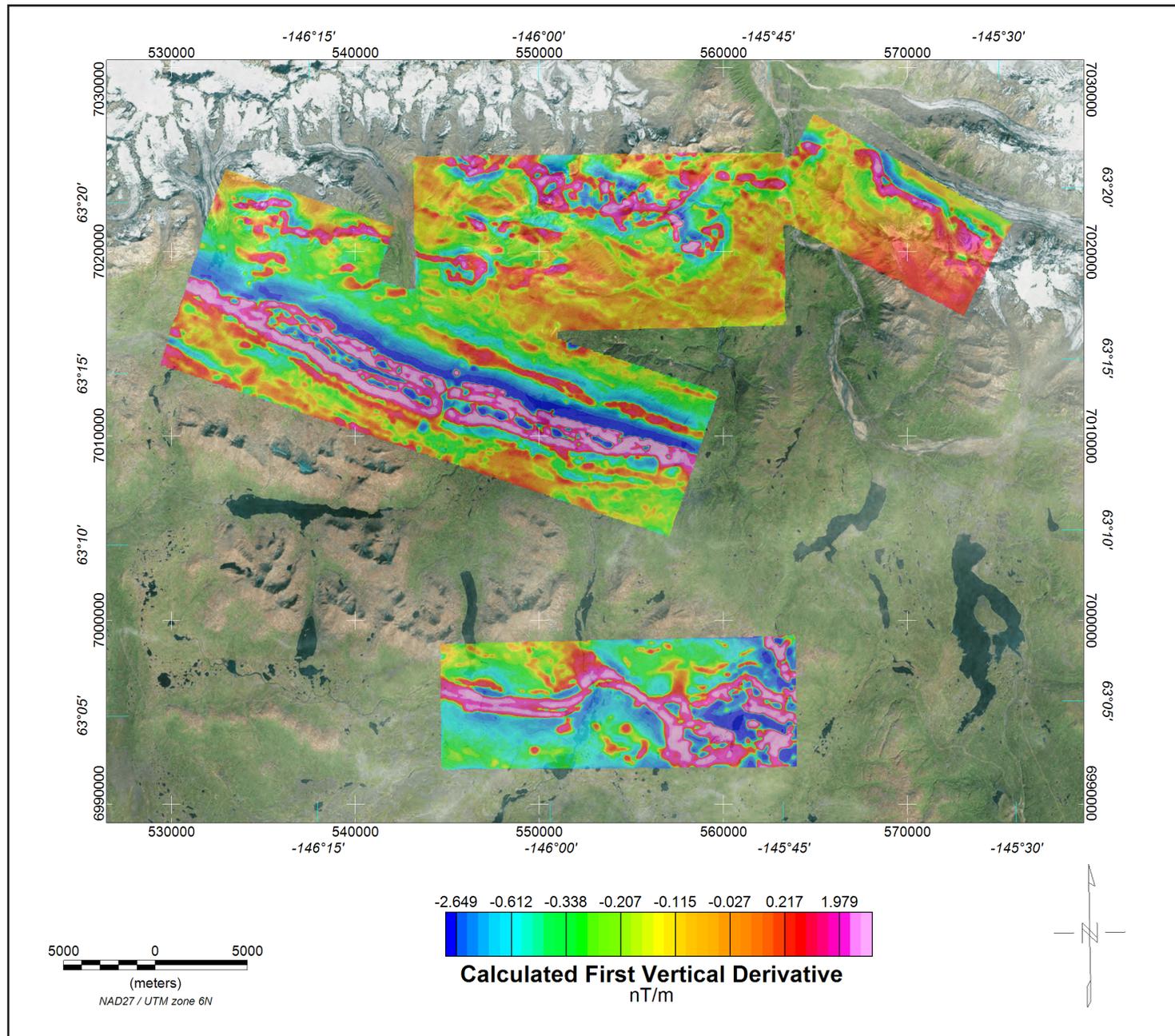


Figure 4. Calculated first vertical derivative grid with orthometric image. The first vertical derivative grid was calculated from the diurnally-corrected, IGRF-corrected total magnetic field grid using a FFT base frequency domain filtering algorithm. The resulting first vertical derivative grid provides 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.

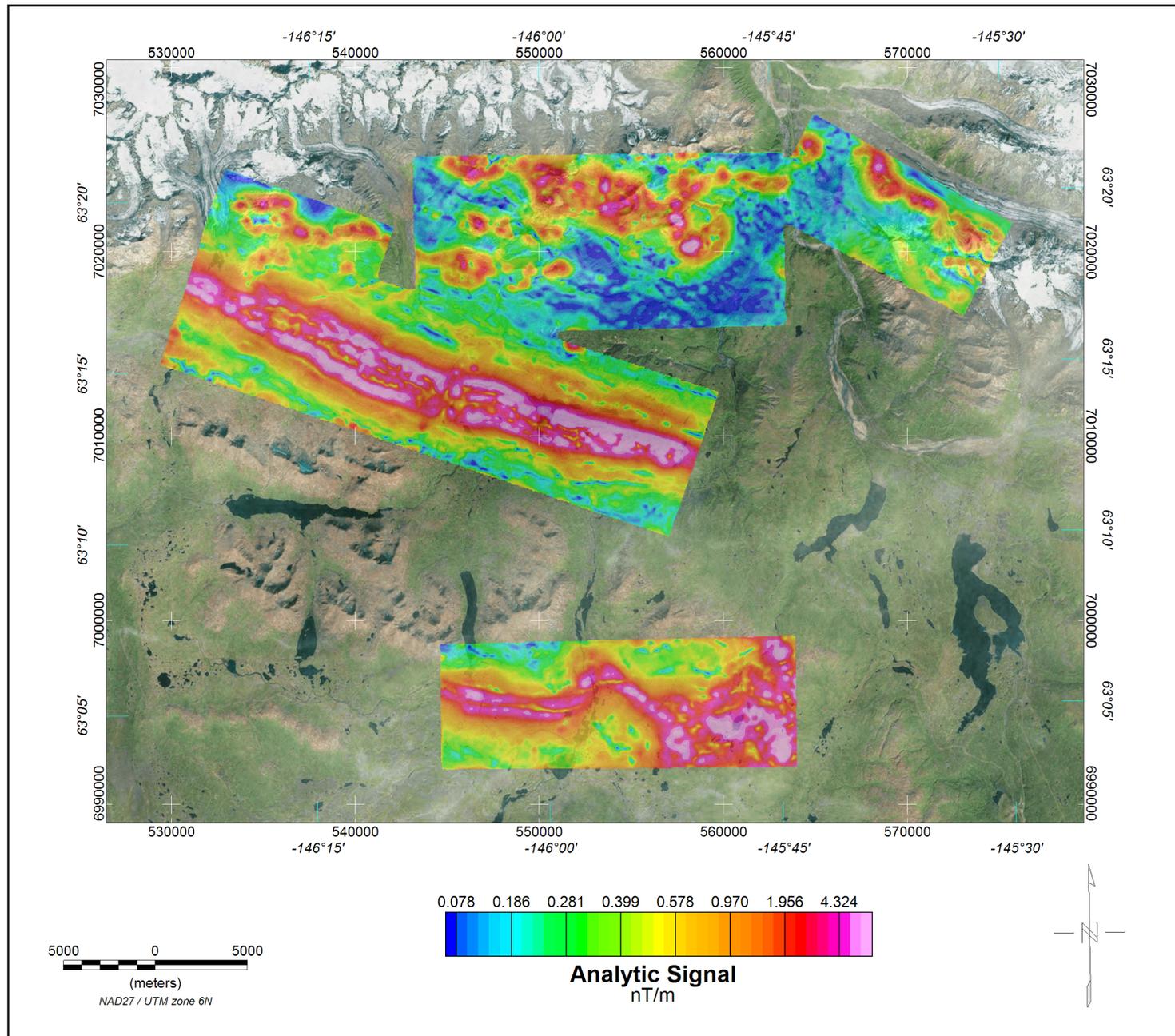


Figure 5. Analytic signal grid with orthometric image. Analytic signal is the total amplitude of all directions of magnetic gradient calculated from the sum of the squares of the three orthogonal gradients. Mapped highs in the calculated analytic signal of magnetic parameter locate the anomalous source 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.

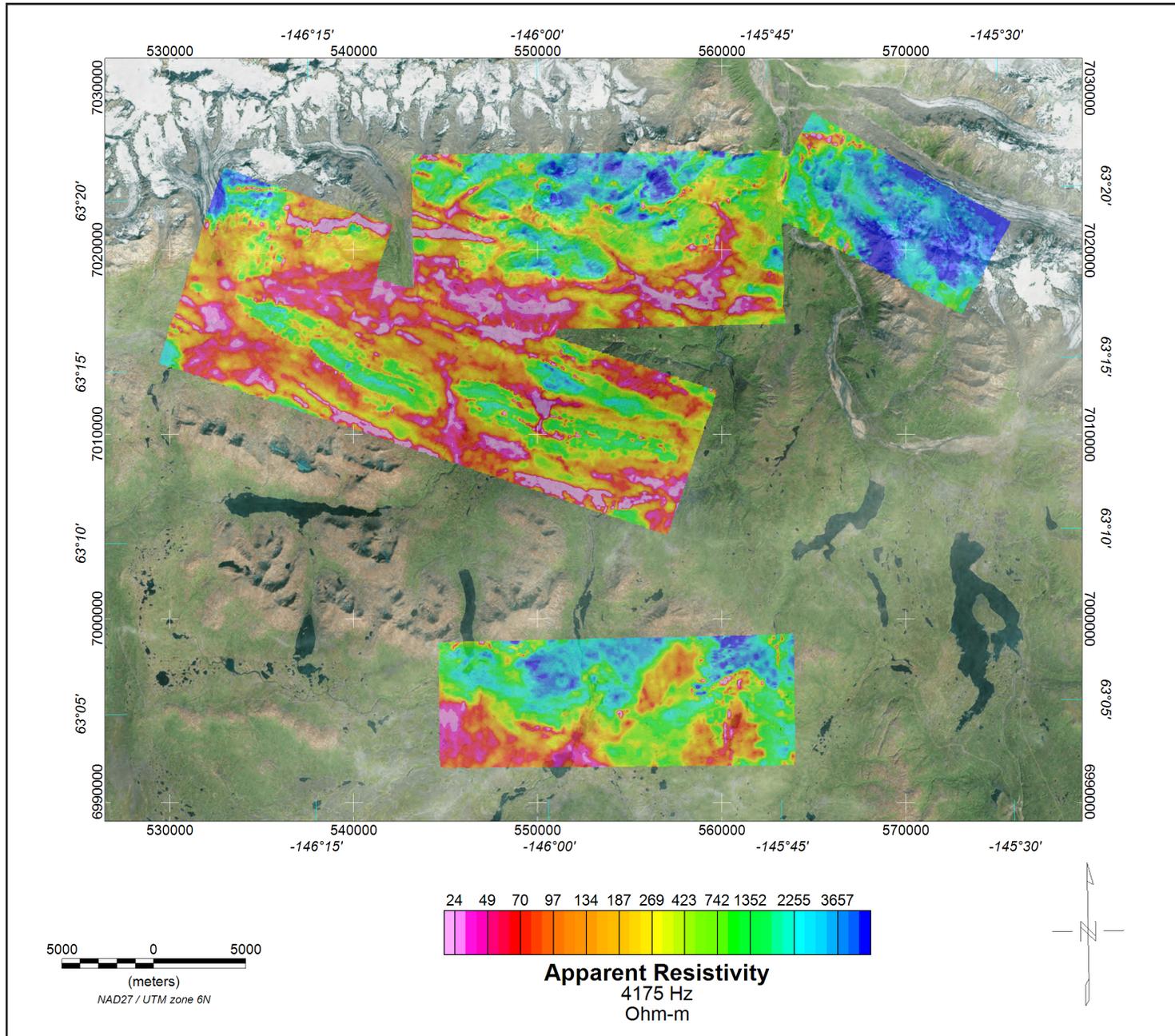


Figure 6. 4,175 Hz coplanar apparent resistivity grid with orthometric image. Analytic signal is the total amplitude of all directions of magnetic gradient calculated from the sum of the squares of the three orthogonal gradients. Mapped highs in the calculated analytic signal of magnetic parameter locate 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.

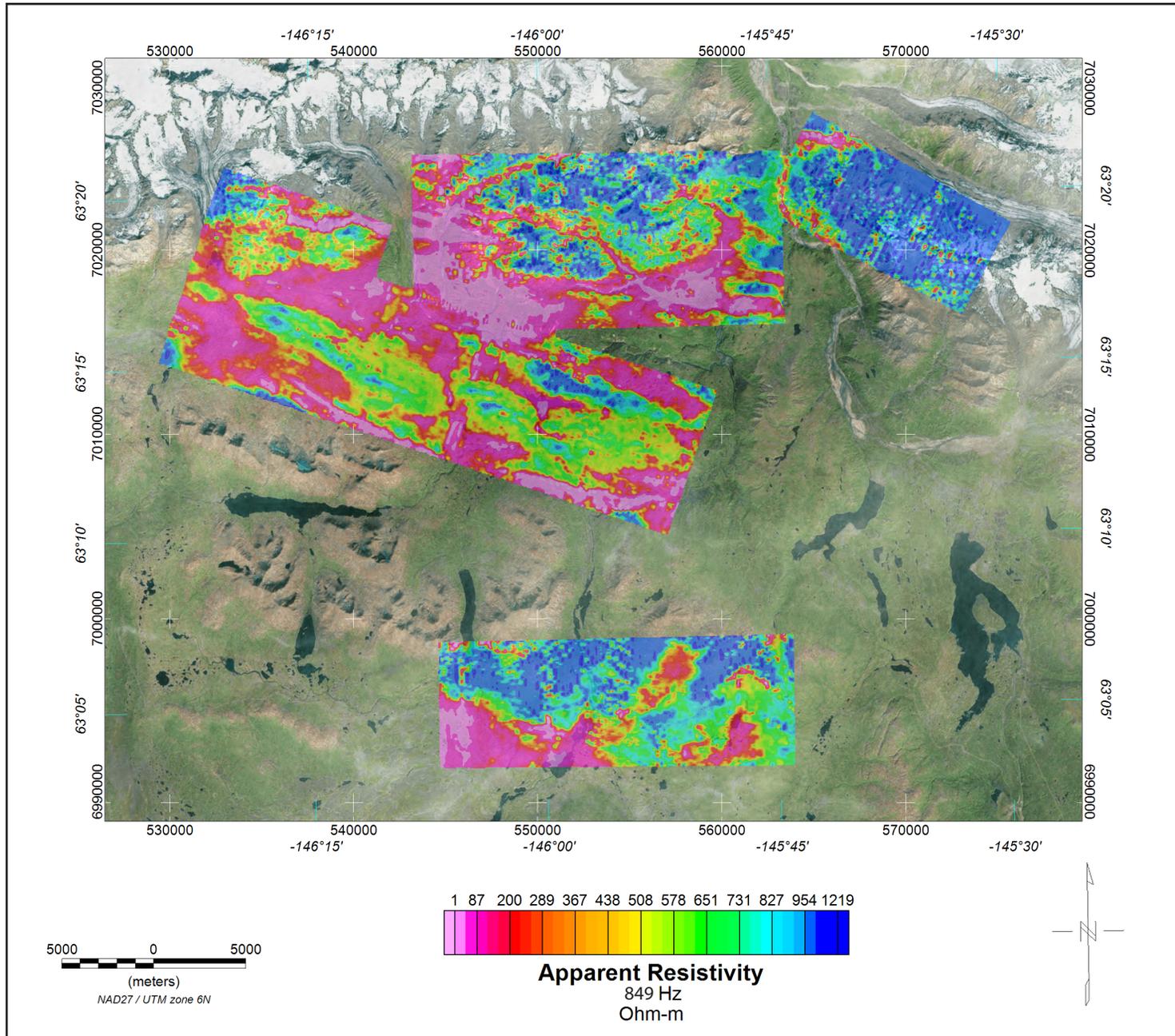


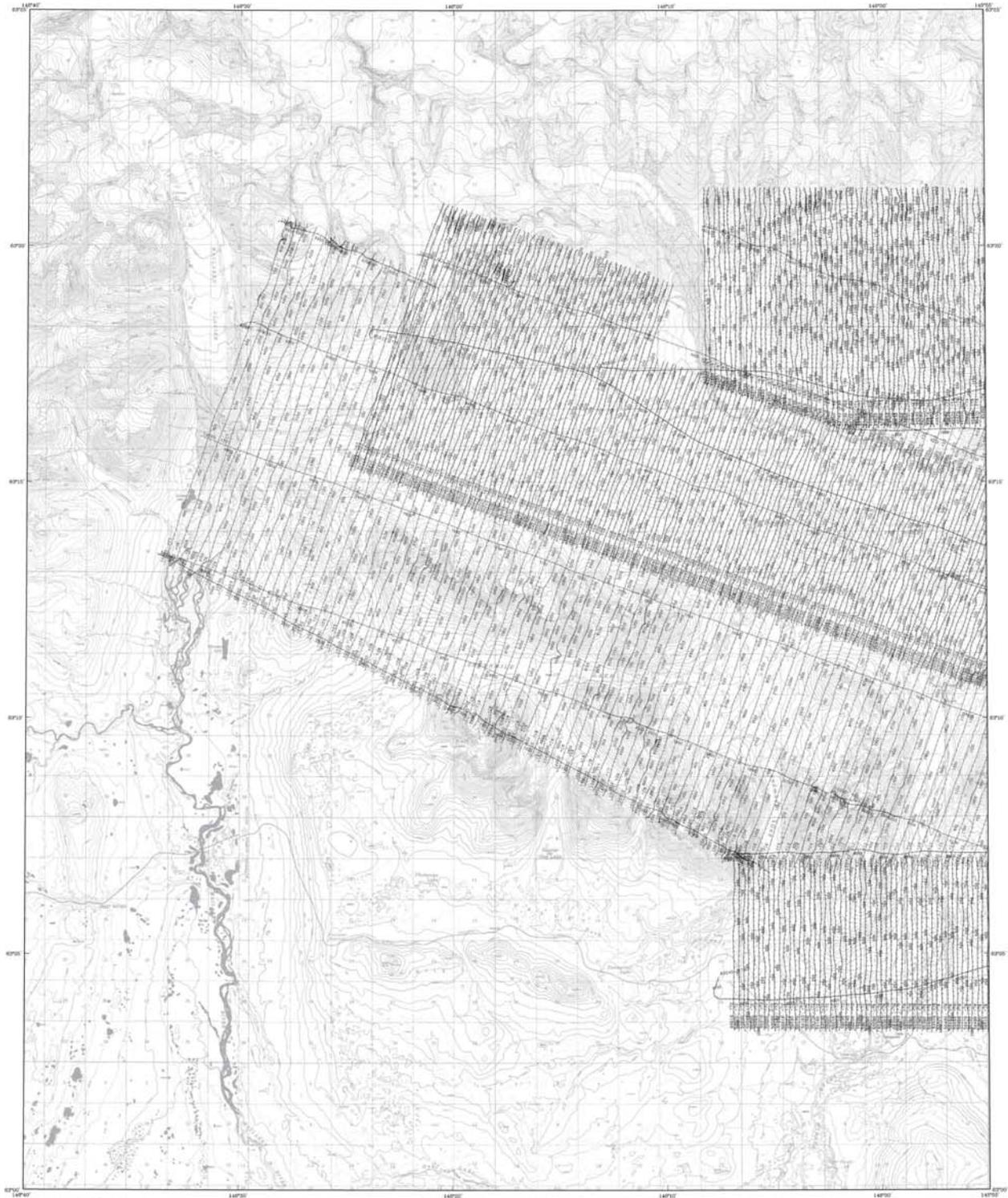
Figure 7. 849 Hz coplanar apparent resistivity grid with orthometric image. The Aerodat Condor EM system measured inphase and quadrature components at five frequencies. Two vertical coaxial coil-pairs operated at 936 and 4,476 Hz while three horizontal coplanar coil-pairs operated at 849, 4,189 and 32,490 Hz. EM data were sampled at 0.1 second intervals. The EM system responds to bedrock conductors, conductive overburden, and cultural sources. Apparent resistivity is generated from the inphase and quadrature component of the coplanar 845 Hz using the pseudo-layer half space model.

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/10.14509/30262>

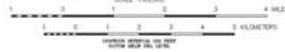
Map Title	Description
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southerndeltariver_flightlines_topo_map_2of2.pdf	flightlines with topographic base map
southerndeltariver_sim_magtf_topo_map_1of2.pdf	simulated magnetic total field grid with topographic base map
southerndeltariver_sim_magtf_topo_map_2of2.pdf	simulated magnetic total field grid with topographic base map
southerndeltariver_sim_magtf_contours_plss_map_1of2.pdf	simulated magnetic total field grid with data contours and public land survey system base layer
southerndeltariver_sim_magtf_contours_plss_map_2of2.pdf	simulated magnetic total field grid with data contours and public land survey system base layer
southerndeltariver_sim_magtf_shaded_plss_map_1of2.pdf	color shaded simulated total magnetic field grid with public land survey system base layer
southerndeltariver_sim_magtf_shaded_plss_map_2of2.pdf	color shaded simulated total magnetic field grid with public land survey system base layer
southerndeltariver_res7200hz_topo_map_1of2.pdf	7,200 Hz apparent resistivity grid with topographic base map
southerndeltariver_res7200hz_topo_map_2of2.pdf	7,200 Hz apparent resistivity grid with topographic base map
southerndeltariver_res7200hz_contours_plss_map_1of2.pdf	7,200 Hz apparent resistivity grid with data contours and public land survey system base layer
southerndeltariver_res7200hz_contours_plss_map_2of2.pdf	7,200 Hz apparent resistivity grid with data contours and public land survey system base layer
southerndeltariver_res7200hz_bw_contours_plss_map_1of2.pdf	black and white 7,200 Hz apparent resistivity grid with data contours and public land survey system base layer
southerndeltariver_res7200hz_bw_contours_plss_map_2of2.pdf	black and white 7,200 Hz apparent resistivity grid with data contours and public land survey system base layer
southerndeltariver_res900hz_topo_map_1of2.pdf	900 Hz apparent resistivity grid with topographic base map
southerndeltariver_res900hz_topo_map_2of2.pdf	901 Hz apparent resistivity grid with topographic base map
southerndeltariver_res900hz_contours_plss_map_1of2.pdf	900 Hz apparent resistivity grid with data contours and public land survey system base layer
southerndeltariver_res900hz_contours_plss_map_2of2.pdf	901 Hz apparent resistivity grid with data contours and public land survey system base layer

Table 1, continued. 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/10.14509/30262>

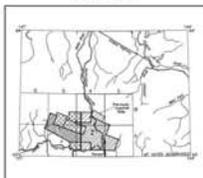
Map Title	Description
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southerndeltariver_res900hz_bw_contours_plss_map_2of2.pdf	black and white 900 Hz apparent resistivity grid with data contours and public land survey system base layer
southerndeltariver_emanomalies_sim_magtf_contours_plss_map_1of2.pdf	em anomalies with simulated total magnetic field grid data contours and public land survey system base layer
southerndeltariver_emanomalies_sim_magtf_contours_plss_map_2of2.pdf	em anomalies with simulated total magnetic field grid data contours and public land survey system base layer
southerndeltariver_emanomalies_sim_magtf_contours_detailed_topo_map_1of7.pdf	detailed em anomalies with simulated total magnetic field grid data contours and topographic base map
southerndeltariver_emanomalies_sim_magtf_contours_detailed_topo_map_2of7.pdf	detailed em anomalies with simulated total magnetic field grid data contours and topographic base map
southerndeltariver_emanomalies_sim_magtf_contours_detailed_topo_map_3of7.pdf	detailed em anomalies with simulated total magnetic field grid data contours and topographic base map
southerndeltariver_emanomalies_sim_magtf_contours_detailed_topo_map_4of7.pdf	detailed em anomalies with simulated total magnetic field grid data contours and topographic base map
southerndeltariver_emanomalies_sim_magtf_contours_detailed_topo_map_5of7.pdf	detailed em anomalies with simulated total magnetic field grid data contours and topographic base map
southerndeltariver_emanomalies_sim_magtf_contours_detailed_topo_map_6of7.pdf	detailed em anomalies with simulated total magnetic field grid data contours and topographic base map
southerndeltariver_emanomalies_sim_magtf_contours_detailed_topo_map_7of7.pdf	detailed em anomalies with simulated total magnetic field grid data contours and topographic base map
southerndeltariver_interpretation_plss_map_1of2.pdf	interpretation with public land survey system base layer
southerndeltariver_interpretation_plss_map_2of2.pdf	interpretation with public land survey system base layer
southerndeltariver_dem_contours_plss_map_1of2.pdf	digital elevation grid with contours and public land survey system base layer
southerndeltariver_dem_contours_plss_map_2of2.pdf	digital elevation grid with contours and public land survey system base layer



See Also U.S. Geological Survey Map No. 1-1000, 4-1000, 5-1000, 6-1000, 7-1000, 8-1000, 9-1000, 10-1000, 11-1000, 12-1000, 13-1000, 14-1000, 15-1000, 16-1000, 17-1000, 18-1000, 19-1000, 20-1000, 21-1000, 22-1000, 23-1000, 24-1000, 25-1000, 26-1000, 27-1000, 28-1000, 29-1000, 30-1000, 31-1000, 32-1000, 33-1000, 34-1000, 35-1000, 36-1000, 37-1000, 38-1000, 39-1000, 40-1000, 41-1000, 42-1000, 43-1000, 44-1000, 45-1000, 46-1000, 47-1000, 48-1000, 49-1000, 50-1000, 51-1000, 52-1000, 53-1000, 54-1000, 55-1000, 56-1000, 57-1000, 58-1000, 59-1000, 60-1000, 61-1000, 62-1000, 63-1000, 64-1000, 65-1000, 66-1000, 67-1000, 68-1000, 69-1000, 70-1000, 71-1000, 72-1000, 73-1000, 74-1000, 75-1000, 76-1000, 77-1000, 78-1000, 79-1000, 80-1000, 81-1000, 82-1000, 83-1000, 84-1000, 85-1000, 86-1000, 87-1000, 88-1000, 89-1000, 90-1000, 91-1000, 92-1000, 93-1000, 94-1000, 95-1000, 96-1000, 97-1000, 98-1000, 99-1000, 100-1000



LOCATION INDEX



FLIGHT LINES OF THE SOUTHERN DELTA RIVER AREA, EAST-CENTRAL ALASKA PARTS OF MT. HAYES QUADRANGLE 2003

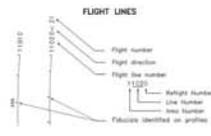
DESCRIPTIVE NOTES

The geophysical data were acquired with a GEODETIC Electromagnetic (EM) system and a Siblex dual magnetometer. Data were flown at a height of 100 feet above the terrain. Flights were performed with an AS350B-2 Super helicopter of a mean terrain clearance of 200 feet along 1000 ft 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 3 miles.

An ANTECH Q224 MAGNETIC / GEODETIC Global Positioning System was used for navigation. The helicopter position was derived every 0.5 seconds using post-flight differential positioning to a relative accuracy of better than 5 m. Flight path locations were projected onto the Clarke 1866 UTM zone 10 westward, 1927 North American datum using a central meridian (CM) of 141° 00' 00" west longitude and an east constant of 500,000 meters. Accuracy of the coordinate data is better than 10 m with respect to the UTM grid.

PREVIOUSLY SURVEYED AREAS

The previously acquired geophysical data were acquired with an aerial Geotek Geometrics (EM) system and a Siblex dual magnetometer. The electromagnetic system utilized a dual antenna system at 840 Hz and 8,470 Hz and three horizontal coil pairs at 840 Hz, 4,130 Hz and 52,490 Hz. Mean terrain clearance for the magnetometer and EM system were slightly higher than 100 and 100 feet, respectively. In addition, the survey recorded data from a radar altimeter, GPS navigation system, 60 Hz magnetic and video camera. The GPS electronic positioning system operated in differential mode. The flight line direction varies from north to south on various courses 1000E, 1000W, 1000N, 1000S, and 1000E. The flight lines were one-eighth mile apart. Extended to lines were flown with the current survey which cover both the 1988 and 2002 survey areas. The older survey was flown with an AS350B2 helicopter.

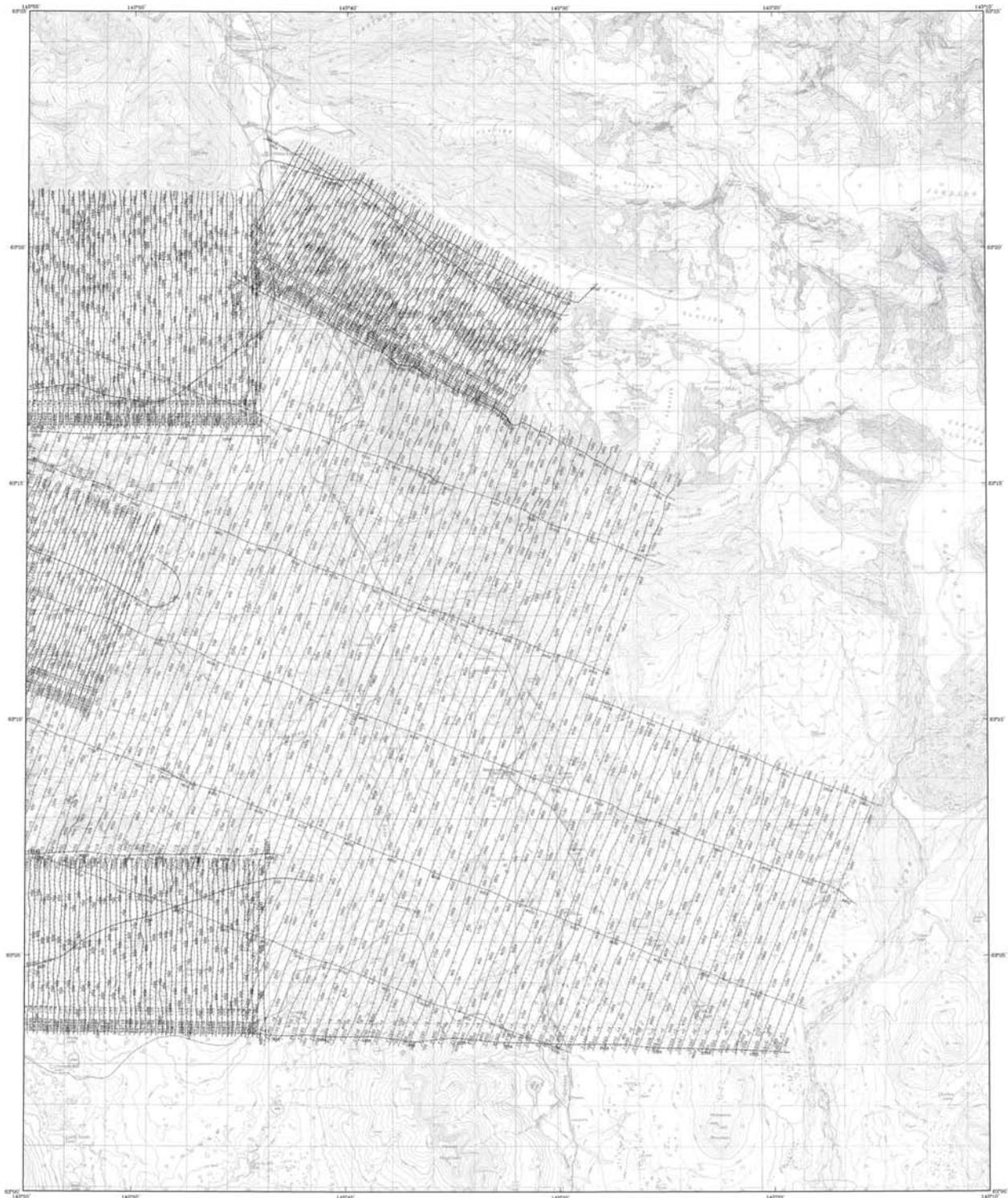


SURVEY HISTORY

This map has been compiled and drawn under contract between the State of Alaska, Department of Natural Resources, Bureau of Geological & Geophysical Surveys (BGG), and the Bureau of Land Management, U.S. Geological Survey. Geophysical data for the current area were acquired and processed by Fugro Airborne Surveys in 2002. Additional geophysical data for the Central Delta, Fish Lake Basin and Tangle Lake areas were acquired in 1988 by the BGG and were previously funded by the U.S. Department of Interior, Bureau of Land Management (BLM) and conducted in support of its mineral assessment program in the Delta River mining district. Laurel Barnes was the contract manager for BGG.

This map and other products from this survey are available by mail order or in person from: BGG, 714 University Ave., Suite 205, Fairbanks, Alaska, 99701. Some products are also available in person only at the BLM's Junction Mining Information Center, 100 Seward Blvd., Junction, Alaska, 99824.

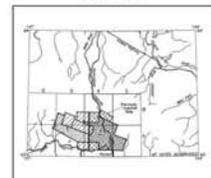




Base from U.S. Geological Survey Map No. 6-1085, 1:40,000
U.S. GEOLOGICAL SURVEY



LOCATION INDEX



FLIGHT LINES OF THE SOUTHERN DELTA RIVER AREA, EAST-CENTRAL ALASKA

PARTS OF MT. HAYES QUADRANGLE

2003

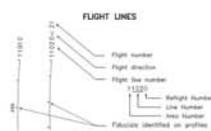
DESCRIPTIVE NOTES

The geophysical data were acquired with a GEODETIC Electromagnetic (EM) system and a Siblex dual magnetometer. Data were flown at a height of 100 feet above the terrain. The EM system consists of a Siblex dual magnetometer, GPS navigation system, 50/60 Hz receiver and transmitter. Flights were performed with an AS350B-2 Super helicopter at a mean terrain clearance of 200 feet above MDT. 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 3 miles.

An ARISTON Q224 INERTIAL / GYROSCOPE Oriented Positioning System was used for navigation. The helicopter was oriented every 2.5 seconds using post-flight differential positioning to a relative accuracy of better than 5 m. Flight path positions were projected onto the Clarke 1866 UTM zone 10 westward, 1927 North American datum using a central meridian (CM) of 147° 00' 00" West, a semi-major axis of 6,378,137 m and a semi-minor axis of 6,356,752 m. The accuracy of the projected data is better than 10 m with respect to the UTM grid.

PREVIOUSLY SURVEYED AREAS

The previously acquired geophysical data were acquired with an ARISTON Q224 INERTIAL / GYROSCOPE Oriented Positioning System and a Siblex dual magnetometer. The electromagnetic system utilized two receiver coils with a 475 Hz and 4.475 Hz and three transmitter coils at 849 Hz, 4.475 Hz and 52.475 Hz. Mean terrain clearance for the magnetometer and EM system were slightly higher than 100 and 100 feet, respectively. In addition, the survey recorded data from a radar altimeter, GPS navigation system, 50/60 Hz receiver and transmitter. The GPS electronic positioning system operated in differential mode. The flight line location varies from south to north on the Mt. Hayes 100' Contour. Contour and Fish Lake 100' and 200' and Tongue Lake 10'-5'. The flight lines were one-eighth mile apart. Estimated to have been flown with the current survey which cover both the 1988 and 2002 survey areas. The older survey was flown with a AS350B2 helicopter.

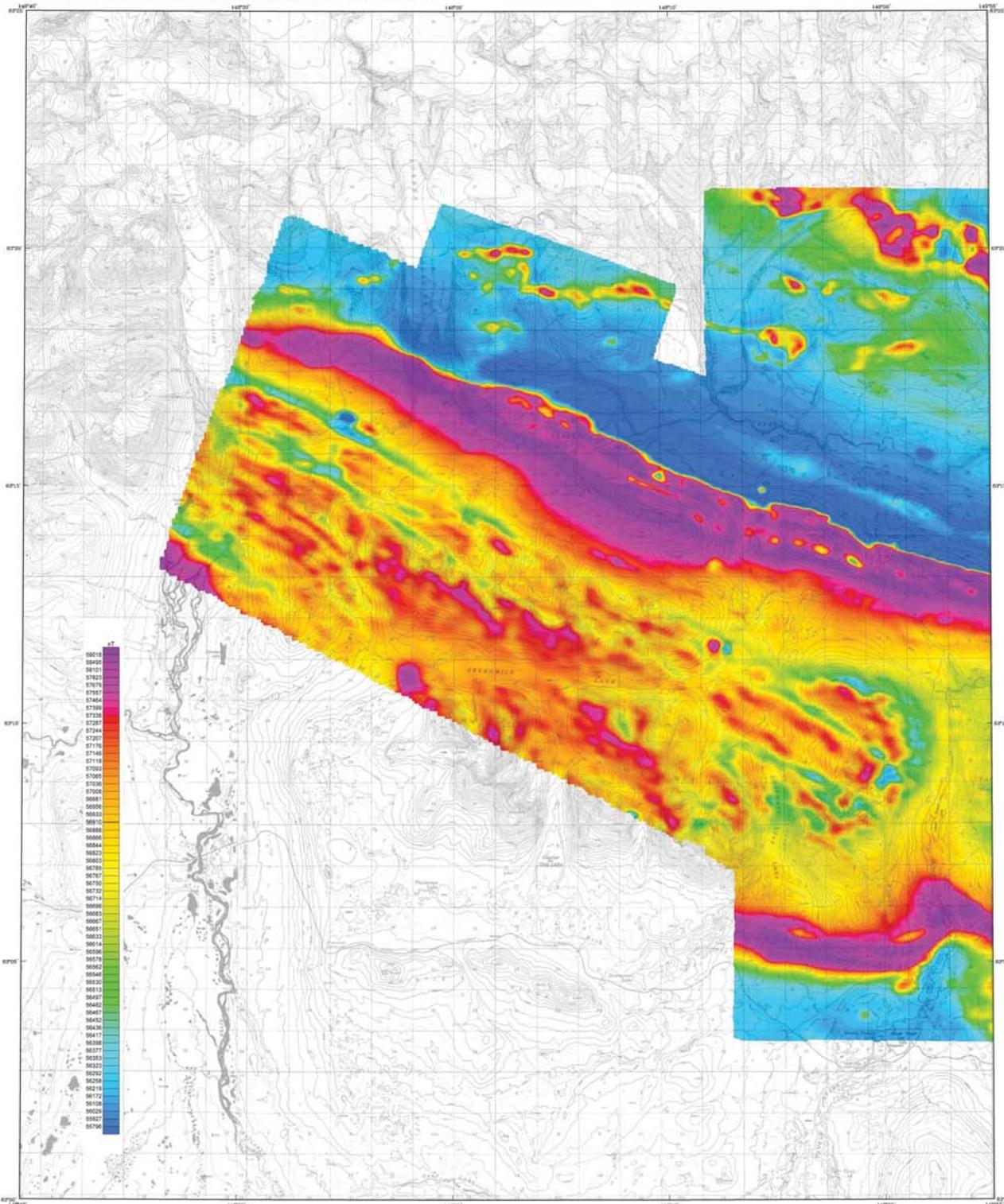


SURVEY HISTORY

This map has been compiled and drawn under contract between the State of Alaska, Department of Natural Resources, Bureau of Geological & Geophysical Surveys (DGG), and Stevens Exploration Management Corporation. Geophysical data for the current survey were acquired and processed by Fugro Airborne Surveys in 2002. Additional geophysical data for the Colville, Delta, Fish Lake, Klamath, and Tongue Lake areas were acquired in 1988 by Aerilog Inc. and were previously funded by the U.S. Department of Interior, Bureau of Land Management (BLM) and conducted as part of its mineral assessment program in the Delta River mining district. Latest BLM file the contract number for DGG.

This map and other products from this survey are available by mail order or in person from DGG, 714 University Ave., Suite 205, Fairbanks, Alaska, 99701. Some products are also available in person only at the BLM's Junction Mining Information Center, 100 Seward Blvd., Junction, Alaska, 99824.

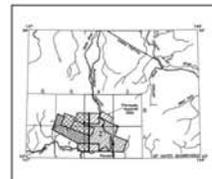




Base Data: US Geological Survey, 1:50,000 Scale, 1988, 1:50,000



LOCATION INDEX



TOTAL MAGNETIC FIELD OF THE SOUTHERN DELTA RIVER AREA, EAST-CENTRAL ALASKA

PARTS OF MT. HAYES QUADRANGLE
2003

DESCRIPTIVE NOTES

The geophysical data were acquired with a DINGEM[®] Electromagnetic (EM) system and a Scintrex cesium magnetometer. Both were flown at a height of 100 feet. In addition the survey recorded data from a radar altimeter, GPS navigation system, DG/RO Hz magnetic and compass correction. Flights were performed with an AS350B-2 5000 feet empty weight helicopter at a mean terrain clearance of 200 feet using NAD83 survey flight lines with a spacing of a quarter mile. The lines were flown perpendicular to the flight lines at intervals of approximately 2 miles. An Ashtech DG24 NAVSTAR / GLOPASS Global Positioning System was used for navigation. The helicopter position was derived every 0.5 seconds using post-flight differential positioning to a real-time accuracy of better than 3 m. Flight 8000 elevations were projected onto the Contour 188 (UTM zone 6) spheroid, 1927 North American datum using a central meridian of 147° 00' 00" W, a north constant of 0 and an east constant of 500,000. Positional accuracy of the recorded data is better than 10 m with respect to the UTM grid.

PREVIOUSLY SURVEYED AREAS

The previously acquired geophysical data were acquired with an Aeromac Cesium magnetometer (EM system) and a Scintrex cesium magnetometer. The electromagnetic system varied from 100 to 150 feet, respectively. In addition the survey recorded data from a radar altimeter, GPS navigation system, DG/RO Hz magnetic and compass correction. The GPS navigation system consisted of differential mode. The flight line direction varies from north to south in the Central NAD83 Delta and Fish Lake NAD83, and Range and Tangle Lake N-2. The flight lines were perpendicular to the other survey lines with respect to the current survey which cover both the 1903 and 2002 survey areas. The other survey lines were flown with an AS350B2 helicopter.

TOTAL MAGNETIC FIELD

The total magnetic field 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) windowed to the low end data, and (3) interpolated onto a regular 100 m grid using a modified spline (1970) technique. The regional variation (or IGRF gradient, 2000, updated to August 2002) was removed from the leveled magnetic data.

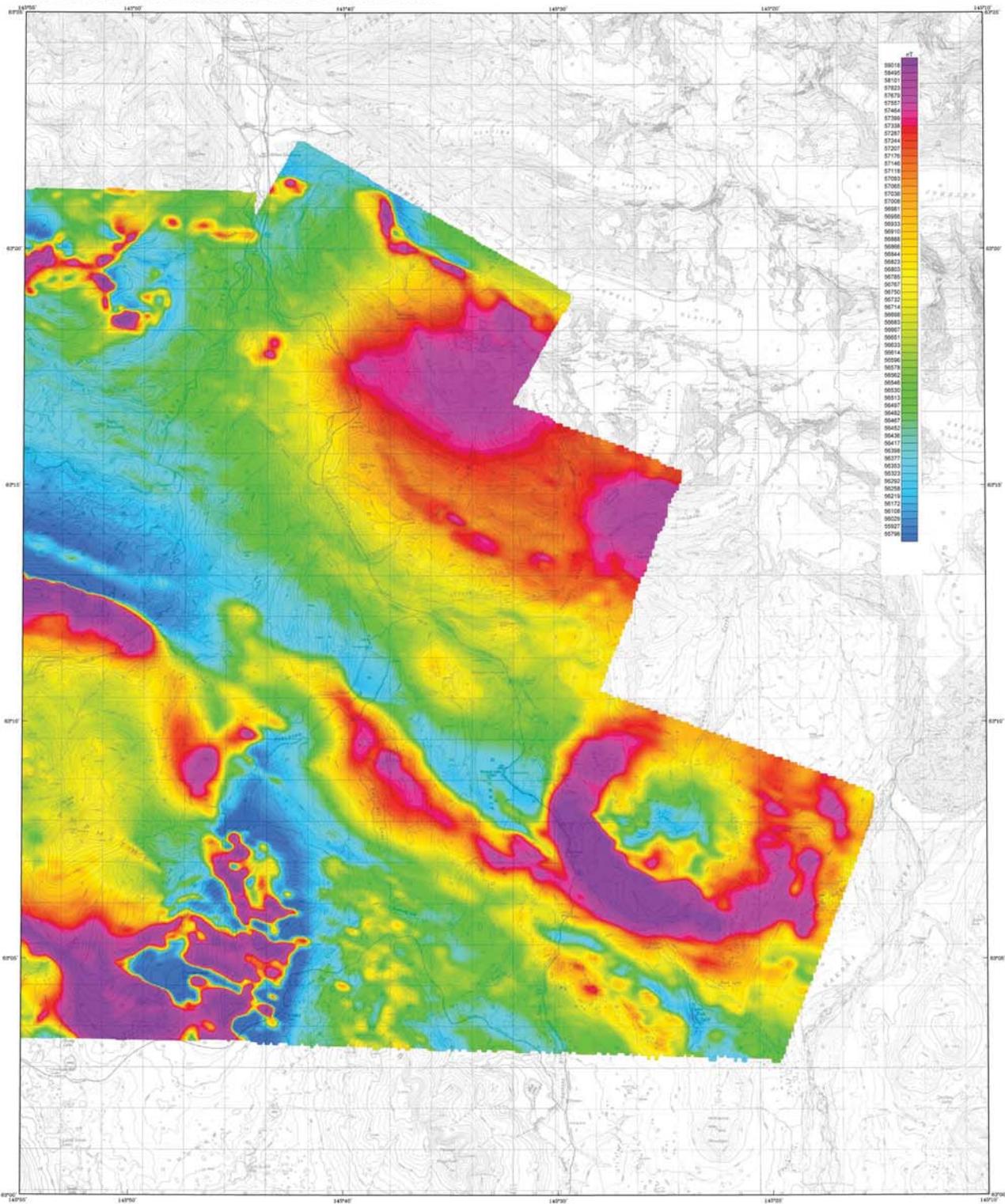
ASHTech, Inc., 2003. A free analysis of interpretation and results can be found at: <http://www.ashtech.com>.
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SURVEY HISTORY

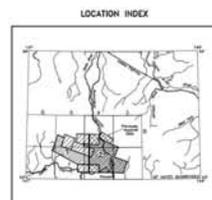
This map has been compiled and derived under contract between the State of Alaska, Department of Natural Resources, Division of Geological & Geophysical Survey (DGGG), and Stevens Exploration Management Corp. Airborne geophysical data for the current area were acquired and processed by Fugro Airborne Surveys in 2002. Airborne geophysical data for the Central, Delta, and Fish Lake mining areas were acquired and processed in 1995 by Aerotec Inc. and were provided for publication by the DGGG. The contract was funded by the U. S. Department of Interior, Bureau of Land Management (BLM) and conducted in support of its mineral assessment program in the Delta River mining district. Laurel Burns was the contract manager for DGGG.

This map and other products from this survey are available by mail order or in person from 2002, 794 University Ave., Suite 200, Fairbanks, Alaska 99709. Some products are also available in person only at the BLM's Juneau Mineral Information Center, 100 Seward Road, Douglas, Alaska 99824.





Base Data: U.S. Geological Survey, 1:50,000 Scale, 1988



TOTAL MAGNETIC FIELD OF THE SOUTHERN DELTA RIVER AREA, EAST-CENTRAL ALASKA

PARTS OF MT. HAYES QUADRANGLE
2003

DESCRIPTIVE NOTES

The geophysical data were acquired with a DIGHEM[®] Electromagnetic (EM) system and a Scintrex cesium magnetometer. Both were flown at a height of 100 feet. In addition the survey recorded data from a radar altimeter, GPS navigation system, 50/70 Hz magnetic and compass. Flights were performed with an AS350B-2 Superpuma helicopter at a mean terrain clearance of 200 feet along 120°E survey flight lines with a spacing of a quarter of mile. The lines were flown perpendicular to the flight lines at intervals of approximately 2 miles.

An Ashtech DD24 NAVSTAR / GLONAVIS Global Positioning System was used for navigation. The helicopter position was derived every 0.5 seconds using post-flight differential positioning to a relative accuracy of better than 2 m. Flight 8000 elevations were projected onto the Contour 188 (UTM zone 6) sphere03, 1927 North American datum using a contour projection (300' of 147°) a north constant 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.

PREVIOUSLY SURVEYED AREAS

The previously acquired geophysical data were acquired with an Aeromagnetic Electromagnetic (EM) system and a Scintrex cesium magnetometer. The electromagnetic system used two vertical coil pairs at 450 Hz and 4.476 Hz and three horizontal coil pairs at 848 Hz, 4.180 Hz and 32.460 Hz. These former operations for the magnetometer and EM system were slightly higher than 100 and 150 feet, respectively. In addition the survey recorded data from a radar altimeter, GPS navigation system, 50 Hz magnetic and video camera. The GPS electronic positioning system consisted of differential mode. The flight line direction varies from north to north to roughly parallel 120°E, Tangle Lake N-C. The flight lines were one-quarter mile apart. Extended by lines were flown with the current survey which cover both the 1905 and 2002 survey areas. The other survey was flown with a AS350B2 helicopter.

TOTAL MAGNETIC FIELD

The total magnetic field 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) windowed to the low end data, and (3) interpolated onto a regular 100 m grid using a modified spline (1970) technique. The regional variation (or IGRF gradient, 2000, updated to August 2002) was removed from the leveled magnetic data.

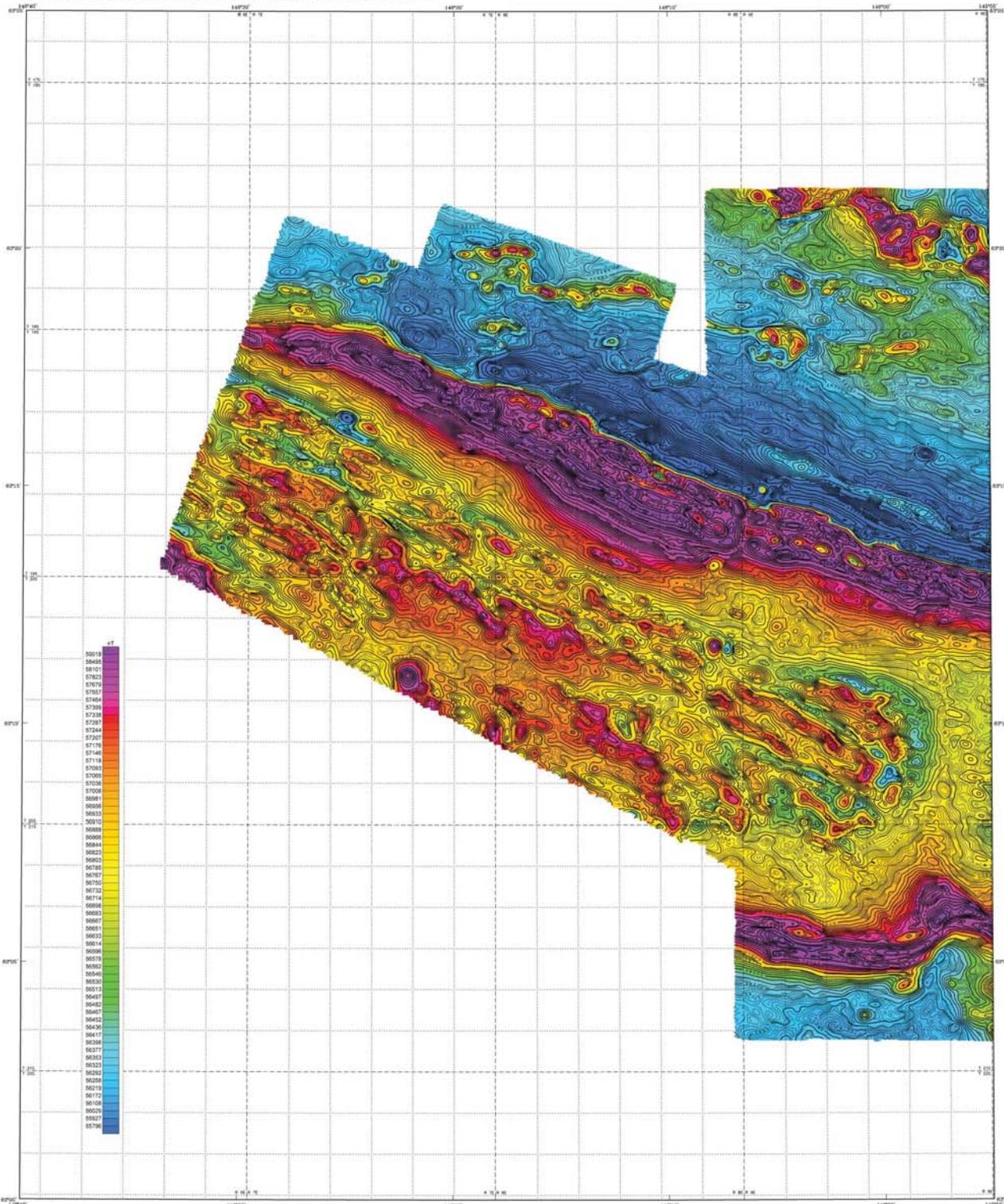
Alaska, U.S.A. is a free market of information and available data. All data are in the public domain. © 2003 Geological Survey, U.S. Geological Survey, U.S. Department of the Interior.

SURVEY HISTORY

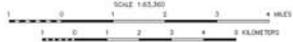
This map has been compiled and drawn under contract between the State of Alaska, Department of Natural Resources, Division of Geological & Geophysical Survey (DGGG), and Stevens Exploration Management Corp. Airborne geophysical data for the current area were acquired and processed by Fugro Airborne Surveys in 2002. Airborne geophysical data for the Contour 188 Delta River Basin were acquired in 1995 by Aeromagnetic Inc. and were provided for publication by DGGG. The current project was funded by the U. S. Department of Interior, Bureau of Land Management (BLM) and conducted in support of its mineral assessment program in the Delta River mining district. Lower Basin was the contract manager for DGGG.

This map and other products from this survey are available by mail order or in person from DGGG, 794 University Ave., Suite 200, Fairbanks, Alaska, 99774. Some products are also available in person only at the BLM's Juneau Mineral Information Center, 100 Seward Road, Douglas, Alaska, 99824.





Geographic coordinates from U.S. Geological Survey, 10, 1000, 4.4, 2000



TOTAL MAGNETIC FIELD OF THE SOUTHERN DELTA RIVER AREA, EAST-CENTRAL ALASKA

PARTS OF MT. HAYES QUADRANGLE
2003

DESCRIPTIVE NOTES

The geophysical data were acquired with a DINGEMAN® Electromagnetic (EM) system and a Geotek cesium magnetometer. Both were flown at a height of 100 feet. In addition to the survey, recorded data from a radar altimeter, GPS navigation system, 50/70 Hz magnetic and compass correctors. Flights were performed with an AS350B-2 Squirrel helicopter at a mean terrain clearance of 200 feet using 4000Z hourly flight times with a spacing of a quarter of a mile. The lines were flown perpendicular to the flight lines at intervals of approximately 2 miles. An Ashtech 0224 NAVSTAR / GLONAVIS Global Positioning System was used for navigation. The helicopter position was derived every 0.5 seconds using post-flight differential positioning to a real-time base station located within 2 miles. Flight elevations were projected onto the NAD83 datum using a datum correction of 147.7 meters. The datum constant of 0 and an east constant of 500,000. Position accuracy of the recorded data is better than 10 m with respect to the UTM grid.

PREVIOUSLY SURVEYED AREAS

The previously acquired geophysical data were acquired with an Aeromagnetic System (AS) system and a Geotek cesium magnetometer. Both were flown at a height of 100 feet. In addition to the survey, recorded data from a radar altimeter, GPS navigation system, 50/70 Hz magnetic and compass correctors. Flights were performed with an AS350B-2 Squirrel helicopter at a mean terrain clearance of 200 feet using 4000Z hourly flight times with a spacing of a quarter of a mile. The lines were flown perpendicular to the flight lines at intervals of approximately 2 miles. An Ashtech 0224 NAVSTAR / GLONAVIS Global Positioning System was used for navigation. The helicopter position was derived every 0.5 seconds using post-flight differential positioning to a real-time base station located within 2 miles. Flight elevations were projected onto the NAD83 datum using a datum correction of 147.7 meters. The datum constant of 0 and an east constant of 500,000. Position accuracy of the recorded data is better than 10 m with respect to the UTM grid.

TOTAL MAGNETIC FIELD

The total magnetic field 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) warped to the tie line data, and (3) interpolated onto a regular 100-m grid using a modified spline (1970) technique. The regional variation (or IGRF gradient, 2000, updated to August 2002) was removed from the tested magnetic data.

MAGNETIC CONTOUR INTERVAL

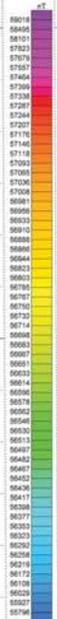
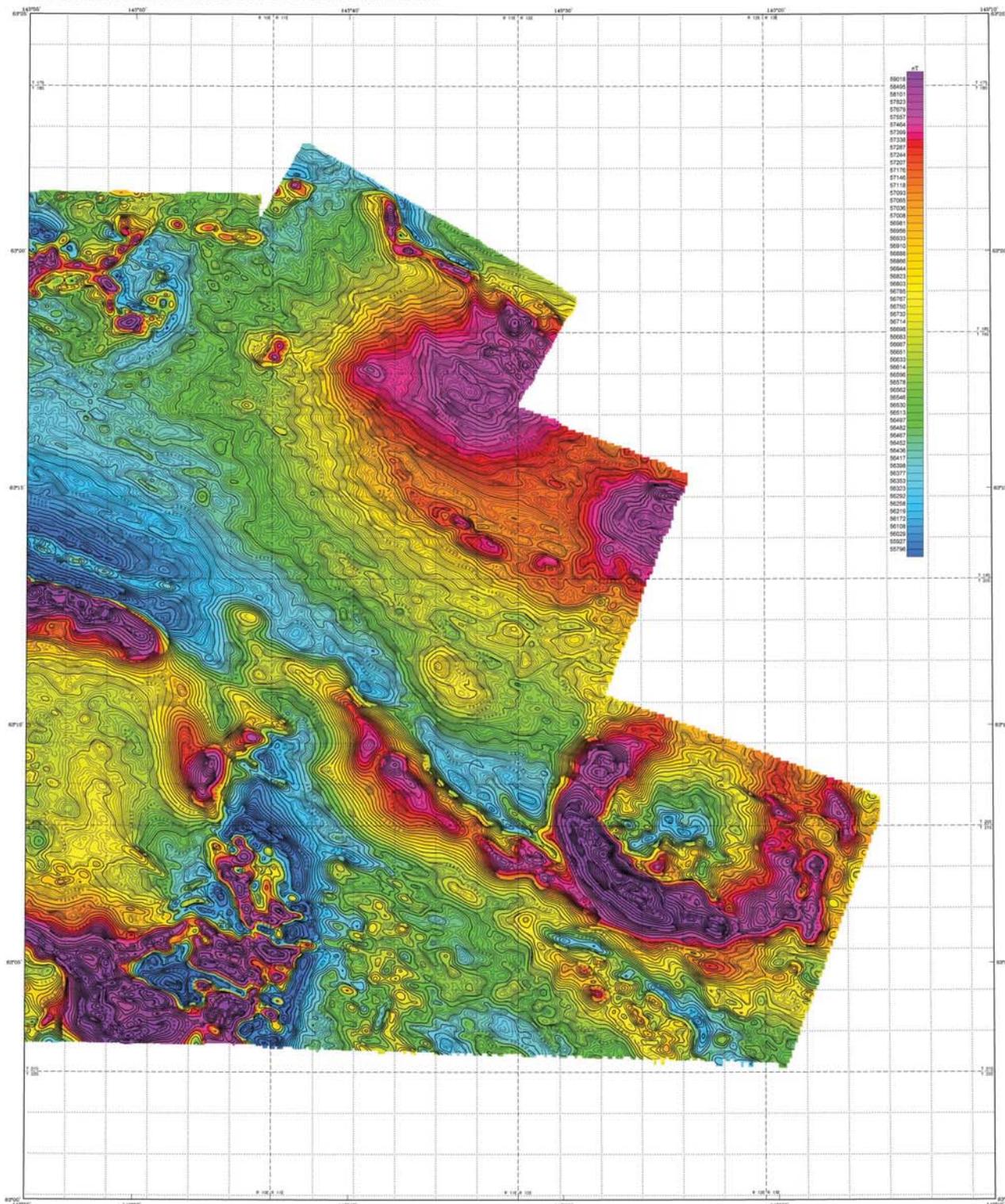


SURVEY HISTORY

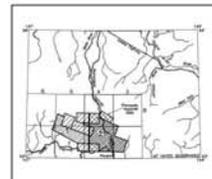
This map has been compiled and drawn under contract between the State of Alaska, Department of Natural Resources, Division of Geological & Geophysical Survey (DGGG), and Stevens Exploration Management Corp. Airborne geophysical data for the current area were acquired and processed by Fugro Airborne Surveys in 2002. Airborne geophysical data for the Central, Eastern, and Lower Delta River areas were acquired in 1995 by Aerotek Inc. and were provided for publication by the DGGG. The current project was funded by the U. S. Department of Interior, Bureau of Land Management (BLM) and conducted in support of its mineral assessment program in the Delta River mining district. Laurel Burns was the contract manager for DGGG.

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GEOPHYSICAL REPORT 2003_5_1b



Scale: 1:63,200. 0 1 2 3 4 KILOMETERS. 0 1 2 3 4 MILES.



TOTAL MAGNETIC FIELD OF THE SOUTHERN DELTA RIVER AREA, EAST-CENTRAL ALASKA

PARTS OF MT. HAYES QUADRANGLE
2003

DESCRIPTIVE NOTES

The geophysical data were acquired with a DORNIER Electromagnetic (EM) system and a Scintrex cesium magnetometer. Both were flown at a height of 100 feet. In addition the survey recorded data from a radar altimeter, GPS navigation system, 50/70 Hz monitors and video camera. Flights were performed with an AS350B-2 Squirrel helicopter at a mean terrain clearance of 200 feet along 1420'E 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 2 miles. An Ashtech 0224 NAVSTAR / GLONAVIS Global Positioning System was used for navigation. The helicopter position was derived every 0.5 seconds using post-flight differential positioning to a reference accuracy of better than 2 m. Flight 8000 elevations were projected onto the UTM zone 18B (UTM zone 6) datum, 1927 North American datum using a conformal projection (CRS) of 1470 m north constant 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.

PREVIOUSLY SURVEYED AREAS

The previously acquired geophysical data were acquired with an Aeromagnetic System (AS) system and a Scintrex cesium magnetometer. The electromagnetic system utilized two vertical coil pairs of 150 m and 4.476 m and three horizontal coil pairs of 849 m, 4.188 m and 32.640 m. These former operations for the magnetometer and EM system were slightly higher than 100 and 150 feet, respectively. In addition the survey recorded data from a radar altimeter, GPS navigation system, 50 Hz monitor and video camera. The GPS electronic positioning system recorded in differential mode. The flight line direction varies from north to south as shown on the map. Flights were flown over Fish Lake 1420'E, and Rainy and Tongue Lake 1420'E. The flight lines were one-quarter mile apart. Extended to lines were flown with the current survey which cover both the 1905 and 2002 survey areas. The other survey was flown with a AS350B2 helicopter.

TOTAL MAGNETIC FIELD

The total magnetic field data were acquired with a sampling interval of 0.1 seconds, and were (1) corrected for diurnal variations by subtraction of (2) waves to the low end data, and (3) interpolated onto a regular 100 m grid using a modified spline (1970) technique. The regional variation (or IGRF gradient, 2000, updated to August 2002) was removed from the leveled magnetic data.

MAGNETIC CONTOUR INTERVAL

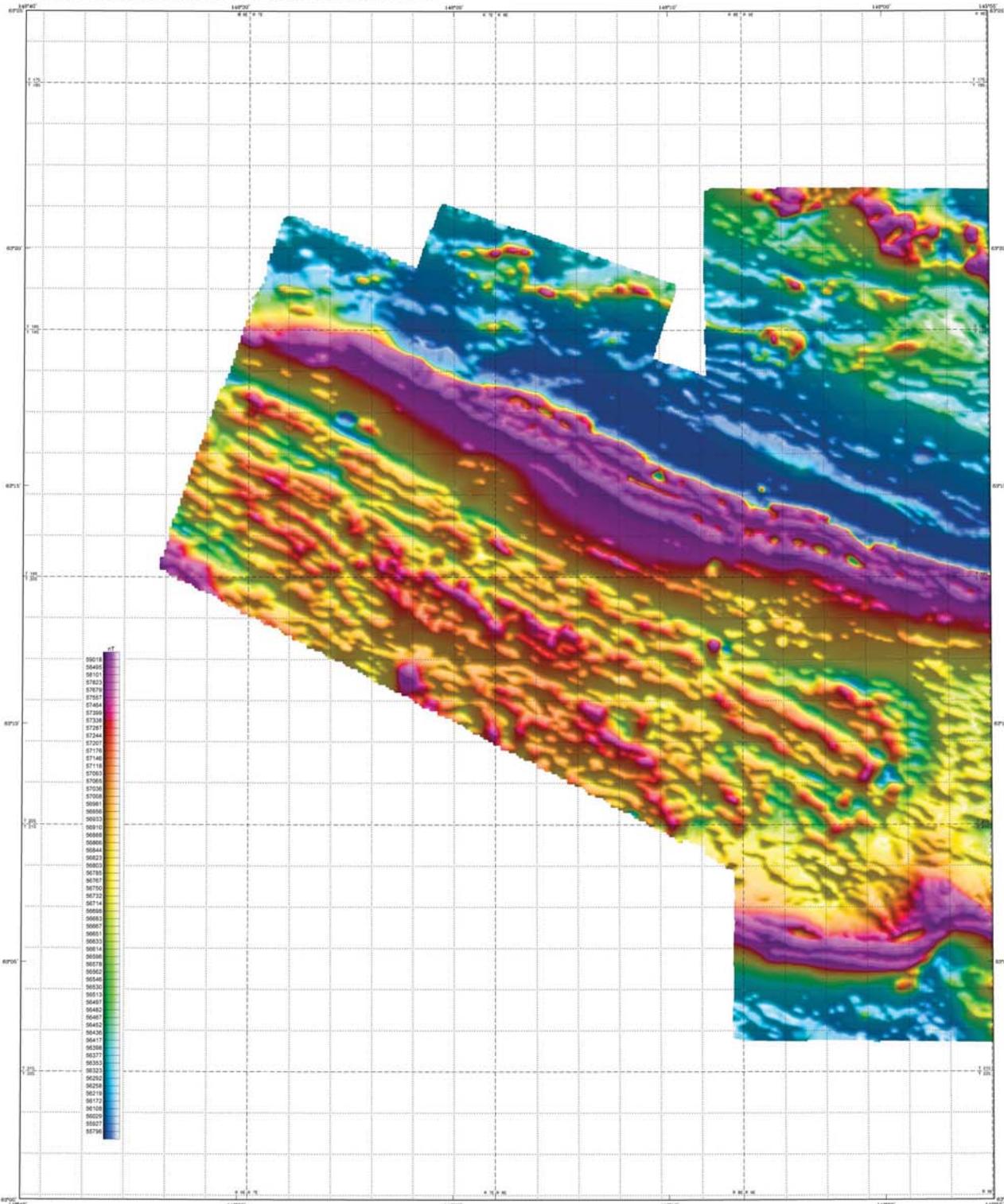
- 250 mT
- 50 mT
- 10 mT
- 5 mT

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 (DGGS), and Stevens Exploration Management Corp. Airborne geophysical data for the current area were acquired and processed by Fugro Airborne Surveys in 2002. Airborne geophysical data for the Central, Eastern, Full Lake, and Upper Lake areas were acquired in 1995 by Aerotech Inc. and were provided for publication by DGGS. The current survey was funded by the U. S. Department of Interior, Bureau of Land Management (BLM) and conducted in support of its mineral assessment program in the Delta River mining district. Laurel Burns was the contract manager for DGGS.

This map and other products from this survey are available by mail order or in person from DGGS, 794 University Ave., Suite 200, Fairbanks, Alaska, 99776. Some products are also available in person only at the BLM's Alaska Mineral Interpretation Center, 100 Banks Road, Douglas, Alaska, 99824.





Geophysical Data were collected under contract with the State of Alaska, Department of Natural Resources, Division of Geological & Geophysical Surveys (DGGG), and processed by Fugro Airborne Surveys in 2002. Airborne geophysical data for the Central, Eastern, and Lower Delta River areas were acquired in 1995 by Aerotek Inc. and were provided for publication by the BLM. The current survey was funded by the U. S. Department of Interior, Bureau of Land Management (BLM) and conducted in support of its mineral assessment program in the Delta River mining district. Laurel Burns was the contract manager for DGGG.



COLOR SHADOW TOTAL MAGNETIC FIELD OF THE SOUTHERN DELTA RIVER AREA, EAST-CENTRAL ALASKA

PARTS OF MT. HAYES QUADRANGLE

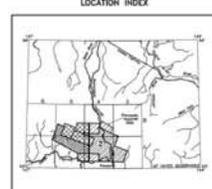
2003

Sun Azimuth: 20 degrees
Inclination: 30 degrees

DESCRIPTIVE NOTES
The geophysical data were acquired with a DINGEM[®] Electromagnetic (EM) system and a Geotek cesium magnetometer. Both were flown at a height of 100 feet. In addition to the survey, recorded data from a radar altimeter, GPS navigation system, 50/70 Hz magnetic and video camera. Flights were performed with an AS350B-2 Squirrel helicopter at a mean terrain clearance of 200 feet using 420ZE 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 2 miles. An Ashtech D224 NAVSTAR / GLONAVIS Global Positioning System was used for navigation. The helicopter position was derived every 0.5 seconds using post-flight differential positioning to a reference station of better than 3 m. Flight 8000 elevations were projected onto the UTM 1880 (UTM zone 6) datum, 1927 North American datum using a control method (3) of 1471 m north constant of 0 and an east constant of 500,000. Positional accuracy of the recorded data is better than 10 m with respect to the UTM grid.

PREVIOUSLY SURVEYED AREAS
The previously acquired geophysical data were acquired with an Aerotek Cesium magnetometer (EM system) and a Geotek cesium magnetometer. The electromagnetic system used two vertical coils at 450 Hz and 4.476 Hz and three horizontal coil pairs at 849 Hz, 4.188 Hz and 32.640 Hz. These lines were flown over the magnetometer and EM system were slightly higher than 100 and 100 feet, respectively. In addition to the survey, recorded data from a radar altimeter, GPS navigation system, 50 Hz magnetic and video camera. The GPS navigation system recorded in differential mode. The flight line direction varies from north to south as follows: Central, Eastern, and Lower Delta River, and Fish Lake, 420ZE, and Rainy and Tongue Lake N-S. The flight lines were one-quarter mile apart. Extended flight lines were flown with the current survey which cover both the 1995 and 2002 survey areas. The other survey was flown with a AS350B2 helicopter.

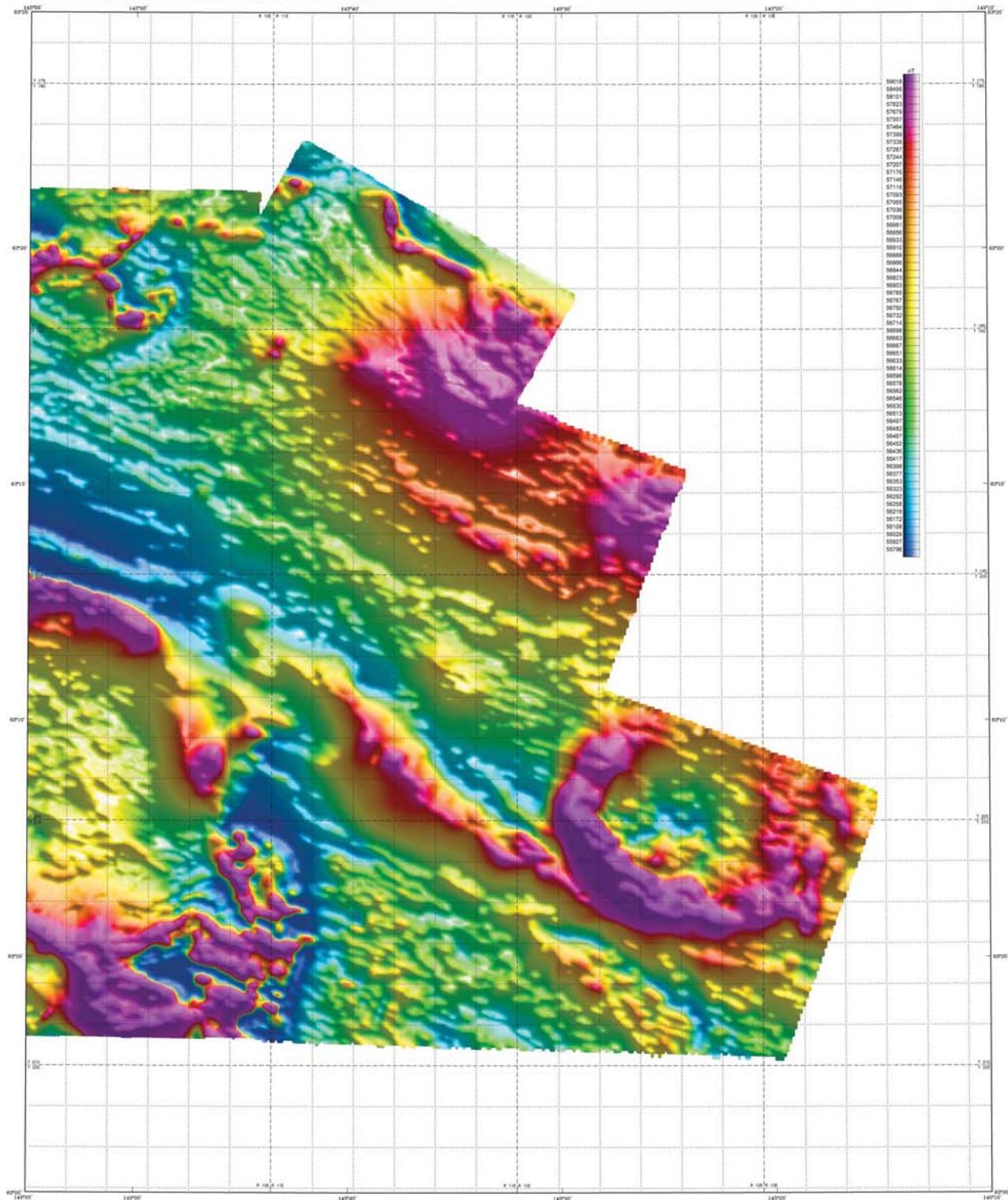
TOTAL MAGNETIC FIELD
The total magnetic field data were acquired with a sampling interval of 0.1 seconds, and were (1) corrected for diurnal variations by subtraction of the digitally recorded base station magnetic data, (2) waded to the low end data, and (3) interpolated onto a regular 100-m grid using a modified spline (1970) technique. The regional variation (or IGRF gradient, 2003, updated to August 2002) was removed from the leveled magnetic data.



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 (DGGG), and processed by Fugro Airborne Surveys in 2002. Airborne geophysical data for the Central, Eastern, and Lower Delta River areas were acquired in 1995 by Aerotek Inc. and were provided for publication by the BLM. The current survey was funded by the U. S. Department of Interior, Bureau of Land Management (BLM) and conducted in support of its mineral assessment program in the Delta River mining district. Laurel Burns was the contract manager for DGGG.

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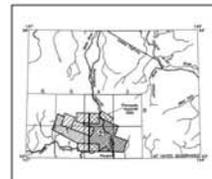




Source: Modified from U.S. Geological Survey, M. Peters et al., 2002, p. 4. USGS



LOCATION INDEX



COLOR SHADOW TOTAL MAGNETIC FIELD OF THE SOUTHERN DELTA RIVER AREA, EAST-CENTRAL ALASKA

PARTS OF MT. HAYES QUADRANGLE

2003

Sun Azimuth: 20 degrees

Inclination: 30 degrees

DESCRIPTIVE NOTES

The geophysical data were acquired with a DINGHEM[®] Electromagnetic (EM) system and a SICKLES[®] cesium magnetometer. Both were flown at a height of 100 feet. In addition the survey recorded data from a radar altimeter, GPS navigation system, 50/70 Hz monitors and video camera. Flights were performed with an AS350B-2 Super helicopter at a mean terrain clearance of 200 feet along 100% 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 2 miles. An Ashtech D224 NAVSTAR / GLONAVIS Global Positioning System was used for navigation. The helicopter position was derived every 0.5 seconds using post-flight differential positioning to a reference station at better than 2 m. Flight path elevations were projected onto the Clarke 1880 (UTM zone 6) spheroid, 1927 North American datum using a conformal projection (30) of 1470 = north constant 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.

PREVIOUSLY SURVEYED AREAS

The previously acquired geophysical data were acquired with an Ashtech D224 NAVSTAR (DG) system and a SICKLES cesium magnetometer. The electromagnetic system utilized two vertical coil pairs at 840 Hz and 4475 Hz and three horizontal coil pairs at 840 Hz, 4180 Hz and 32,460 Hz. These former operations for the magnetometer and DG system were slightly higher than 100 and 100 feet, respectively. In addition the survey recorded data from a radar altimeter, GPS navigation system, 50 Hz monitor and video camera. The GPS electronic positioning system consisted of differential mode. The flight line direction varies from north to south as follows: Canyon 100%; Lakes and Fish Lake 100%; and Rainy and Tongue Lake N-S. The flight lines were one-way, one flight. Extended to the lines were flown with the current survey which cover both the 1995 and 2002 survey areas. The other survey was flown with a AS350B2 helicopter.

TOTAL MAGNETIC FIELD

The total magnetic field data were acquired with a sampling interval of 0.1 seconds, and were (1) corrected for diurnal variations by subtraction of the diurnal variation, (2) reduced to the base line data, and (3) interpolated onto a regular 100 m grid using a modified spline (1970) technique. The regional variation (or IGRF gradient, 2000, updated to August 2002) was removed from the reduced magnetic data.

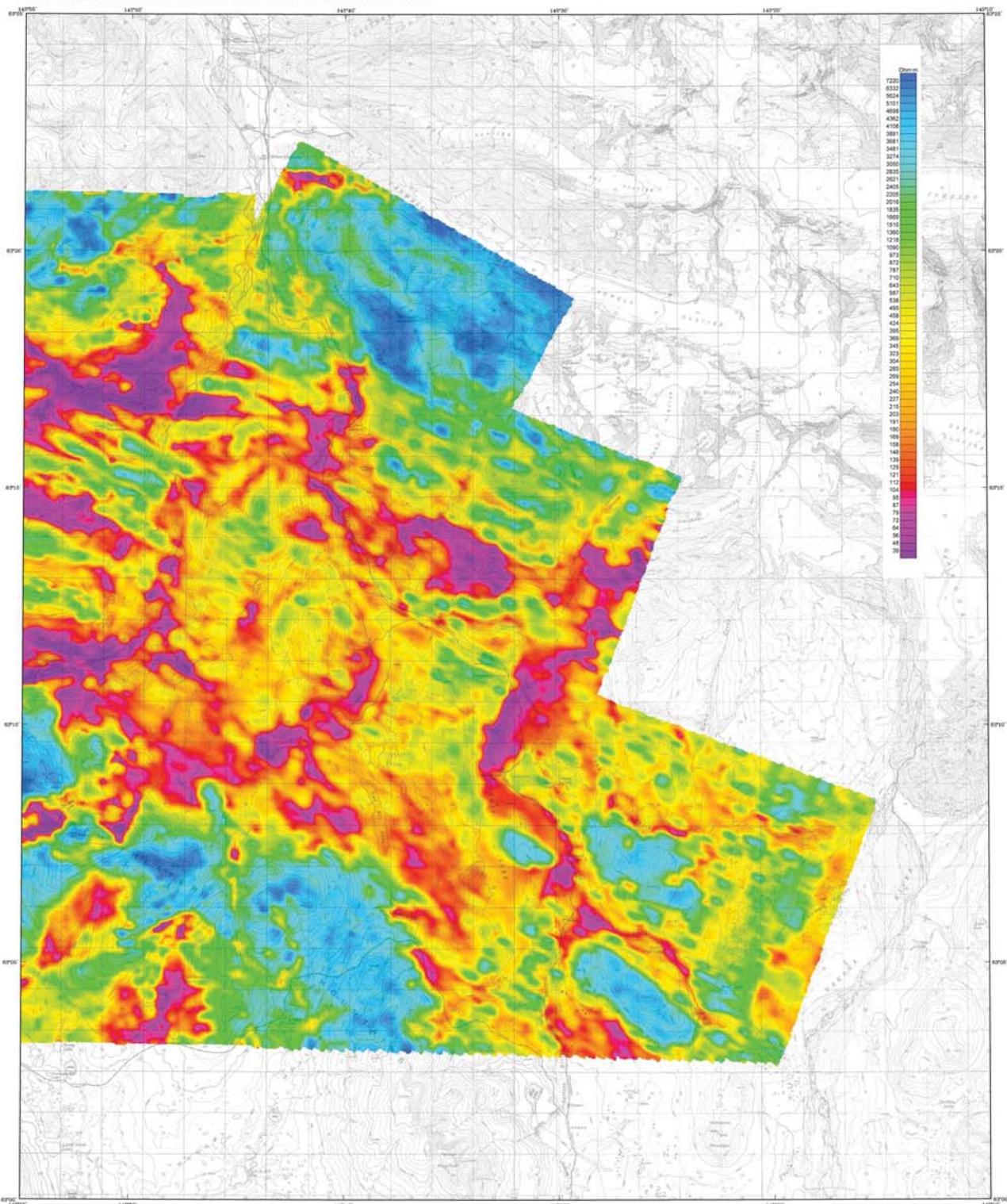
Ashtech, Inc., 2003. A free manual of interpretation and analysis code (PDF) located on their website: <http://www.ashtech.com>

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 (DGGS), and Stevens Exploration Management Corp., airborne geophysical data for the current area were acquired and processed by Fugro Airborne Surveys in 2002. Airborne geophysical data for the Canyon, Lakes, Fish Lake, and Tongue Lake areas were acquired in 1995 by Aerotek Inc. and were provided for publication by the DLG. The current project was funded by the U. S. Department of Interior, Bureau of Land Management (BLM) and conducted in support of its mineral assessment program in the Delta River mining district. Laurel Burns was the contract manager for DGGS.

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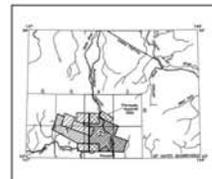




Base Data: U.S. Geological Survey, 10, 000, 1:63,200



LOCATION INDEX



7200 Hz COPLANAR RESISTIVITY OF THE SOUTHERN DELTA RIVER AREA, EAST-CENTRAL ALASKA PARTS OF MT. HAYES QUADRANGLE 2003

DESCRIPTIVE NOTES

The geophysical data were acquired with a DIGHEM[®] Electromagnetic (EM) system and a Sinterre cesium magnetometer. Both were flown at a height of 100 feet. In addition the survey recorded data from a radar altimeter, GPS navigation system, 50/70 Hz magnetic and video camera. Flights were performed with an AS350B-2 Spherule helicopter at a mean terrain clearance of 500 feet along 1207E survey flight lines with a spacing of 0.1 quarter mile. The lines were flown perpendicular to the flight lines at intervals of approximately 3 miles.

An Ashtech D224 NAVSTAR / GLOPASS Global Positioning System was used for navigation. The helicopter position was derived every 0.5 seconds using post-flight differential positioning to a relative accuracy of better than 2 m. Flight 6000 elevations were projected onto the Contour 188 (UTM zone 6) spheroid, 1927 North American datum using a central meridian (147° 14' 00" W) and a constant 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.

PREVIOUSLY SURVEYED AREAS

The previously acquired geophysical data were acquired with a Sinterre cesium magnetometer (EM system and a Sinterre cesium magnetometer). The electromagnetic system used two vertical coil pairs at 150 Hz and 4.476 Hz and three horizontal coil pairs at 849 Hz, 4.189 Hz and 52.640 Hz. These have a clearance for the magnetometer and EM system were slightly higher than 100 and 150 feet, respectively. In addition the survey recorded data from a radar altimeter, GPS navigation system, 50 Hz magnetic and video camera. The GPS electronic positioning system consisted of differential mode. The flight line direction varies from north to south in between Contour 1207E, Tundra and Fish Lake 1207E, and Rummy and Tongue Lake N-2. The flight lines were one-quarter mile apart. Extended to lines were flown with the current survey which cover both the 1905 and 2002 survey areas. The other survey was flown with a AS350B2 helicopter.

RESISTIVITY

The DIGHEM[®] EM system measured inphase and quadrature components of five frequencies. Two vertical coplanar coil pairs operated at 1000 and 5000 Hz with three horizontal coplanar coil pairs operated at 500, 1200, and 56,000 Hz. EM data were sampled at 0.1 second intervals. The EM system responds to induced conductors, conductive overburden, and cultural sources. Apparent resistivity is generated from the inphase and quadrature components of the inphase 7200 Hz using the pseudo-two half space model (Strover 1976). The data were interpreted using a 2D resistivity model using the 1985 helicopter data from the previously surveyed areas. To facilitate the merge between data sets, the resistivity for the pre-flight acquired 4189 Hz coplanar data was reinterpreted using the pseudo-two half space model.

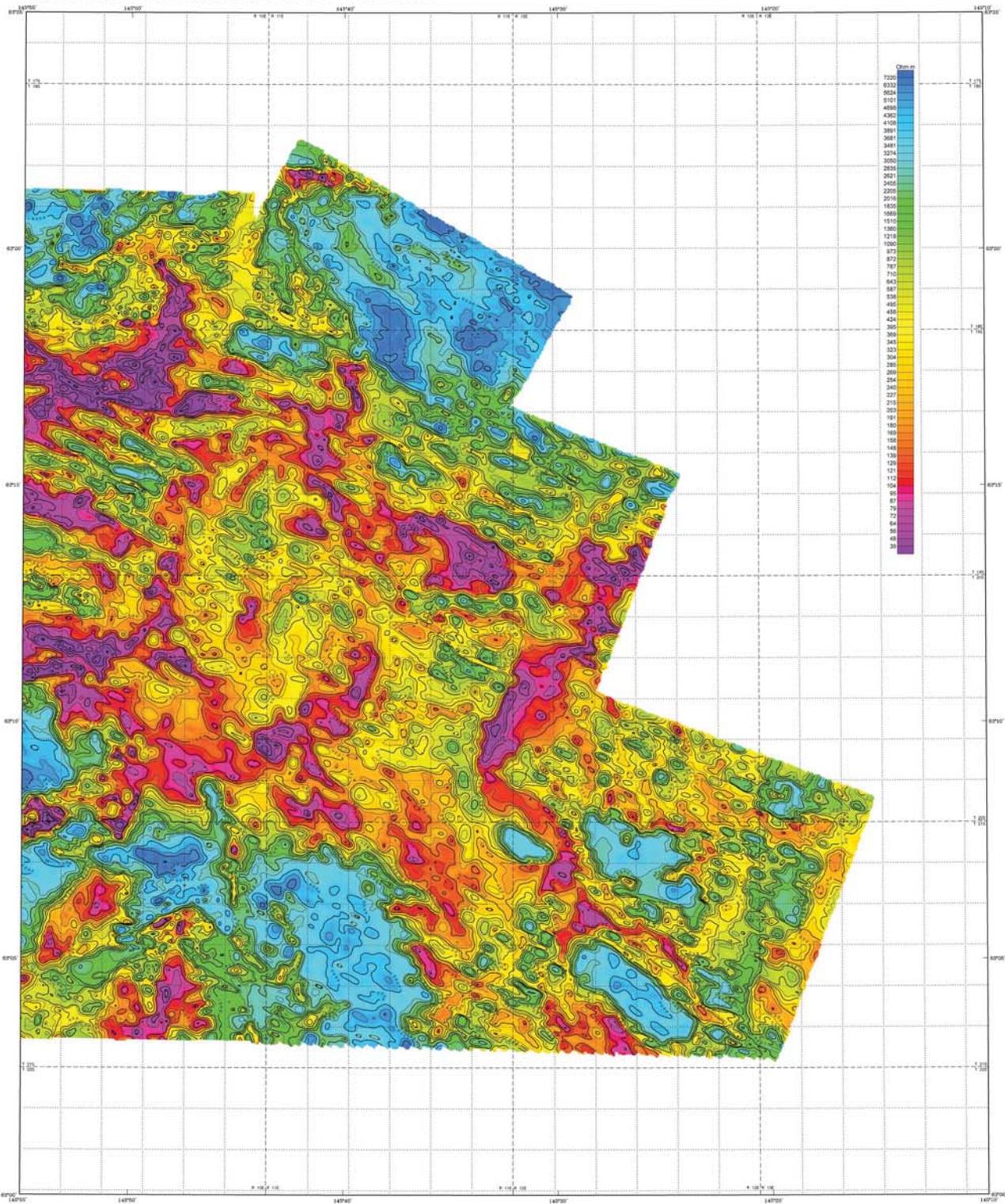
Scale: 1:63,200. Aerial photograph interpretation and ground truth data were used to identify and map features. The system used a Sinterre cesium magnetometer (EM system and a Sinterre cesium magnetometer).

SURVEY HISTORY

This map has been compiled and derived under contract between the State of Alaska, Department of Natural Resources, Division of Geological & Geophysical Survey (DGGG), and Stevens Exploration Management Corp. (SEMEC) geophysical data for the current area were acquired and processed by Fugro Airborne Surveys in 2002. Additional geophysical data for the Contour 188 area, Fish Lake area, and Tongue Lake area were acquired in 1995 by Sinterre Inc. and were provided for publication by the DGGG. The current survey was funded by the U. S. Department of Interior, Bureau of Land Management (BLM) and conducted in support of its mineral assessment program in the Delta River mining district. Loren Burns was the contract manager for DGGG.

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Scale: 1:62,500
North arrow: True (Geographic) North
Map Date: 1-2-2003
Map Scale: 1:62,500



7200 Hz COPLANAR RESISTIVITY OF THE SOUTHERN DELTA RIVER AREA, EAST-CENTRAL ALASKA

PARTS OF MT. HAYES QUADRANGLE
2003

DESCRIPTIVE NOTES

The geophysical data were acquired with a DIGHEM[®] Electromagnetic (EM) system and a Geotek cesium magnetometer. Both were flown at a height of 100 feet. In addition the survey recorded data from a radar altimeter, GPS navigation system, 50/70 Hz magnetic and compass. Flights were performed with an AS350B-2 Squirrel helicopter at a mean terrain clearance of 200 feet along 1420E survey flight lines with a spacing of 1/2 quarter mile. The lines were flown perpendicular to the flight lines at intervals of approximately 3 miles.

An Ashtech D224 NAVSTAR / GLOPASS Global Positioning System was used for navigation. The helicopter position was observed every 2.5 seconds using post-flight differential positioning to a relative accuracy of better than 2 m. Flight 8000 elevations were projected onto the Contour 188 (UTM zone 6) spheroid, 1927 North American datum using a vertical datum of 1470 m. Horizontal accuracy of the projected data is better than 10 m with respect to the UTM grid.

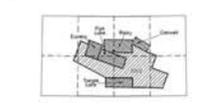
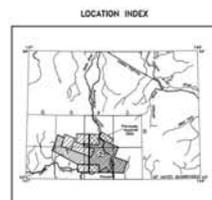
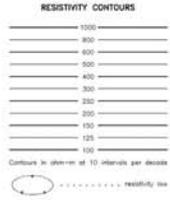
PREVIOUSLY SURVEYED AREAS

The previously acquired geophysical data were acquired with an Aercon Counter Decimeter (CD) system and a Geotek cesium magnetometer. The electromagnetic system utilized two horizontal coil pairs at 145 Hz and 4.76 Hz and three horizontal coil pairs at 849 Hz, 4.18 Hz and 32.60 Hz. These former surveys used the magnetometer and EM system were slightly higher than 100 and 150 feet, respectively. In addition the survey recorded data from a radar altimeter, GPS navigation system, 50 Hz magnetic and compass. The GPS navigation system consisted of differential mode. The flight line direction varies from north to south to roughly 1420E, 1420E and Fish Lake 1420E, and Rainsy and Tangle Lake N-C. The flight lines were approximately 1/2 mile apart. Extended flight lines were flown with the current survey which cover both the 1420E and 1420E survey areas. The other survey was flown with a AS350B2 helicopter.

RESISTIVITY

The DIGHEM[®] EM system measured inphase and quadrature components of five frequencies. Two vertical coplanar coil pairs operated at 1000 and 5000 Hz while three horizontal coplanar coil pairs operated at 1000, 1200, and 16,000 Hz. EM data were sampled at 0.1 second intervals. The EM system records its inphase and quadrature components of the inphase 7200 Hz using the pseudo-bay half space model (Baker 1976). The data were interpreted using a resistivity 100 m grid using a resistivity 100 m grid. The 7200 Hz coplanar data from the current survey have been merged with the 1420E data from the previously surveyed areas. To facilitate the merge between data sets, the resistivity for the previously acquired 1420E EM coplanar data was recalculated using the pseudo-bay half space model.

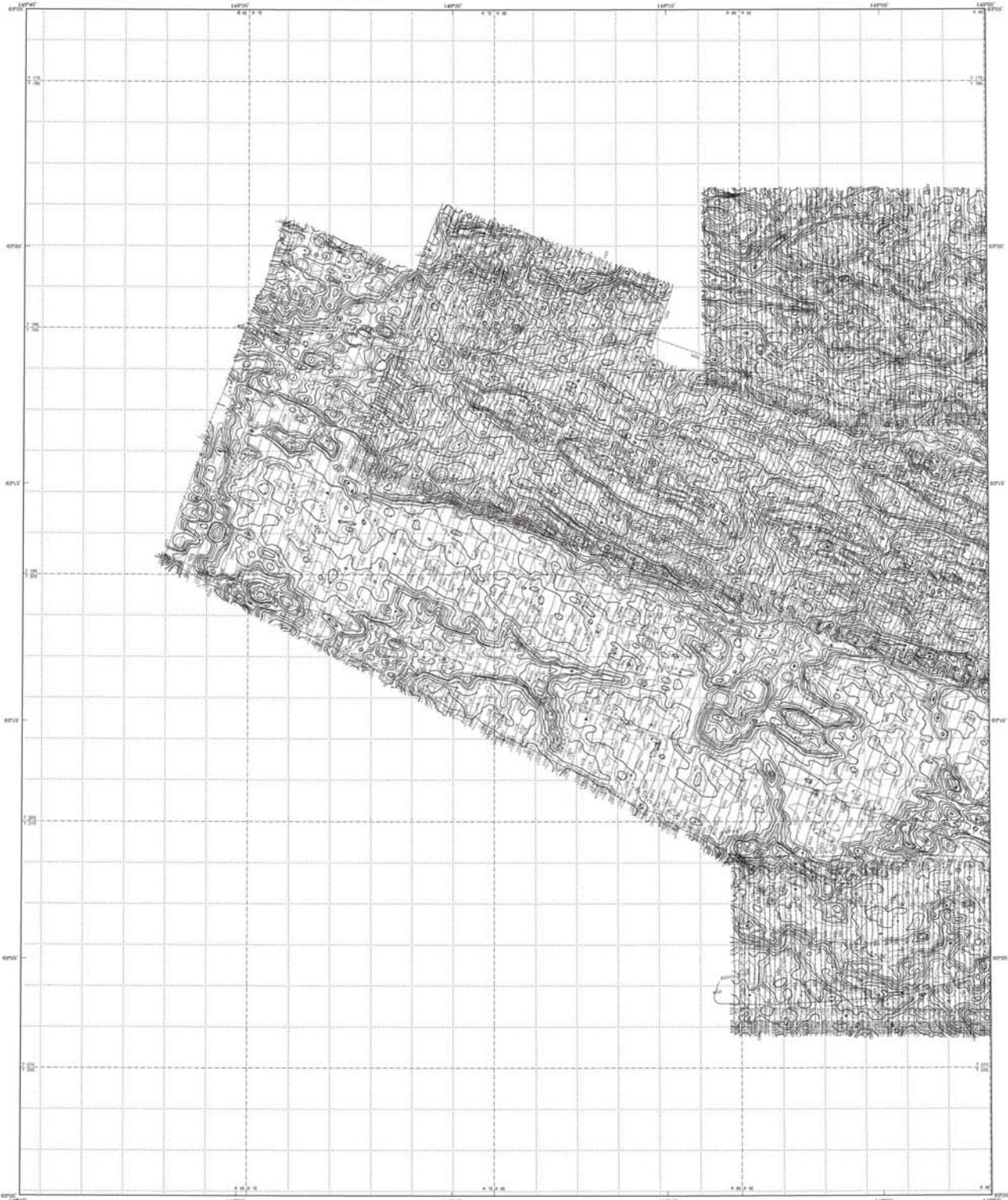
Scale: 1:62,500
North arrow: True (Geographic) North
Map Date: 1-2-2003
Map Scale: 1:62,500



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 (DGGG), and Stevens Exploration Management Corp. Airborne geophysical data for the current area were acquired and processed by Fugro Airborne Surveys in 2002. Airborne geophysical data for the Contour, Eastern, Fish Lake, and Tangle Lake areas were acquired in 1995 by Aercon Inc. and were provided for publication by the BLM. The current survey was funded by the U. S. Department of Interior, Bureau of Land Management (BLM) and conducted in support of its mineral assessment program in the Delta River mining district. Laurel Burns was the contract manager for DGGG.

This map and other products from this survey are available by mail order or in person from DGGG, 794 University Ave., Suite 200, Fairbanks, Alaska, 99774. Some products are also available in person only at the BLM's Juneau Mineral Information Center, 100 Seward Road, Douglas, Alaska, 99824.



Approved for Release by NSA on 05-08-2013 pursuant to E.O. 13526



7200 Hz COPLANAR RESISTIVITY OF THE SOUTHERN DELTA RIVER AREA, EAST-CENTRAL ALASKA

PARTS OF MT. HAYES QUADRANGLE
2003



DESCRIPTIVE NOTES

The geophysical data were acquired with a DIGHEM[®] Electromagnetic (EM) system and a Solaire cesium magnetometer. Both were flown at a height of 100 feet. In addition the survey recorded data from a radar altimeter, GPS navigation system, 50/100 Hz magnetic and cesium compass. Flights were performed with an AS350B-2 Super helicopter at a maximum altitude of 200 feet along 120°E magnetic flight lines with a spacing of 4 quarter mile a mile. The lines were flown perpendicular to the flight lines at intervals of approximately 2 miles. An Ashtech G24 NAVSTAR / GLONASS Global Positioning System was used for navigation. The helicopter position was derived every 0.5 seconds using post-flight differential positioning to a receiver accuracy of better than 0.5 m. Flight path positions were projected onto the UTM zone 1883 (UTM zone 6) UTM zone 1827 North American datum using a conformal projection of 1:63,300 scale constant of 0 and an east constant of 500,000. Positional accuracy of the recorded data is better than 10 m with respect to the UTM grid.

PREVIOUSLY SURVEYED AREAS

The previously acquired geophysical data were acquired with an Aercon Cesium Magnetometer (CM) system and a Solaire cesium magnetometer. The electromagnetic system utilized two vertical magnetic coil pairs at 150 Hz and 4.476 Hz and three horizontal coil pairs at 843 Hz, 4.188 Hz and 32.460 Hz. These former operations for the magnetometer and EM system were slightly higher than 100 and 150 feet, respectively. In addition the survey recorded data from a radar altimeter, GPS navigation system, 50 Hz magnetic and cesium compass, differential mode. The flight line direction varies from north to south or between Cassin N20°E, Laska and Fish Lake N20°E, and Rinky and Tongue Lakes N-C. The flight lines were one-eight mile apart. Excepted to this area flown with the current survey which cover both the 1995 and 2003 survey areas, the other survey was flown with a AS350B2 helicopter.

RESISTIVITY

The DIGHEM[®] EM system measured inphase and quadrature components of five frequencies. Two vertical coplanar coil pairs oriented at 1000 and 5500 Hz with three horizontal coplanar pairs oriented at 500, 1200, and 56,000 Hz. EM data were sampled at 0.1 second intervals. The EM system responds to subsurface conductive overburden, and cultural sources. Apparent resistivity is generated from the inphase and quadrature components of the inphase 7200 Hz using the pseudo-two half space model (Dey and Weidner 1976). The data were interpreted using the 7200 Hz apparent resistivity from the current survey. The 7200 Hz apparent resistivity data from the current survey have been merged with the 1995 apparent resistivity data from the previously surveyed areas. To facilitate the merge between data sets, the resistivity for the pre-instantly acquired 1995 Hz coplanar data was re-interpreted using the pseudo-two half space model.

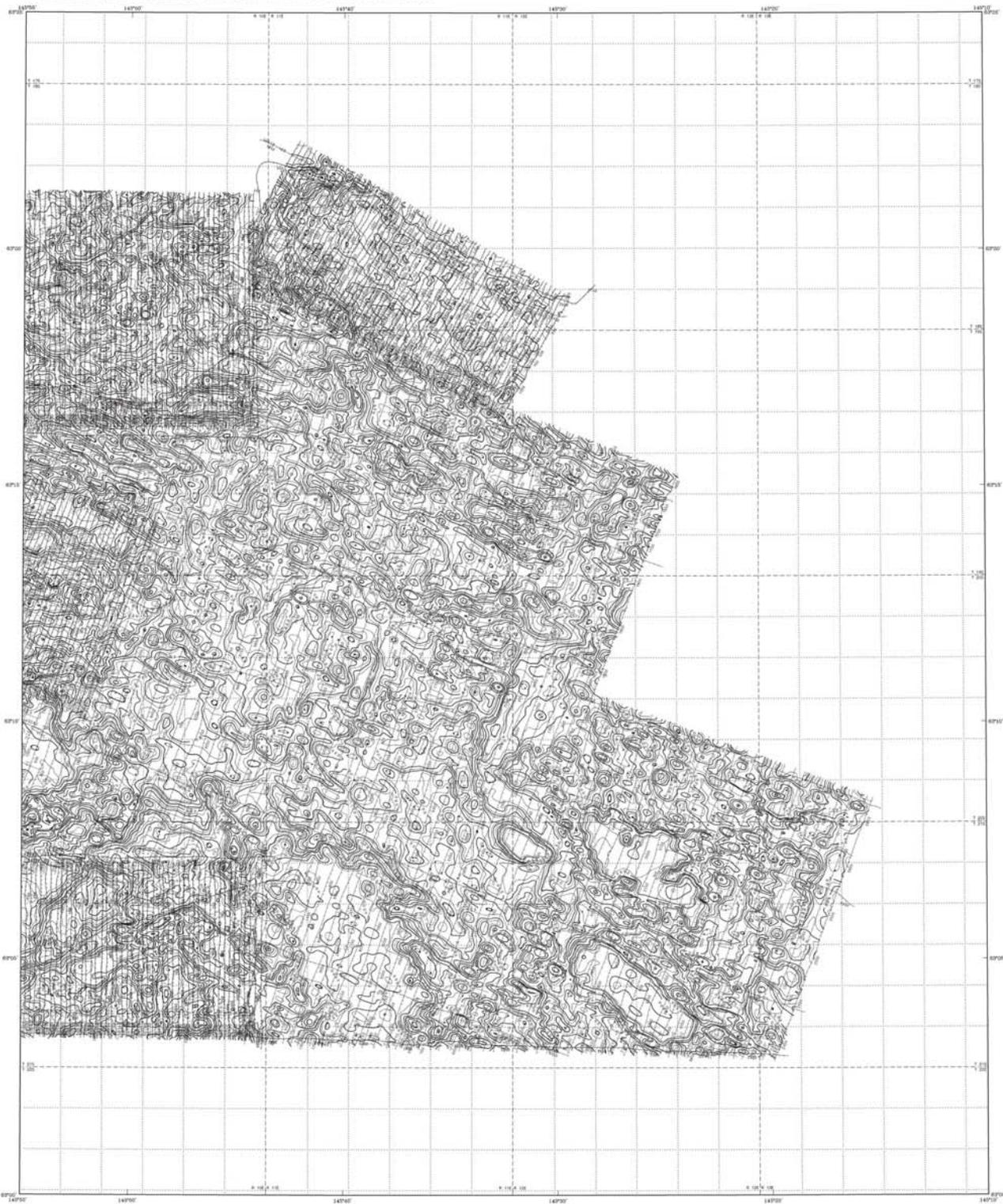
Scale: 1:63,300
UTM Zone 1883
Datum: NAD 83
Units: Meters
Easting: 14920 to 14980
Northing: 6010 to 6070



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 (DGGS), and Stevens Exploration Management Corp. (SEMC) geophysical data for the current area were acquired and processed by Fugro Airborne Surveys in 2002. Previous geophysical data for the Cassin, Laska, Fish Lake, Rinky and Tongue Lakes areas were acquired in 1995 by Aercon Inc. and were provided for publication by the BLM. The current survey was funded by the U. S. Department of Interior, Bureau of Land Management (BLM) and conducted in support of its mineral assessment program in the Delta River mining district. Loren Burns was the contract manager for DGGS.

This map and other products from this survey are available by mail order or in person from 2002, 794 University Ave., Suite 200, Fairbanks, Alaska 99709. Some products are also available in person only at the BLM's Juneau Mineral Information Center, 100 Banks Road, Douglas, Alaska 99824.



Scale: 1:62,500
North arrow: True N. Magnetic declination: 10° 00' 00" W, 10/10/03



7200 Hz COPLANAR RESISTIVITY OF THE SOUTHERN DELTA RIVER AREA, EAST-CENTRAL ALASKA

PARTS OF MT. HAYES QUADRANGLE
2003

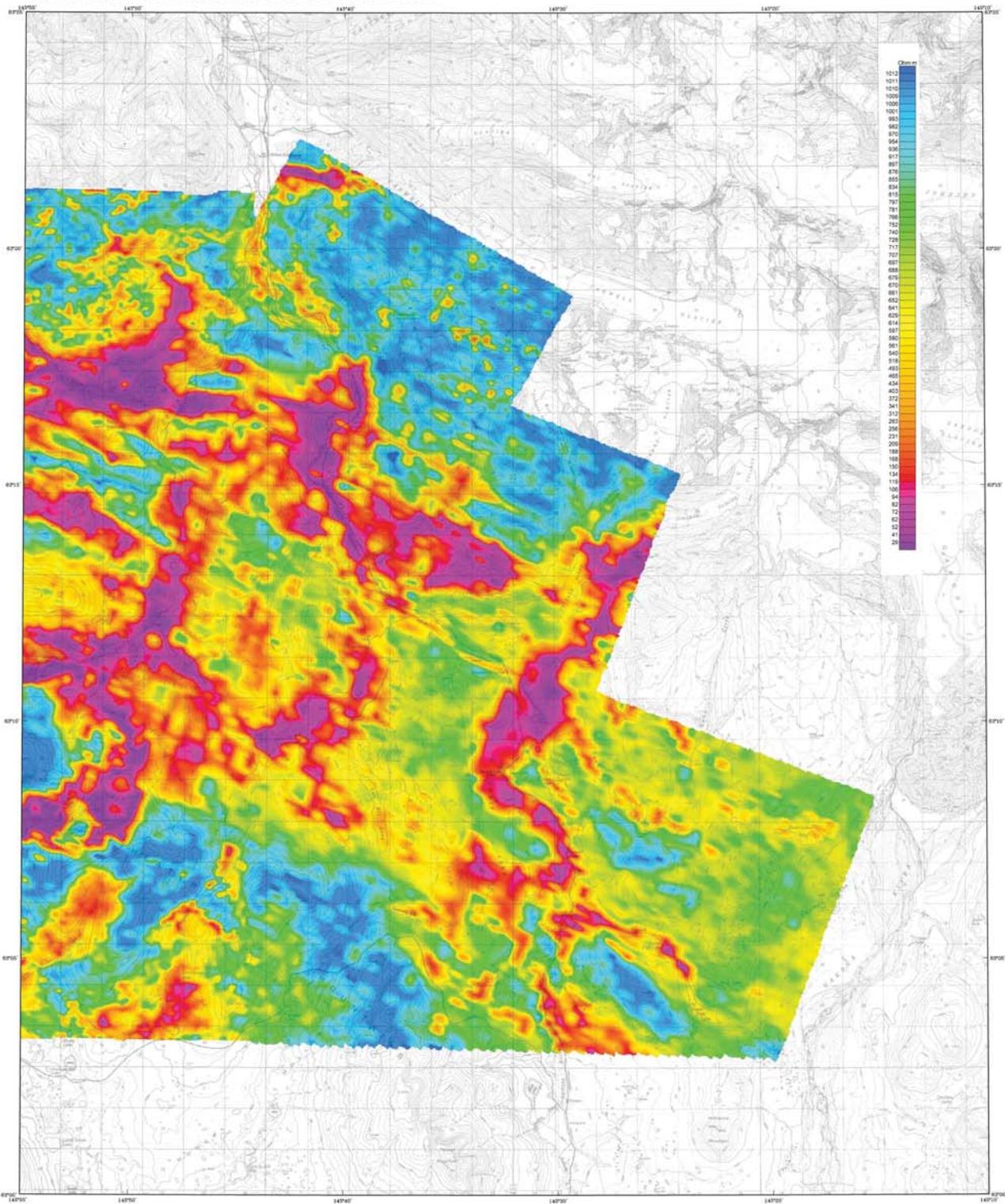
DESCRIPTIVE NOTES
The geophysical data were acquired with a DIGHEM[®] Electromagnetic (EM) system and a Solinst[®] caesium magnetometer. Both were flown at a height of 100 feet. In addition the survey recorded data from a radar altimeter, GPS navigation system, 50/50 Hz magnetic and cable compass. Flights were performed with an AS350B-2 Super[®] helicopter at a maximum clearance of 200 feet using 1207E surveying flight crew with a load of 2,000 lbs. The lines were flown perpendicular to the flight line at intervals of approximately 3 miles. An Ashtech[®] GO2A NAVSTAR / GLONASS Global Positioning System was used for navigation. The helicopter position was derived every 0.5 seconds using post-flight differential positioning to a receiver accuracy of better than 0.1 m. Flight path elevations were projected onto the Contour 188 UTM zone 6) 180000, 1827 North American datum using a contour 188 projection. The UTM zone is constant of 0 and an east constant of 500,000. Position accuracy of the recorded data is better than 10 m with respect to the UTM grid.

PREVIOUSLY SURVEYED AREAS
The previously acquired geophysical data were acquired with an Aeromagnetic (Aeromagnetic) (AM) system and a Solinst[®] caesium magnetometer. The aeromagnetic system utilized two vertical caesium coil pairs at 150 Hz and 4.476 Hz and three horizontal coil pairs at 843 Hz, 4.188 Hz and 32.460 Hz. Mean terrain clearance for the magnetometer and EM system were slightly higher than 100 and 150 feet, respectively. In addition the survey recorded data from a radar altimeter, GPS navigation system, 50/50 Hz magnetic and cable compass. The GPS electronic positioning system consisted of Fish Lake 1207E, and Romy and Tangle Lake H-25. The flight lines were one-eight mile apart. Conducted by this area flown with the current survey which cover both the 1985 and 2002 survey areas. The other survey was flown with an AS350B2 helicopter.

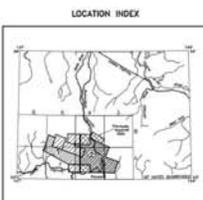
RESISTIVITY
The DIGHEM[®] EM system measured in-phase and quadrature components of five frequencies. Two vertical coplanar coil pairs operated at 1000 and 5500 Hz while three horizontal coplanar pairs operated at 500, 7200, and 56,000 Hz. EM data were sampled at 0.1 second intervals. The EM system responds to subsurface conductive overburden, and cultural sources. Apparent resistivity is generated from the in-phase and quadrature components of the in-phase 7200 Hz using the pseudo-true half space model (Stewart 1976). The data were interpreted with a 100 m resistivity model. The data were interpreted with a 100 m resistivity model. The 7200 Hz resistivity data from the current survey have been merged with the 1985 resistivity data from the previously surveyed areas. To facilitate the merge between data sets, the resistivity for the pre-instantly acquired 1985 Hz coplanar data was re-interpreted using the pseudo-true half space model.



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 (DGGG), and Stevens Exploration Management Corp. Airborne geophysical data for the current area were acquired and processed by Fugro Airborne Surveys in 2003. Airborne geophysical data for the Contour, Romy, Fish Lake, Romy, and Tangle Lake areas were acquired in 1985 by Aeromagnetic and were provided for publication by the DGGG. The current map was funded by the U. S. Department of Interior, Bureau of Land Management (BLM) and conducted in support of its mineral assessment program in the Delta River mining district. Loren Burns was the contract manager for DGGG.
This map and other products from this survey are available by mail order or in person from 2002, 794 University Ave., Suite 200, Fairbanks, Alaska 99709. Some products are also available in person only at the BLM's Juneau Mineral Information Center, 100 Banks Road, Douglas, Alaska 99824.



Base Data: U.S. Geological Survey, 1:50,000, 1:62,500, 1:125,000



900 Hz COPLANAR RESISTIVITY OF THE SOUTHERN DELTA RIVER AREA, EAST-CENTRAL ALASKA

PARTS OF MT. HAYES QUADRANGLE
2003

DESCRIPTIVE NOTES

The geophysical data were acquired with a DIGHEM[®] Electromagnetic (EM) system and a Scintrex cesium magnetometer. Both were flown at a height of 100 feet. In addition, the survey recorded data from a radar altimeter, GPS navigation system, 50/70 Hz magnetic and cesium cesium. Flights were performed with an AS350B-2 5000 feet wing N207E surveying aircraft with a loading of a quarter mile. The lines were flown perpendicular to the flight line at intervals of approximately 3 miles.

An Ashtech DD24 NAVSTAR / GLOPASS Global Positioning System was used for navigation. The helicopter position was derived every 0.5 seconds using post-flight differential positioning to a real-time accuracy of better than 2 m. Flight 6000 elevations were projected onto the Contour 100 (UTM zone 6) spheroid, 1927 North American datum using a central meridian (CM) of 147° 00' north constant 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.

PREVIOUSLY SURVEYED AREAS

The previously acquired geophysical data were acquired with an Aercon Counter Electromagnetic (EM) system and a Scintrex cesium magnetometer. The electromagnetic system used two vertical coil pairs at 849 Hz and 4,476 Hz and three horizontal coil pairs at 849 Hz, 4,180 Hz and 32,460 Hz. These former operations for the magnetometer and EM system were slightly higher than 100 and 150 feet, respectively. In addition, the survey recorded data from a radar altimeter, GPS navigation system, 50 Hz magnetic and cesium cesium. The GPS electronic positioning system consisted of differential mode. The flight line direction varies from south to north to follow Contour N207E, Tangle and Fish Lake N207E, and Rinky and Tangle Lake N-C. The flight lines were cross-ridge, side-slope. Extended to lines were flown with the current survey which cover both the 1993 and 2002 survey areas. The other survey was flown with a AS350B2 helicopter.

RESISTIVITY

The DIGHEM[®] EM system measured in-phase and quadrature components of five frequencies. Two vertical coplanar coil pairs operated at 1000 and 5000 Hz while three horizontal coplanar coil pairs operated at 500, 1000, and 50,000 Hz. EM data were sampled at 0.1 second intervals. The EM system responds to subsurface conductive overburden, and cultural sources. Apparent resistivity is generated from the in-phase and quadrature components of the in-phase 900 Hz using the pseudo-layer half space model (Freyer 1976). The data were interpreted using a 200 Hz computer data from the current survey have been merged with the 900 Hz data from the previously surveyed areas. To facilitate the merge between data sets, the resistivity for the previously acquired 849 Hz coplanar data was recalculated using the pseudo-layer half space model.

ALASKA DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS
1700 N. P. 98-005
Finger, P.O. 1976, Reservoir mapping with an airborne magnetometric system (Geophysical, v. 41, p. 144-172)

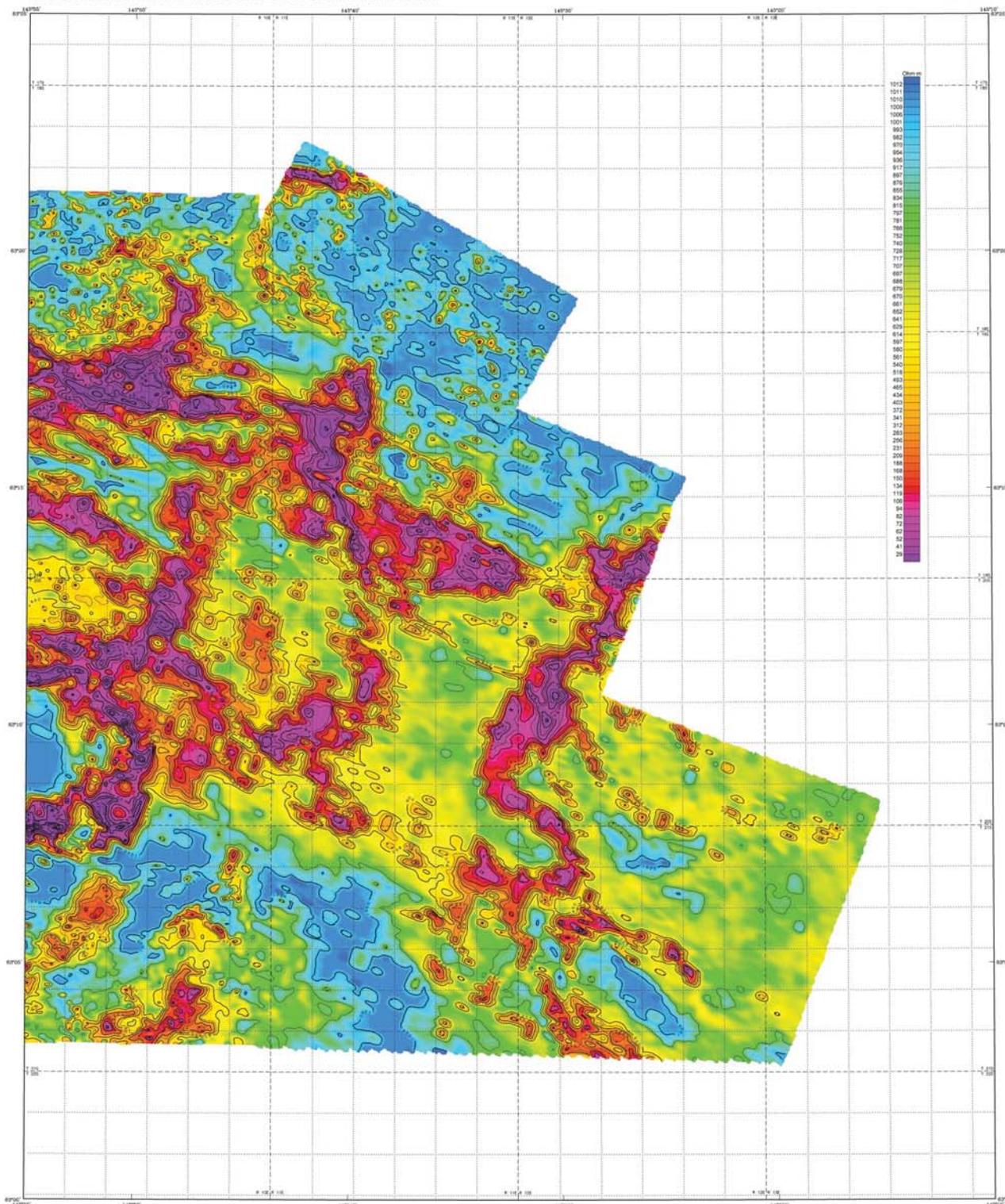


SURVEY HISTORY

This map has been compiled and derived under contract between the State of Alaska, Department of Natural Resources, Division of Geological & Geophysical Surveys (DGGG), and Stevens Exploration Management Corp. Airborne geophysical data for the current area were acquired and processed by Fugro Airborne Surveys in 2002. Airborne geophysical data for the Contour 100, Fish Lake, and Rinky and Tangle Lake areas were acquired in 1993 by Aercon Inc. and were provided for publication by the DGGG. The current survey was funded by the U. S. Department of Interior, Bureau of Land Management (BLM) and conducted in support of its mineral assessment program in the Delta River mining district. Loren Burns was the contract manager for DGGG.

How maps and other products from this survey are available by mail order or in person from DGGG, 794 University Ave., Suite 200, Fairbanks, Alaska, 99704. Some products are also available in person only at the BLM's Juneau Mineral Information Center, 100 Seward Road, Douglas, Alaska, 99824.





Scale: 1:63,300
1 2 3 4 KILOMETERS

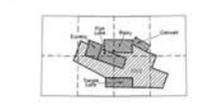
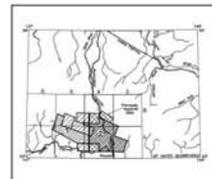


900 Hz COPLANAR RESISTIVITY OF THE SOUTHERN DELTA RIVER AREA, EAST-CENTRAL ALASKA PARTS OF MT. HAYES QUADRANGLE 2003

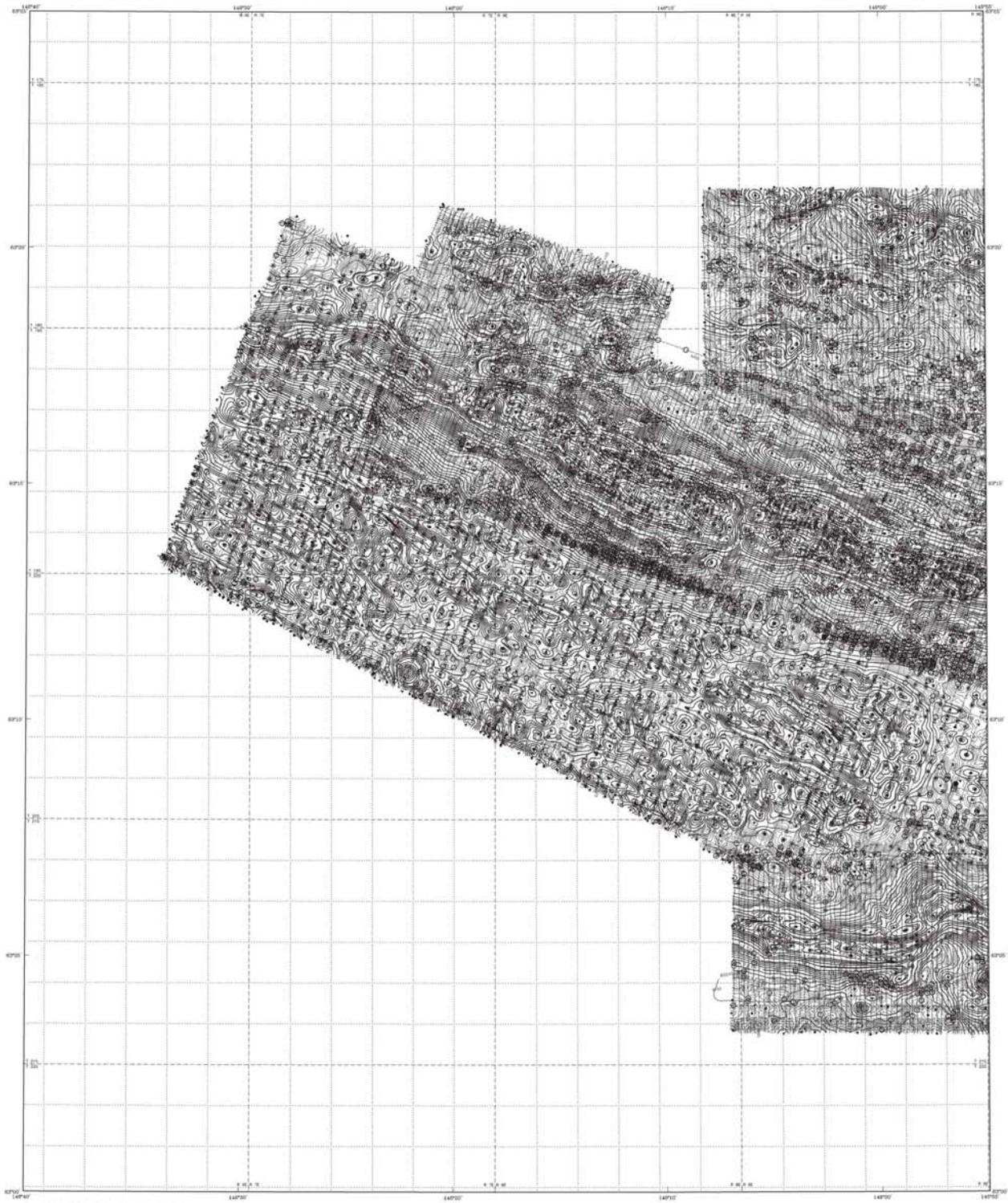
DESCRIPTIVE NOTES
The geophysical data were acquired with a DIGHEM[®] Electromagnetic (EM) system and a Scintrex cesium magnetometer. Both were flown at a height of 100 feet. In addition the survey recorded data from a radar altimeter, GPS navigation system, 50/70 Hz magnetic and compass. Flights were performed with an AS350B-2 5000 feet gross weight helicopter at a mean terrain clearance of 200 feet along N207E surveying lines with a spacing of 2 kilometers. The lines were flown perpendicular to the flight line at intervals of approximately 3 hours. An Ashtech D224 NAVSTAR / GLONAVSS Global Positioning System was used for navigation. The helicopter position was observed every 2.5 seconds using post-flight differential positioning to a relative accuracy of better than 2 m. Flight 8000 elevations were projected onto the Contour 188 (UTM zone 6) spheroid, 1927 North American datum using a contour datum of 100 feet. The datum constant is 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.

PREVIOUSLY SURVEYED AREAS
The previously acquired geophysical data were acquired with an Aercon Counter Decimeter (CD) system and a Scintrex cesium magnetometer. The electromagnetic system utilized two horizontal coil pairs at 150 Hz and 4.476 Hz and three horizontal coil pairs at 849 Hz, 4.188 Hz and 52.640 Hz. These lines were flown with the magnetometer and EM system were slightly higher than 100 and 150 feet, respectively. In addition the survey recorded data from a radar altimeter, GPS navigation system, 50 Hz magnetic and compass. The flight lines were flown perpendicular to the flight line with the current survey, which cover both the 1905 and 2002 survey. The other survey was flown with a AS350B2 helicopter.

RESISTIVITY
The DIGHEM[®] EM system measured in-phase and quadrature components of five frequencies. Two vertical coplanar coil pairs operated at 1000 and 5000 Hz with three horizontal coplanar coil pairs operated at 500, 1000, and 50,000 Hz. EM data were sampled at 0.1 second intervals. The EM system records the in-phase and quadrature components of the in-phase 900 Hz using the pseudo-bay half space model (Freyer 1976). The data were interpreted using a regular 100 m grid using a modified semi (1976) technique. The 900 Hz coplanar data from the current survey have been merged with the data from the previously surveyed areas. To facilitate the merge between data sets, the resistivity for the previously acquired 849 Hz coplanar data was reinterpreted using the pseudo-bay half space model.



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 (DGGG), and Stevens Exploration Management Corp. Airborne geophysical data for the current area were acquired and processed by Fugro Airborne Surveys in 2002. Airborne geophysical data for the Contour, Earth, Fish Lake, and Tongue Lake areas were acquired in 1995 by Aercon Inc. and were provided for publication by the BLM. The current survey was funded by the U. S. Department of Interior, Bureau of Land Management (BLM) and conducted in support of its mineral assessment program in the Delta River mining district. Laurel Burns was the contract manager for DGGG.
This map and other products from this survey are available by mail order or in person from DGGG, 794 University Ave., Suite 200, Fairbanks, Alaska, 99774. Some products are also available in person only at the BLM's Juneau Mineral Information Center, 100 Seward Road, Douglas, Alaska, 99824.



Scale: 1:62,500. UTM Zone 18N, Datum: NAD 83, Spheroid: GRS 1980, Units: Meter.



LOCATION INDEX



TOTAL MAGNETIC FIELD AND ELECTROMAGNETIC ANOMALIES OF THE SOUTHERN DELTA RIVER AREA, EAST-CENTRAL ALASKA

PARTS OF MT. HAYES QUADRANGLE
2003

DESCRIPTIVE NOTES

The geophysical data were acquired with a GEODETIC Electromagnetic (EM) system and a Sinterex digital magnetometer. Data were flown at a height of 100 feet. The system flew a survey rectangle from a raster altimeter, GPS navigation system, 50/100 Hz monitors and video camera. Flights were performed with an AS350B-2 Super helicopter at a mean terrain clearance of 200 feet using ADS-B 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 3 miles.

an ASPEN/CGI24 HAZARDUS Global Positioning System and used for navigation. The helicopter position was derived every 0.5 seconds using post-flight differential positioning to a relative accuracy of better than 5 m. Flight path locations were projected onto the Clarke 1866 UTM zone 18N datum, 1927 North American datum using a central meridian (CM) of 141° 11' north coordinate of 0 and an easting constant of 500,000. Planimetric accuracy of the generated data is better than 10 m with respect to the UTM grid.

PREVIOUSLY SURVEYED AREAS

The previously acquired geophysical data were acquired with an aerial Geometric Electromagnetic (EM) system and a Sinterex digital magnetometer. The electromagnetic system utilized four modified magnetic coil pairs at 830 Hz and 8,470 Hz and three horizontal coil pairs at 840 Hz, 8,150 Hz and 52,450 Hz, respectively. In addition, the survey recorded data from a raster altimeter, GPS navigation system, 50 Hz monitor and video camera. The GPS electronic positioning system operated in differential mode. The flight line direction varies from north to south on a regular course (100°). Cores and Fish Lake 1027E and Blainy and Tongue Lake 10-5. The flight lines were approximately one mile apart. Extended to lines were flown with the current survey with other than the 1986 and 2002 survey areas. The older survey was flown with a AS350B2 helicopter.

ELECTROMAGNETIC ANOMALIES

- Conductivity
- 100 Siemens
- 50 Siemens
- Qualitative anomaly
- Area conductivity associated with an EM magnetic response

ELECTROMAGNETICS

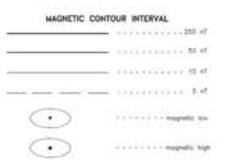
To determine the location of EM anomalies or their boundaries, the GEODETIC EM system measured primary and secondary components of EM frequency. Two vertical coil-pair sets oriented at 100° and 50° to other three horizontal magnetometer pairs oriented at 80°, 200°, and 160° (90°). EM data were collected at 0.1 second intervals. The EM system responds to bedrock conductors, conductive pebbles, and cultural structures. The power line monitor and the flight track video were examined to locate cultural sources. The EM responses that are indicated are classified by conductivity.

TOTAL MAGNETIC FIELD

The total magnetic field data were acquired with a sampling interval of 0.1 seconds, and were (1) corrected for diurnal variations by subtraction of the magnetic variation, (2) reduced to the magnetic declination of the time of flight, and (3) interpolated onto a regular 100 m grid using a smoothing spline (SPLINE) technique. The regional correction (or IGRF gradient, 2000, updated by Nagel 2002) was removed from the leveled magnetic data.

TOTAL MAGNETIC FIELD

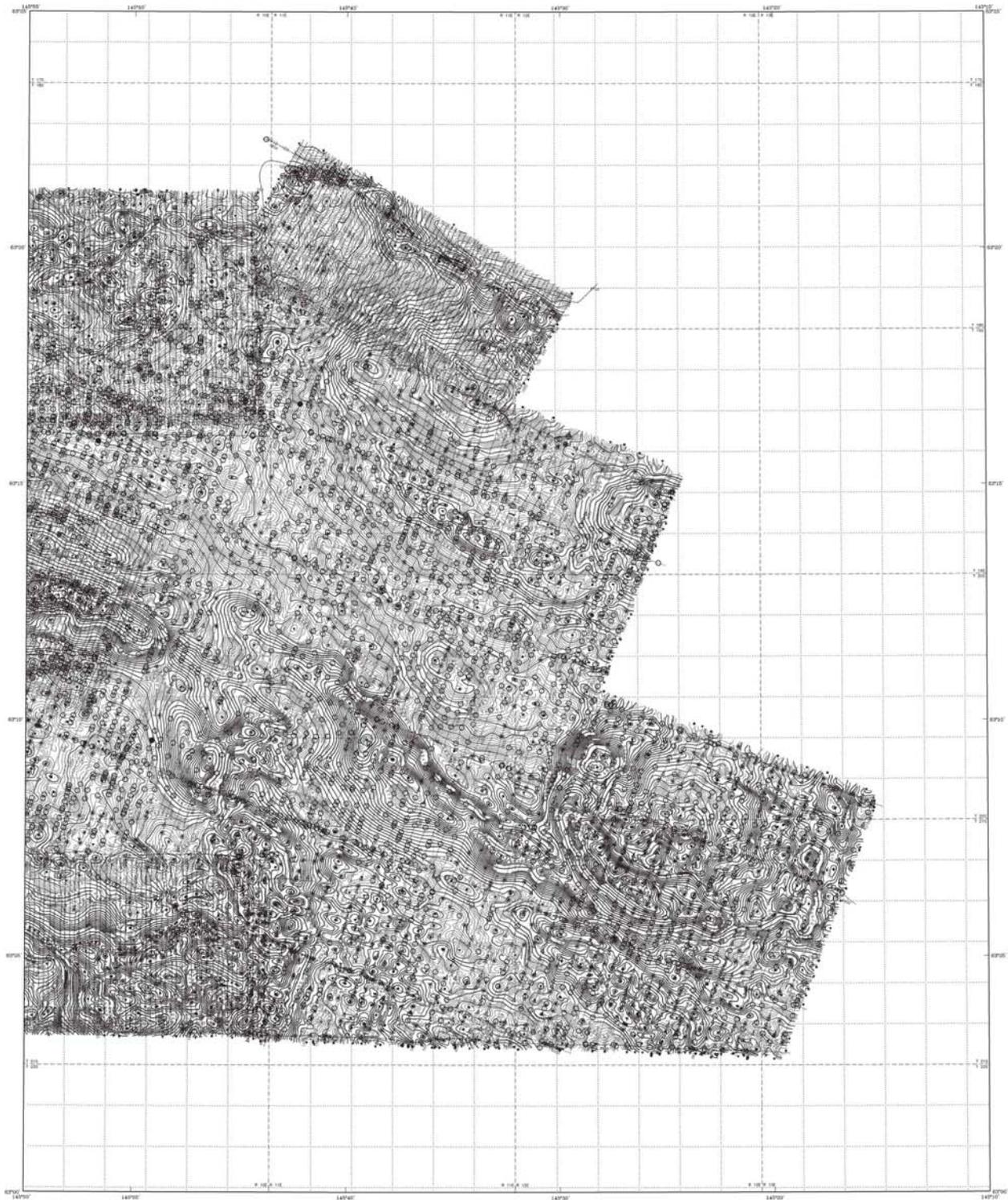
The total magnetic field data were acquired with a sampling interval of 0.1 seconds, and were (1) corrected for diurnal variations by subtraction of the magnetic variation, (2) reduced to the magnetic declination of the time of flight, and (3) interpolated onto a regular 100 m grid using a smoothing spline (SPLINE) technique. The regional correction (or IGRF gradient, 2000, updated by Nagel 2002) was removed from the leveled magnetic data.



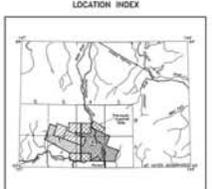
SURVEY HISTORY

This map has been compiled and drawn under contract between the State of Alaska, Department of Natural Resources, Bureau of Geological & Geophysical Surveys (DGG), and Stevens Exploration Management Corporation geophysical data for the current area were acquired and processed by Fargo Airborne Surveys in 2002. Additional geophysical data for the Colville, Delta, Fish Lake, Blainy and Tongue Lake areas were acquired in 1986 by the Delta River area and were processed by the U.S. Department of Interior, Bureau of Land Management (BLM) and conducted in support of its mineral assessment program in the Delta River mining district. Later Bureau use the contract number for DGG.

This map and other products from this survey are available by mail order or in person from DGG, 714 University Ave., Suite 205, Fairbanks, Alaska, 99701. Some products are also available in person only at the BLM's Junction Mining Information Center, 150 Seward Street, Stearns, Alaska, 99824.



Scale: 1:63,600
North arrow: True (T), Magnetic (M), Declination (D) 1983 = 11° 10' W, 2003 = 11° 10' W



TOTAL MAGNETIC FIELD AND ELECTROMAGNETIC ANOMALIES OF THE SOUTHERN DELTA RIVER AREA, EAST-CENTRAL ALASKA

PARTS OF MT. HAYES QUADRANGLE
2003

DESCRIPTIVE NOTES

The geophysical data were acquired with a GEODEX[®] Electromagnetic (EM) system and a Siblex[®] dual magnetometer. Both were flown at a height of 100 feet. In addition, the dual magnetometer was mounted on a motor-driven, GPS navigation system, Siblex/10 Hz monitors and video camera. Flights were performed with an AS350B-2 Super helicopter at a mean terrain clearance of 200 feet above NAD83 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 3 miles.

An ASPEN[®] Q224 Navigator / GLOMAGS Global Positioning System was used for navigation. The helicopter position was derived every 0.5 seconds using post-flight differential positioning to a relative accuracy of better than 5 m. Flight path locations were projected onto the Clarke 1866 UTM zone 18 UTM grid. The flight navigation system used a camera-mounted GPS and a mean terrain clearance of 200 feet above NAD83 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 3 miles.

PREVIOUSLY SURVEYED AREAS

The previously acquired geophysical data were acquired with an aerial Geotek[®] EM system and a Siblex[®] dual magnetometer. The electromagnetic system utilized dual magnetometers at 840 Hz and 4,470 Hz and three horizontal air coils at 840 Hz, 4,470 Hz and 52,400 Hz. In addition, the survey recorded data from a motor-driven, GPS navigation system, Siblex/10 Hz monitors and video camera. The flight navigation system utilized a camera-mounted GPS and a mean terrain clearance of 200 feet above NAD83 survey flight lines with a spacing of a quarter of a mile. The lines were flown with the current survey with either both the 1988 and 2002 survey areas. The older survey was flown with a AS350B helicopter.

ELECTROMAGNETIC ANOMALIES

- Conductance
- Inductance
- Susceptance anomaly
- △ Inductance anomaly

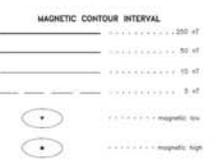
ELECTROMAGNETICS

To determine the location of EM anomalies or their boundaries, the GEODEX EM system measured primary and secondary components of EM frequency. Two vertical induction coils oriented at 1000 and 5000 Hz and three horizontal induction coils oriented at 840, 2200, and 50,000 Hz. EM data were recorded at 0.5 second intervals. The EM system response to bedrock conductors, inductive conductors, and cultural structures. The power line monitor and the flight track video were employed to locate cultural structures. The EM responses that are indicated are classified by conductance.



TOTAL MAGNETIC FIELD

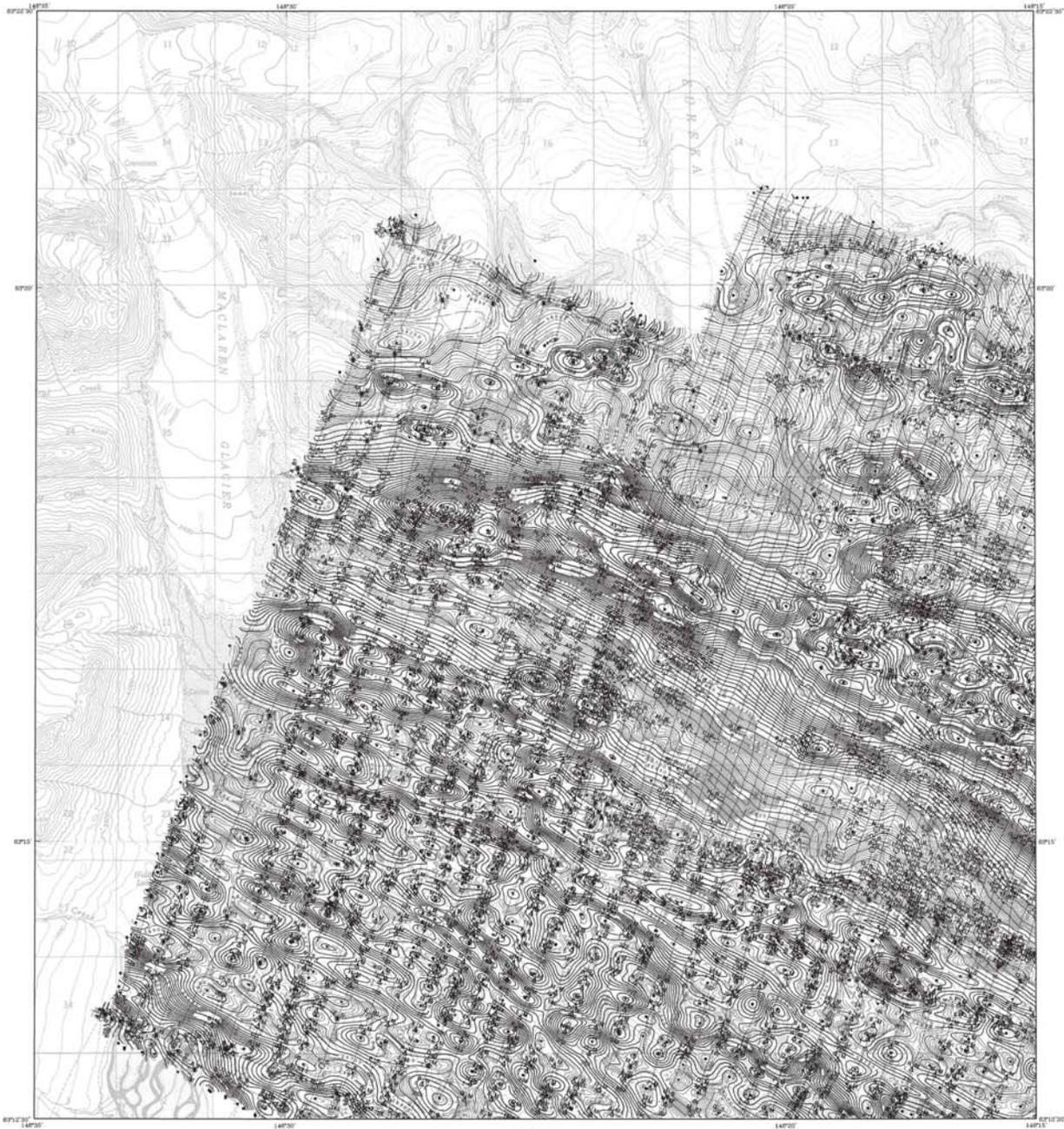
The total magnetic field data were acquired with a sampling interval of 0.1 seconds, and were (1) corrected for diurnal variations by subtraction of (2) regional magnetic field, (3) magnetic declination, and (4) magnetic declination. The regional magnetic field (RMF) was removed from the revised magnetic data.



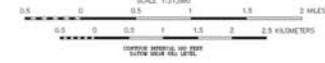
SURVEY HISTORY

This map has been compiled and drawn under contract between the State of Alaska, Department of Natural Resources, Bureau of Geological & Geophysical Surveys (BGG), and the Bureau of Land Management (BLM). The geophysical data for this current area were acquired and processed by Fugro Airborne Surveys in 2002. Additional geophysical data for the Colville, Delta, Fish Lake, Koyuk, and Tongue Lake areas were acquired in 1988 by the BLM and were previously used for a mineral assessment program in the Delta River mining district. Latest BLM use the correct nomenclature for DGS.

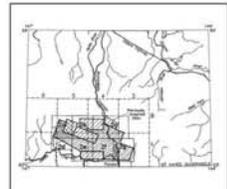
This map and other products from this survey are available by mail order or in person from DGS, 714 University Ave., Suite 205, Fairbanks, Alaska, 99701. Some products are also available in person only at the BLM's Alaska Mining Information Center, 150 Seward Street, Seward, Alaska, 99624.



Base Data U.S. Geological Survey 40, Maps A-4, B-5, A-6, B-6
S.T. 1962 S-4, 1972 Quadrangle, Sheet 1



LOCATION INDEX FOR SCALE 1:51,680



TOTAL MAGNETIC FIELD AND DETAILED ELECTROMAGNETIC ANOMALIES OF THE SOUTHERN DELTA RIVER AREA, EAST-CENTRAL ALASKA

PARTS OF MT. HAYES A-5, A-6, B-5 AND B-6 QUADRANGLES

2003

DESCRIPTIVE NOTES

The geophysical data were acquired with a GOMEM[®] Electromagnetic (EM) system and a Scripps cesium magnetometer. Both were flown at a height of 100 feet. In addition the survey recorded data from a radio altimeter, GPS navigation system, 500-foot magnetic and dip compass. Flights were performed with an A3550B-2 Sauer helicopter at a mean terrain elevation of 200 feet above 1420° North. Flight lines were spaced at a quarter of a mile. The lines were flown perpendicular to the flight lines at intervals of approximately 3 miles.

An Ashtech G24 NAVSTAR / GLOBALSTAR Global Positioning System was used for navigation. The helicopter position was derived every 0.5 seconds using postflight differential positioning to a relative accuracy of better than 5 m. Flight path positions were projected onto the GRS80 (UTM zone 6) spheroid, 1927 North American datum using a central meridian (CM) of 147° 00' 00" west of G and an east constant of 500,000. Positional accuracy of the presented data is better than 10 m with respect to the UTM grid.

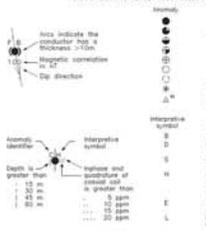
PREVIOUSLY SURVEYED AREAS

The previously acquired geophysical data were acquired with an aerial Corbin Electromagnetic (EM) system and a Scripps cesium magnetometer. The electromagnetic system utilized two vertical coil pairs at 830 Hz and 4.74 Hz and two horizontal coil pairs at 830 Hz, 4.185 Hz and 33,490 Hz. Mean terrain elevations for the magnetometer and EM system were higher than 150 and 100 feet, respectively. In addition the survey recorded data from a radio altimeter, GPS navigation system, 80 Hz monitor and video camera. The GPS electronic positioning system operated in differential mode. The flight line direction curves from track to track are followed (except for 1420° curves and Fish Lake 1420°E and 1420°W and Tongue Lake N-S), the flight lines were one-eighth mile apart. Elevation to lines were flown with the current survey which cover both the 1950 and 2002 survey areas. The older survey was flown with a A3530B2 helicopter.

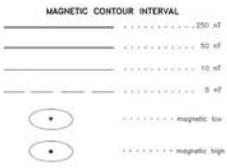
ELECTROMAGNETICS

To determine the location of EM anomalies at their boundaries the GOMEM EM system measured separate and quadrature components at five frequencies. Two vertical coil-pair pairs operated at 1000 and 2000 Hz while three horizontal coil-pair pairs operated at 300, 700, and 36,000 Hz. EM data were sampled at 0.1 second intervals. The EM system responds to bedrock conductors, conductive structures, and cultural structures. The type of conductor is indicated on the geophysical map by the intensity of the induced and secondary magnetic fields. The type of conductor is based on EM anomaly shapes of the induced- and secondary magnetic fields with conductor and magnetic patterns and topography. The more the anomaly and the right track view were examined to locate cultural sources.

ELECTROMAGNETIC ANOMALIES



●	>100 Siemens
●	50-100 Siemens
●	20-50 Siemens
●	10-20 Siemens
●	5-10 Siemens
●	1-5 Siemens
○	<1 Siemens
○	Quadrature anomaly
○	EM magnetic response



SURVEY HISTORY

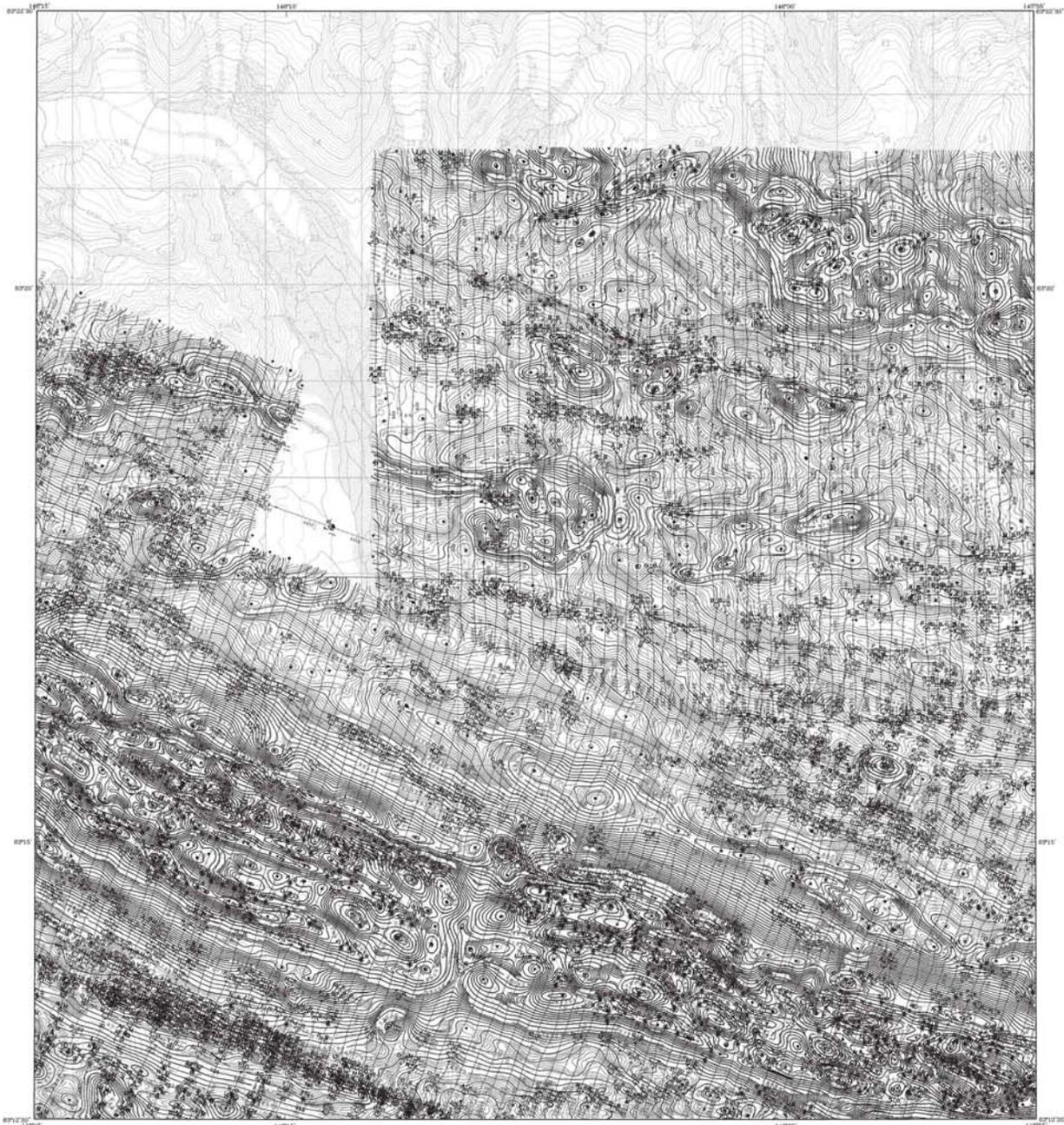
This map has been compiled and drawn under contract between the State of Alaska, Department of Natural Resources, Bureau of Geological & Geophysical Surveys (GGGS), and Geosens Exploration Management Corp. Airborne geophysical data for the current area were acquired and processed by Fugro Airborne Surveys in 2002. Airborne geophysical data for the Central, Exuma, Fish Lake, Rany and Tongue Lake areas were acquired in 1950 by an uncredited contractor and were provided for publication by the BLM. The current survey was funded by the U.S. Department of Interior, Bureau of Land Management (BLM) and conducted in support of its mineral assessment program in the Delta River mining district. Laurel Burns was the contract manager for GGGS.

This map and other products from this survey are available by web order or in person from GGGS, 714 University Ave., Suite 200, Fairbanks, Alaska, 99709. Some products are also available in person only at the BLM's Alaska Mineral Information Center, 100 Seaska Road, Douglas, Alaska, 99524.

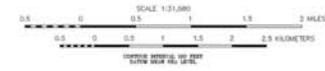
TOTAL MAGNETIC FIELD

The total magnetic field data were acquired with a sampling interval of 0.5 seconds. The data were (1) converted for datum operations by subtraction of the magnetic declination (magnetic declination), (2) leveled to the 56 sea level, and (3) interpolated onto a regular 100 m grid using a modified spline (1970) technique. The regional correction (or IGRF gradient, 2000) is based on August, 2002) was removed from the leveled magnetic data.

Hess, H., 1970. A new method of interpolation and smooth curve fitting based on the principle of least squares. *Journal of the Association of Computing Machinery*, v. 17, no. 4, p. 589-602.



Base Data US Geological Survey 48, Maps A-4, A-5, B-4, B-5
U.S. GPO: 1978 Quadrangle Series

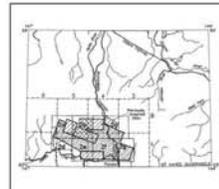


LOCATION INDEX FOR SCALE 1:51,680



TOTAL MAGNETIC FIELD AND DETAILED ELECTROMAGNETIC ANOMALIES OF THE SOUTHERN DELTA RIVER AREA, EAST-CENTRAL ALASKA

PARTS OF MT. HAYES A-4, A-5, B-4 AND B-5 QUADRANGLES
2003



DESCRIPTIVE NOTES

The geophysical data were acquired with a GOMHEM[®] Electromagnetic (EM) system and a Scripps cesium magnetometer. Both were flown at a height of 100 feet. In addition the survey recorded data from a radio altimeter, GPS navigation system, 500-foot retractor and line sensors. Flights were performed with an AC3082-2 Sycamore helicopter at mean terrain elevations of 200 feet above MSL. Survey flight lines were at spacing of a quarter of a mile. The lines were flown perpendicular to the flight lines at intervals of approximately 3 miles.

An AARtech GG24 NAVSTAR / GLOHASIS Global Positioning System was used for navigation. The helicopter position was derived every 0.5 seconds using postflight differential positioning to a relative accuracy of better than 5 m. Flight path positions were projected onto the GCSNAD 1983 (UTM zone 6) spheroid, 1927 North American datum using a central meridian (CM) of 147° 0 north, constant of 0 and an east constant of 500,000. Positional accuracy of the presented data is better than 10 m with respect to the UTM grid.

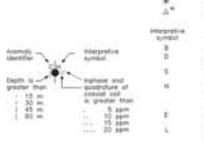
PREVIOUSLY SURVEYED AREAS

The previously acquired geophysical data were acquired with an aerial Corbis Electromagnetic (EM) system and a Scripps cesium magnetometer. The electromagnetic system utilized two vertical coil pairs at 450 Hz and 1470 Hz over three horizontal lines. The flight lines were at 4.188 Hz and 33,490 Hz. Mean terrain elevations for the magnetic lines were 100 feet, respectively. In addition the survey recorded data from a radio altimeter, GPS navigation system, 50 Hz monitor and video camera. The GPS electronic positioning system operated in differential mode. The flight line direction varied from track to track on following General 1427C, Curlew and Fish Lake 1207E, and Rainy and Tongue Lake 11-C. The flight lines were one-eighth mile apart. Elevation to lines were Rain with the current survey which cover both the 1995 and 2002 survey areas. The other survey was flown with a AC3082 helicopter.

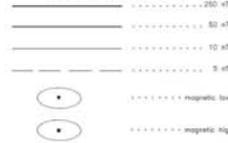
ELECTROMAGNETICS

To determine the location of EM anomalies of their positions, the GOMHEM EM system measured magnetic and quadrature components at five frequencies. Two vertical coil-pair pairs operated at 1000 and 2000 Hz above three horizontal coil-pair pairs operated at 300, 700, and 1470 Hz. EM data were sampled at 0.1 second intervals. The EM system responds to bedrock conductors, conductive sediments, and cultural sources. The type of conductor is indicated on the composite map by the intensity of the response and quadrature response. Together with conductor and magnetic patterns and topography, the more the north-south and the right track view were examined to locate cultural sources.

ELECTROMAGNETIC ANOMALIES



MAGNETIC CONTOUR INTERVAL



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 (DGGS), and Geosens Exploration Management Corp. Airborne geophysical data for the current area were acquired and processed by Fugro Airborne Surveys in 2002. Airborne geophysical data for the Corwell, Excess, Fish Lake, Rainy and Tongue Lake areas were acquired in 1995 by a private contractor and were provided for publication by the BLM. The current survey was funded by the U.S. Department of Interior, Bureau of Land Management (BLM) and conducted in support of its mineral assessment program in the Delta River mining district. Laurel Burns was the contract manager for DGGS.

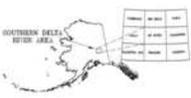
This map and other products from this survey are available by mail order or in person from DGGS, 714 University Ave., Suite 200, Fairbanks, Alaska, 99709. Some products are also available in person only at the BLM's Alaska Mineral Information Center, 100 Seaview Road, Douglas, Alaska, 99524.

TOTAL MAGNETIC FIELD
The total magnetic field data were acquired with a sampling interval of 0.1 second. The data were (1) converted for diurnal variations by subtraction of the diurnal rise (diurnal station), (2) leveled to the 56 line datum, and (3) interpolated onto a regular 100 m grid using the minimum variance (1975) technique. The regional correction (or IGRF gradient, 2000), updated to August, 2002) was removed from the leveled magnetic data.

Hess, H., 1970. A new method of interpretation and smooth curve fitting based on time progression theory of the generation of Crustal Features. p. 17. In: A. J. 589-602.



Base Map: U.S. Geological Survey, Mt. Hayes 1:50,000, 4-4, 4-5, 4-6.



ELECTROMAGNETICS

To determine the location of EM anomalies of their boundaries, the DIGHEM EM system measured magnetic and quadrature components of the frequency. Two vertical component pairs operated at 1000 and 2000 Hz and two horizontal component pairs operated at 500, 750 and 1000 Hz. EM data were corrected for diurnal magnetic variation, and cultural features. The type of conductor is indicated on the aeromagnetic map by the integrative number attached to each EM anomaly. Determination of the type of conductor is based on EM anomaly shapes of the conductors and topographic features. Together with structural and geologic features, the aeromagnetic map and topographic map are used to identify conductive features.

ELECTROMAGNETIC ANOMALIES

- 1000 anomaly
- 2000 anomaly
- 500 anomaly
- 750 anomaly
- 1000 anomaly
- 1500 anomaly
- 2000 anomaly
- 2500 anomaly
- 3000 anomaly
- 3500 anomaly
- 4000 anomaly
- 4500 anomaly
- 5000 anomaly
- 5500 anomaly
- 6000 anomaly
- 6500 anomaly
- 7000 anomaly
- 7500 anomaly
- 8000 anomaly
- 8500 anomaly
- 9000 anomaly
- 9500 anomaly
- 10000 anomaly

DESCRIPTIVE NOTES
The geophysical data were acquired with a DIGHEM[®] Electromagnetic (EM) system and a Scripps oceanographic magnetometer. Both were flown at a height of 100 feet. In addition the survey recorded data from a mobile altimeter, GPS magnetometer station, 500-foot and 100-foot barometers, and a 100-foot barometer. The data were corrected for diurnal magnetic variation, and cultural features. The type of conductor is indicated on the aeromagnetic map by the integrative number attached to each EM anomaly. Determination of the type of conductor is based on EM anomaly shapes of the conductors and topographic features. Together with structural and geologic features, the aeromagnetic map and topographic map are used to identify conductive features.

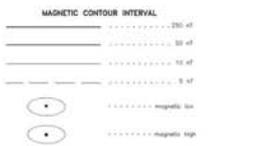
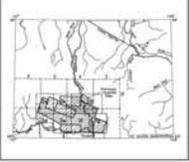
TOTAL MAGNETIC FIELD AND DETAILED ELECTROMAGNETIC ANOMALIES OF THE SOUTHERN DELTA RIVER AREA, EAST-CENTRAL ALASKA
PARTS OF MT. HAYES A-3, A-4, B-3 AND B-4 QUADRANGLES
2003



TOTAL MAGNETIC FIELD
The total magnetic field data were acquired with a Scripps oceanographic magnetometer. The data were corrected for diurnal magnetic variation, and cultural features. The type of conductor is indicated on the aeromagnetic map by the integrative number attached to each EM anomaly. Determination of the type of conductor is based on EM anomaly shapes of the conductors and topographic features. Together with structural and geologic features, the aeromagnetic map and topographic map are used to identify conductive features.



LOCATION INDEX FOR SCALE 1:51,680

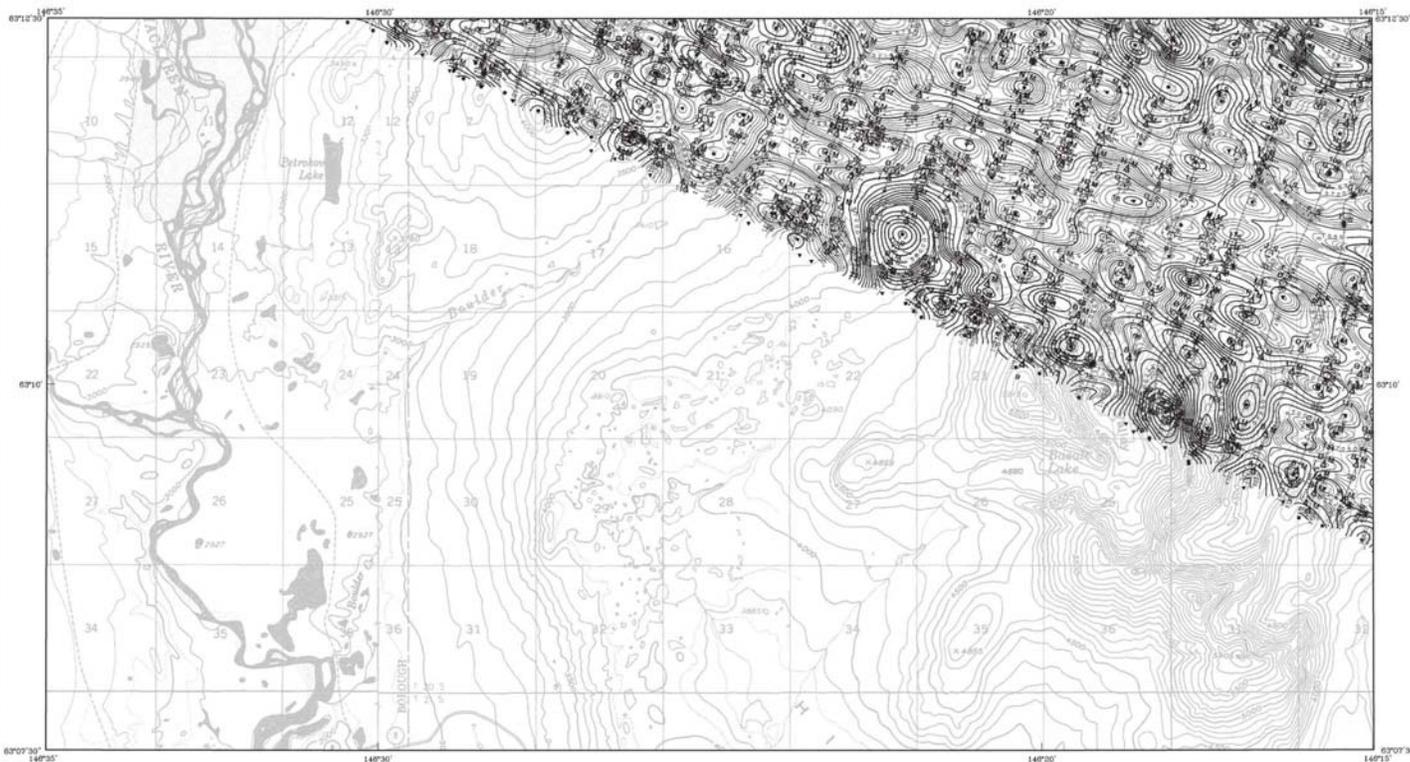


PREVIOUSLY SURVEYED AREAS

The previous magnetic field data were acquired with an Aeromagnetic Electromagnetic (EM) system and a Scripps oceanographic magnetometer. The EM system utilized two vertical component pairs at 1000 Hz and 2000 Hz and two horizontal component pairs at 500, 750 and 1000 Hz. The data were corrected for diurnal magnetic variation, and cultural features. The type of conductor is indicated on the aeromagnetic map by the integrative number attached to each EM anomaly. Determination of the type of conductor is based on EM anomaly shapes of the conductors and topographic features. Together with structural and geologic features, the aeromagnetic map and topographic map are used to identify conductive features.

SURVEY HISTORY

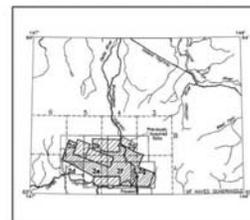
This map has been compiled and drawn under contract between the State of Alaska, Department of Natural Resources, Division of Geological & Geophysical Surveys (DGGG), and the Bureau of Land Management (BLM). The aeromagnetic data were acquired and processed by Targa Airborne Services, Inc. (Targa) in 1993. The data were corrected for diurnal magnetic variation, and cultural features. The type of conductor is indicated on the aeromagnetic map by the integrative number attached to each EM anomaly. Determination of the type of conductor is based on EM anomaly shapes of the conductors and topographic features. Together with structural and geologic features, the aeromagnetic map and topographic map are used to identify conductive features.



From U.S. Geological Survey W. Stone 4-6, 1978, 4-8, 1979, Washington, Alaska



LOCATION INDEX FOR SCALE 1:51,680



TOTAL MAGNETIC FIELD AND DETAILED ELECTROMAGNETIC ANOMALIES OF THE SOUTHERN DELTA RIVER AREA, EAST-CENTRAL ALASKA PARTS OF MT. HAYES A-5 AND A-6 QUADRANGLES 2003

DESCRIPTIVE NOTES

The geophysical data were acquired with a DIGHEM³ Electromagnetic (EM) system and a Scintrex cesium magnetometer. Both were flown at a height of 100 feet. In addition the survey recorded data from a radar altimeter, GPS navigation system, 50/60 Hz monitors and video camera. Flights were performed with an AS350B-2 Squirrel helicopter at a mean terrain clearance of 200 feet along N207E 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 3 miles.

An Aantech G224 NAVSTAR 7 GLONASS Global Positioning System was used for navigation. The helicopter position was derived every 0.5 seconds using post-flight differential positioning to a relative accuracy of better than 5 m. Flight path positions were projected onto the Clarke 1866 (UTM zone 6) spheroid, 1927 North American datum using a central meridian (CM) of 147°, a north constant of 0 and an east constant of 500,000. Positional accuracy of the presented data is better than 10 m with respect to the UTM grid.

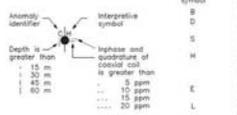
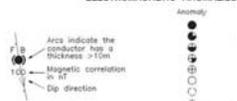
PREVIOUSLY SURVEYED AREAS

The previously acquired geophysical data were acquired with an Aerodot Condor Electromagnetic (EM) system and a Scintrex cesium magnetometer. The electromagnetic system utilized two vertical coaxial coil pairs of 936 Hz and 4.416 Hz and three horizontal coil pairs of 849 Hz, 4.189 Hz and 32,490 Hz. Mean terrain clearance for the magnetometer and EM system were slightly higher than 150 and 100 feet, respectively. In addition the survey recorded data from a radar altimeter, GPS navigation system, 60 Hz monitor and video camera. The GPS electronic positioning system operated in differential mode. The flight line direction comes from block to block as follows: Conwell N207E, Eureka and Fish Lake N207E, and Rainy and Tongue Lake N4-S. The flight lines were one-eighth mile apart. Extended tie lines were flown with the current survey which cover both the 1995 and 2002 survey areas. The older survey was flown with a AS350B2 helicopter.

ELECTROMAGNETICS

To determine the location of EM anomalies and their boundaries, the DIGHEM³ EM system measured phase and quadrature components of five frequencies. Two vertical coaxial-coil pairs operated at 1000 and 5500 Hz while three horizontal coaxial-coil pairs operated at 900, 7200, and 56,000 Hz. EM data were sampled at 0.1 second intervals. The EM system responds to bedrock conductors, conductive overburden, and cultural sources. The type of conductor is indicated on the aeromagnetic map by the interpretive symbol attached to each EM anomaly. Determination of the type of conductor is based on EM anomaly shapes of the coaxial- and coplanar-coil responses, together with conductor and magnetic patterns and topography. The power line monitor and the flight track video were examined to locate cultural sources.

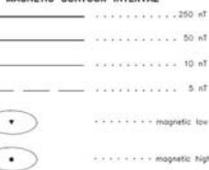
ELECTROMAGNETIC ANOMALIES



Anomaly	Conductance
●	>100 siemens
●	50-100 siemens
●	20-50 siemens
●	10-20 siemens
●	5-10 siemens
●	1-5 siemens
○	< 1 siemens
○	+ 1 siemens
○	Questionable anomaly
○	EM magnetic response

Interpretive symbol	Conductor ("mode")
B	Bedrock conductor ("thin sheet")
S	Narrow bedrock conductor ("thin sheet")
H	Broad conductive rock unit, deep conductive weathering, thick conductive cover ("coil space")
E	Edge of broad conductor ("edge of half space")
L	Culture, e.g., power line, metal building or fence

MAGNETIC CONTOUR INTERVAL



SURVEY HISTORY

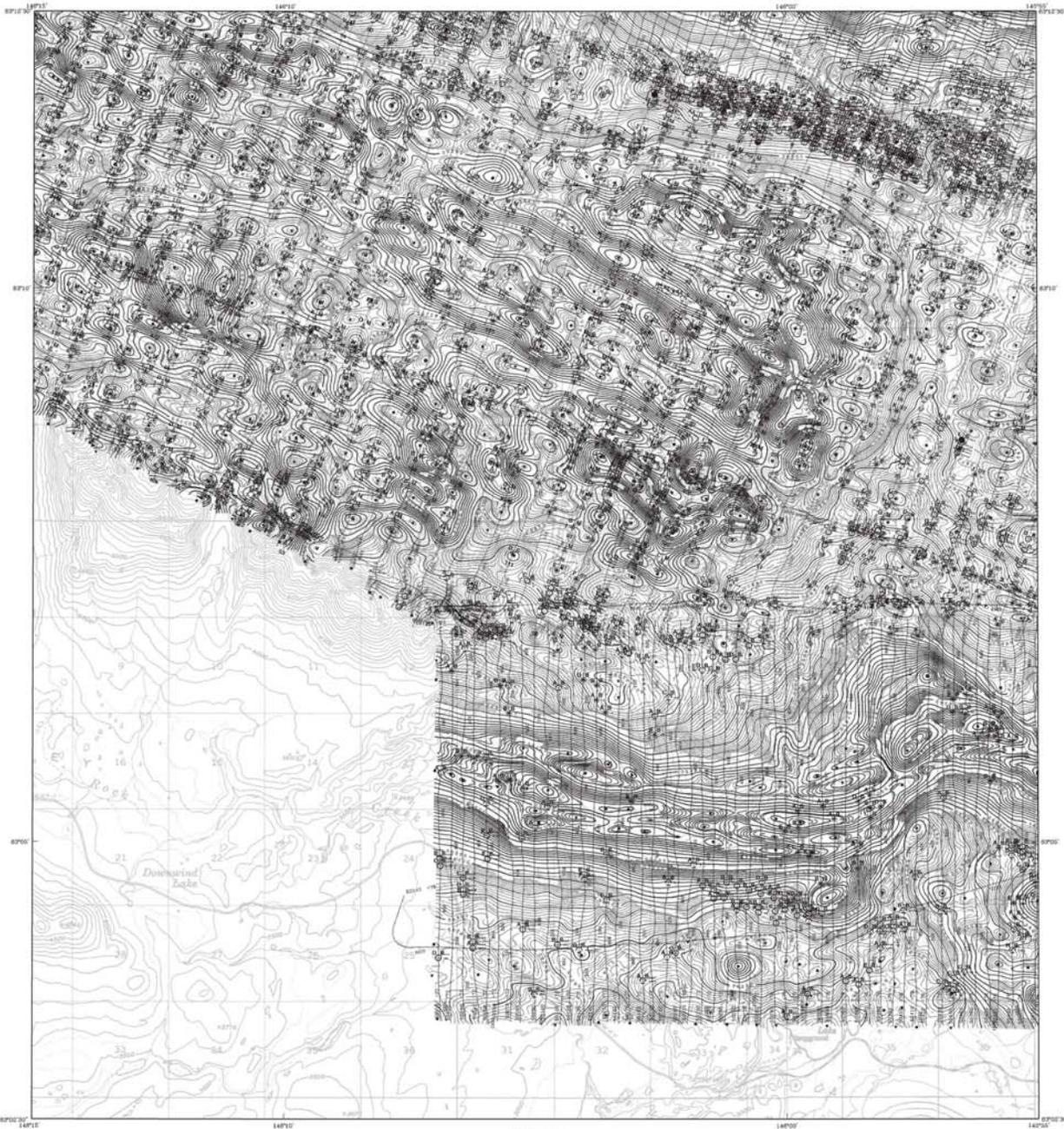
This map has been compiled and drawn under contract between the State of Alaska, Department of Natural Resources, Division of Geological & Geophysical Surveys (DGG), and Stevens Exploration Management Corp. Airborne geophysical data for the current area were acquired and processed by Fugro Airborne Surveys in 2002. Airborne geophysical data for the Conwell, Eureka, Fish Lake, Rainy and Tongue Lake areas were acquired in 1995 by Aerodot Inc. and were provided for publication by the BLM. The current survey was funded by the U. S. Department of Interior, Bureau of Land Management (BLM) and conducted in support of its mineral assessment program in the Delta River mining district. Laurel Burns was the contract manager for DGG.

This map and other products from this survey are available by mail order or in person from DGG, 734 University Ave., Suite 200, Fairbanks, Alaska, 99709. Some products are also available in person only at the BLM's Juneau Mineral Information Center, 100 Svalikko Road, Douglas, Alaska, 99824.

TOTAL MAGNETIC FIELD

The total magnetic field 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 tie line data, and (3) interpolated onto a regular 100 m grid using a modified Simpson (1970) technique. The regional variation (or IGRF gradient, 2000, updated to August, 2002) was removed from the leveled magnetic data.

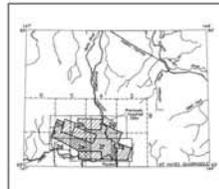
ALASKA, H. 1970. A new method of interpolation and smooth curve fitting based on least squares. *Journal of the Association of Computing Machinery*, v. 17, no. 4, p. 589-602.



From U.S. Geological Survey 60, Sheet A-4, 1950, and 60, Sheet A-5, 1950, Southgate, Alaska.



LOCATION INDEX FOR SCALE 1:31,880



TOTAL MAGNETIC FIELD AND DETAILED ELECTROMAGNETIC ANOMALIES OF THE SOUTHERN DELTA RIVER AREA, EAST-CENTRAL ALASKA

PARTS OF MT. HAYES A-4 AND A-5 QUADRANGLES
2003



DESCRIPTIVE NOTES

The geophysical data were acquired with a DIOHEM[®] Electromagnetic (EM) system and a Schriev cesium magnetometer. Both were flown at a height of 100 feet. In addition the survey recorded data from a rotor antenna, GPS navigation system, 50/70 Hz bandpass and noise canceler. Flights were performed with an AC350B-2 Sikorski helicopter at a mean flight altitude of 200 feet using a mean flight line with a spacing of a quarter of a mile. The lines are flown perpendicular to the flight lines at intervals of approximately 3 miles. An ashtech G24 NADSTAR / OLIVETTI Global Positioning System was used for navigation. The helicopter position was derived every 0.5 seconds using post-flight differential positioning to a relative accuracy of better than 3 m. Flight path positions were projected onto the Clarke 1866 (UTM zone 6) spheroid, 1927 North American datum using a control projection (CA) of 147.0 north constant of 0 and an east constant of 500,000. Positional accuracy of the presented data is better than 10 m with respect to the UTM grid.

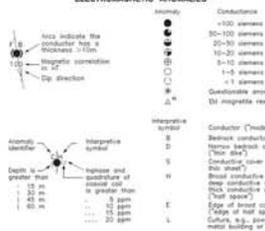
PREVIOUSLY SURVEYED AREAS

The previously acquired geophysical data were acquired with an Aerovis Gamma Electromagnetic (EM) system and a Schriev cesium magnetometer. The electromagnetic system utilized four vertical coil pairs at 840 Hz and 4,470 Hz and one horizontal coil pair at 840 Hz, 4,188 Hz and 32,490 Hz. Line terms elements of the magnetometer EM system were slightly larger than 100 and 100 feet, respectively. In addition the survey recorded data from a rotor antenna, GPS navigation system, 80 Hz monitor and noise canceler. The GPS navigation system operated in differential mode. The flight line direction varies from track to track on follow course 1527E, Kuruk and Fish Lake N207E and Rainy and Tangle Lake N1-S. The flight lines were one-way and Tangle Lake N1-S. The flight lines were the current survey which cover both the 1950 and 2003 survey areas. The older survey was flown with a 4233B2 Helicopter.

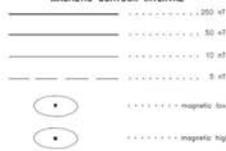
ELECTROMAGNETICS

To determine the location of EM anomalies or their boundaries, the DIOHEM EM system measured phase and quadrature components of five frequencies. Two vertical coil-coil pairs operated at 1000 and 5000 Hz while three horizontal coil-coil pairs operated at 300, 700, and 50,000 Hz. EM data were collected at 0.1 second intervals. The EM system responds to bedrock conductors, conductor anomalies, and cultural sources. The type of conductor is indicated on the descriptive map by the impedance value attached to each EM anomaly. The impedance on the type of conductor is based on EM anomalies of the resistive and resistive coil responses, together with conductor and magnetic patterns and topography. The lower the impedance and the higher the values were estimated to locate cultural sources.

ELECTROMAGNETIC ANOMALIES



MAGNETIC CONTOUR INTERVAL



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 (DGGG), and Stevens Exploration Management Corporation geophysical data for the current area were acquired and processed by Tugis Alaska Surveys in 2002. Airborne geophysical data for the Curlew, Kuruk, Fish Lake, Rainy and Tangle Lake areas were acquired in 1950 by aerobatics and were provided for publication by the BLM. The current survey was funded by the U. S. Department of Interior, Bureau of Land Management (BLM) and conducted in support of the mineral assessment program in the Delta River mining district. Laura Burns was the contract manager for DGGG.

This map and other products from this survey are available to all order or in person from DGGG, 7th University Ave., Suite 200, Fairbanks, Alaska, 99709. Some products are also available in person only at the BLM's Alaska Minerals Information Center, 100 Sakaluk Road, Douglas, Alaska, 99824.

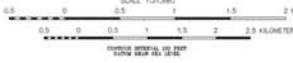
TOTAL MAGNETIC FIELD

The total magnetic field data were acquired with an aerobatics system of 0.1 second pulse wave (1) corrected for diurnal variations by subtraction of the diurnal variation from the total field, (2) leveled to the sea datum, and (3) interpolated with a minimum 100 m grid using the minimum (1970) technique. The regional variation (or IGRF gradient, 2000) adjusted in August 2002) was removed from the leveled magnetic data.

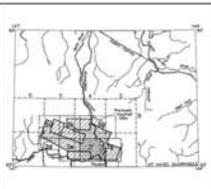
Heise, H., 1970. A new method of interpretation and smooth curve fitting based on time-averaged curves of the phenomenon of Conducting Waterline. p. 17. In: K. A. 88-89-90.



From U.S. Geological Survey 60, Sheet A-4, 1961, Geologic Atlas



LOCATION INDEX FOR SCALE 1:31,680



TOTAL MAGNETIC FIELD AND DETAILED ELECTROMAGNETIC ANOMALIES OF THE SOUTHERN DELTA RIVER AREA, EAST-CENTRAL ALASKA

PART OF MT. HAYES A-4 QUADRANGLE
2003

DESCRIPTIVE NOTES

The geophysical data were acquired with a DIOHEM[®] Electromagnetic (EM) system and a Schriev calcium magnetometer. Both were flown at a height of 100 feet. In addition the survey recorded data from a color altimeter, GPS navigation system, 500/60 Hz monitors and odometer. Flights were performed with an AC308B-2 Sikorski helicopter at a mean terrain clearance of 200 feet above treetops. The flight lines with a spacing of 0.25 miles and a flight line interval of approximately 3 miles.

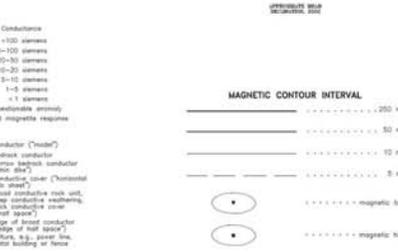
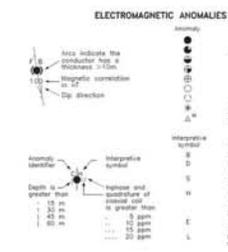
An Ashtech G24 HAKSTAR / OLIVETTI Global Positioning System was used for navigation. The helicopter position was derived every 0.5 seconds using post-flight differential positioning to a relative accuracy of better than 3 m. Flight path positions were projected onto the Clarke 1860 (UTM zone 6) spheroid, 1927 North American datum using a control elevation (CA) of 147.0 m north constant of 0 and an east constant of 500,000. Positional accuracy of the oriented data is better than 10 m with respect to the UTM grid.

PREVIOUSLY SURVEYED AREAS

The previously acquired geophysical data were acquired with an Aerovis Gamma Electromagnetic (EM) system and a Schriev calcium magnetometer. The aerovis 300 Hz and 4.475 Hz and one horizontal coil pair at 840 Hz, 4.188 Hz and 32,490 Hz. Mean terrain clearance for the aerovis EM system was approximately 100 to 150 feet, respectively. In addition the survey recorded data from a color altimeter, GPS navigation system, 80 Hz monitor and video camera. The GPS electronic positioning system operated in differential mode. The flight line direction varies from track to track on tracks Gamma 1577, Gamma and Fish Lake N207E and Rainy and Tangle Lake N-S. The flight lines were one-eighth mile apart. Extended to lines were flown with the current survey which cover both the 1950 and 2002 survey areas. The older survey was flown with a C-47D2 helicopter.

ELECTROMAGNETICS

To determine the location of EM anomalies or their boundaries, the DIOHEM EM system measured phase and quadrature components of five frequencies. Two vertical coil-coil pairs operated at 1000 and 2000 Hz while three horizontal coil-coil pairs operated at 300, 700, and 50,000 Hz. EM data were oriented at 0.1 degree intervals. The EM system responds to bedrock conductors, conductive anomalies, and cultural structures. The type of conductor is indicated on the geophysical map by the response curves attached to each EM anomaly. These curves are based on the type of conductor based on EM response of the receiver and transmitter coil responses, together with conductor and magnetic patterns and frequency. The power the receiver and the flight track lines were examined to locate cultural sources.



SURVEY HISTORY

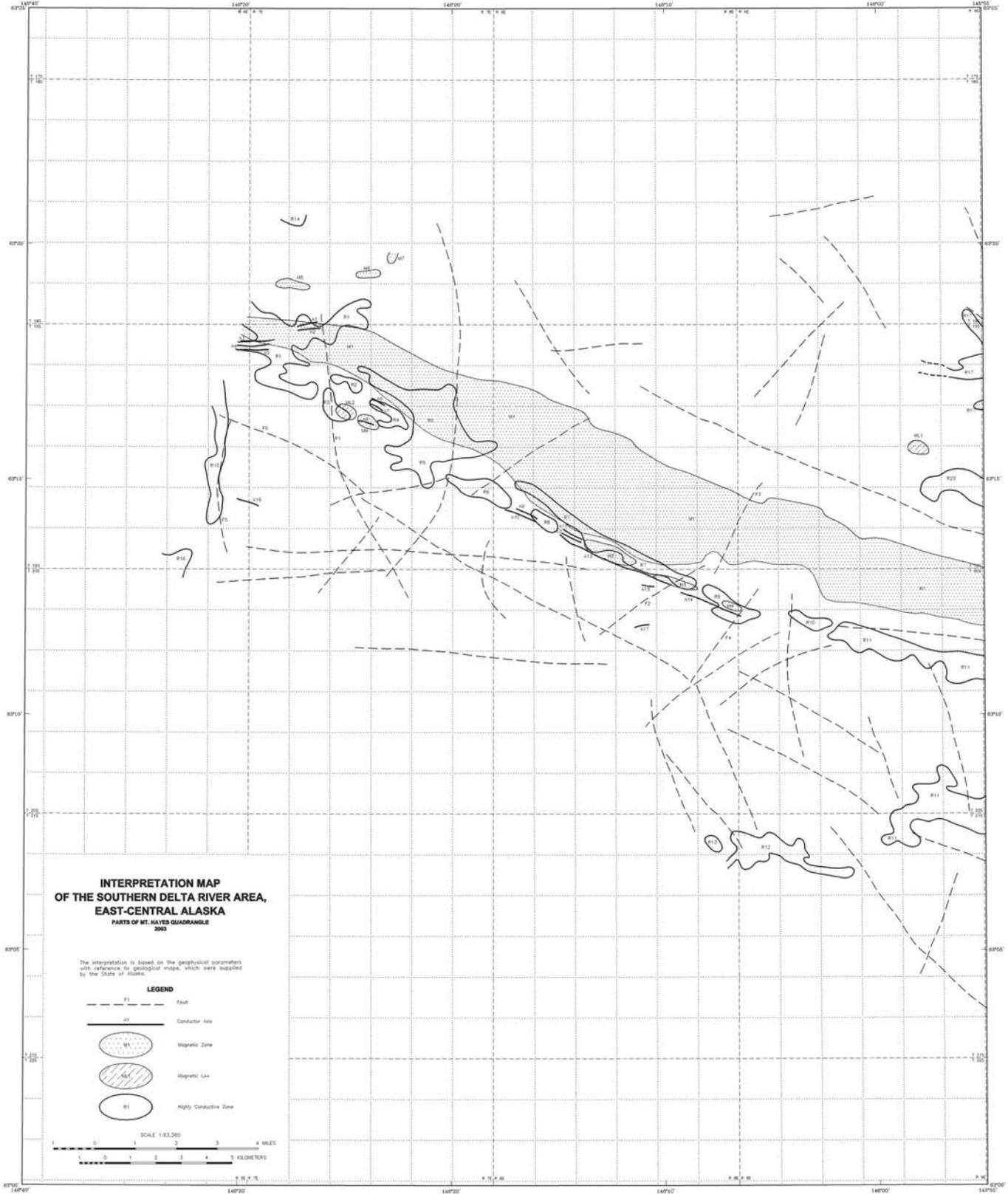
This map has been compiled and drawn under contract between the State of Alaska, Department of Natural Resources, Division of Geological & Geophysical Surveys (DGGGS), and Stevens Exploration Management Corporation geophysical data for the current area were acquired and processed by Tugot Airborne Surveys in 2002. Airborne geophysical data for the Corvax, Kuskokwim, Fish Lake, Rainy and Tangle Lake areas were acquired in 1950 by Aerovis, Inc. and were processed for publication by the BLM. The current survey was funded by the U.S. Department of Interior, Bureau of Land Management (BLM) and conducted in support of its mineral assessment program in the Delta River mining district. Laurel Burns was the contract manager for DGGGS.

This map and other products from this survey are available to all users at no charge from DGGGS, The University, Suite 200, Fairbanks, Alaska, 99703. Some products are also available in paper only at the BLM's Alaska Mineral Information Center, 100 Seward Road, Douglas, Alaska, 99824.

TOTAL MAGNETIC FIELD

The total magnetic field data were acquired with an aerovis EM system and a Schriev calcium magnetometer. The data were processed by subtraction of the magnetic response of the receiver and transmitter coils (2) derived to the use data, and (3) interpolated onto a regular grid using the 1970 technique. The regional variation (or IGRF gradient, 2000) was used to adjust (2002) was removed from the 'raw' magnetic data.

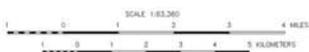
Alaska, 1970. A new method of interpretation and smooth curve fitting based on total magnetic intensity of the Department of Geological Engineering, U.S. G.S. 948-802.



**INTERPRETATION MAP
 OF THE SOUTHERN DELTA RIVER AREA,
 EAST-CENTRAL ALASKA**
 PARTS OF MT. HAYES QUADRANGLE
 2003

The interpretation is based on the geophysical parameters with reference to geological maps, which were supplied by the State of Alaska.

- LEGEND**
- F1 Fault
 - A1 Conductor Axis
 - M1 Magnetic Zone
 - L1 Magnetic Line
 - H1 Highly Conductive Zone

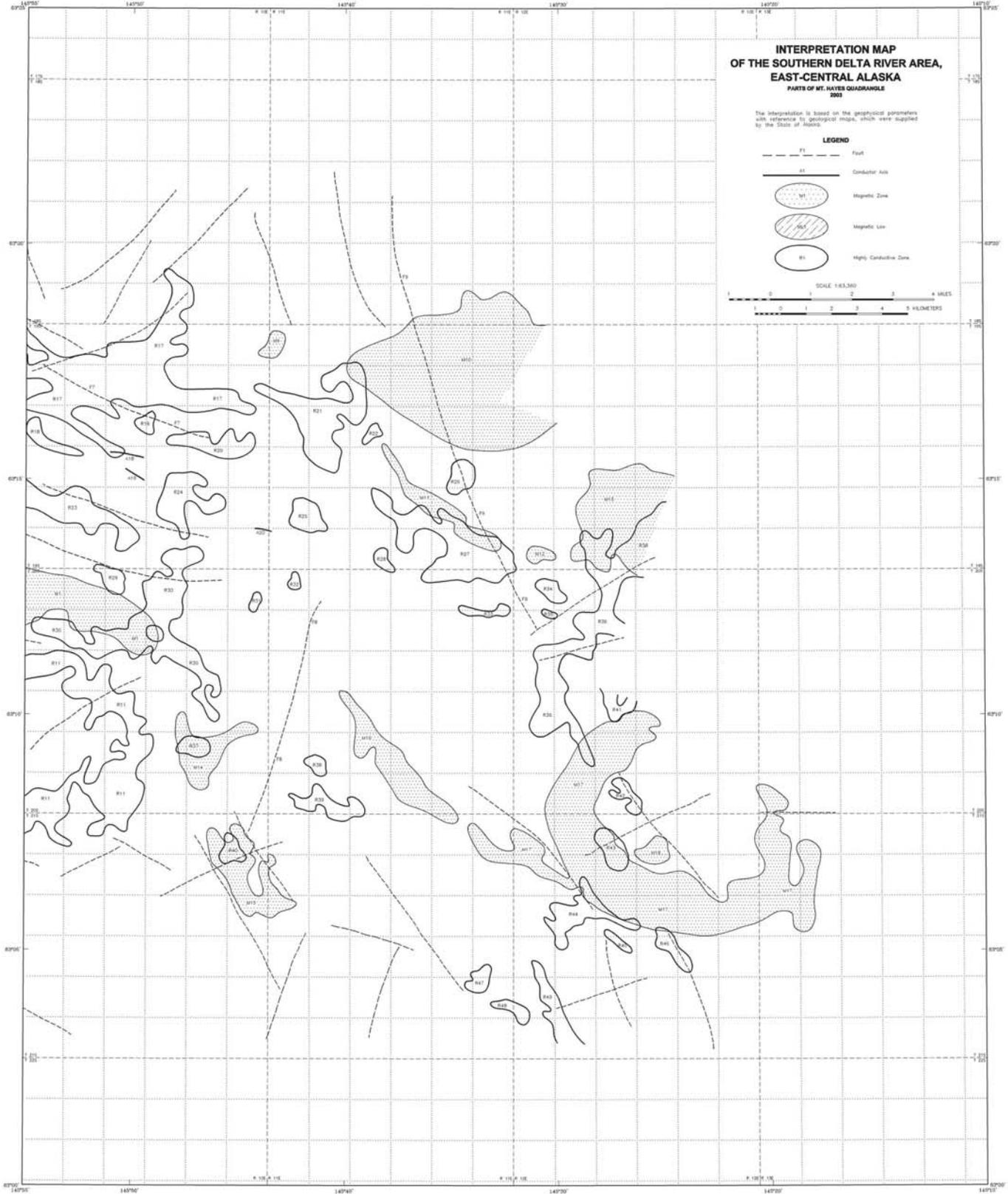


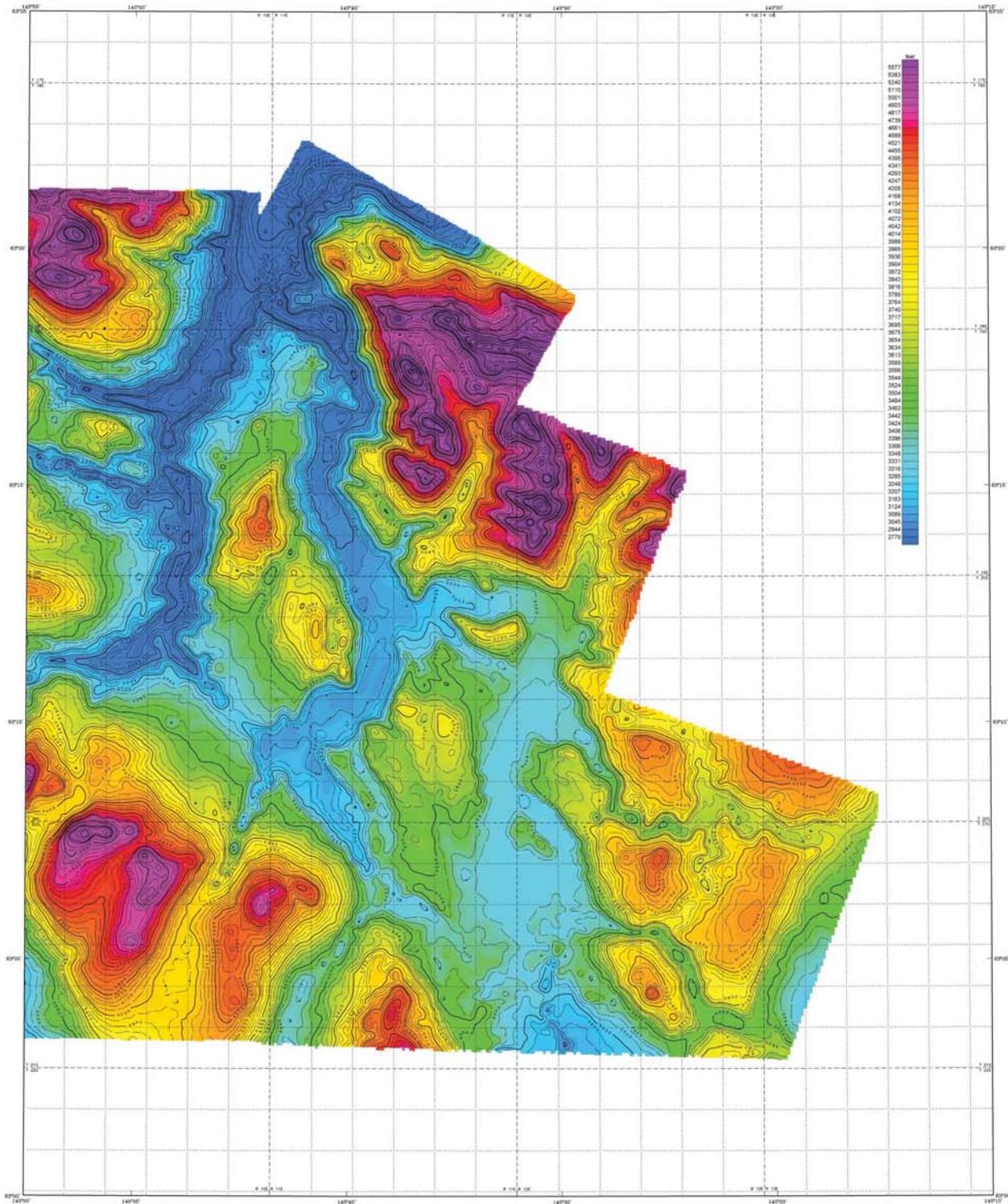
INTERPRETATION MAP
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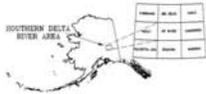
LEGEND

- F1 Fault
- CL Conductive Axis
- M1 Magnetic Zone
- M2 Magnetic Low
- H1 High Conductive Zone

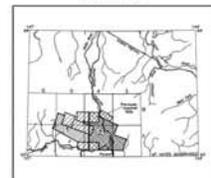




Scale within Area U.S. Geological Survey 60, Sheet 4-1, 600, 4-1, 600
Fig. 1461, 6-1, 600, 600, 600, 600



LOCATION INDEX



DIGITAL ELEVATION MODEL OF THE SOUTHERN DELTA RIVER AREA, EAST-CENTRAL ALASKA

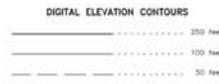
PARTS OF MT. HAYES QUADRANGLE
2003

DESCRIPTIVE NOTES
The geophysical data were acquired with a DIMEH1 Electromagnetic (EM) system and a Solitare dual-magnetometer. Data were flown at a height of 100 feet. In addition, the survey recorded data from a radar altimeter, GPS navigation system, SSI/60 Hz monitors and video camera. Flights were performed with an AS350B-2 Squirrel helicopter at a mean terrain clearance of 200 feet above H20E 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 3 miles. An Garmin G224 NAVSTAR/GLONAVIS Global Positioning System was used for navigation. The helicopter position was derived every 0.5 seconds using post-flight differential positioning to a relative accuracy of better than 5 m. Flight path positions were projected onto the Clarke 1866 (UTM zone 18) datum, 1927 North American datum using a central meridian (CM) of 143° 30' north-south, a scale factor of 0.999 963 3, and an east constant of 500,000. Relative accuracy of the generated data is better than 10 m with respect to the UTM grid.

PREVIOUSLY SURVEYED AREAS
The previously acquired geophysical data were acquired with a Solitare dual-magnetometer. The electromagnetic system used was a Solitare dual-magnetometer. Data were flown at a height of 100 feet. In addition, the survey recorded data from a radar altimeter, GPS navigation system, SSI/60 Hz monitors and video camera. Flights were performed with an AS350B-2 Squirrel helicopter at a mean terrain clearance of 200 feet above H20E 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 3 miles. An Garmin G224 NAVSTAR/GLONAVIS Global Positioning System was used for navigation. The helicopter position was derived every 0.5 seconds using post-flight differential positioning to a relative accuracy of better than 5 m. Flight path positions were projected onto the Clarke 1866 (UTM zone 18) datum, 1927 North American datum using a central meridian (CM) of 143° 30' north-south, a scale factor of 0.999 963 3, and an east constant of 500,000. Relative accuracy of the generated data is better than 10 m with respect to the UTM grid.

DIGITAL ELEVATION MODEL
This Digital Elevation Model (DEM) has been compiled from GPS-C values using the aircraft altimeter data recorded during the course of a helicopter-borne geophysical survey. This is a contour map of a quarter of a mile, smooth 20 degree. Elevation values have been interpolated/gridded between survey lines. Every effort has been made to make the model a useful general reference. No guarantee can be made that this model is a true representation of the rugged above and level and it may contain minor elevation responses from buildings and in some instances dense timber. Users of the product should be aware of the topographic limitations mapped hereafter.

DO NOT USE THIS MAP FOR NAVIGATION PURPOSES



SURVEY HISTORY
This map has been compiled and drawn under contract between the State of Alaska, Department of Natural Resources, Bureau of Geological & Geophysical Surveys (BGG), and Shreve Exploration Management Corporation. Geophysical data for this area were acquired and processed by Fargo Airborne Services in 2002. Airborne geophysical data for the Colville, Kupuk, Fish Lake, Kulu, and Tongue Lake areas were acquired in 1992 for the project and were processed by the U.S. Department of Interior, Bureau of Land Management (BLM) and conducted in support of its mineral assessment program in the Delta River mining district. Laine Barnes was the contract manager for BGG.

This map and other products from this survey are available by mail order or in person from DGG, 734 University Ave., Suite 203, Fairbanks, Alaska, 99709. Some products are also available in person only at the BLM's Bureau Mineral Information Center, 100 Seward Road, Douglas, Alaska, 99624.