WESTERN FORTYMILE ELECTROMAGNETIC AND MAGNETIC AIRBORNE GEOPHYSICAL SURVEY DATA COMPILATION

Burns, L.E., Barefoot, J.D., Graham, G.R.C., Fugro Airborne Surveys Corp., and Stevens Exploration Management Corp.

Geophysical Report 2019-7

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DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS

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WESTERN FORTYMILE ELECTROMAGNETIC AND MAGNETIC AIRBORNE GEOPHYSICAL SURVEY DATA COMPILATION

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ABSTRACT

This geophysical survey is located in eastern Alaska in the Fortymile mining district, about 225 kilometers east of Fairbanks, Alaska. Frequency domain electromagnetic and magnetic data were collected with the DIGHEMV system in September 2007. A total of 1825.9 line kilometers were collected covering 646.3 square kilometers. Line spacing was 400 meters (m). Data were collected 30 m above the ground surface from a helicopter towed sensor platform ("bird") on a 30 m long line.

PURPOSE

This airborne geophysical survey is part of a program to acquire data on Alaska's most promising mineral belts and districts. The information acquired is aimed at catalyzing new private sector exploration, discovery, and ultimate development and production. The purpose of the survey was to map the magnetic and conductive properties of the survey area. Mineralization prospects in the district include the LWM, Fish, Eva, and Drumstick silver-lead-zinc-copper prospects. Other gold and base-metal anomalies, altered zones, favorable lithologies, and structural zones are known to exist throughout the survey area.

SURVEY OVERVIEW DESCRIPTION

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

ACKNOWLEDGMENTS

Funding was provided by the U.S. Bureau of Land Management (BLM).

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[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	Printable maps in pdf format
maps_prn_format	contractor	Printable maps in HPGL/G 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
video_flightpath	contractor	Survey flight path downward facing video

REFERENCES

Akima, H., 1970, A new method of interpolation and smooth curve fitting based on local procedures: Journal of the Association of Computing Machinery, v. 17, n. 4, p. 589–602.

Burns, L.E., U.S. Bureau of Land Management, Fugro Airborne Surveys Corp., and Stevens Exploration Management Corp., 2008, Line, grid, and vector data, plot files, and descriptive project report for the airborne geophysical survey of part of the western Fortymile mining district, east-central Alaska: Alaska Division of Geological & Geophysical Surveys Geophysical Report 2008-1, 9 sheets, 1 DVD. http://doi.org/10.14509/15961

Pritchard, R.A., and Fugro Airborne Surveys, 2008, Project report of the airborne geophysical survey of part of the western Fortymile mining district, east-central Alaska: Alaska Division of Geological & Geophysical Surveys Geophysical Report 2008-1-5, 60 p. http://doi.org/10.14509/24444

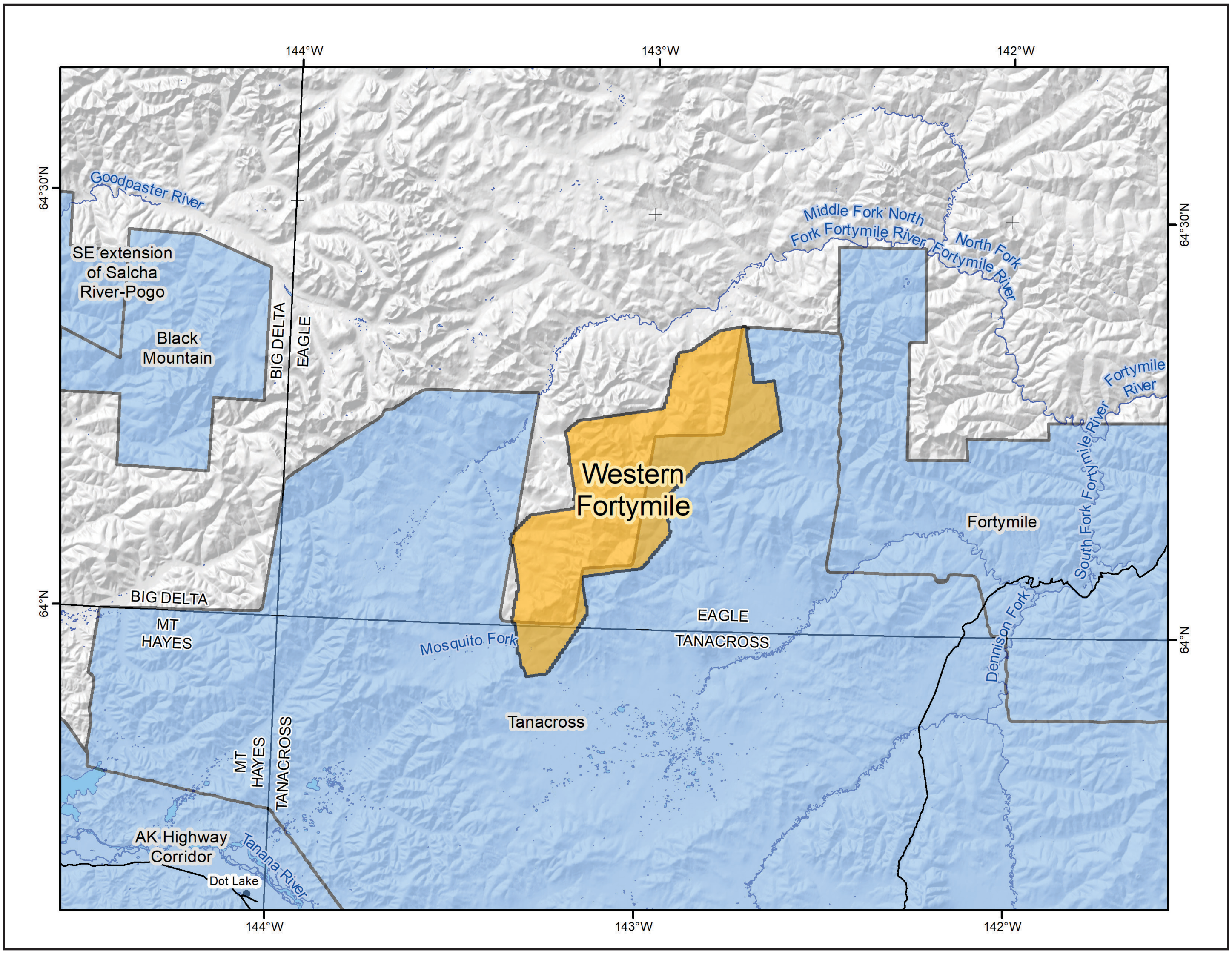
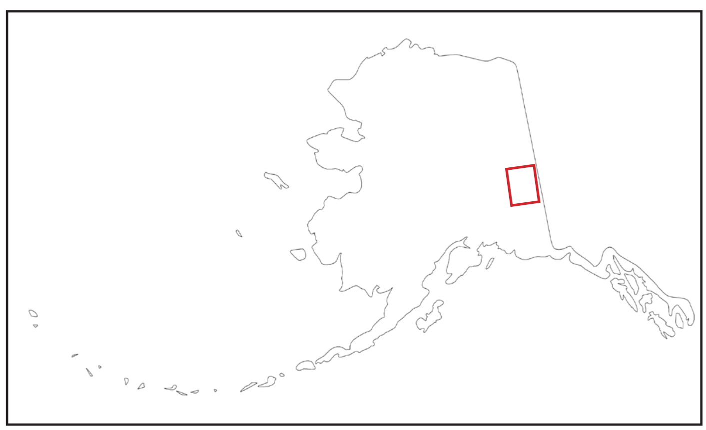


Figure 1. Western Fortymile electromagnetic and magnetic airborne geophysical survey location shown in eastern Alaska (right). Western Fortymile survey area shown with adjacent DGGS geophysical surveys, landmarks, relevant 1:250,000-scale quadrangle boundaries, mountain ranges, rivers, glaciers, and elevation hillshade.



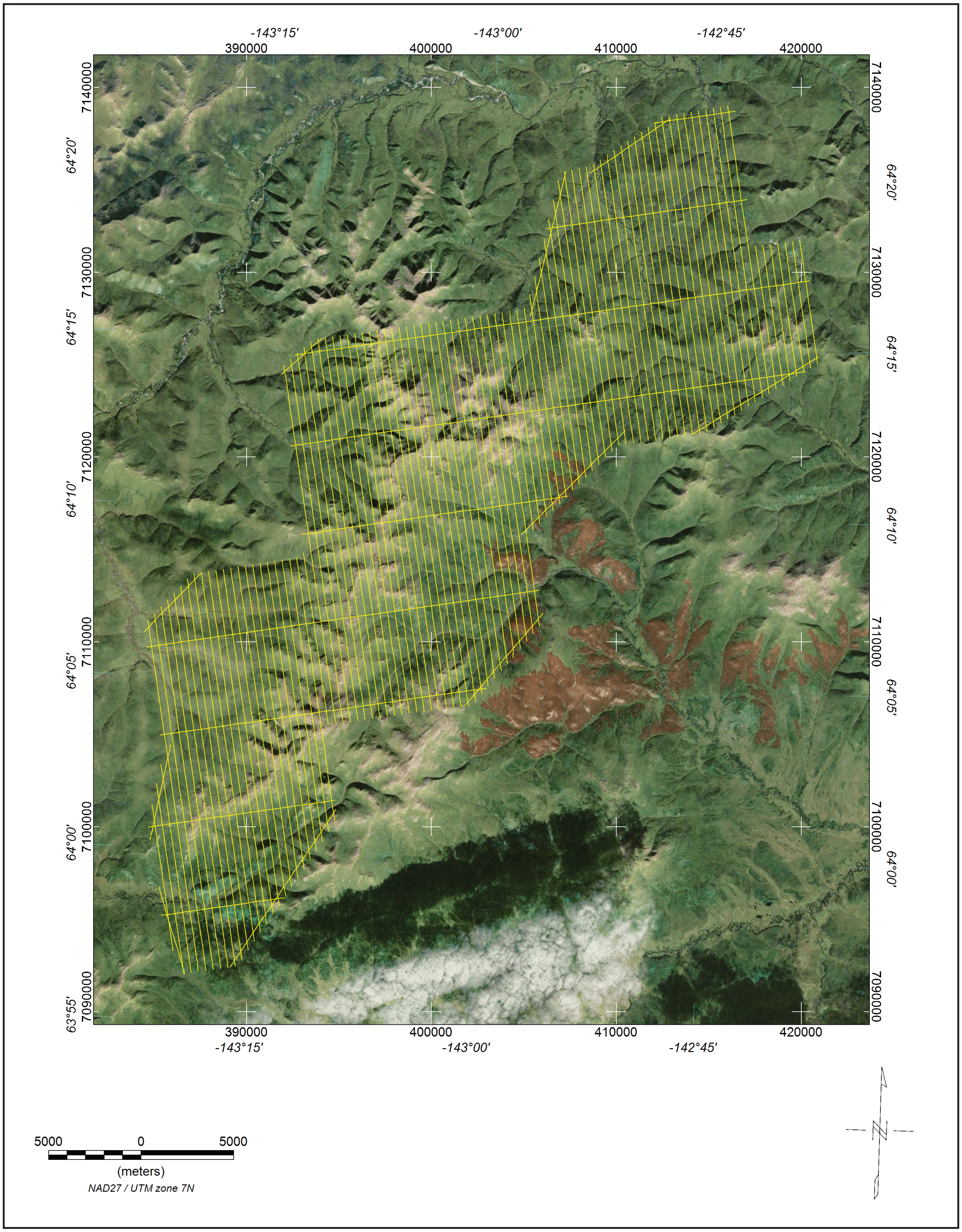


Figure 2. Flight path with orthometric image.

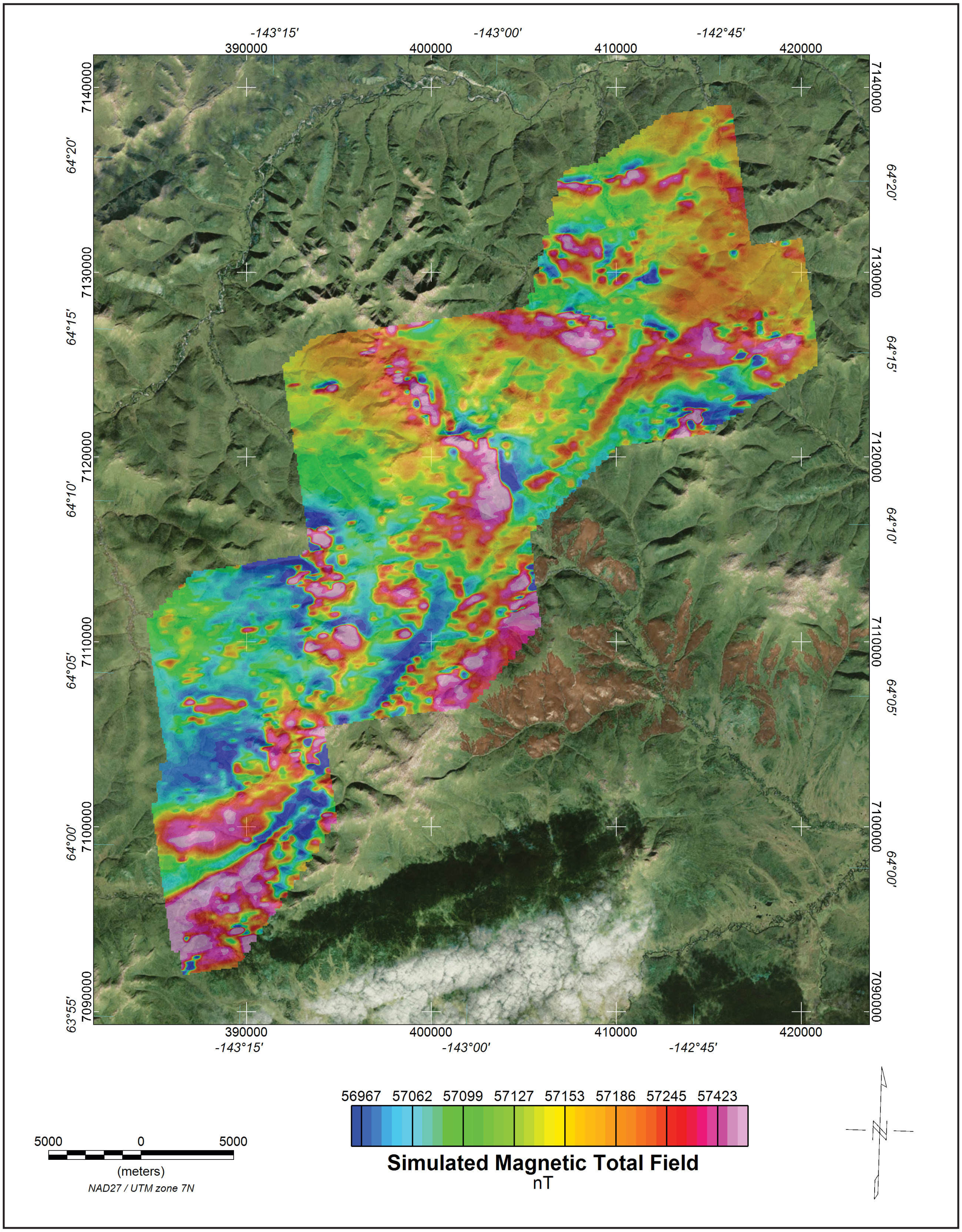


Figure 3. The simulated magnetic total field data were created using digitally recorded data from a Fugro D1344 cesium magnetometer with a Scintrex CS3 sensor. Data were collected at a sampling interval of 0.1 seconds. The magnetic data were (1) corrected for diurnal variations by subtracting the digitally recorded base station magnetic data, (2) IGRF corrected (IGRF model 2005, updated to August 2007), updated for date of flight and altimeter variations), (3) leveled to the tie line data, (4) a constant value of approximately 55,000 nT was added to all data, and (5) interpolated onto a regular 80 m grid using a modified Akima (1970) technique.

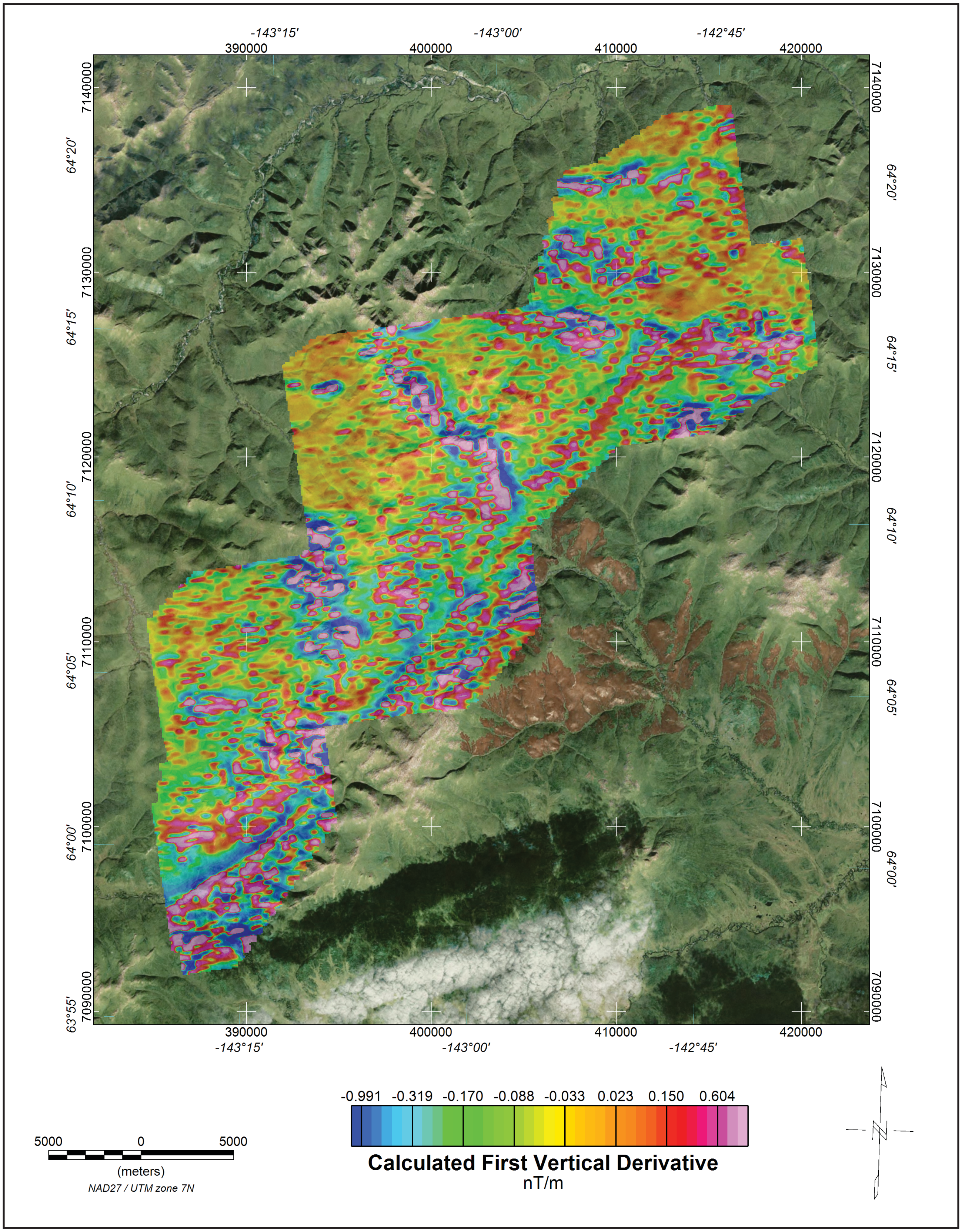


Figure 4. The first vertical derivative grid was calculated from the processed total magnetic field grid using a FFT base frequency domain filtering algorithm. The resulting first vertical derivative grid provides better definition and resolution of near- surface magnetic units and helps to identify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

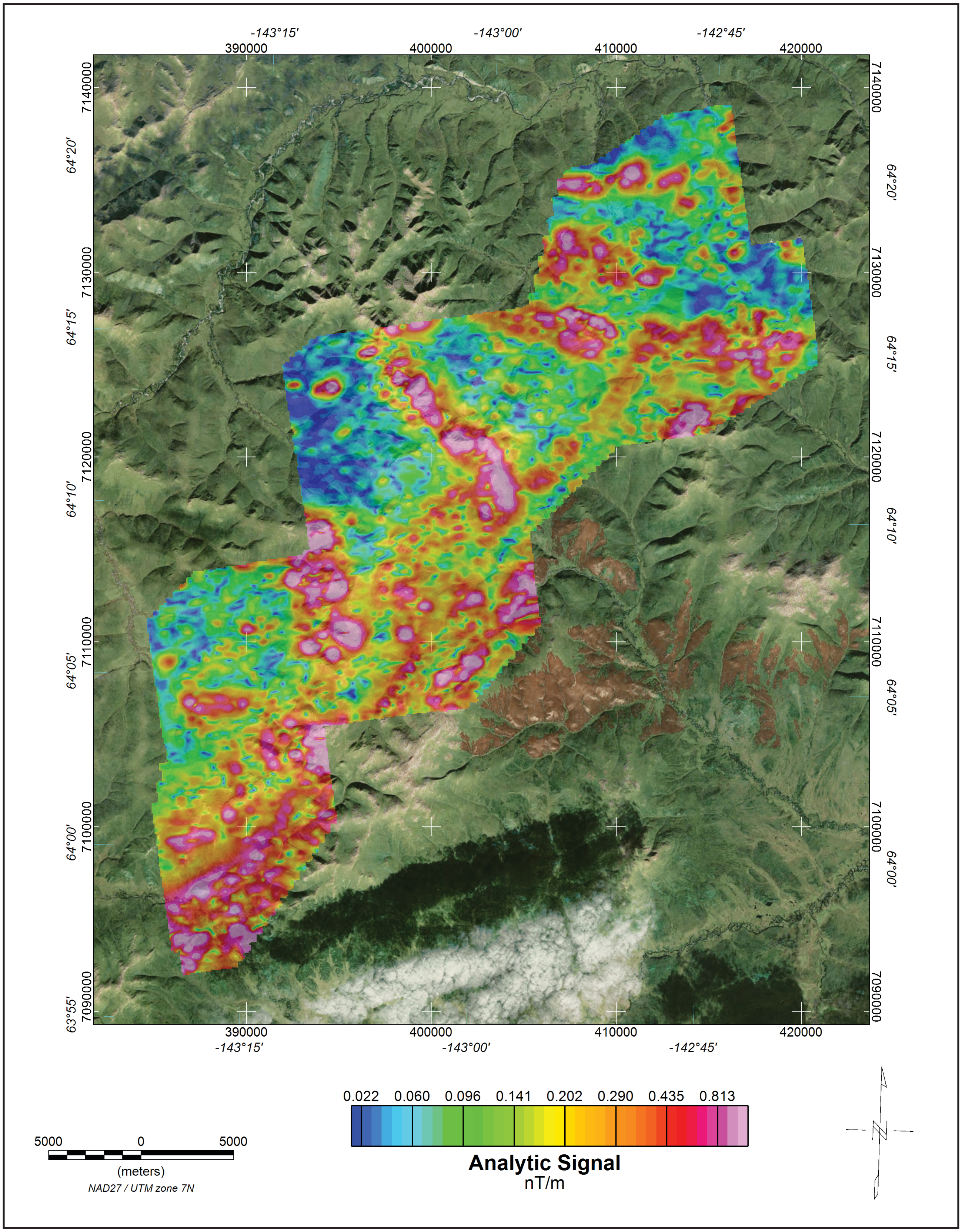


Figure 5. Analytic signal is the total amplitude of all directions of magnetic gradient calculated from the sum of the squares of the three orthogonal gradients. Mapped highs in the calculated analytic signal of magnetic parameter locate the anomalous source body edges and corners (such as contacts, 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.

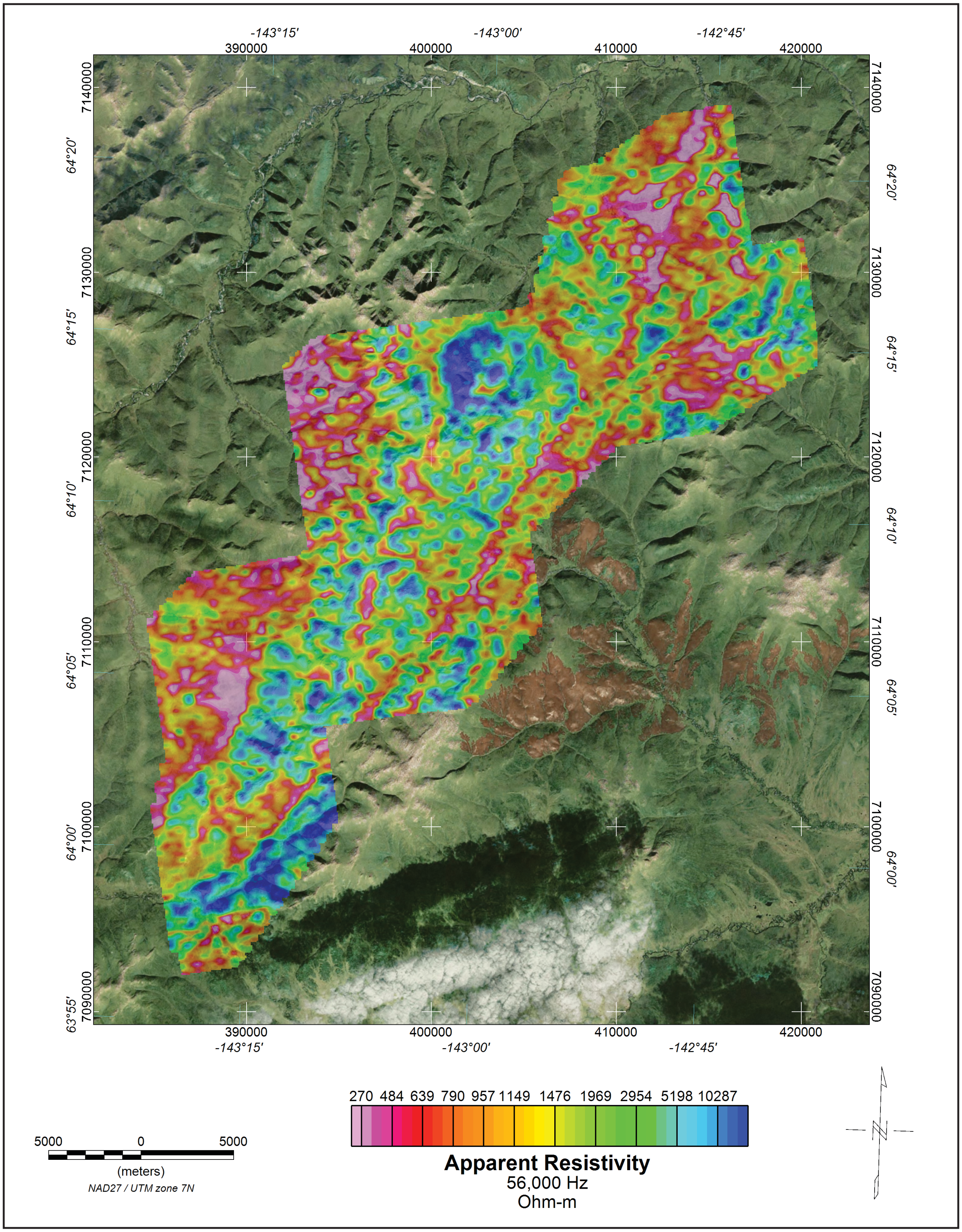


Figure 6. The DIGHEM[V] EM system measured inphase and quadrature components at five frequencies. Two vertical coaxial coil-pairs operated at 1000 and 5500 Hz while three horizontal coplanar coil-pairs operated at 900, 7,200 and 56,000 Hz. EM data were sampled at 0.1 second intervals. The EM system responds to bedrock conductors, conductive overburden, and cultural sources. Apparent resistivity is generated from the inphase and quadrature component of the coplanar 56,000 Hz using the pseudo-layer half space model. The data were interpolated onto a regular 80 m grid using a modified Akima (1970) technique.

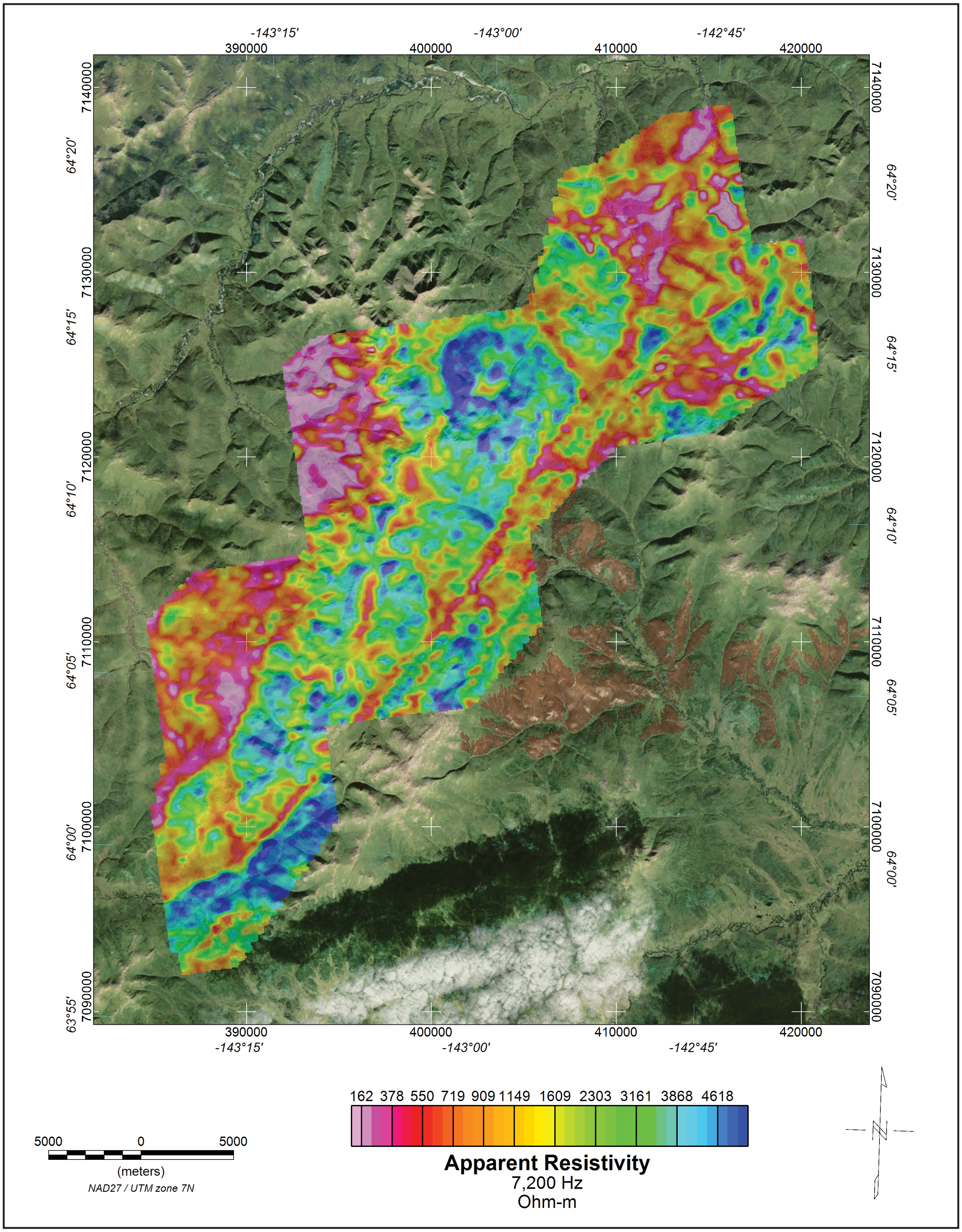


Figure 7. The DIGHEM[V] EM system measured inphase and quadrature components at five frequencies. Two vertical coaxial coil-pairs operated at 1000 and 5500 Hz while three horizontal coplanar coil-pairs operated at 900, 7,200 and 56,000 Hz. EM data were sampled at 0.1 second intervals. The EM system responds to bedrock conductors, conductive overburden, and cultural sources. Apparent resistivity is generated from the inphase and quadrature component of the coplanar 7,200 Hz using the pseudo-layer half space model. The data were interpolated onto a regular 80 m grid using a modified Akima (1970) technique.

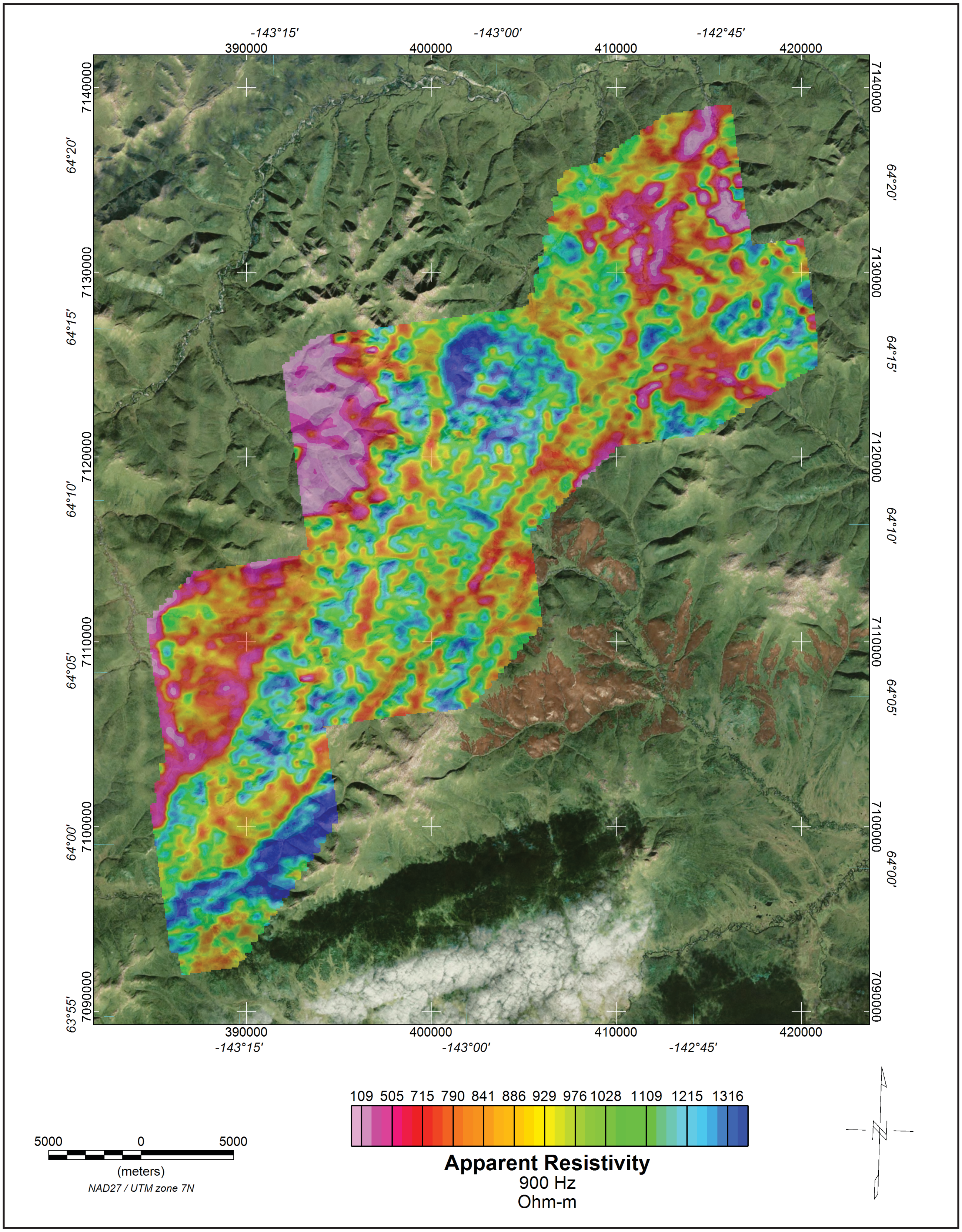


Figure 8. The DIGHEM[V] EM system measured inphase and quadrature components at five frequencies. Two vertical coaxial coil-pairs operated at 1000 and 5500 Hz while three horizontal coplanar coil-pairs operated at 900, 7,200 and 56,000 Hz. EM data were sampled at 0.1 second intervals. The EM system responds to bedrock conductors, conductive overburden, and cultural sources. Apparent resistivity is generated from the inphase and quadrature component of the coplanar 900 Hz using the pseudo-layer half space model. The data were interpolated onto a regular 80 m grid using a modified Akima (1970) technique.

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/10.14509/30178.

Map Title	Description
westernfortymile_sim_magtf_topo_map.pdf	simulated total magnetic field grid with topographic base map
westernfortymile_sim_magtf_contours_plss_map.pdf	simulated total magnetic field grid with contours and public land survey system base layer
westernfortymile_calculated1vd_topo_map.pdf	calculated first vertical derivative grid of the simulated total magnetic field with topographic base map
westernfortymile_res56khz_topo_map.pdf	56,000 Hz apparent resistivity grid with topographic base map
westernfortymile_res56khz_contours_plss_map.pdf	56,000 Hz apparent resistivity grid with contours and public land survey system base layer
westernfortymile_res7200hz_topo_map.pdf	7,200 Hz apparent resistivity grid with topographic base map
westernfortymile_res7200hz_contours_plss_map.pdf	7,200 Hz apparent resistivity grid with contours and public land survey system base layer
westernfortymile_res900hz_topo_map.pdf	900 Hz apparent resistivity grid with topographic base map
westernfortymile_res900hz_contours_plss_map.pdf	900 Hz apparent resistivity grid with contours and public land survey system base layer

ALASKA DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS
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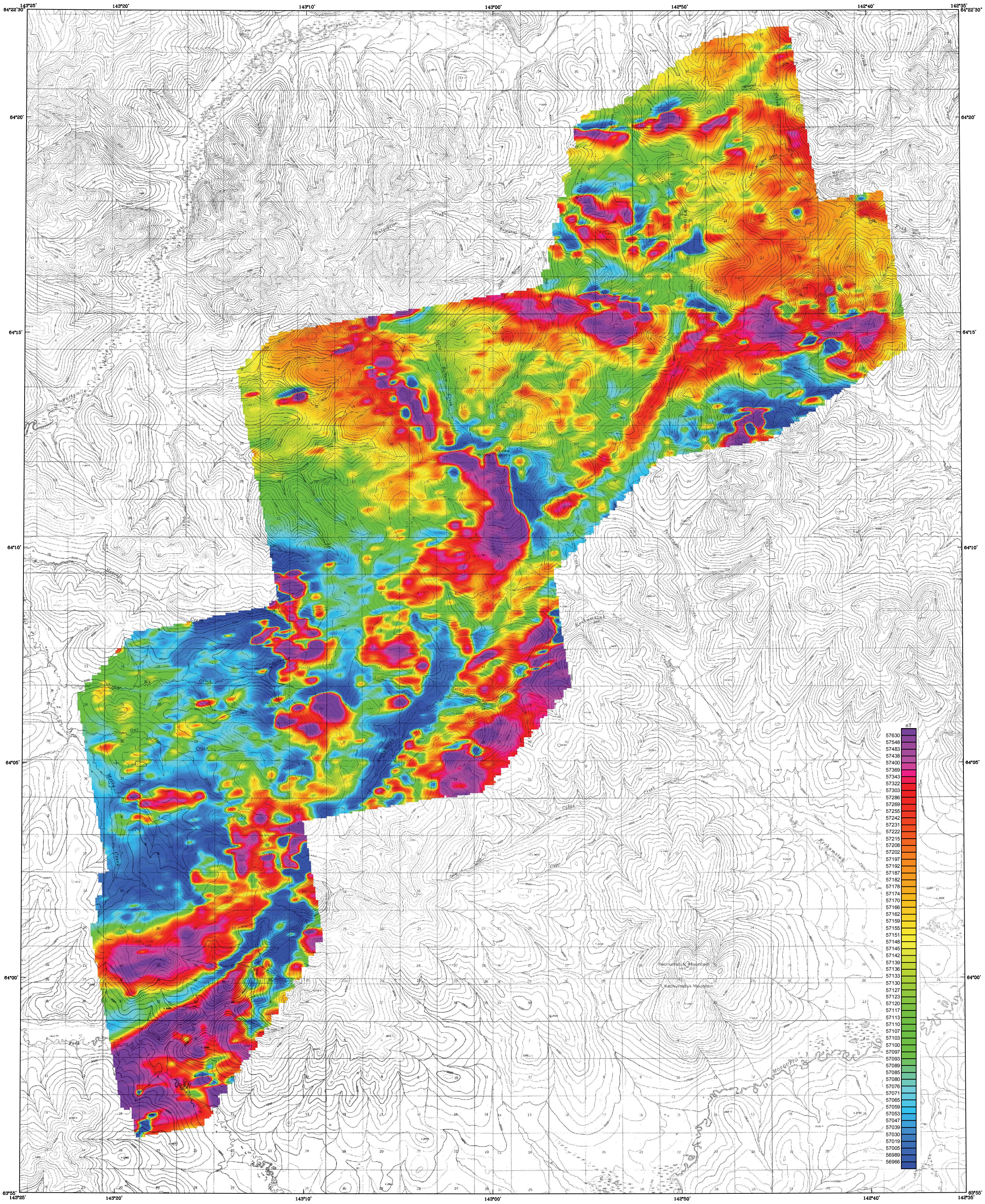
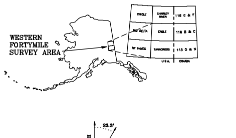
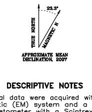
GEOPHYSICAL REPORT 2008-1-1a



Base from U.S. Geological Survey Eagle A-4, 1956; A-5, 1956; B-4, 1956; B-5, 1956; Tanacross D-4, 1956; D-5, 1956; Quadrangles, Alaska





SCALE 1:63,360

1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS

CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL

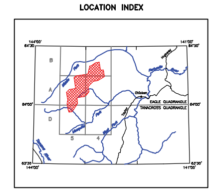
TOTAL MAGNETIC FIELD OF PART OF THE WESTERN FORTYMILE MINING DISTRICT, EAST-CENTRAL ALASKA

PARTS OF EAGLE and TANACROSS QUADRANGLES

by
Laurel E. Burns, U.S. Bureau of Land Management, Fugro Airborne Surveys Corp., and Stevens Exploration Management Corp.

2008

LOCATION INDEX



DESCRIPTIVE NOTES

The geophysical data were acquired with a DIGHEM V Electromagnetic (EM) system and a Fugro D1344 cesium magnetometer with a Scintrex CS3 cesium sensor. The EM and magnetic sensors 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-3 Squirrel helicopter at a mean terrain clearance of 200 feet along NW-SE (350°) survey flight lines with a spacing of a quarter of a mile. Tie lines were flown perpendicular to the flight lines at intervals of approximately 3 miles.

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SURVEY HISTORY

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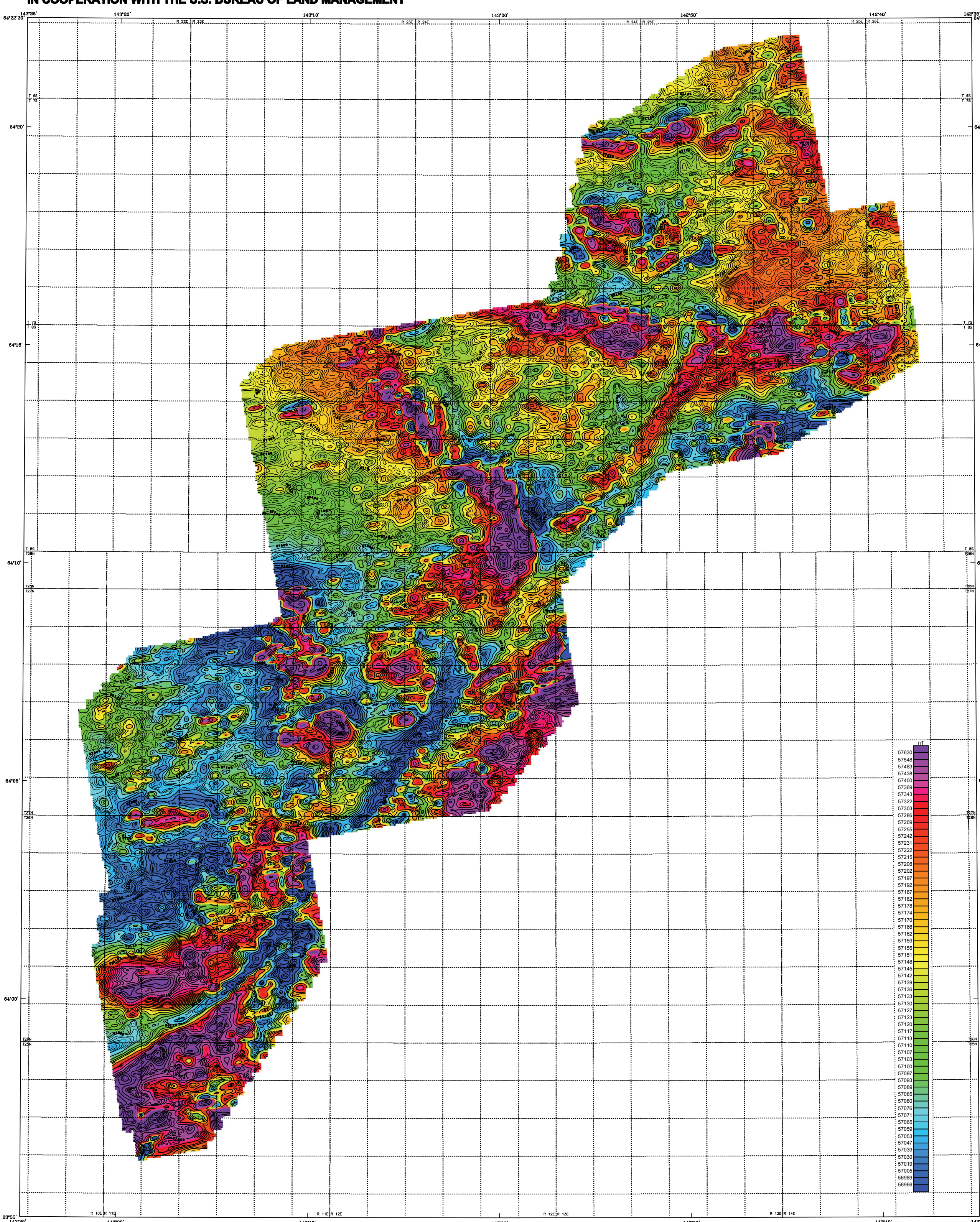
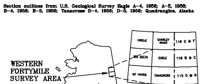
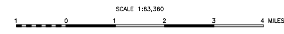


Section outlines from U.S. Geological Survey Eagle A-4, 1956; A-5, 1956; B-4, 1956; B-5, 1956; Tanacross D-4, 1956; D-5, 1956; Quadrangles, Alaska





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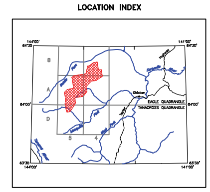

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PARTS OF EAGLE and TANACROSS QUADRANGLES

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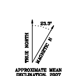

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MAGNETIC CONTOUR INTERVAL

————	100 nT
————	20 nT
————	4 nT
— — —	2 nT

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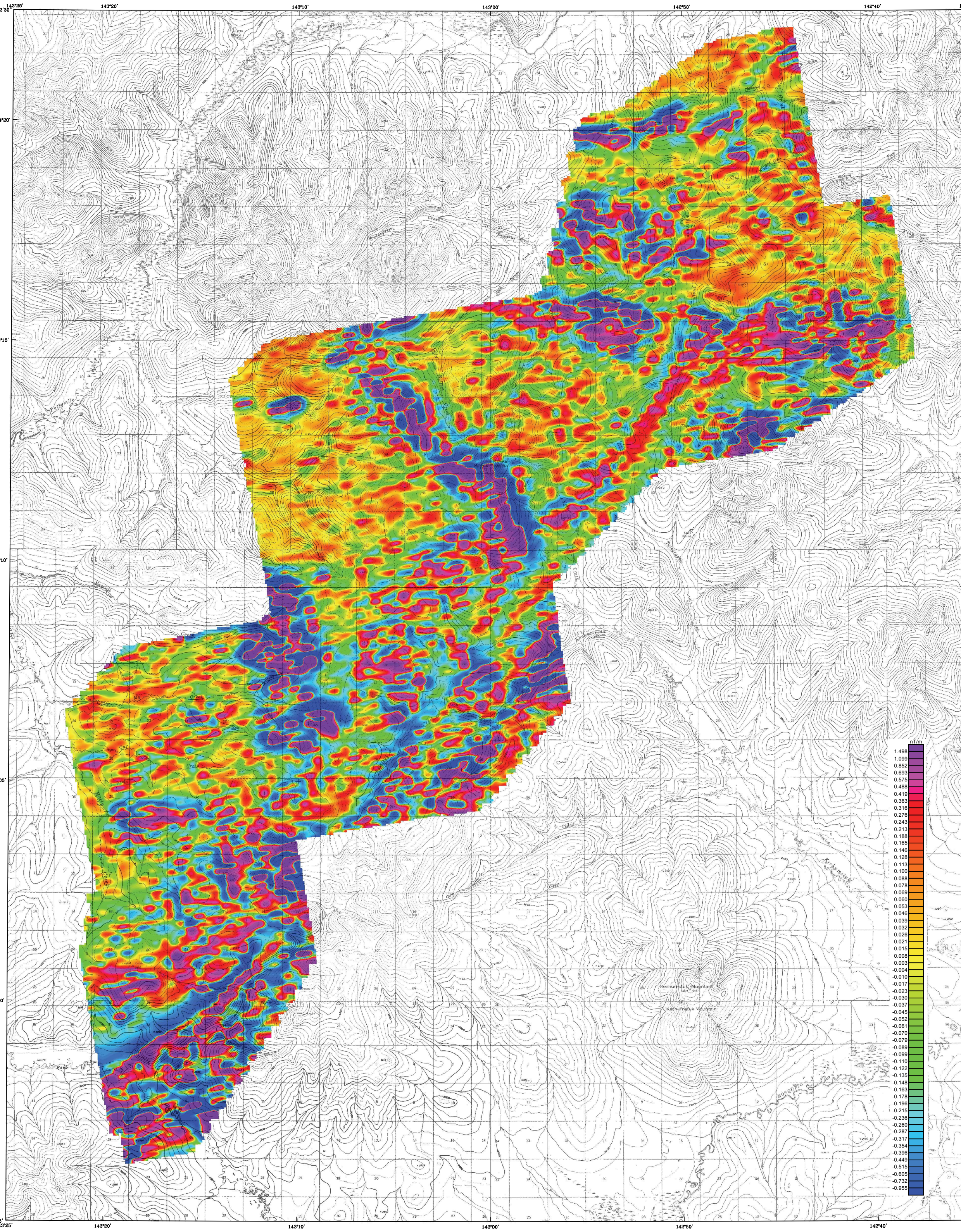
GEOPHYSICAL REPORT 2008-1-1c



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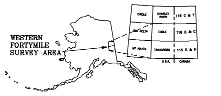

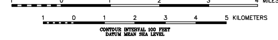

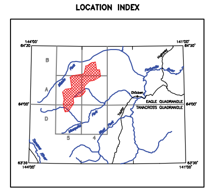

FIRST VERTICAL DERIVATIVE OF THE MAGNETIC FIELD OF PART OF THE WESTERN FORTYMILE MINING DISTRICT, EAST-CENTRAL ALASKA

PARTS OF EAGLE and TANACROSS QUADRANGLES

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COLOR BAR HISTOGRAM

Approximately 98% of the first vertical derivative of the magnetic field for the Western Fortymile Mining District dataset lie within the range displayed on the color bar. Data values actually range from −14.440 nT/m (dark blue) to about 23.823 nT/m (magenta). Actual values can be seen in digital publication GPR 2008-1.

FIRST VERTICAL DERIVATIVE OF THE MAGNETIC FIELD

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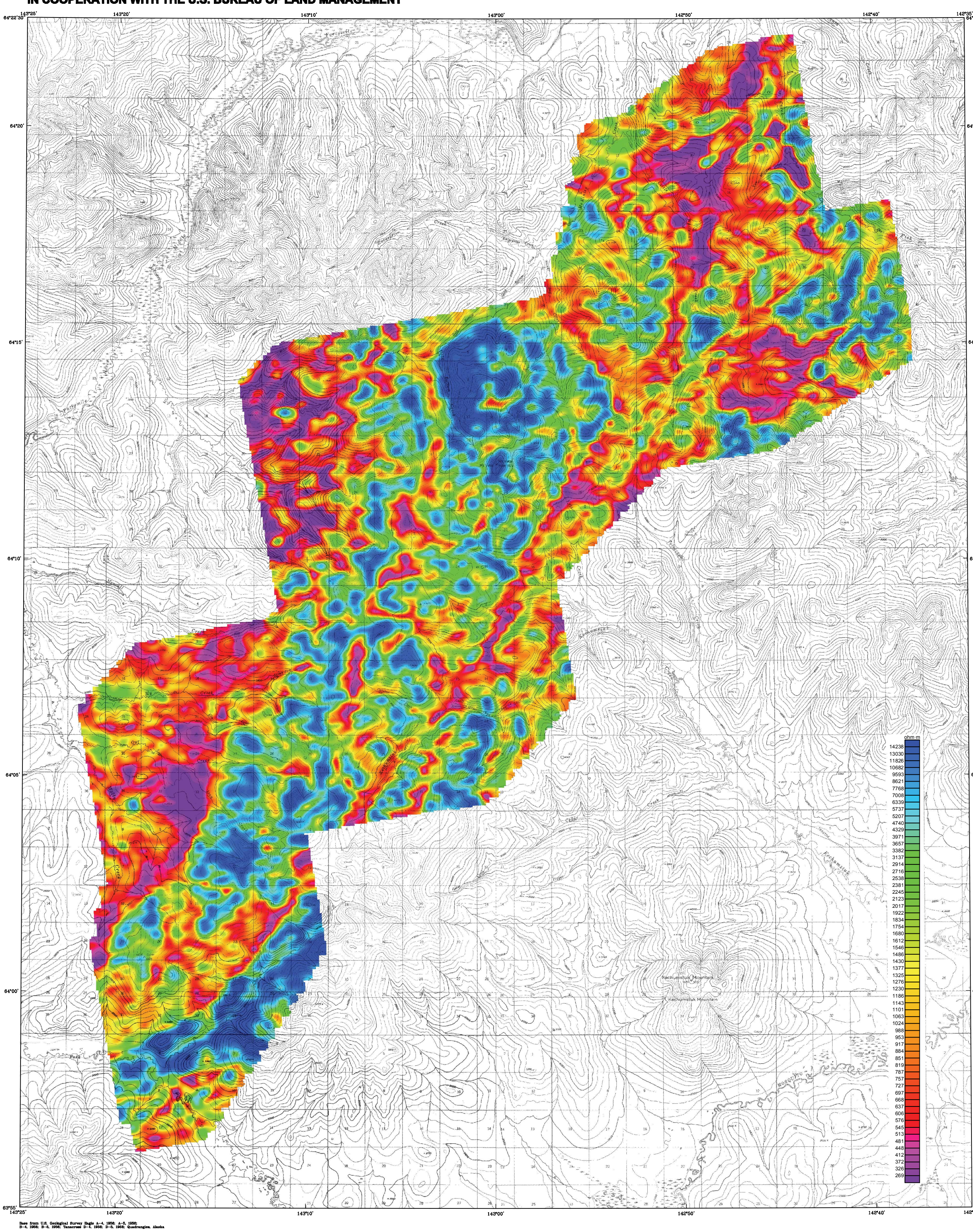

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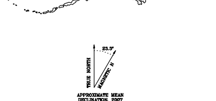
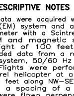
SCALE 1:63,360

1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS

CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL





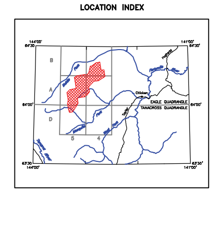
APPROXIMATE MEAN DECLINATION, 2007

56,000 Hz COPLANAR APPARENT RESISTIVITY OF PART OF THE WESTERN FORTYMILE MINING DISTRICT, EAST-CENTRAL ALASKA

PARTS OF EAGLE and TANACROSS QUADRANGLES

by
Laurel E. Burns, U.S. Bureau of Land Management, Fugro Airborne Surveys Corp., and Stevens Exploration Management Corp.
2008

LOCATION INDEX



DESCRIPTIVE NOTES

The geophysical data were acquired with a DIGHEM^V Electromagnetic (EM) system and a Fugro D1344 cesium magnetometer with a Scintrex CS3 cesium sensor. The EM and magnetic sensors 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-3 Squirrel helicopter at a mean terrain clearance of 200 feet along NW-SE (350°) survey flight lines with a spacing of a quarter of a mile. Tie lines were flown perpendicular to the flight lines at intervals of approximately 3 miles.

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The DIGHEM^V EM system measured inphase and quadrature components at five frequencies. Two vertical coaxial coil-pairs operated at 1000 and 5500 Hz while three horizontal coplanar 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. Apparent resistivity is generated from the inphase and quadrature component of the coplanar 56,000 Hz using the pseudo-layer half space model. The data were interpolated onto a regular 80 m grid using a modified Akima (1970) technique.

Akima, H.,1970, A new method of interpolation and smooth curve fitting based on local procedures: Journal of the Association of Computing Machinery, v. 17, no.4, p.589-602.

SURVEY HISTORY

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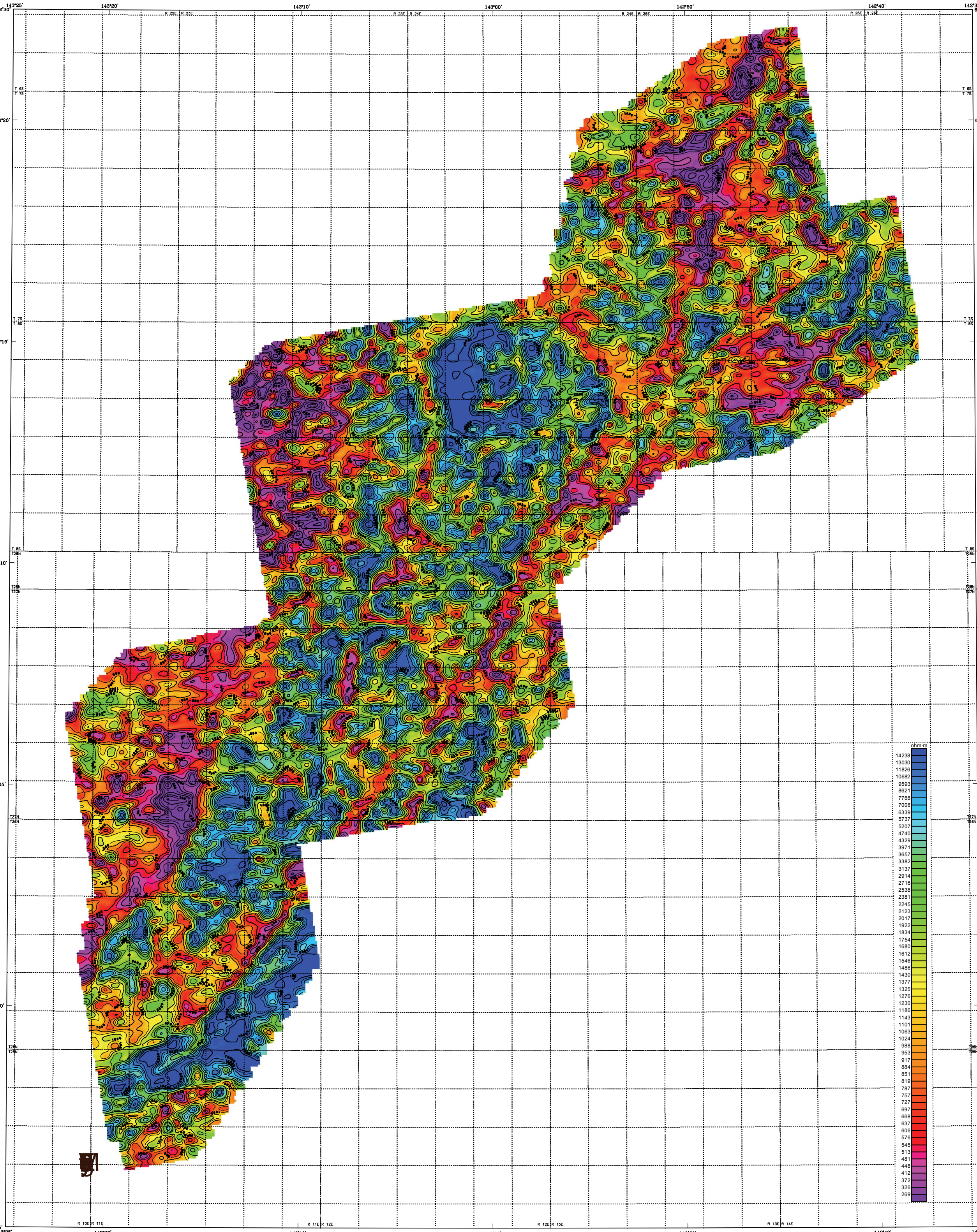
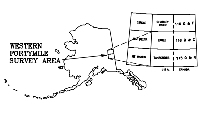
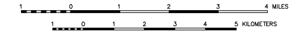


Section outlines from U.S. Geological Survey Eagle A-4, 1956; A-5, 1956; B-4, 1956; B-5, 1956; Tanacross D-4, 1956; D-5, 1956; Quadrangles, Alaska





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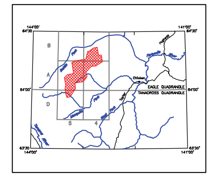

56,000 Hz COPLANAR APPARENT RESISTIVITY OF PART OF THE WESTERN FORTYMILE MINING DISTRICT, EAST-CENTRAL ALASKA

PARTS OF EAGLE and TANACROSS QUADRANGLES

by
Laurel E. Burns, U.S. Bureau of Land Management, Fugro Airborne Surveys Corp., and Stevens Exploration Management Corp.
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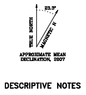

APPROXIMATE MEAN DECLINATION, 2007

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RESISTIVITY CONTOURS

1000
800
600
500
400
300
250
200
150
125
100

Contours in ohm-m at 10 intervals per decade

. . . . resistivity low

SURVEY HISTORY

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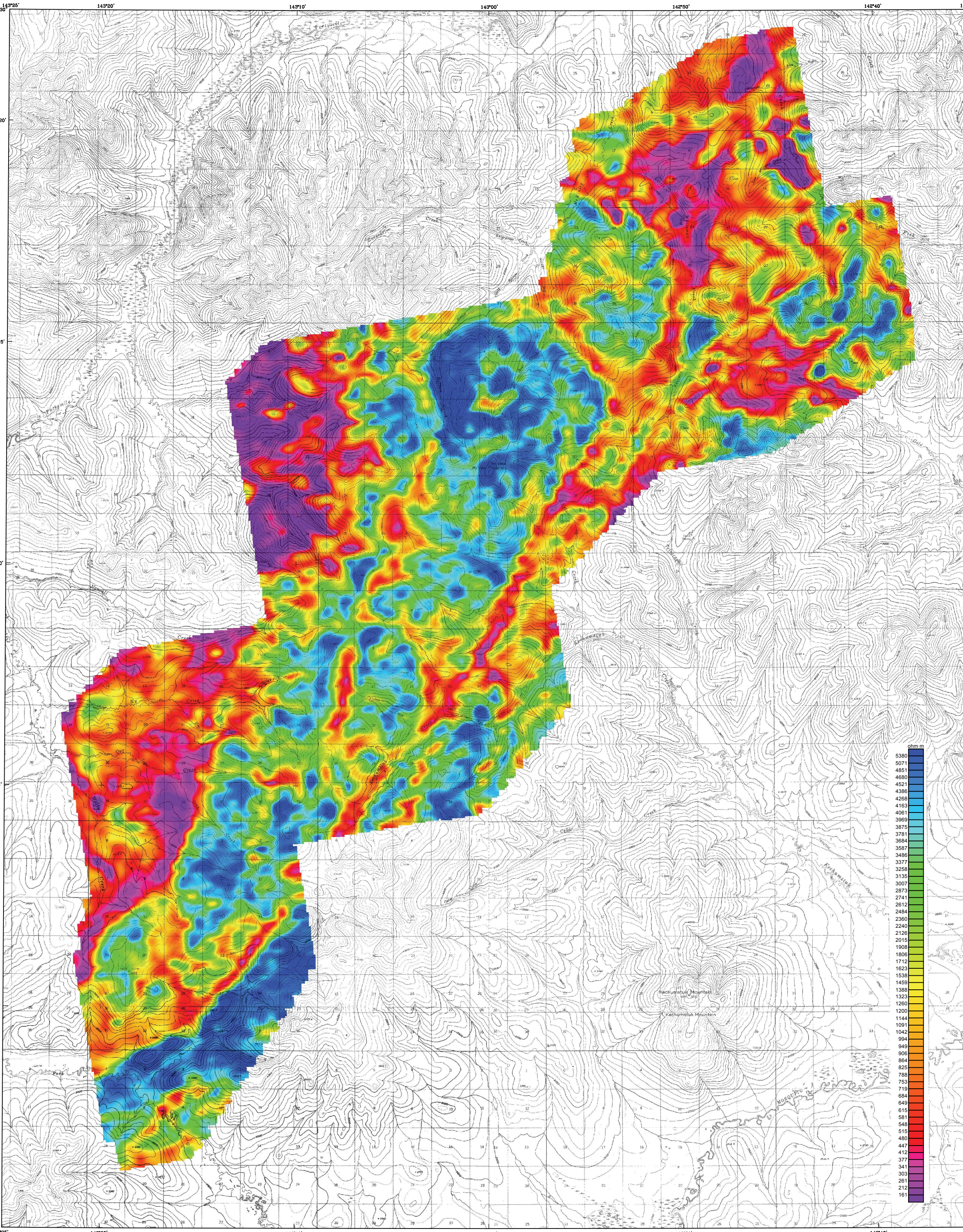
ALASKA DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS
IN COOPERATION WITH THE U.S. BUREAU OF LAND MANAGEMENT

GEOPHYSICAL REPORT 2008-1-3a



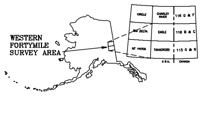
Base from U.S. Geological Survey Eagle A-4, 1956; A-5, 1956; B-4, 1956; B-5, 1956; Tanacross D-4, 1956; D-5, 1956; Quadrangles, Alaska

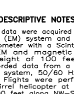
SCALE 1:63,360

1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS

CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL





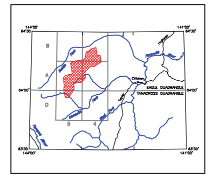
APPROXIMATE MEAN DECLINATION, 2007

7200 Hz COPLANAR APPARENT RESISTIVITY OF PART OF THE WESTERN FORTYMILE MINING DISTRICT, EAST-CENTRAL ALASKA

PARTS OF EAGLE and TANACROSS QUADRANGLES

by
Laurel E. Burns, U.S. Bureau of Land Management, Fugro Airborne Surveys Corp., and Stevens Exploration Management Corp.
2008

LOCATION INDEX



DESCRIPTIVE NOTES

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RESISTIVITY

The DIGHEM[V] EM system measured inphase and quadrature components at five frequencies. Two vertical coaxial coil-pairs operated at 1000 and 5500 Hz while three horizontal coplanar 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. Apparent resistivity is generated from the inphase and quadrature component of the coplanar 7200 Hz using the pseudo-layer half space model. The data were interpolated onto a regular 80 m grid using a modified Akima (1970) technique.

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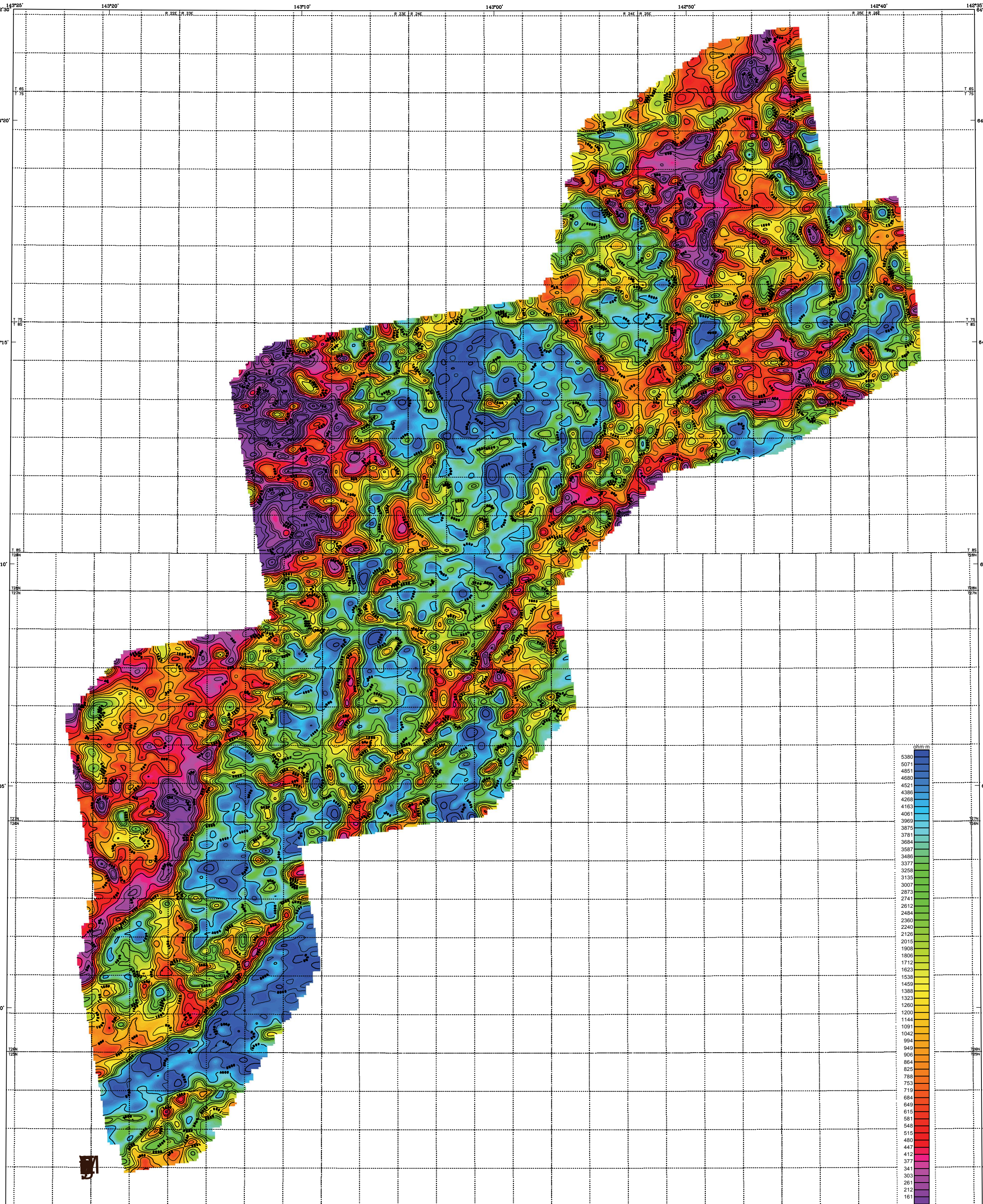
GEOPHYSICAL REPORT 2008-1-3b



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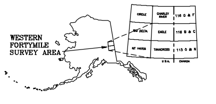
SCALE 1:63,360

1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS



APPROXIMATE MEAN DECLINATION, 2007

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PARTS OF EAGLE and TANACROSS QUADRANGLES

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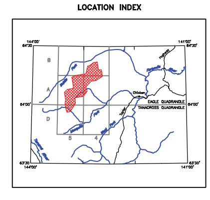

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RESISTIVITY CONTOURS

1000
800
600
500
400
300
250
200
150
125
100

Contours in ohm–m at 10 intervals per decade

resistivity low

SURVEY HISTORY

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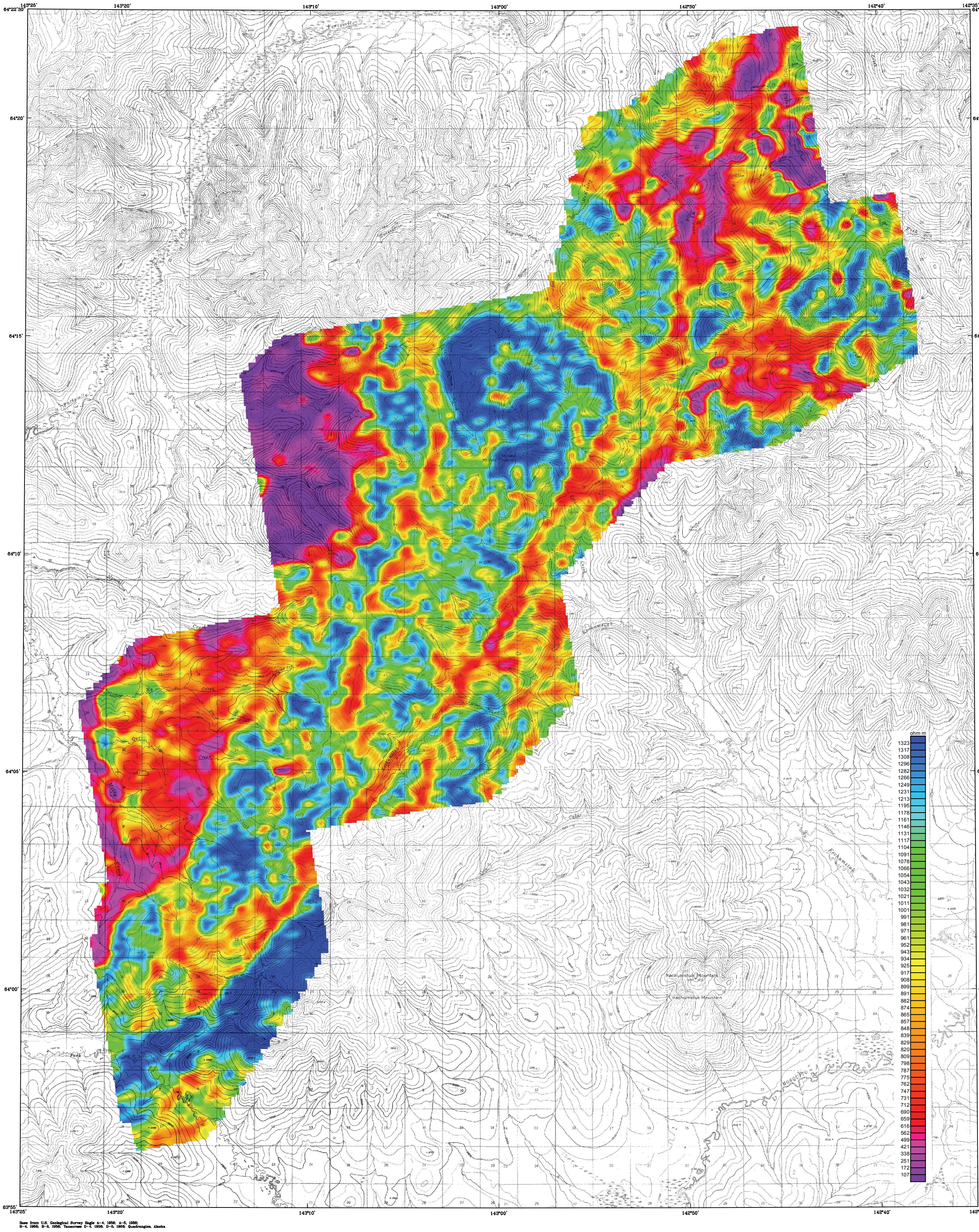

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1 0 1 2 3 4 MILES

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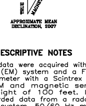
CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL



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900 Hz COPLANAR APPARENT RESISTIVITY OF PART OF THE WESTERN FORTYMILE MINING DISTRICT, EAST-CENTRAL ALASKA

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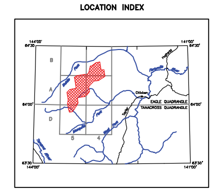

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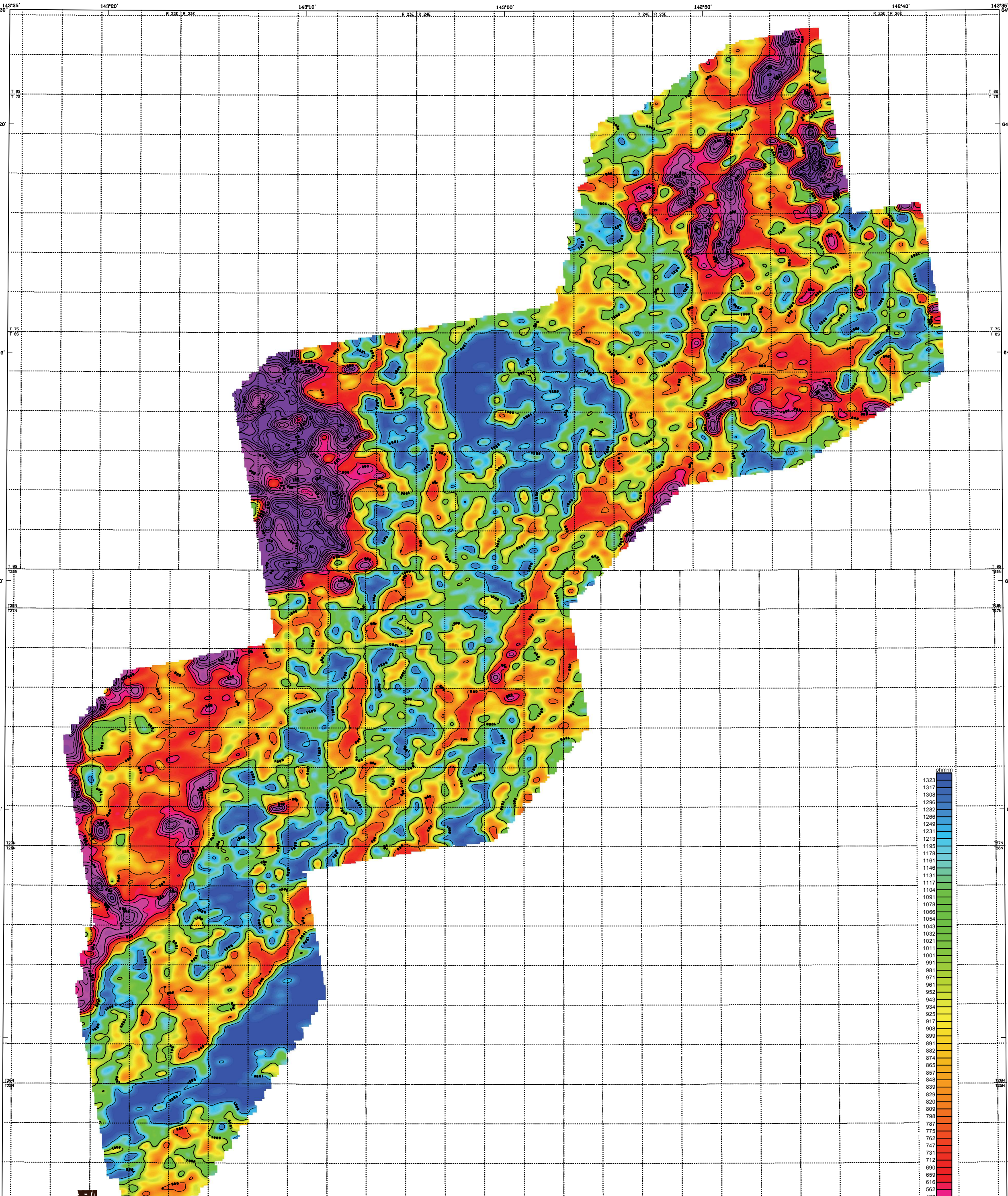

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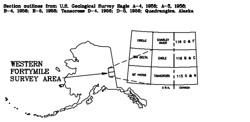

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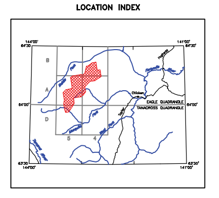

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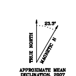

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