SLATE CREEK – SLANA RIVER ELECTROMAGNETIC AND MAGNETIC AIRBORNE GEOPHYSICAL SURVEY DATA COMPILATION

Burns, L.E., Barefoot, J.D., Naibert, T.J., Fugro Airborne Surveys Corp., and Stevens Exploration Management Corp.

Geophysical Report 2018-9

2019
STATE OF ALASKA
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS

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Suggested citation:
Burns, L.E., Barefoot, J.D., Naibert, T.J., Fugro Airborne Surveys Corp., and Stevens Exploration Management Corp., 2019, Slate Creek – Slana River electromagnetic and magnetic airborne geophysical survey data compilation: Alaska Division of Geological & Geophysical Surveys Geophysical Report 2018-9. http://doi.org/10.14509/29852

SLATE CREEK – SLANA RIVER ELECTROMAGNETIC AND MAGNETIC AIRBORNE GEOPHYSICAL SURVEY DATA COMPILATION

Burns, L.E.[1], Barefoot, J.D.[1], Naibert, T.J.[1], Fugro Airborne Surveys Corp., and Stevens Exploration Management Corp

ABSTRACT

This geophysical survey is located in interior Alaska in the Chistochina mining district, about 225 kilometers southeast of Fairbanks. Frequency domain electromagnetic and magnetic data were collected with the DIGHEMV system from September to October 2008. A total of 3367.1 line kilometers were collected covering 1151.9 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. Mineral prospects in the survey area include Golden Range, Grubstake, Judy, and POW. 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 Alaska State Legislature as part of the DGGS Airborne Geophysical/Geological Mineral Inventory (AGGMI) program.

[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	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/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
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., Fugro Airborne Surveys Corp., and Stevens Exploration Management Corp., 2009, Line, grid, and vector data, and maps for the airborne geophysical survey of the Slate Creek-Slana River Survey, Chistochina mining district, south-central Alaska: Alaska Division of Geological & Geophysical Surveys Geophysical Report 2009-1, 18 sheets, scale 1:63,360, 1 DVD. doi.org/10.14509/19621

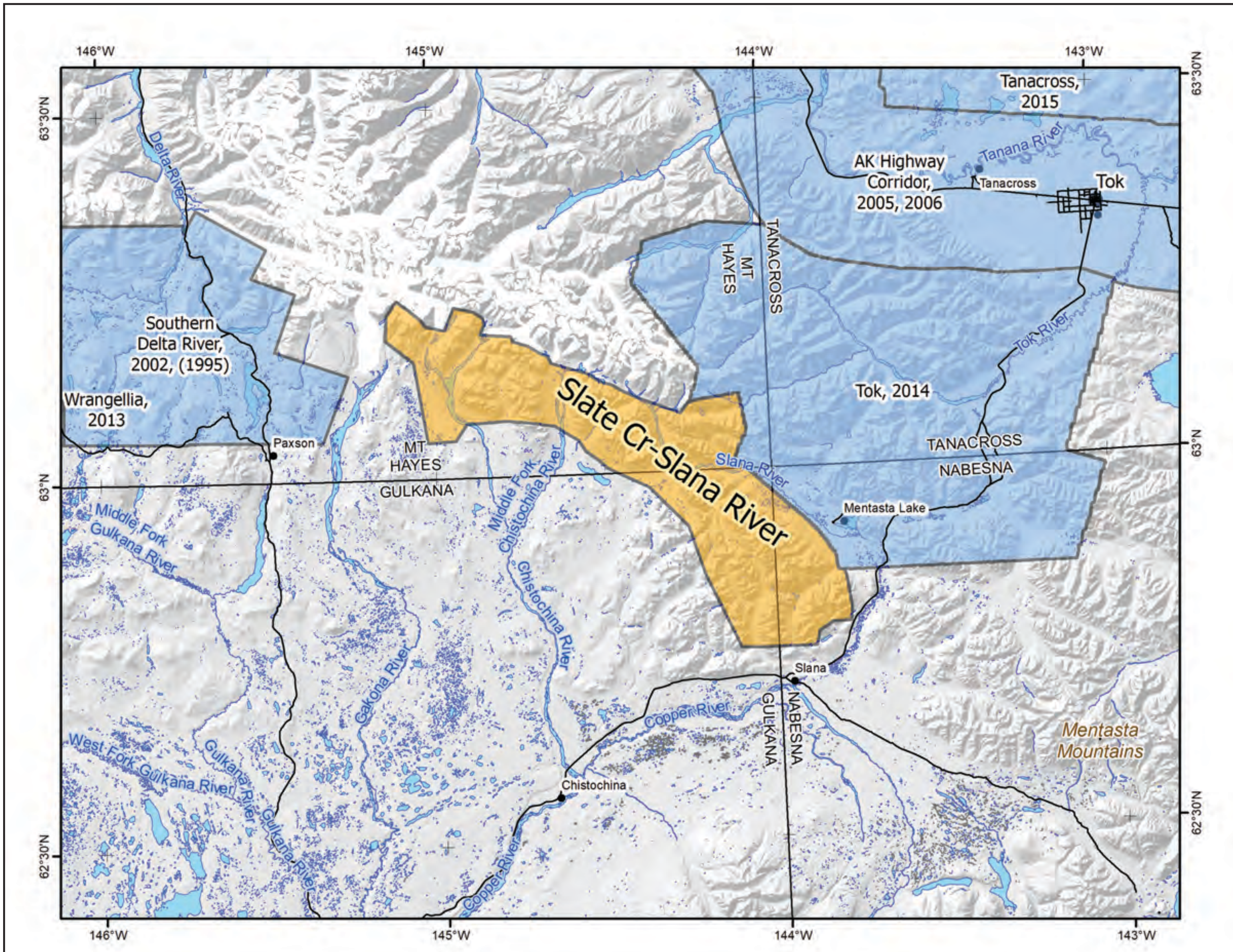

Figure 1. Slate Creek–Slana River electromagnetic and magnetic airborne geophysical survey location in Alaska (inset). Slate Creek–Slana River survey area shown with adjacent DGGS geophysical surveys, landmarks, relevant 1:250,000-scale quadrangle boundaries, mountain ranges, rivers, glaciers, and elevation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

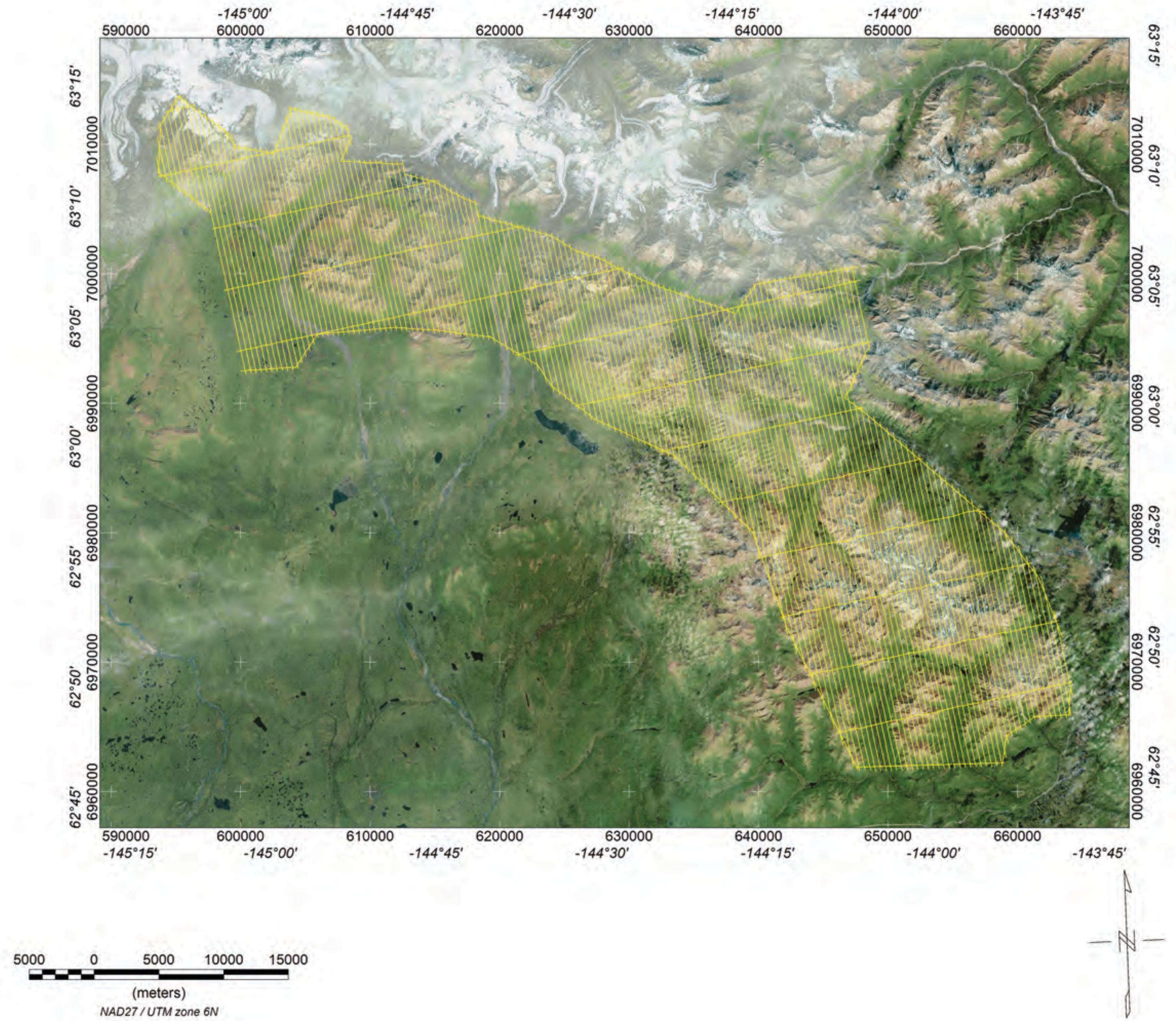

Figure 2. Flight path with orthometric image.

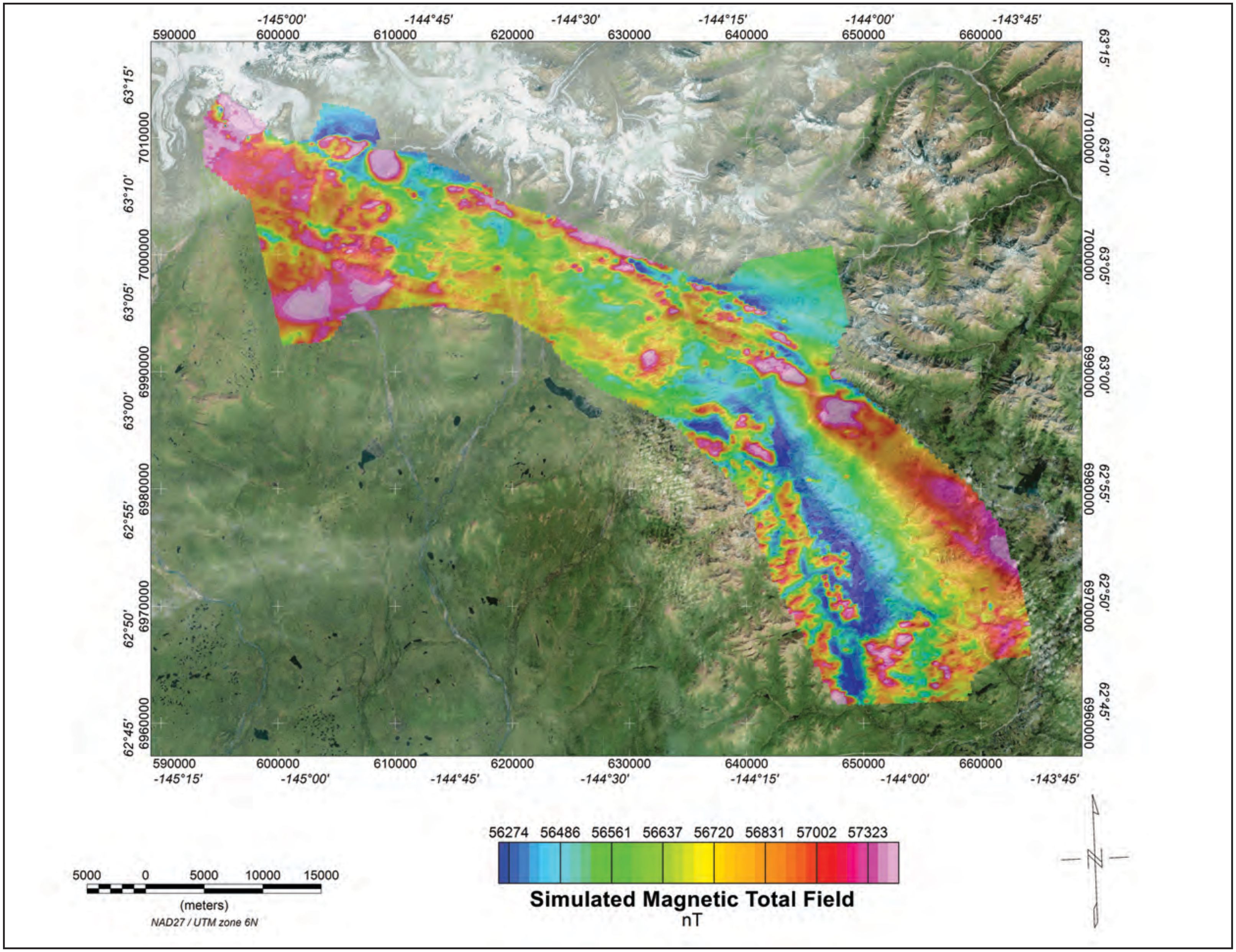

Figure 3. The simulated magnetic total field data were created using digitally recorded data from a Fugro D1344 cesium magnetometer with a Scintrex CS3 sensor. Data were collected at a sampling interval of 0.1 seconds. The magnetic data were (1) corrected for diurnal variations by subtracting the digitally recorded base station magnetic data, (2) IGRF corrected (IGRF model 2005, updated for date of flight and altimeter variations), (3) leveled to the tie line data, (4) a constant value of approximately 57,000 nT was added to all data, and (5) interpolated onto a regular 80 m grid using a modified Akima (1970) technique.

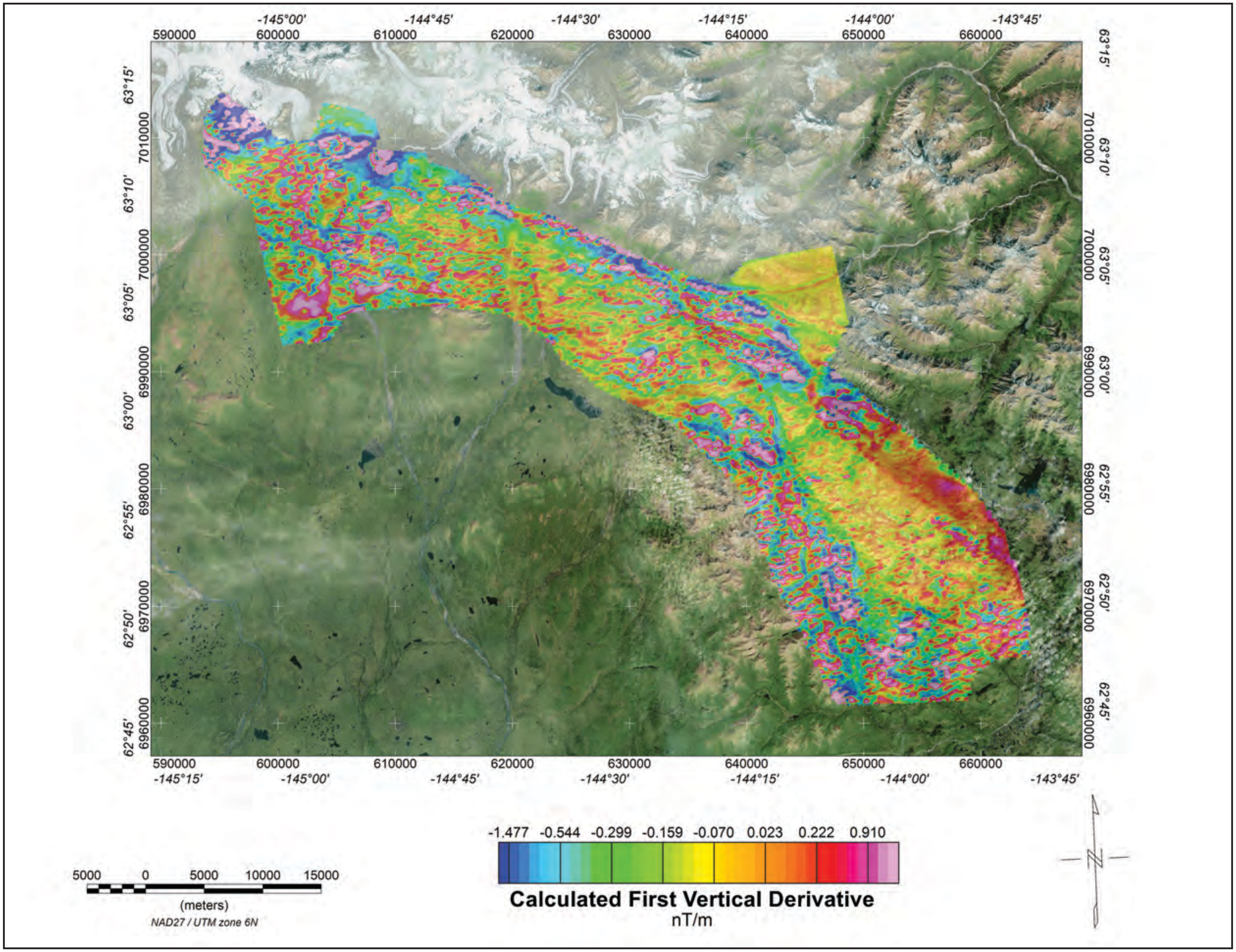

Figure 4. The first vertical derivative grid was calculated from the diurnally-corrected, IGRF-corrected total magnetic field grid using a FFT base frequency domain filtering algorithm. The resulting first vertical derivative grid provides better definition and resolution of near- surface magnetic units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

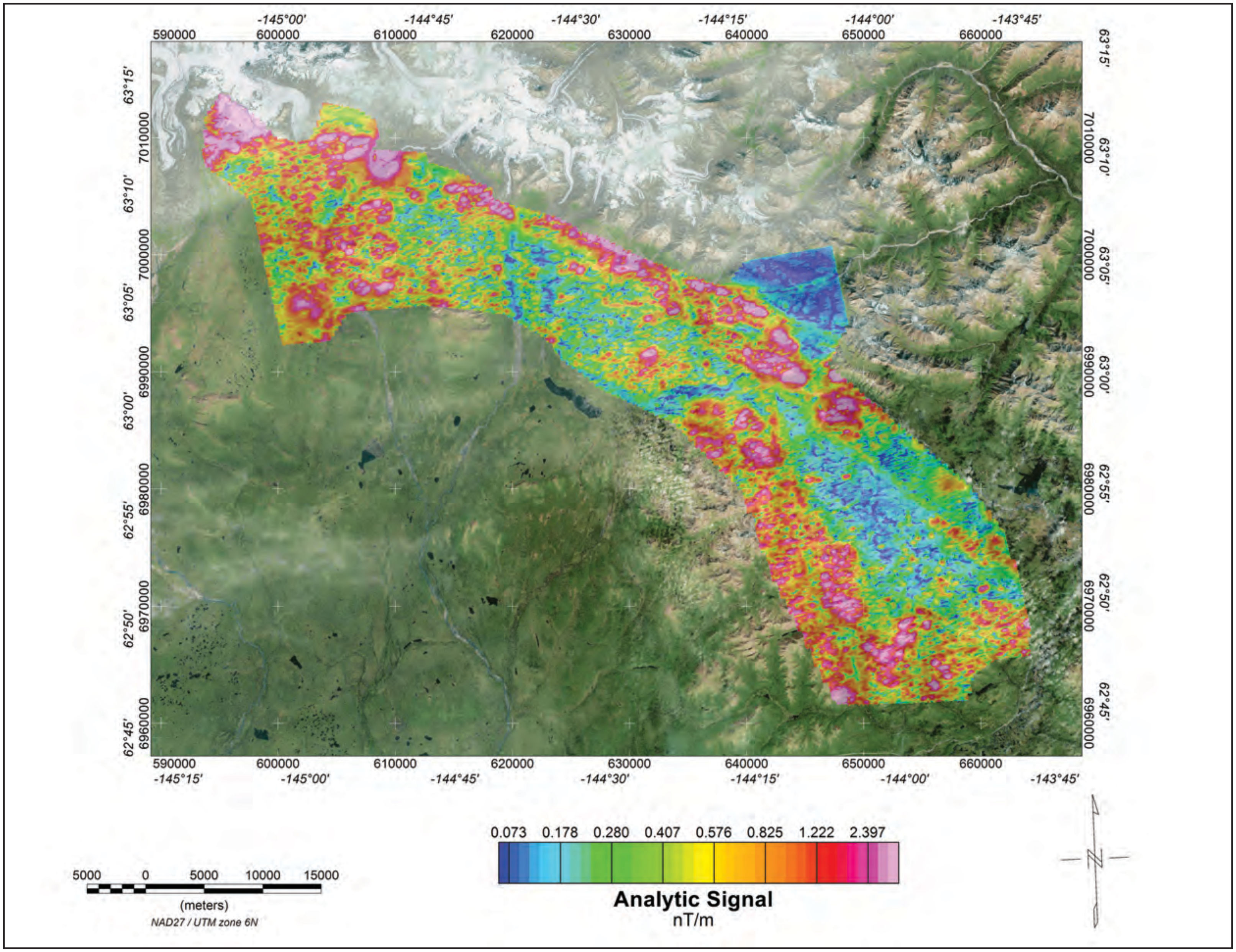

Figure 5. Analytic signal is the total amplitude of all directions of magnetic gradient calculated from the sum of the squares of the three orthogonal gradients. Mapped highs in the calculated analytic signal of magnetic parameter locate the anomalous source body edges and corners (such as contacts,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

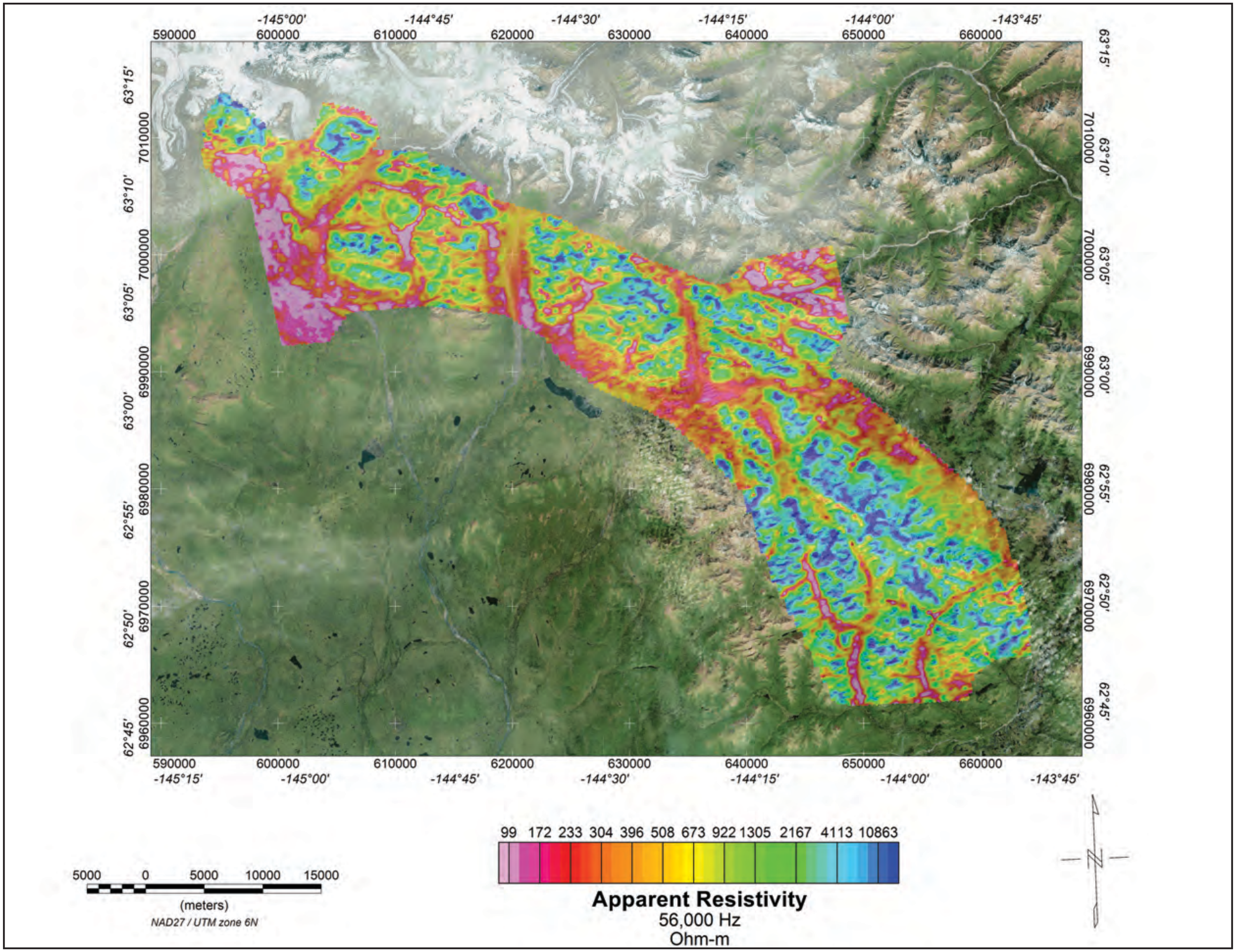

Figure 6. The DIGHEM[V] EM system measured inphase and quadrature components at five frequencies. Two vertical coaxial coil-pairs operated at 1000 and 5500 Hz while three horizontal coplanar coil-pairs operated at 900, 7,200, and 56,000 Hz. EM data were sampled at 0.1 second intervals. The EM system 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.

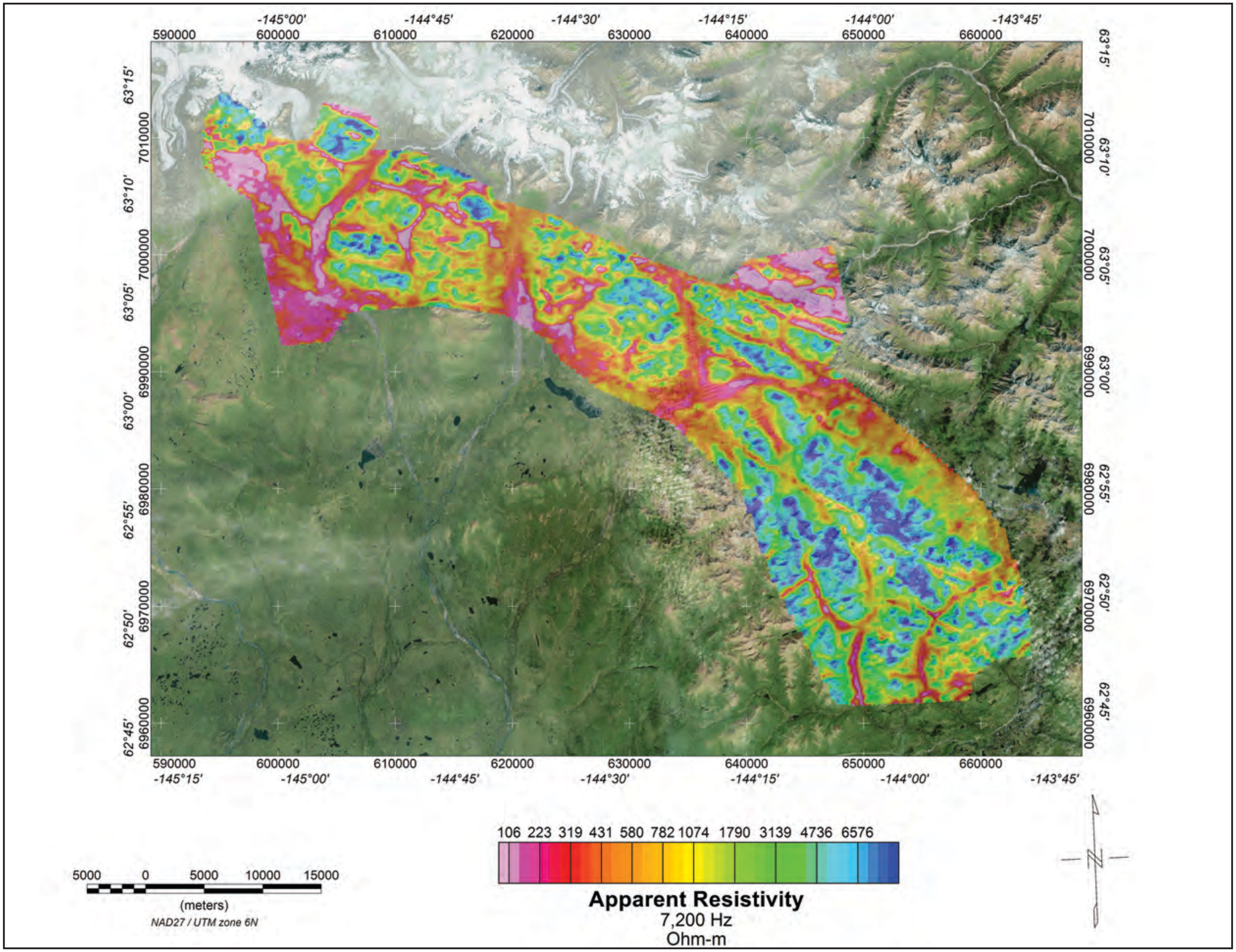

Figure 7. The DIGHEM[V] EM system measured inphase and quadrature components at five frequencies. Two vertical coaxial coil-pairs operated at 1000 and 5500 Hz while three horizontal coplanar coil-pairs operated at 900, 7,200 and 56,000 Hz. EM data were sampled at 0.1 second intervals. The EM system responds 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.

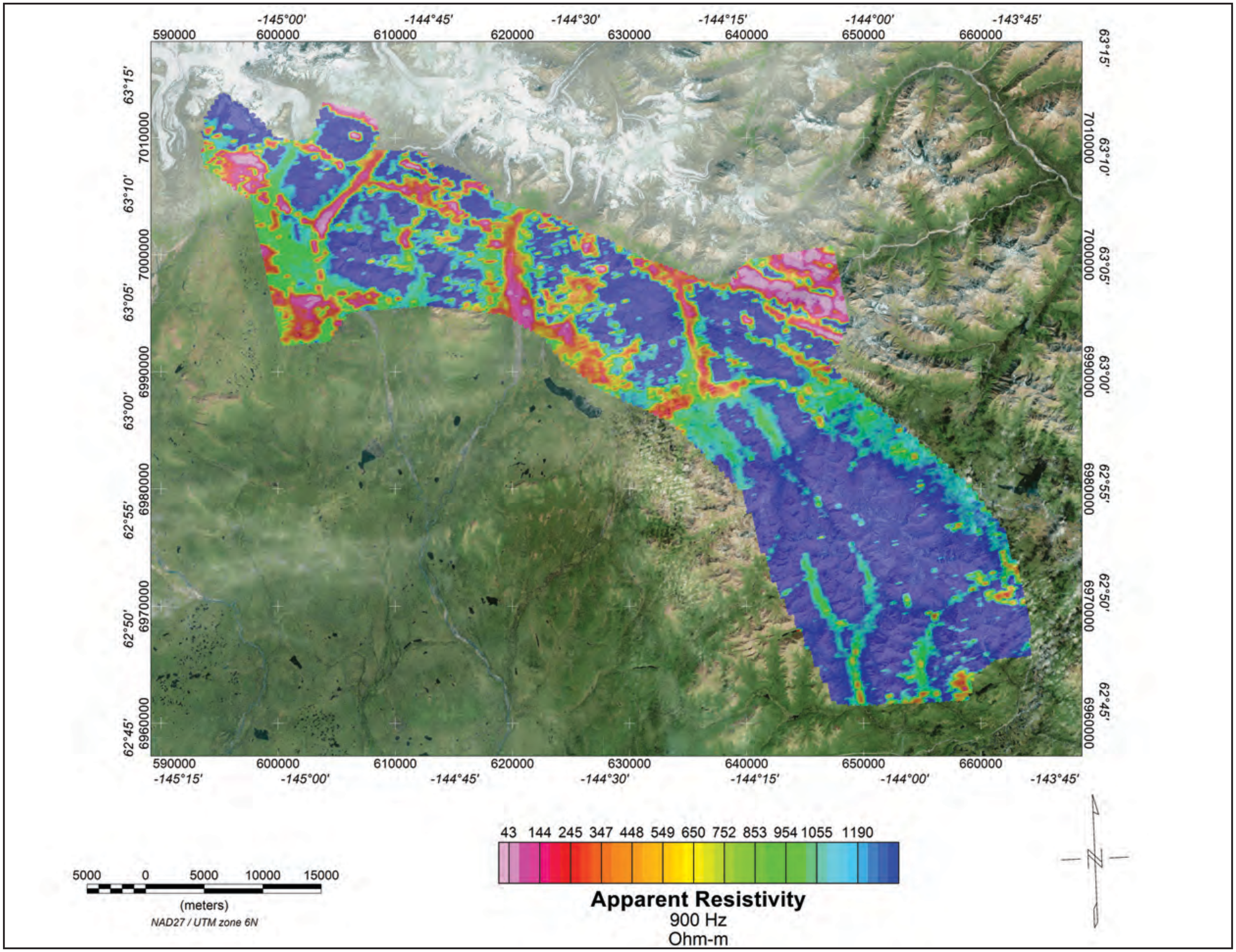

Figure 8. The DIGHEM^{V} EM system measured inphase and quadrature components at five frequencies. Two vertical coaxial coil-pairs operated at 1000 and 5500 Hz while three horizontal coplanar coil-pairs operated at 900, 7,200 and 56,000 Hz. EM data were sampled at 0.1 second intervals. The EM system 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/10.14509/29852.

Map Title	Description
slatecreek_slana_sim_magtf_topo_map_a.pdf	simulated total magnetic field grid with topographic base map
slatecreek_slana_sim_magtf_topo_map_b.pdf	simulated total magnetic field grid with topographic base map
slatecreek_slana_sim_magtf_contours_plss_map_a.pdf	simulated total magnetic field grid with contours and public land survey system base layer
slatecreek_slana_sim_magtf_contours_plss_map_b.pdf	simulated total magnetic field grid with contours and public land survey system base layer
slatecreek_slana_calculated1vd_topo_map_a.pdf	calculated first vertical derivative grid of the diurnally-corrected, IGRF-corrected magnetic data with topographic base map
slatecreek_slana_calculated1vd_topo_map_b.pdf	calculated first vertical derivative grid of the diurnally-corrected, IGRF-corrected magnetic data with topographic base map
slatecreek_slana_res56khz_topo_map_a.pdf	56,000 Hz coplanar apparent resistivity grid with topographic base map
slatecreek_slana_res56khz_topo_map_b.pdf	56,000 Hz coplanar apparent resistivity grid with topographic base map
slatecreek_slana_res56khz_contours_plss_map_a.pdf	56,000 Hz coplanar apparent resistivity grid with contours and public land survey system base layer
slatecreek_slana_res56khz_contours_plss_map_b.pdf	56,000 Hz coplanar apparent resistivity grid with contours and public land survey system base layer
slatecreek_slana_res7200hz_topo_map_a.pdf	7,200 Hz coplanar apparent resistivity grid with topographic base map
slatecreek_slana_res7200hz_topo_map_b.pdf	7,200 Hz coplanar apparent resistivity grid with topographic base map
slatecreek_slana_res7200hz_contours_plss_map_a.pdf	7,200 Hz coplanar apparent resistivity grid with contours and public land survey system base layer
slatecreek_slana_res7200hz_contours_plss_map_b.pdf	7,200 Hz coplanar apparent resistivity grid with contours and public land survey system base layer
slatecreek_slana_res900hz_topo_map_a.pdf	900 Hz coplanar apparent resistivity grid with topographic base map
slatecreek_slana_res900hz_topo_map_b.pdf	900 Hz coplanar apparent resistivity grid with topographic base map
slatecreek_slana_res900hz_contours_plss_map_a.pdf	900 Hz coplanar apparent resistivity grid with contours and public land survey system base layer
slatecreek_slana_res900hz_contours_plss_map_b.pdf	900 Hz coplanar apparent resistivity grid with contours and public land survey system base layer
slatecreek_slana_emanomalies_sim_magtf_detailed_topo_map_a.pdf	detailed electromagnetic anomalies with simulated total magnetic field grid and topographic base map
slatecreek_slana_emanomalies_sim_magtf_detailed_topo_map_b.pdf	detailed electromagnetic anomalies with simulated total magnetic field grid and topographic base map
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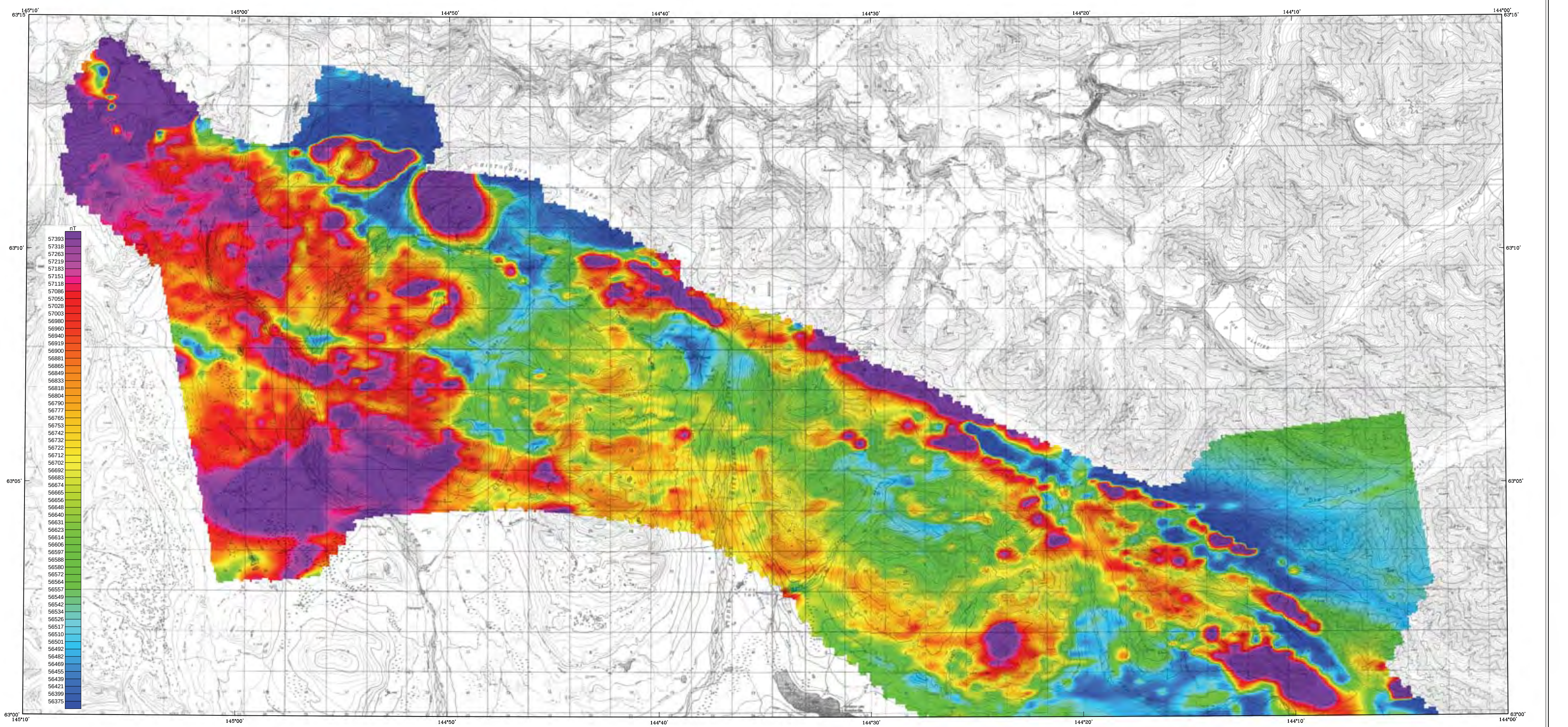
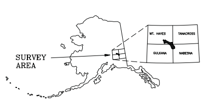
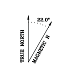
slatecreek_slana_emanomalies_sim_magtf_detailed_topo_map_d.pdf	detailed electromagnetic anomalies with simulated total magnetic field grid and topographic base map
slatecreek_slana_emanomalies_sim_magtf_detailed_topo_map_e.pdf	detailed electromagnetic anomalies with simulated total magnetic field grid and topographic base map
slatecreek_slana_interpretation_plss_map_a.pdf	interpretation of the geophysical data with public land survey system base layer
slatecreek_slana_interpretation_plss_map_b.pdf	interpretation of the geophysical data with public land survey system base layer



Base from U.S. Geological Survey Mt. Hayes A-1, 1975; A-2, 1975; A-3, 1963; Quadrangles, Alaska





APPROXIMATE MEAN DECLINATION, 2008

SCALE 1:63,360

1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS

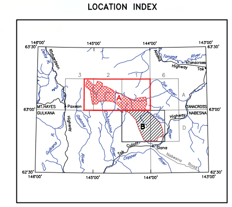
CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL

TOTAL MAGNETIC FIELD OF THE SLATE CREEK - SLANA RIVER AREA, CHISTOCHINA MINING DISTRICT, SOUTHCENTRAL ALASKA

PART OF MT. HAYES QUADRANGLE

by
Laurel E. Burns, Fugro Airborne Surveys Corp., and Stevens Exploration Management Corp.
2009

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.

A Novatel OEM4-G2L 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 5m. 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 10m with respect to the UTM grid.

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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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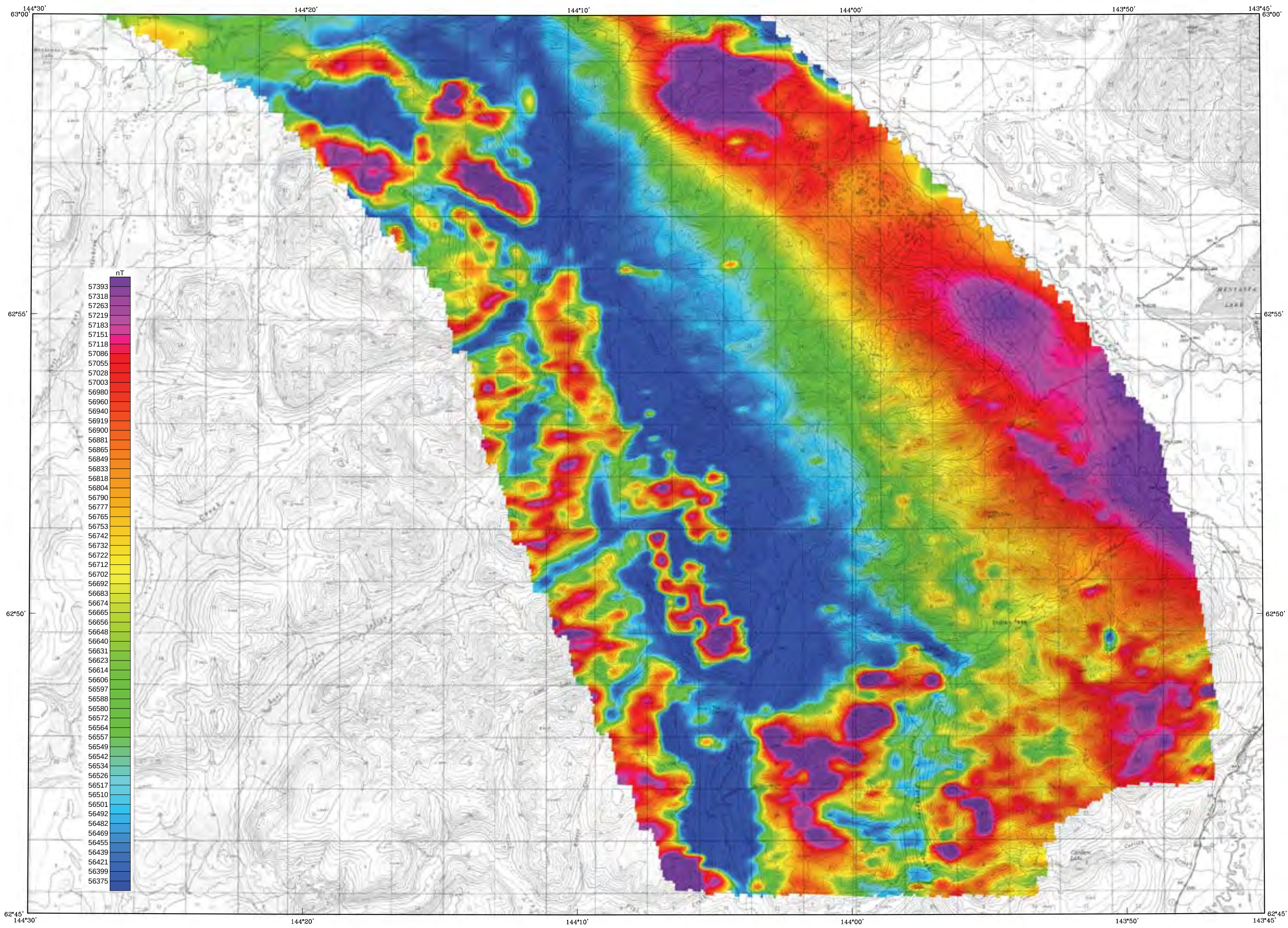


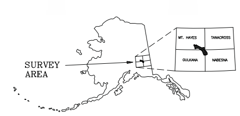
Base from U.S. Geological Survey Gulkana D-1, 1978; Nabesna D-6, 1969; Quadrangles, Alaska

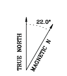
SCALE 1:63,360

1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS

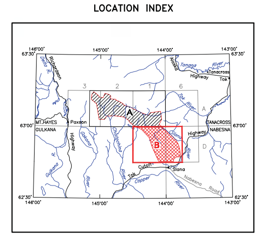
CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL





APPROXIMATE MEAN DECLINATION, 2008

LOCATION INDEX



TOTAL MAGNETIC FIELD OF THE SLATE CREEK - SLANA RIVER AREA, CHISTOCHINA MINING DISTRICT, SOUTHCENTRAL ALASKA

PARTS OF GULKANA and NABESNA QUADRANGLES

by
Laurel E. Burns, Fugro Airborne Surveys Corp., and Stevens Exploration Management Corp.
2009

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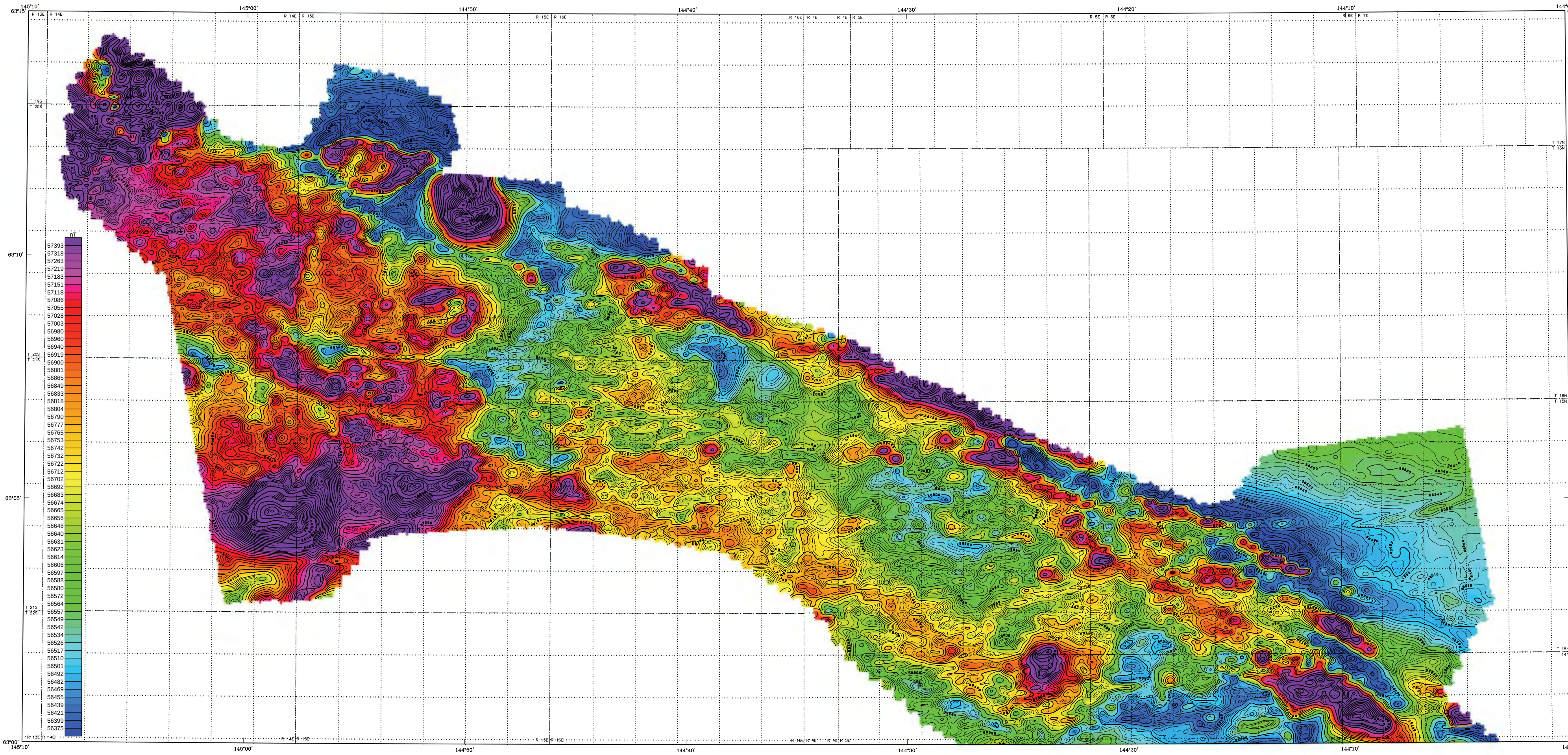
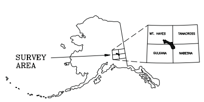
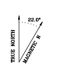


Section outlines from U.S. Geological Survey Mt. Hayes A-1, 1975; A-2, 1975; A-3, 1963; Quadrangles, Alaska





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1 0 1 2 3 4 MILES

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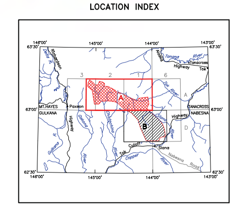

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MAGNETIC CONTOUR INTERVAL

. . . . 250 nT

. . . . 50 nT

. . . . 10 nT

. . . . 5 nT

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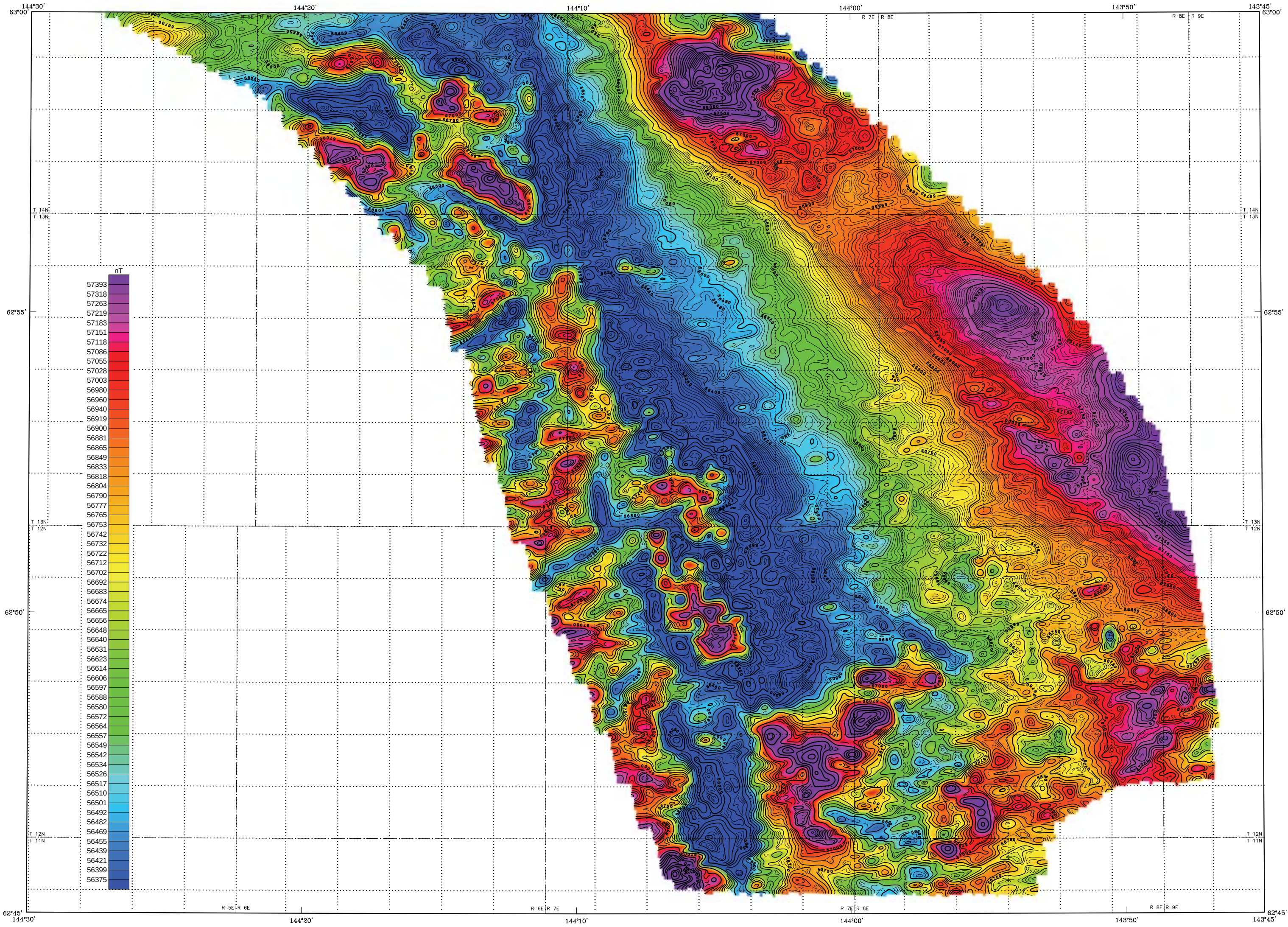
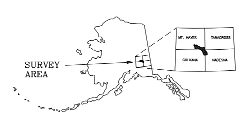


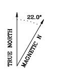
Section outlines from U.S. Geological Survey Gulkana D-1, 1978; Nabesna D-6, 1969; Quadrangles, Alaska

SCALE 1:63,360

1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS





APPROXIMATE MEAN DECLINATION, 2008

TOTAL MAGNETIC FIELD OF THE SLATE CREEK - SLANA RIVER AREA, CHISTOCHINA MINING DISTRICT, SOUTHCENTRAL ALASKA

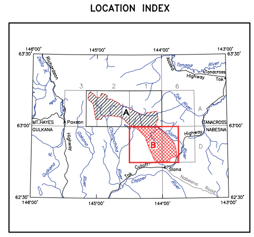
PARTS OF GULKANA and NABESNA QUADRANGLES

by

Laurel E. Burns, Fugro Airborne Surveys Corp., and Stevens Exploration Management Corp.

2009

LOCATION INDEX



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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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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.

MAGNETIC CONTOUR INTERVAL

. . . . 250 nT

. . . . 50 nT

. . . . 10 nT

. . . . 5 nT

SURVEY HISTORY

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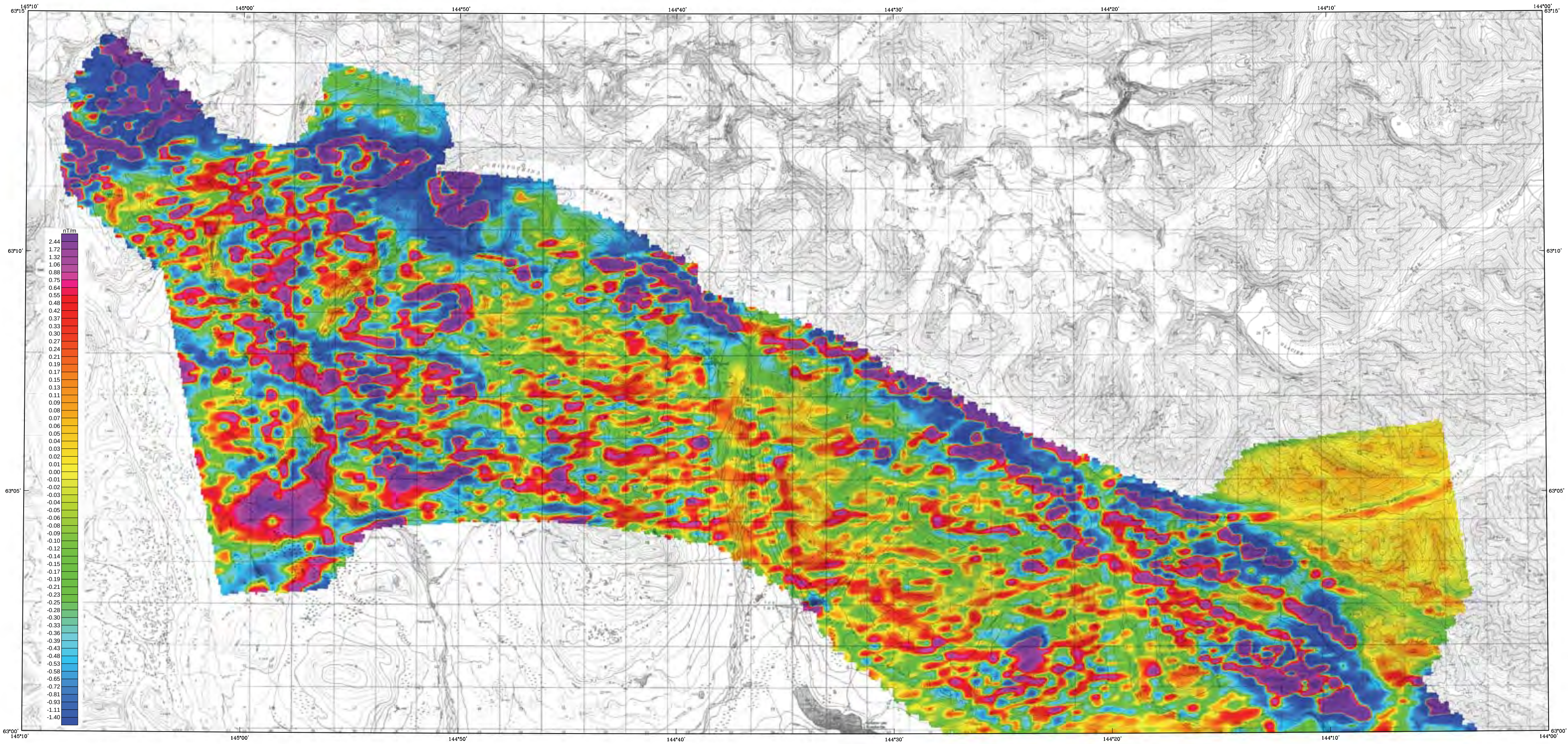

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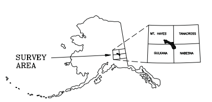

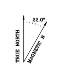

APPROXIMATE MEAN DECLINATION, 2008

SCALE 1:63,360

1 0 1 2 3 4 MILES

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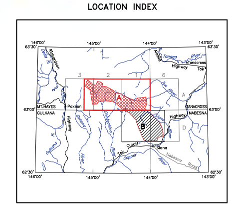
CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL

LOCATION INDEX



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PART OF MT. HAYES QUADRANGLE

by
Laurel E. Burns, Fugro Airborne Surveys Corp., and Stevens Exploration Management Corp.
2009

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COLOR BAR HISTOGRAM

Approximately 99% 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 −13.68 nT/m (dark blue) to about 41.10 nT/m (magenta).

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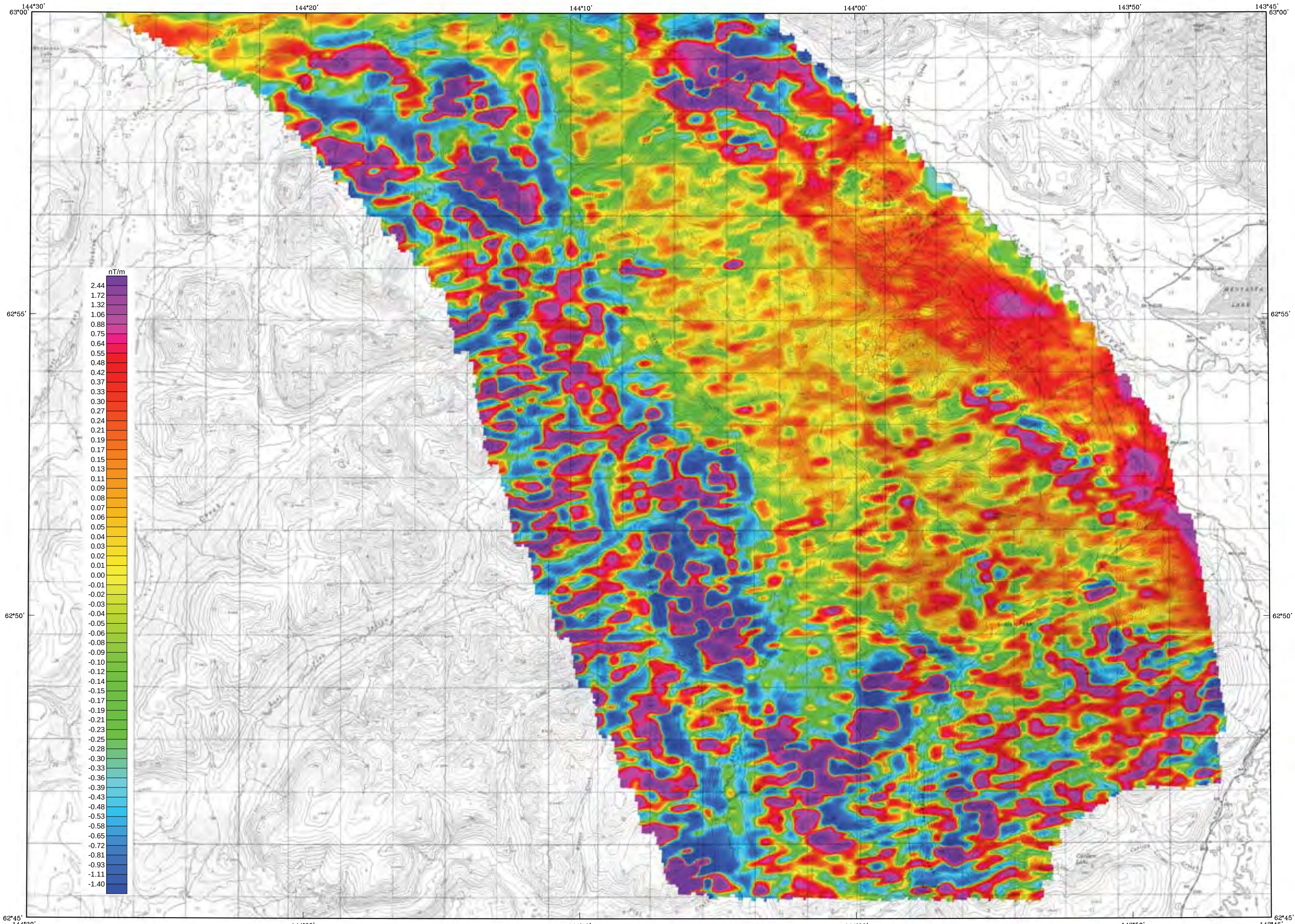

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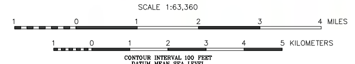
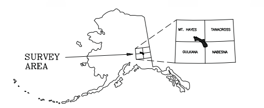
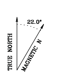
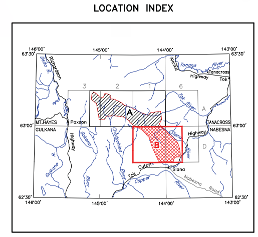






APPROXIMATE MEAN DECLINATION, 2008

LOCATION INDEX



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PARTS OF GULKANA and NABESNA QUADRANGLES

by
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2009

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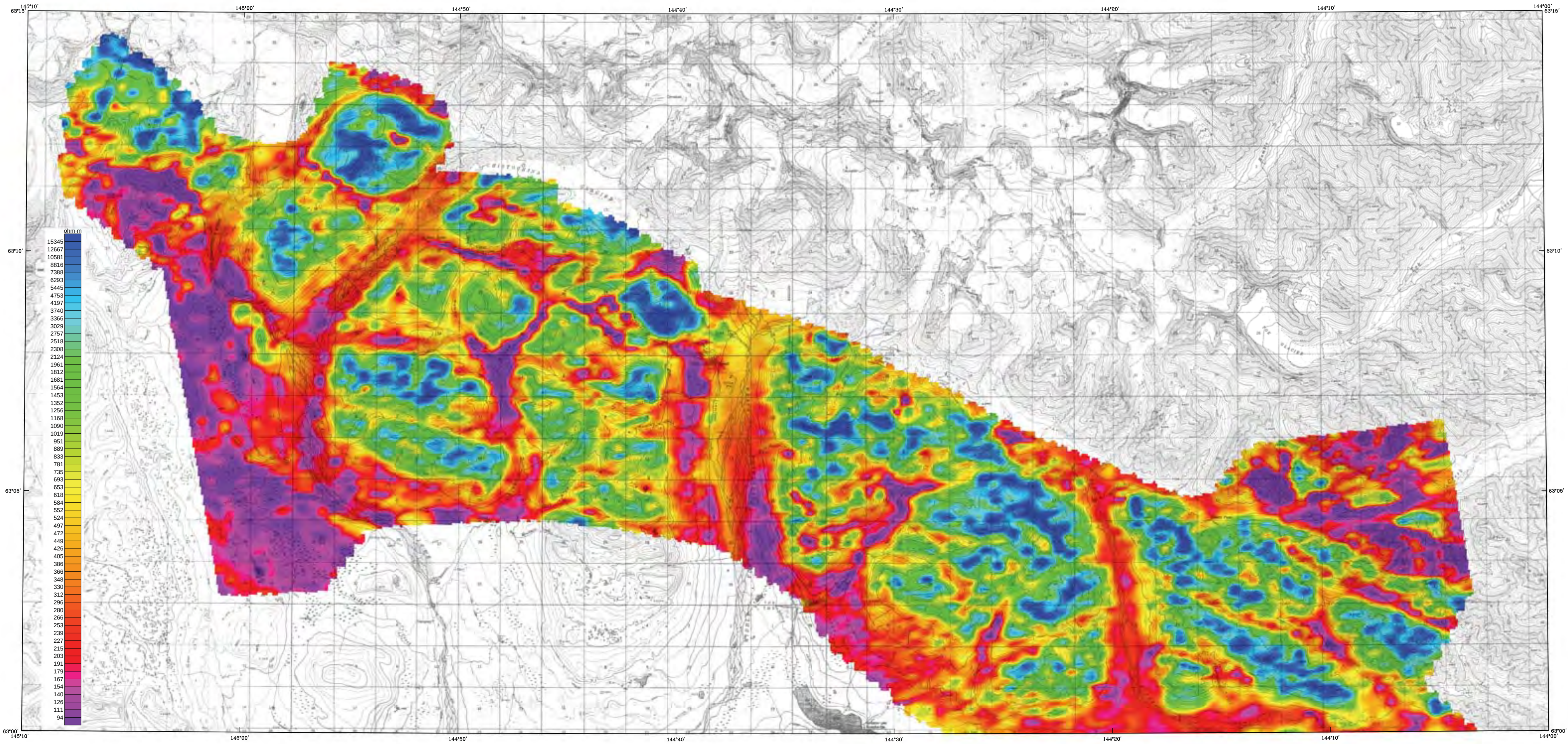


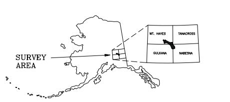
Base from U.S. Geological Survey Mt. Hayes A-1, 1975; A-2, 1975; A-3, 1963; Quadrangles, Alaska

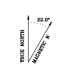
SCALE 1:63,360

1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS

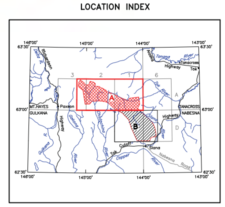
CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL





APPROXIMATE MEAN DECLINATION, 2008

LOCATION INDEX



56,000 Hz COPLANAR APPARENT RESISTIVITY OF THE SLATE CREEK - SLANA RIVER AREA, CHISTOCHINA MINING DISTRICT, SOUTHCENTRAL ALASKA

PART OF MT. HAYES QUADRANGLE

by
Laurel E. Burns, Fugro Airborne Surveys Corp., and Stevens Exploration Management Corp.
2009

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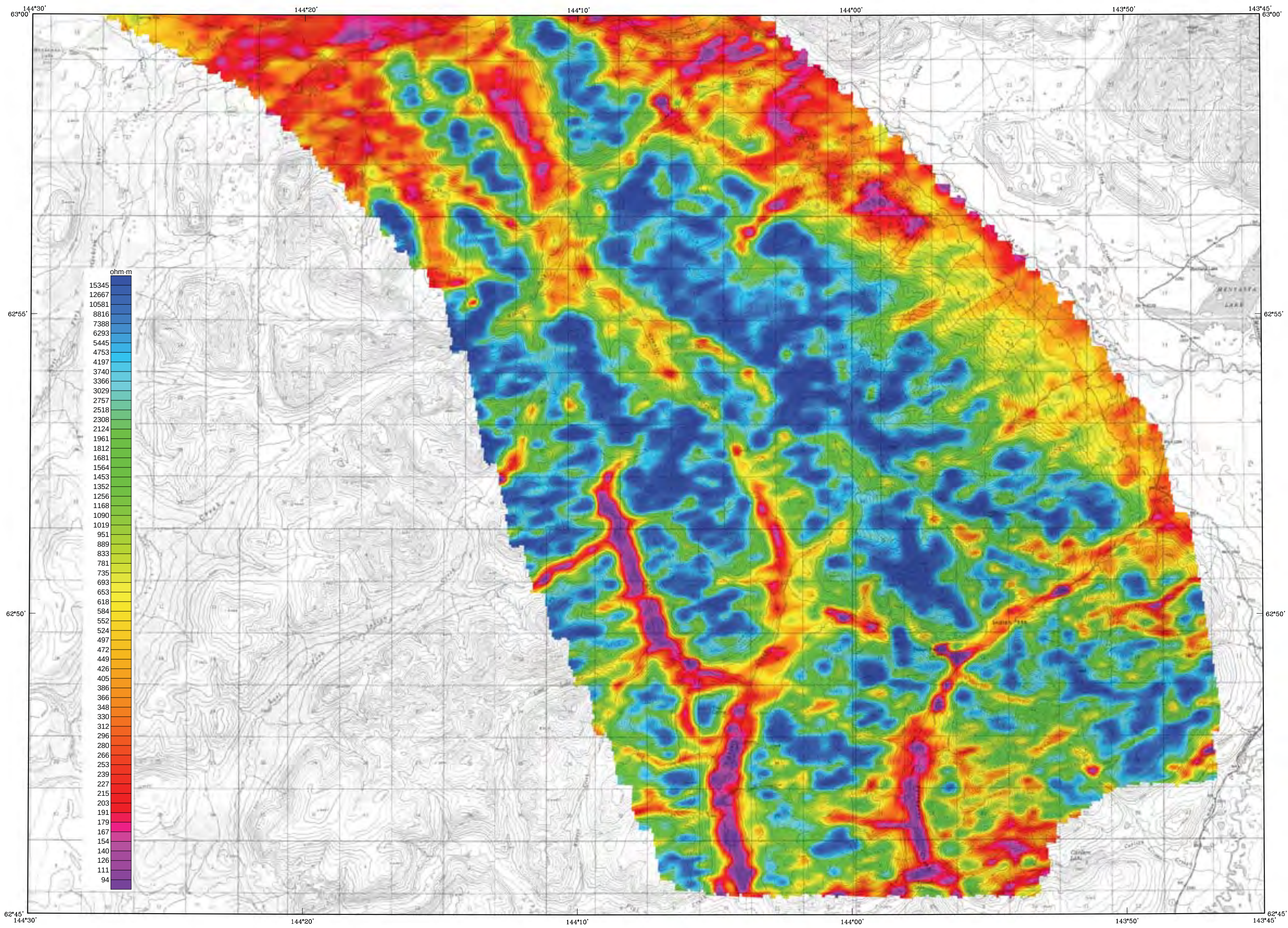
ALASKA DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS

GEOPHYSICAL REPORT 2009-1-4B



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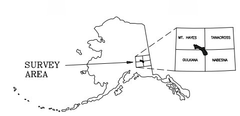
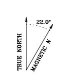
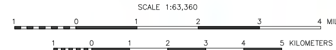




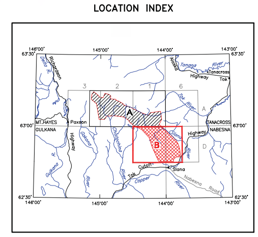
APPROXIMATE MEAN DECLINATION, 2008

SCALE 1:63,360



CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL

LOCATION INDEX



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PARTS OF GULKANA and NABESNA QUADRANGLES

by
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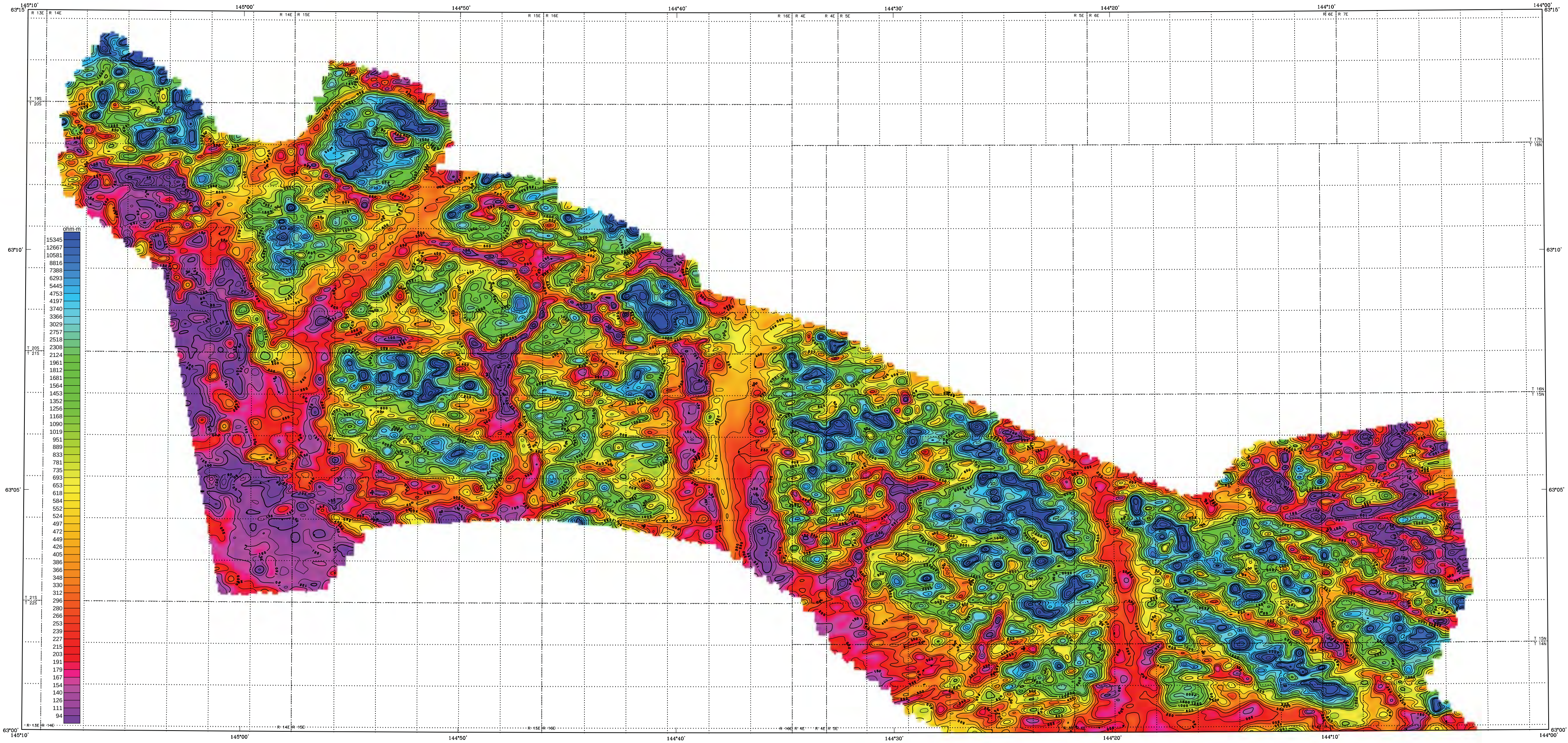

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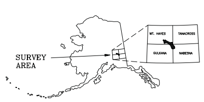

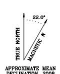

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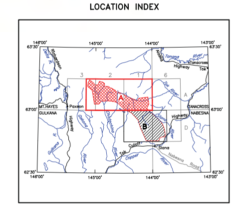

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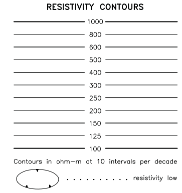
RESISTIVITY CONTOURS



SURVEY HISTORY

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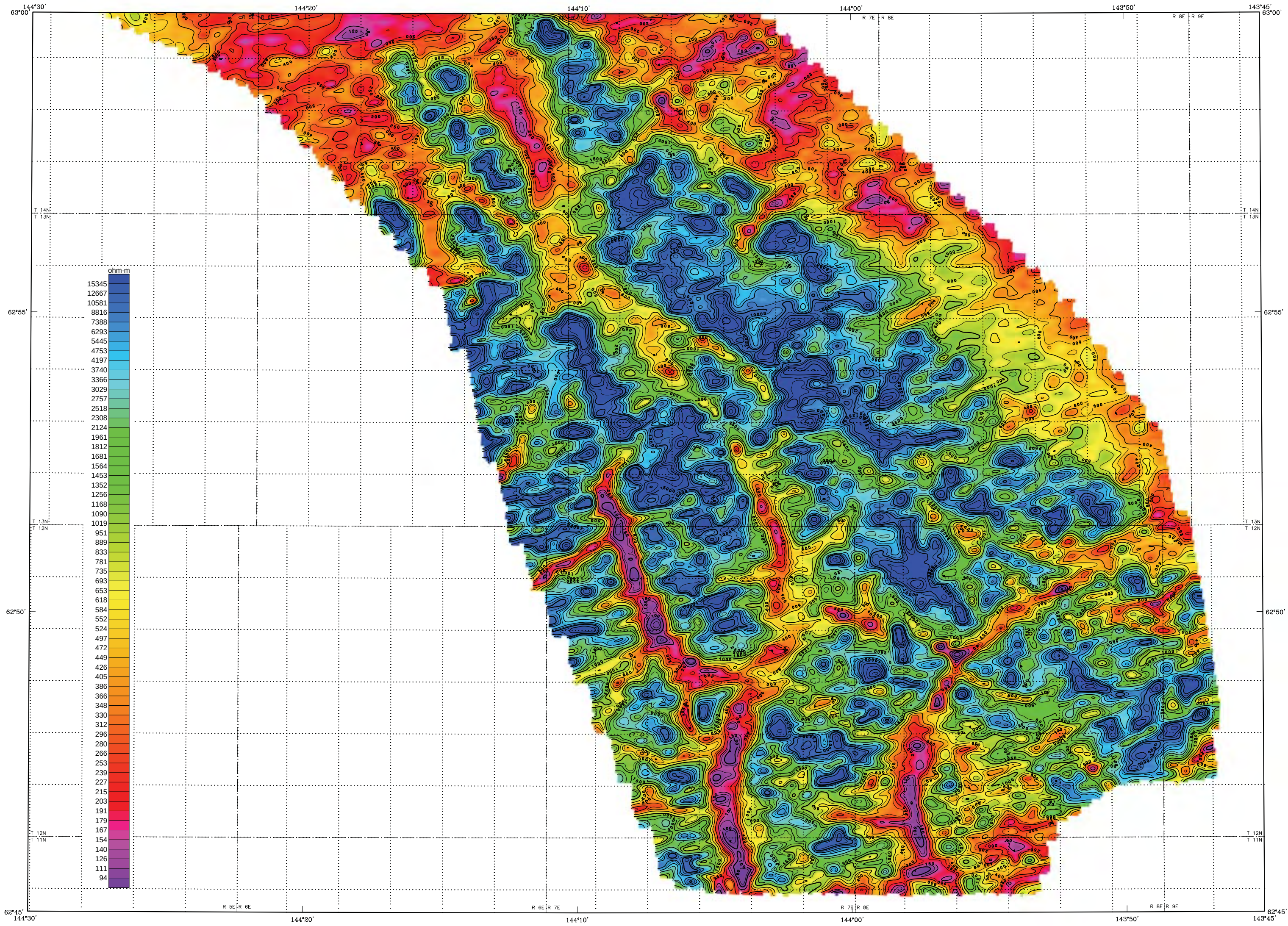
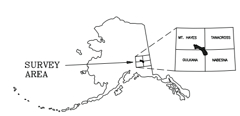
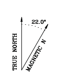


Section outlines from U.S. Geological Survey Gulkana D-1, 1976; Nabesna D-6, 1969; Quadrangles, Alaska





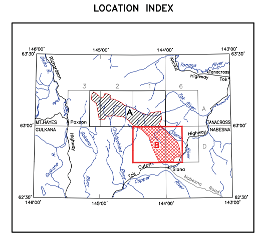
APPROXIMATE MEAN DECLINATION, 2008

SCALE 1:63,360

1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS

LOCATION INDEX



56,000 Hz COPLANAR APPARENT RESISTIVITY OF THE SLATE CREEK - SLANA RIVER AREA, CHISTOCHINA MINING DISTRICT, SOUTHCENTRAL ALASKA

PARTS OF GULKANA and NABESNA QUADRANGLES

by
Laurel E. Burns, Fugro Airborne Surveys Corp., and Stevens Exploration Management Corp.
2009

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.

A Novatel OEM4−G2L 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 5m. 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 10m with respect to the UTM grid.

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 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.

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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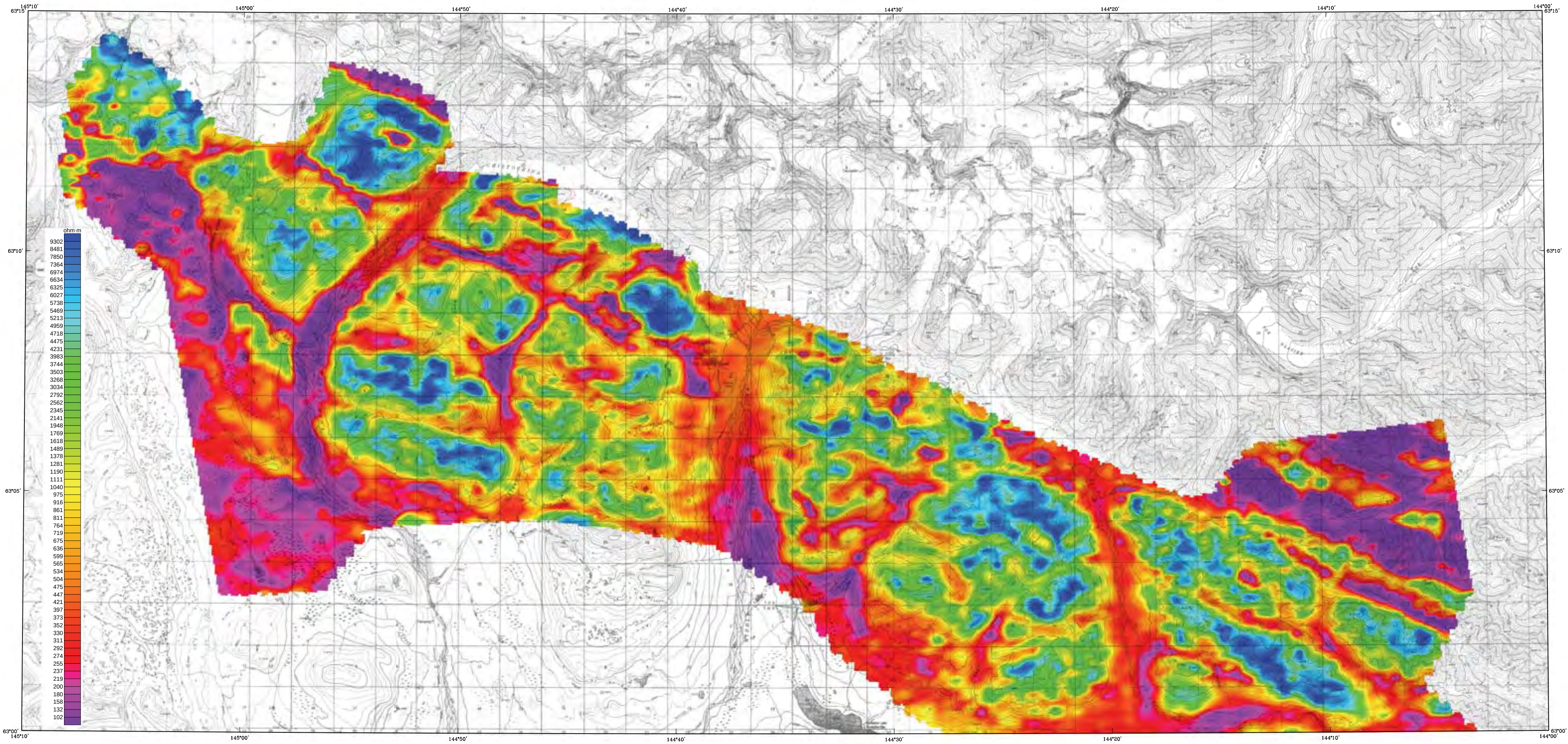
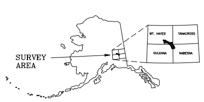
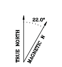


Base from U.S. Geological Survey Mt. Hayes A-1, 1975; A-2, 1975; A-3, 1963; Quadrangles, Alaska





APPROXIMATE MEAN DECLINATION, 2008

SCALE 1:63,360

1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS

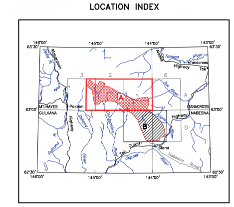
CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL

7200 Hz COPLANAR APPARENT RESISTIVITY OF THE SLATE CREEK - SLANA RIVER AREA, CHISTOCHINA MINING DISTRICT, SOUTHCENTRAL ALASKA

PART OF MT. HAYES QUADRANGLE

by
Laurel E. Burns, Fugro Airborne Surveys Corp., and Stevens Exploration Management Corp.
2009

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.

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.

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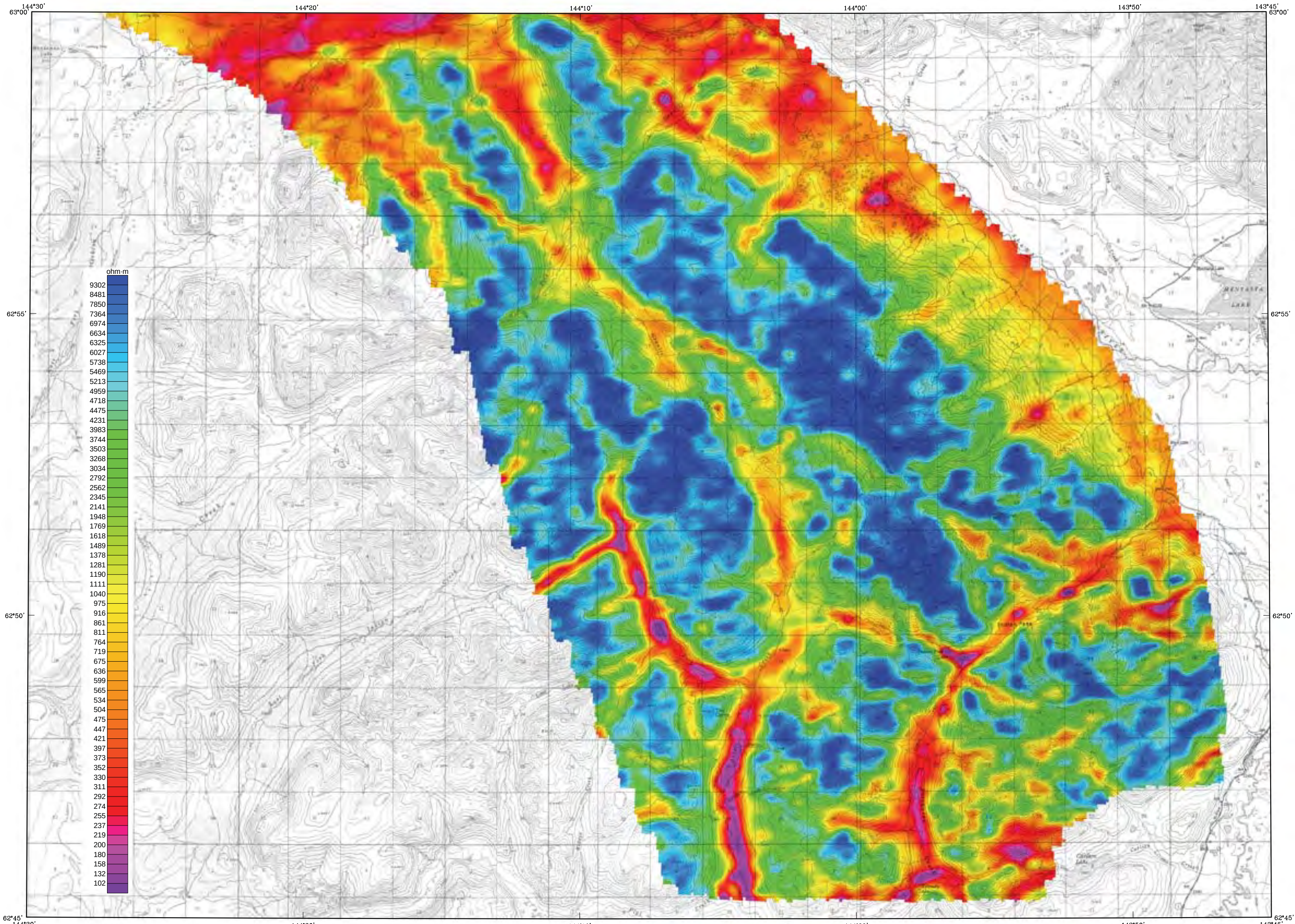


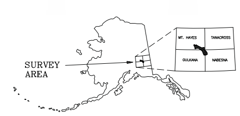
Base from U.S. Geological Survey Gulkana D-1, 1978; Nabesna D-6, 1969; Quadrangles, Alaska

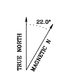
SCALE 1:63,360

1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS

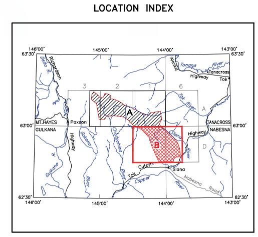
CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL





APPROXIMATE MEAN DECLINATION, 2008

LOCATION INDEX



7200 Hz COPLANAR APPARENT RESISTIVITY OF THE SLATE CREEK - SLANA RIVER AREA, CHISTOCHINA MINING DISTRICT, SOUTHCENTRAL ALASKA

PARTS OF GULKANA and NABESNA QUADRANGLES

by
Laurel E. Burns, Fugro Airborne Surveys Corp., and Stevens Exploration Management Corp.
2009

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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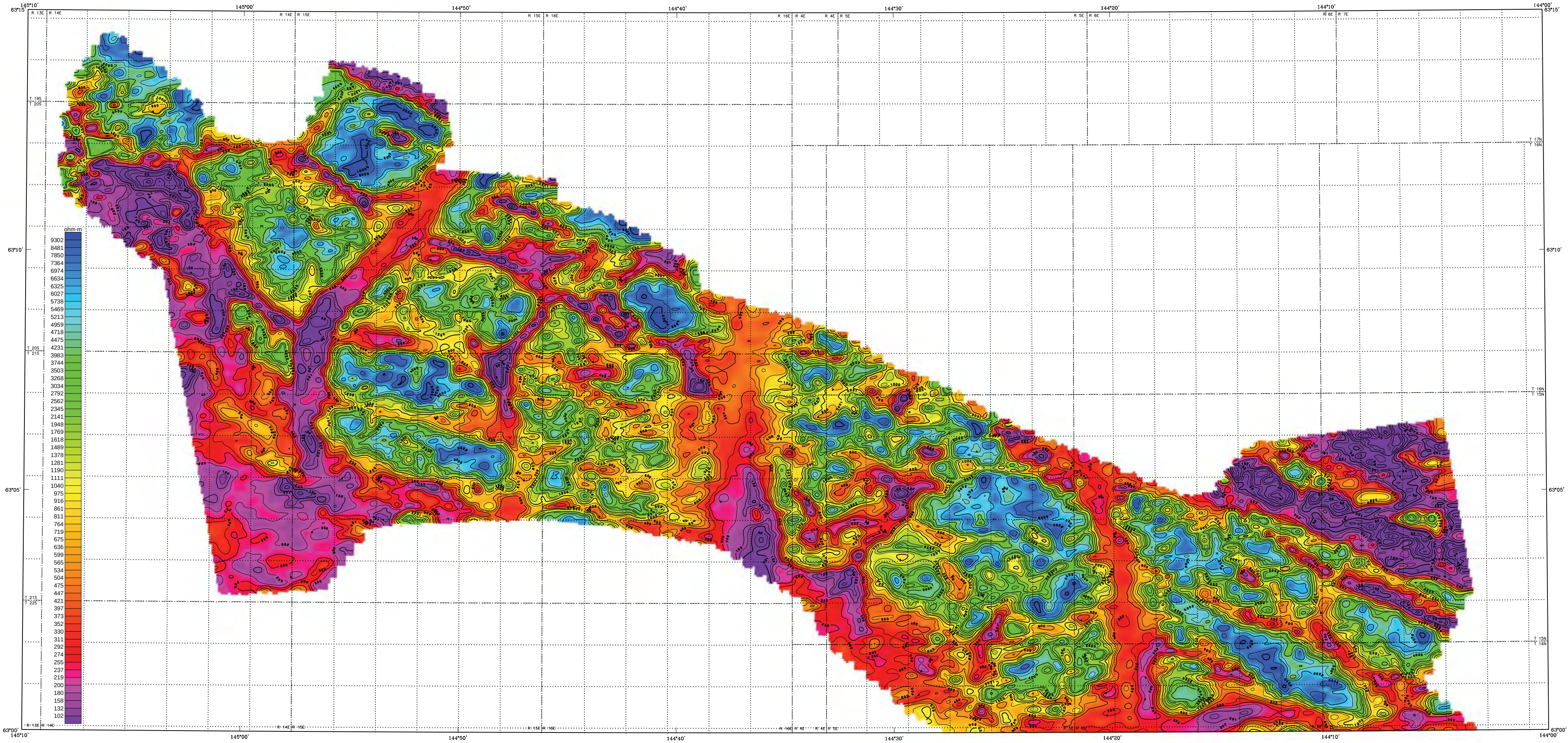
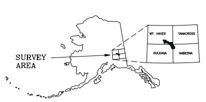
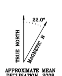
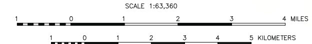


Section outlines from U.S. Geological Survey Mt. Hayes A-1, 1975; A-2, 1975; A-3, 1963; Quadrangles, Alaska

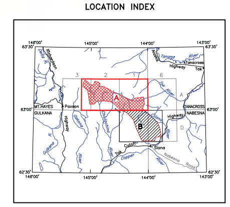




SCALE 1:63,360



LOCATION INDEX



7200 Hz COPLANAR APPARENT RESISTIVITY OF THE SLATE CREEK - SLANA RIVER AREA, CHISTOCHINA MINING DISTRICT, SOUTHCENTRAL ALASKA

PART OF MT. HAYES QUADRANGLE

by
Laurel E. Burns, Fugro Airborne Surveys Corp., and Stevens Exploration Management Corp.
2009

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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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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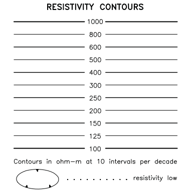
RESISTIVITY CONTOURS



SURVEY HISTORY

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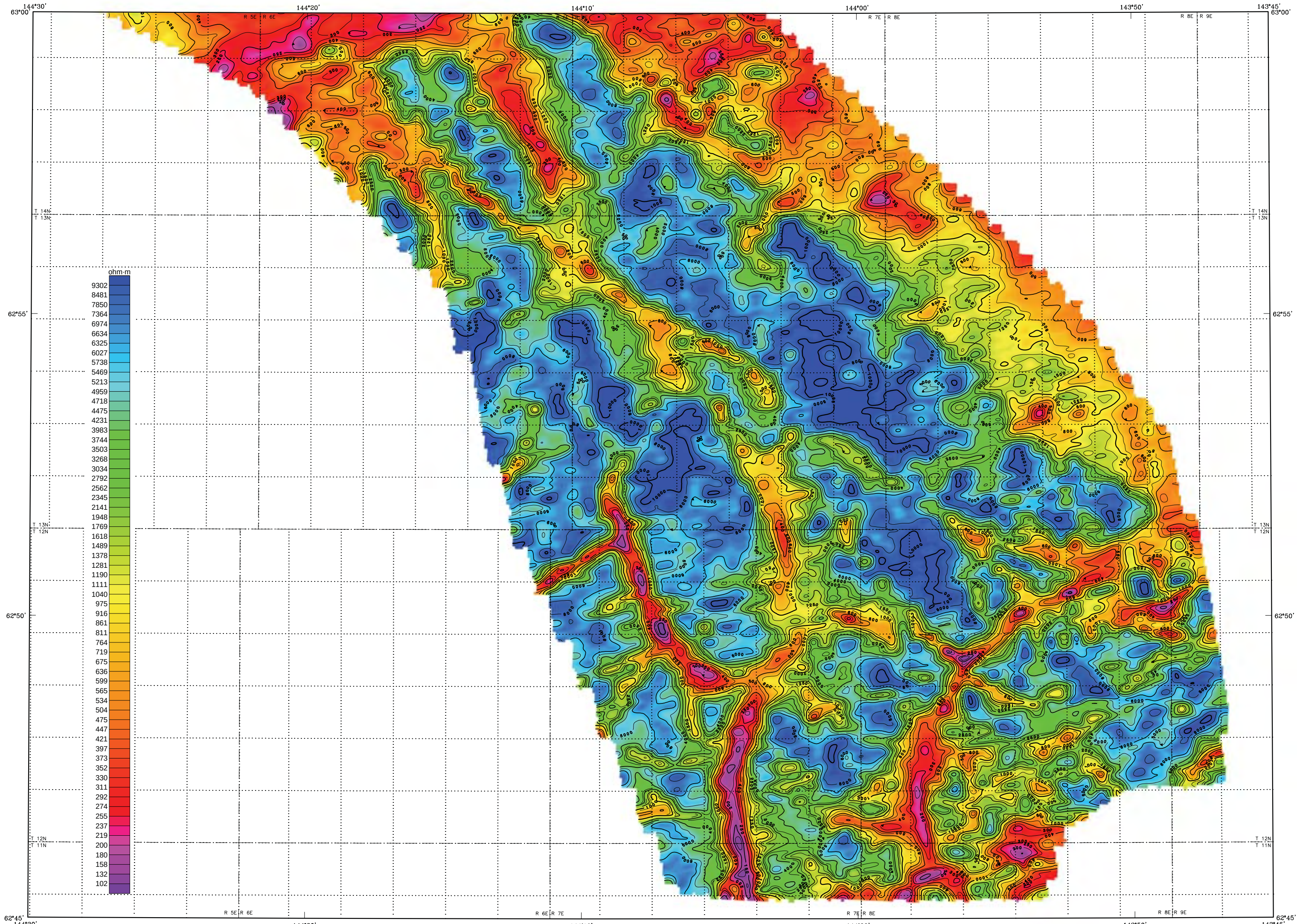


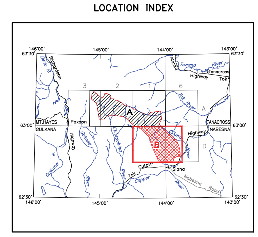
Section outlines from U.S. Geological Survey Gulkana D-1, 1978; Nabesna D-6, 1969; Quadrangles, Alaska

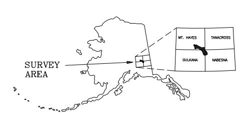
SCALE 1:63,360

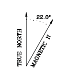
1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS

LOCATION INDEX







APPROXIMATE MEAN DECLINATION, 2008

7200 Hz COPLANAR APPARENT RESISTIVITY OF THE SLATE CREEK - SLANA RIVER AREA, CHISTOCHINA MINING DISTRICT, SOUTHCENTRAL ALASKA

PARTS OF GULKANA and NABESNA QUADRANGLES

by

Laurel E. Burns, Fugro Airborne Surveys Corp., and Stevens Exploration Management Corp.

2009

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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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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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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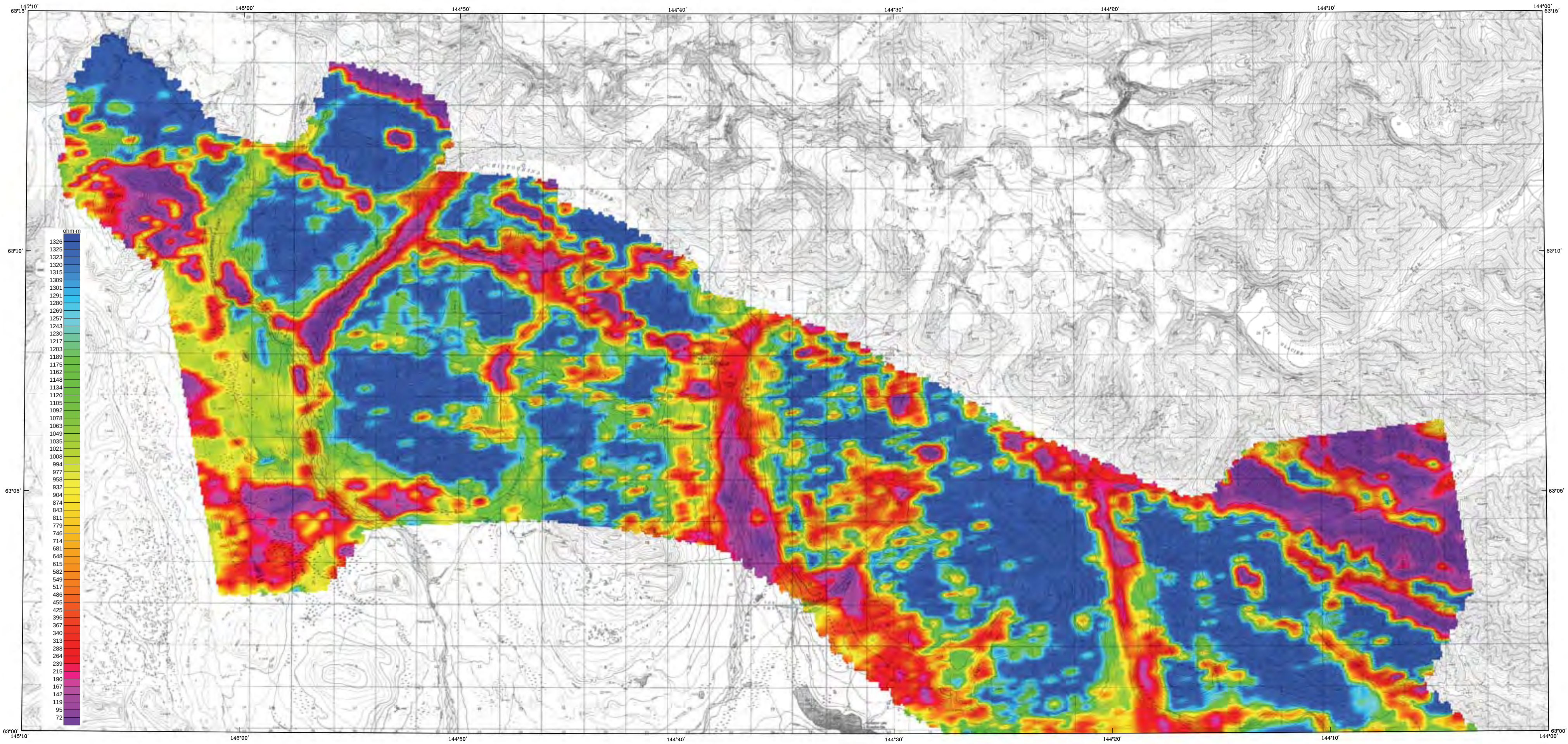
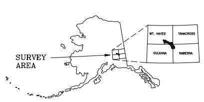
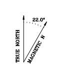


Base from U.S. Geological Survey Mt. Hayes A-1, 1975; A-2, 1975; A-3, 1963; Quadrangles, Alaska





APPROXIMATE MEAN DECLINATION, 2008

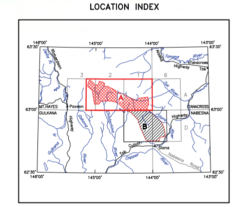
SCALE 1:63,360

1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS

CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL

LOCATION INDEX



900 Hz COPLANAR APPARENT RESISTIVITY OF THE SLATE CREEK - SLANA RIVER AREA, CHISTOCHINA MINING DISTRICT, SOUTHCENTRAL ALASKA

PART OF MT. HAYES QUADRANGLE

by
Laurel E. Burns, Fugro Airborne Surveys Corp., and Stevens Exploration Management Corp.
2009

DESCRIPTIVE NOTES

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RESISTIVITY

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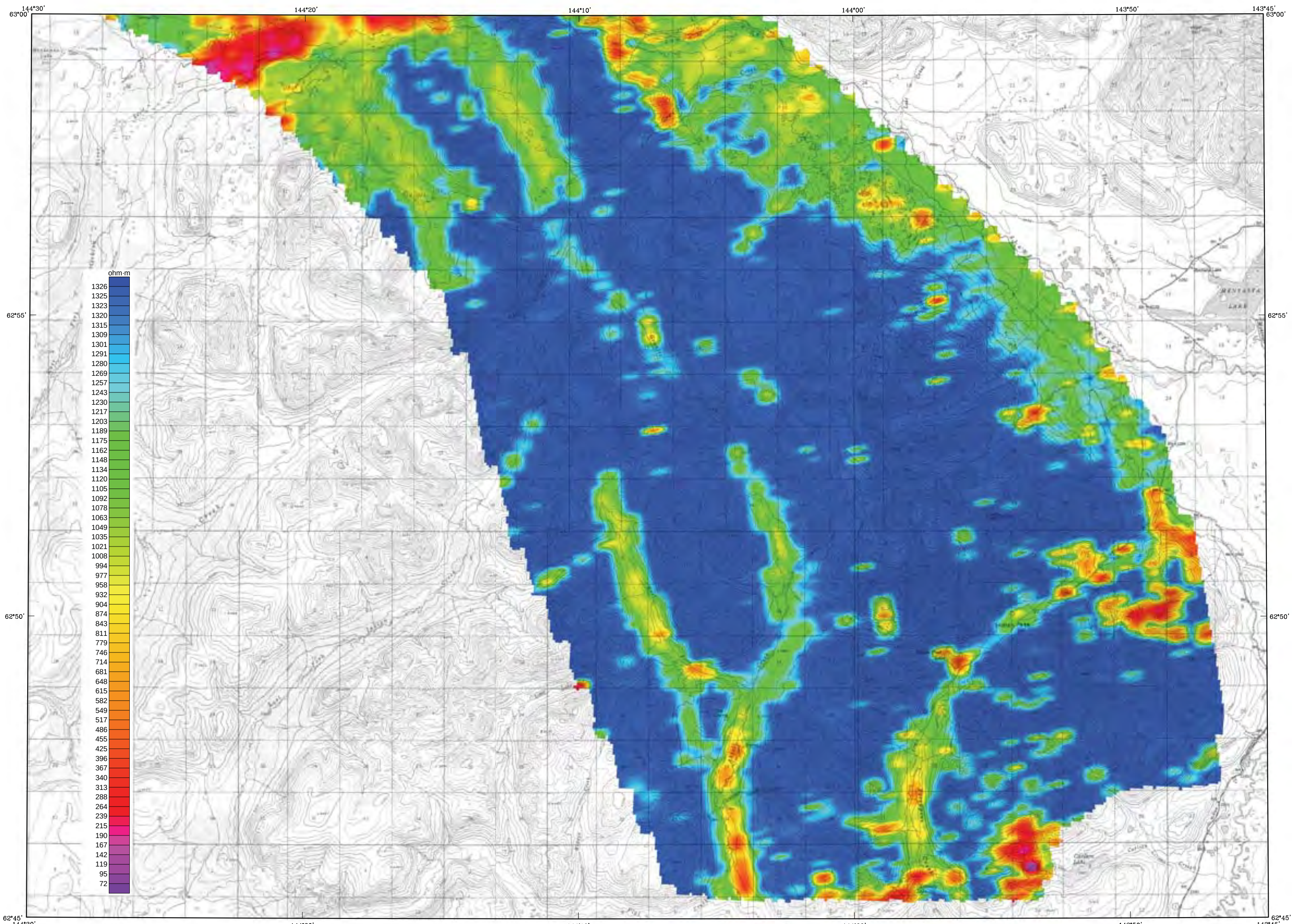


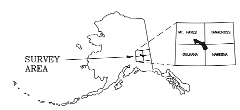
Base from U.S. Geological Survey Gulkana D-1, 1978; Nabesna D-6, 1969; Quadrangles, Alaska

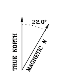
SCALE 1:63,360

1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS

CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL





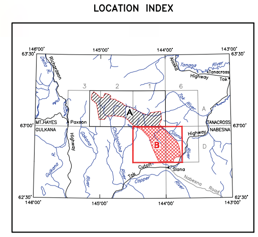
APPROXIMATE MEAN DECLINATION, 2008

900 Hz COPLANAR APPARENT RESISTIVITY OF THE SLATE CREEK - SLANA RIVER AREA, CHISTOCHINA MINING DISTRICT, SOUTHCENTRAL ALASKA

PARTS OF GULKANA and NABESNA QUADRANGLES

by
Laurel E. Burns, Fugro Airborne Surveys Corp., and Stevens Exploration Management Corp.
2009

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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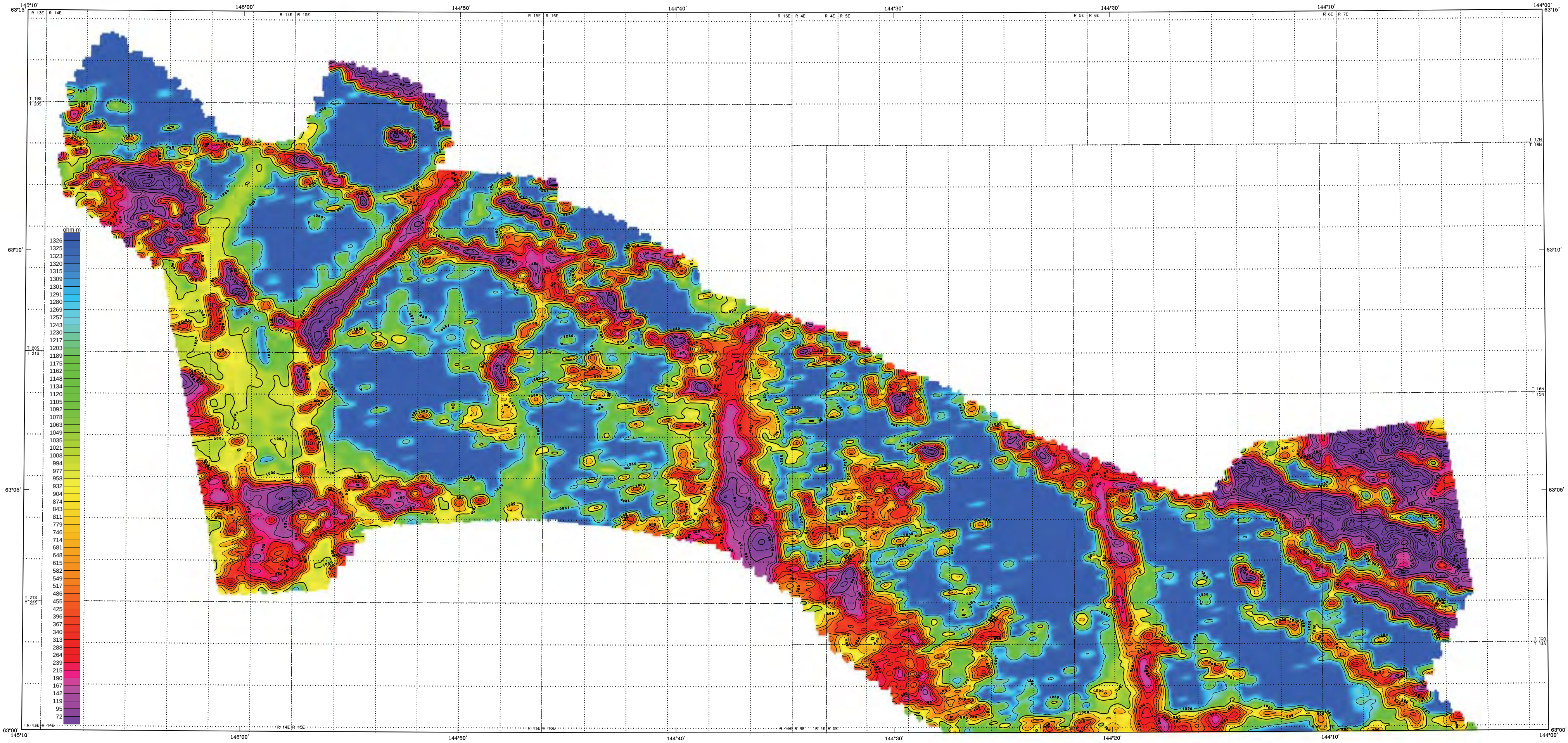

Section outlines from U.S. Geological Survey Mt. Hayes A-1, 1975; A-2, 1975; A-3, 1963; Quadrangles, Alaska

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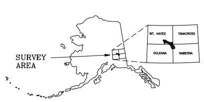
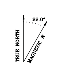
1 0 1 2 3 4 MILES

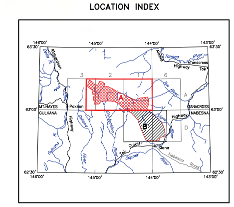
1 0 1 2 3 4 5 KILOMETERS





APPROXIMATE MEAN DECLINATION, 2008

LOCATION INDEX



900 Hz COPLANAR APPARENT RESISTIVITY OF THE SLATE CREEK - SLANA RIVER AREA, CHISTOCHINA MINING DISTRICT, SOUTHCENTRAL ALASKA

PART OF MT. HAYES QUADRANGLE

by

Laurel E. Burns, Fugro Airborne Surveys Corp., and Stevens Exploration Management Corp.

2009

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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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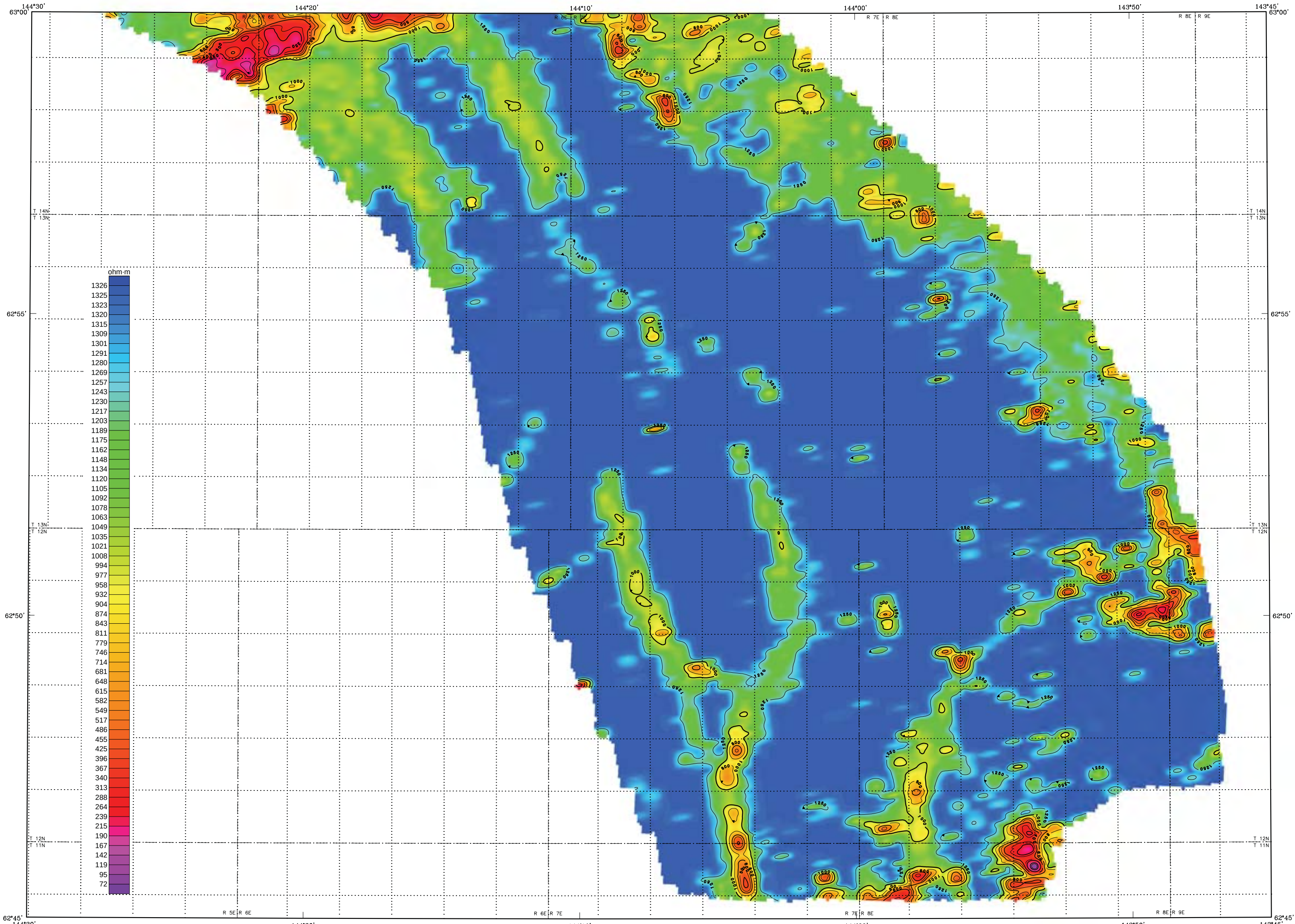

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SCALE 1:63,360

1 0 1 2 3 4 MILES

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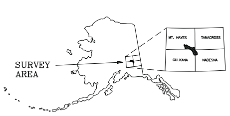
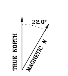
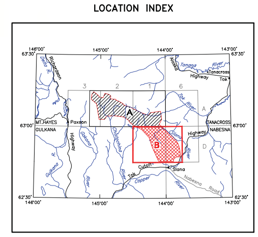




APPROXIMATE MEAN DECLINATION, 2008

LOCATION INDEX



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PARTS OF GULKANA and NABESNA QUADRANGLES

by
Laurel E. Burns, Fugro Airborne Surveys Corp., and Stevens Exploration Management Corp.
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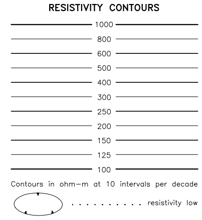
RESISTIVITY CONTOURS



Contours in ohm-m at 10 intervals per decade

SURVEY HISTORY

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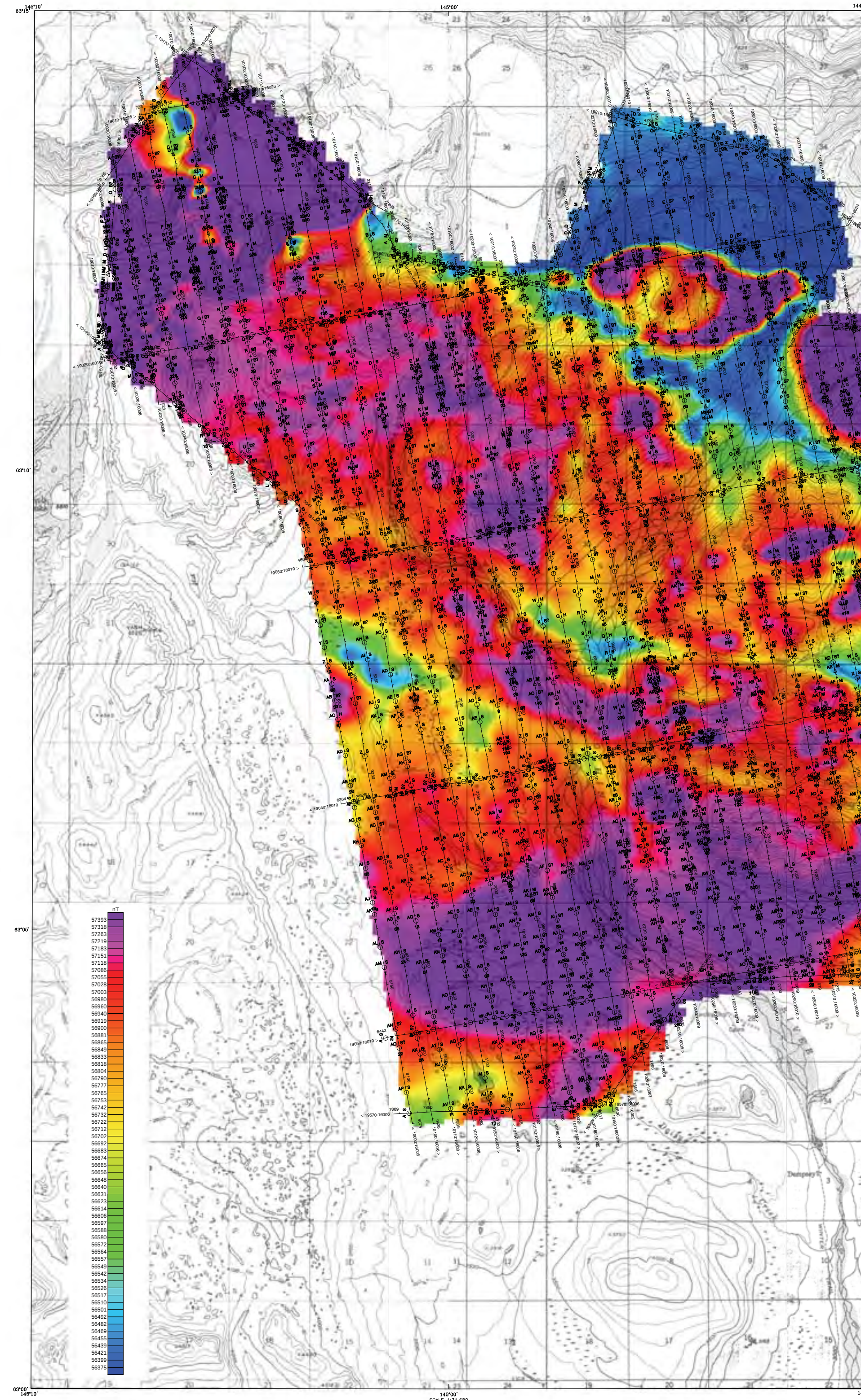
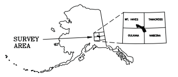


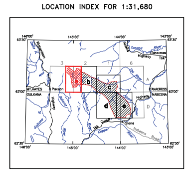
Base from U.S. Geological Survey Mt. Hayes A-2, 1975; A-3, 1963; Quadrangles, Alaska

SCALE 1:31,680

CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL



LOCATION INDEX FOR 1:31,680



TOTAL MAGNETIC FIELD AND DETAILED ELECTROMAGNETIC ANOMALIES OF THE SLATE CREEK - SLANA RIVER AREA, CHISTOCHINA MINING DISTRICT, SOUTHCENTRAL ALASKA

PARTS of MT. HAYES A-2 and A-3 QUADRANGLES

by
Laurel E. Burns, Fugro Airborne Surveys Corp., and Stevens Exploration Management Corp.
2009

DESCRIPTIVE NOTES

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TOTAL MAGNETIC FIELD

The magnetic total field data were processed 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 subtraction of the digitally recorded base station magnetic data, (2) IGRF corrected (IGRF model 2005, updated for date of flight and altimeter variations), (3) leveled to the tie line data, and (4) interpolated onto a regular 80 m grid using a modified Akima (1970) technique.

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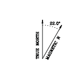
ELECTROMAGNETIC ANOMALIES

Arcs indicate the conductor has a thickness >10m
Dip direction
Magnetic correlation in nT

Anomaly	Conductance
●	>100 siemens
◕	50–100 siemens
◓	20–50 siemens
⊕	10–20 siemens
⊕	5–10 siemens
○	1–5 siemens
◌	< 1 siemens
✳	Questionable anomaly
△	EM magnetite response
□	Culture

Anomaly identifier
Interpretive symbol

Interpretive symbol	Conductor model
B	Bedrock conductor
D	Narrow bedrock conductor ("thin dike")
S	Conductive cover ("horizontal thin sheet")
H	Broad conductive rock unit, deep conductive weathering, thick conductive cover ("half-space")
E	Edge of broad conductor ("edge of half space")
L	Culture, e.g. power line, metal building or fence
M	Magnetite
"?"	Indicates some uncertainty as to the most appropriate EM source model, but does not question the validity of the EM anomaly.



ELECTROMAGNETICS

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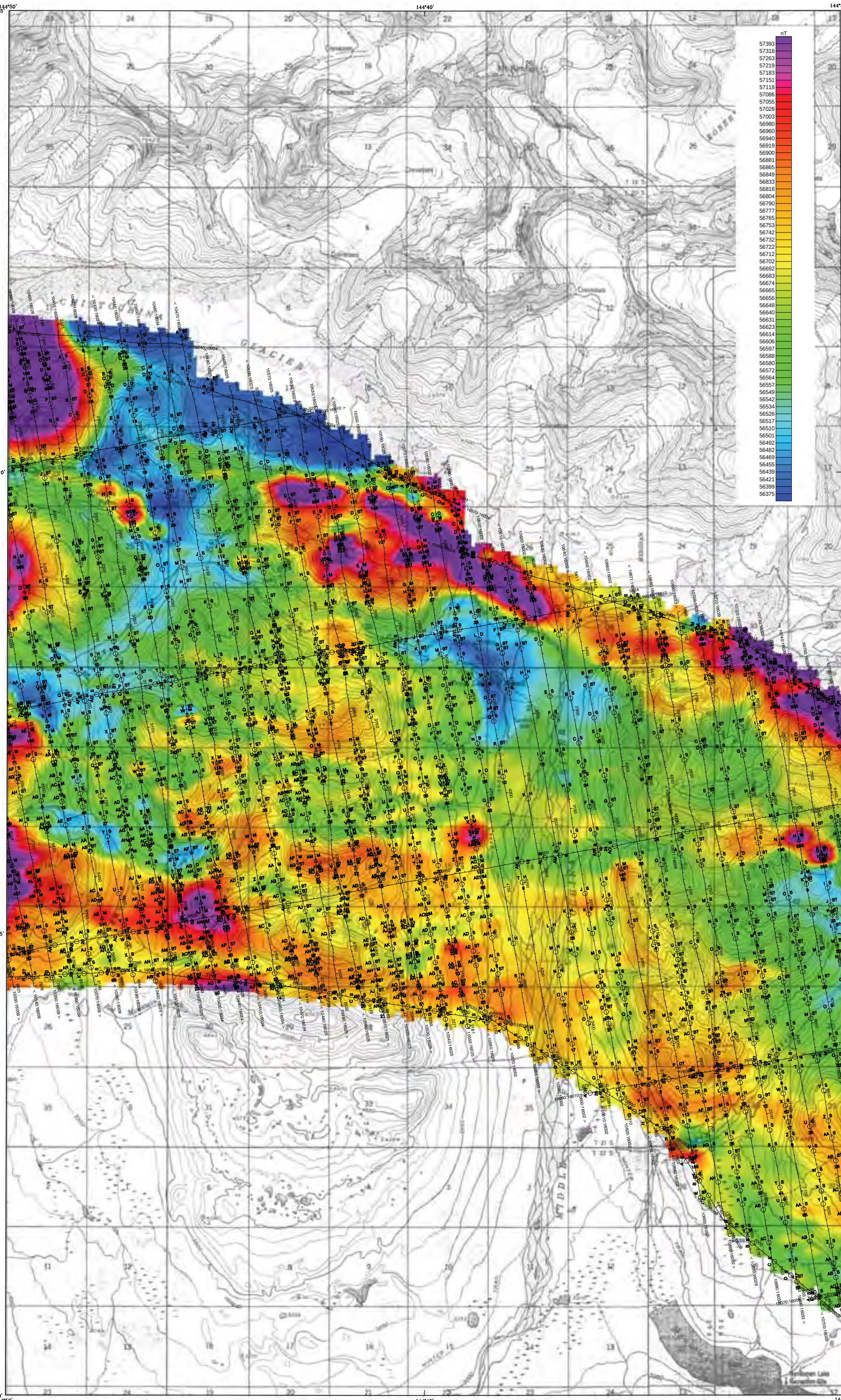


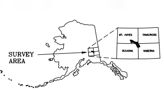
Base from U.S. Geological Survey Mt. Hayes A-2, 1975; Quadrangle, Alaska

SCALE 1:31,680

0.5 0 0.5 1 1.5 2 MILES

0.5 0 0.5 1 1.5 2 2.5 KILOMETERS

CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL

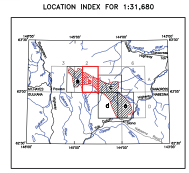


TOTAL MAGNETIC FIELD AND DETAILED ELECTROMAGNETIC ANOMALIES OF THE SLATE CREEK - SLANA RIVER AREA, CHISTOCHINA MINING DISTRICT, SOUTHCENTRAL ALASKA

PART of MT. HAYES A-2 QUADRANGLE

by
Laurel E. Burns, Fugro Airborne Surveys Corp., and Stevens Exploration Management Corp.
2009

LOCATION INDEX FOR 1:31,680



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Arcs indicate the conductor has a thickness >10m
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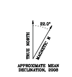

APPROXIMATE MEAN DECLINATION, 2008

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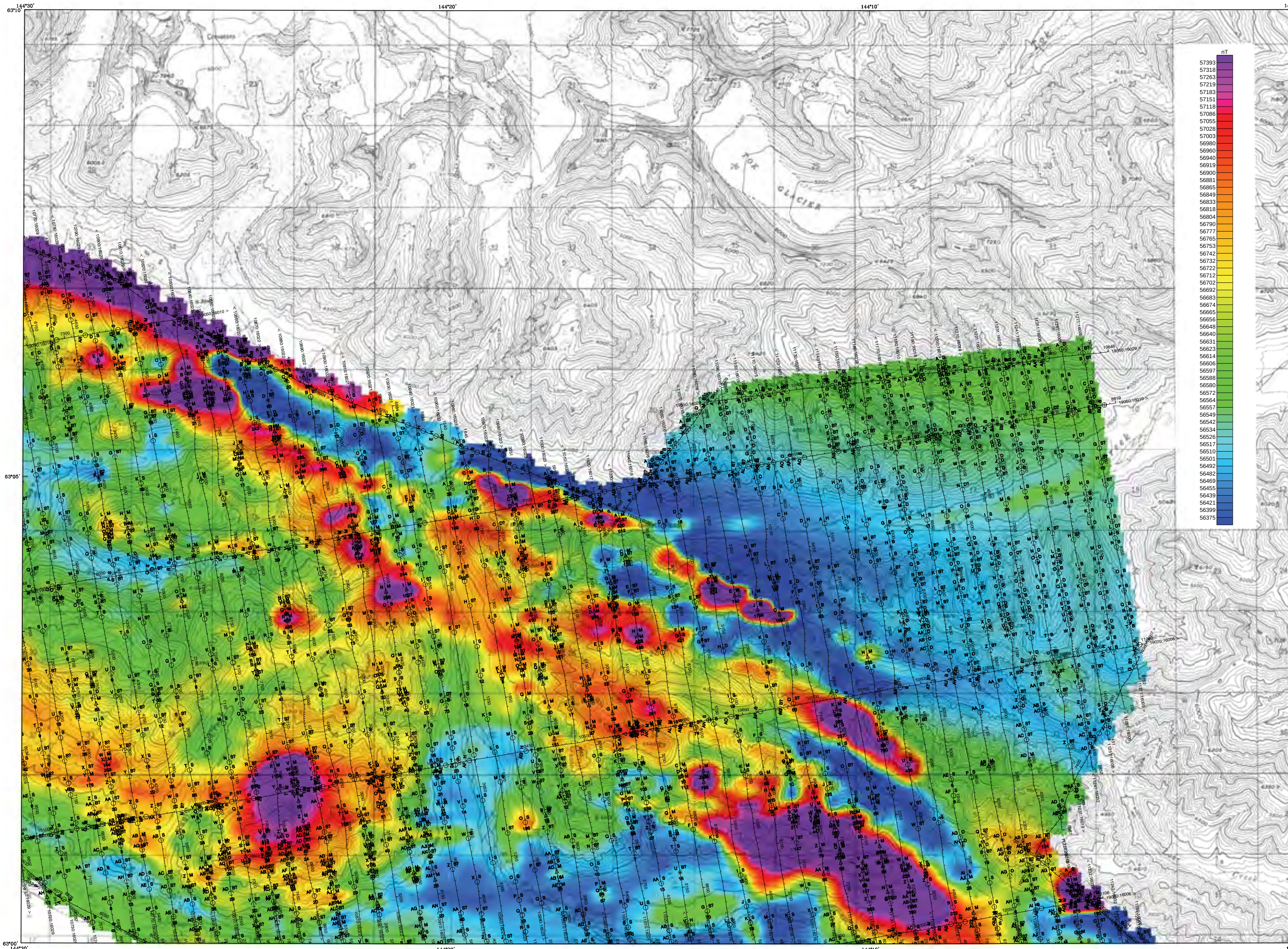
ALASKA DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS

GEOPHYSICAL REPORT 2009-2-1c
PART of MT. HAYES A-1 QUADRANGLE



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0.5 0 0.5 1 1.5 2 MILES

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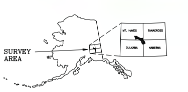

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PART of MT. HAYES A-1 QUADRANGLE

by
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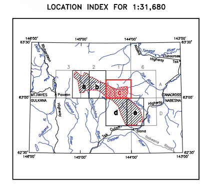
2009

LOCATION INDEX FOR 1:31,680



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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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.

ELECTROMAGNETIC ANOMALIES

F B
100
Arcs indicate the conductor has a thickness >10m
Dip direction
Magnetic correlation in nT

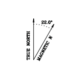
Anomaly	Conductance
●	>100 siemens
◕	50-100 siemens
◒	20-50 siemens
⊕	10-20 siemens
⊕	5-10 siemens
○	1-5 siemens
◌	< 1 siemens
✳	Questionable anomaly
△	EM magnetite response
□	Culture

Anomaly identifier
C H
Interpretive symbol

Interpretive symbol	Conductor model
B	Bedrock conductor
D	Narrow bedrock conductor ("thin dike")
S	Conductive cover ("horizontal thin sheet")
H	Broad conductive rock unit, deep conductive weathering, thick conductive cover ("half-space")
E	Edge of broad conductor ("edge of half space")
L	Culture, e.g. power line, metal building or fence
M	Magnetite
"?"	Indicates some uncertainty as to the most appropriate EM source model, but does not question the validity of the EM anomaly.

ELECTROMAGNETICS

To determine the location of EM anomalies or their boundaries, 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. 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.



APPROXIMATE MEAN DECLINATION, 2008

SURVEY HISTORY

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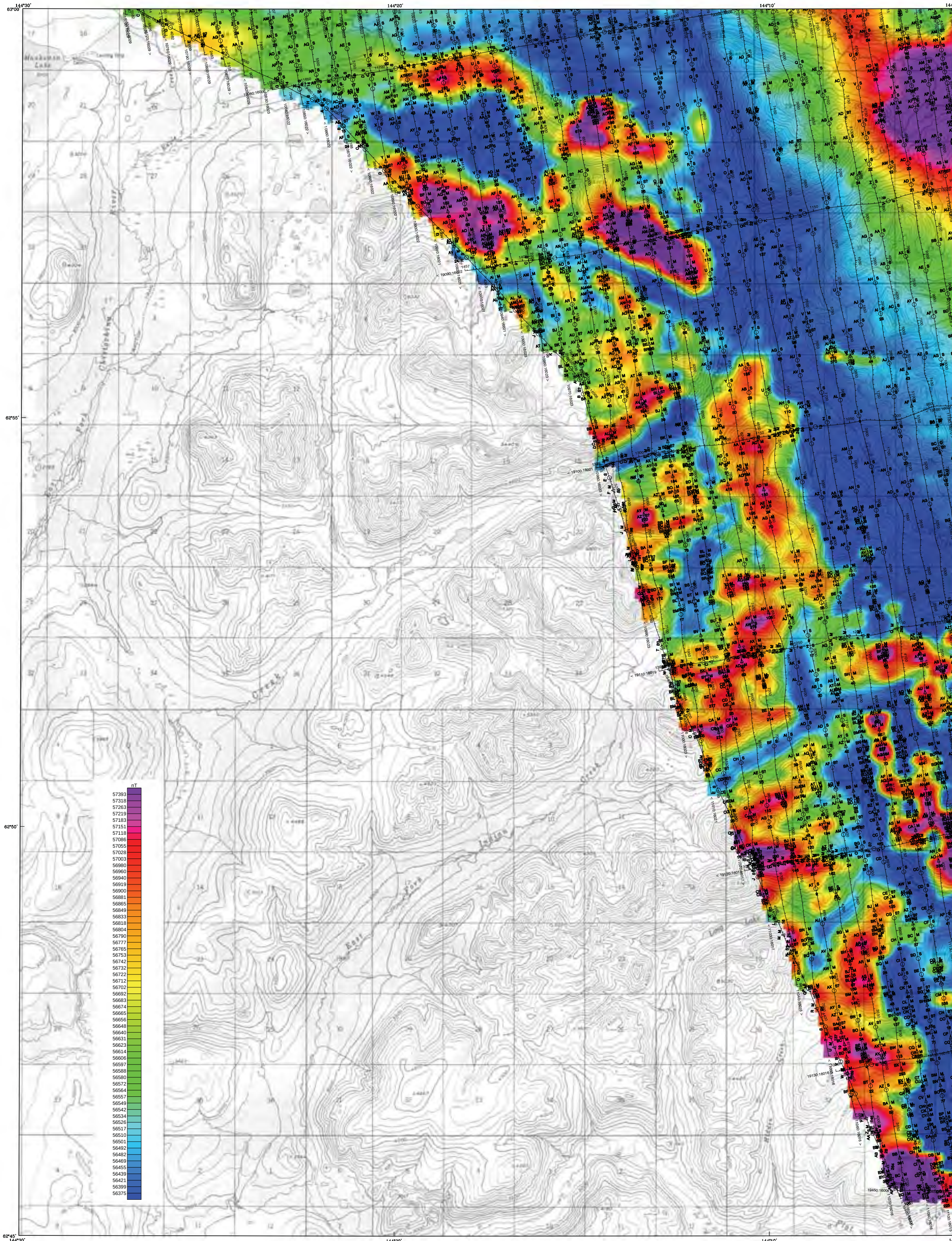


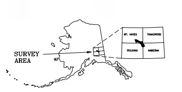
Base from U.S. Geological Survey Mt. Gulkana D-1, 1978; Quadrangle, Alaska

SCALE 1:31,680

0.5 0 0.5 1 1.5 2 MILES

0.5 0 0.5 1 1.5 2 2.5 KILOMETERS

CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL

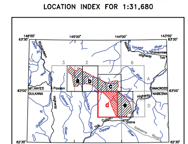


TOTAL MAGNETIC FIELD AND DETAILED ELECTROMAGNETIC ANOMALIES OF THE SLATE CREEK - SLANA RIVER AREA, CHISTOCHINA MINING DISTRICT, SOUTHCENTRAL ALASKA

PART of GULKANA D-1 QUADRANGLE

by
Laurel E. Burns, Fugro Airborne Surveys Corp., and Stevens Exploration Management Corp.
2009

LOCATION INDEX FOR 1:31,680



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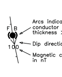
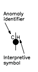
ELECTROMAGNETIC ANOMALIES



Anomaly	Conductance
●	>100 siemens
◕	50-100 siemens
◒	20-50 siemens
⊕ (quarter filled)	10-20 siemens
⊕	5-10 siemens
○	1-5 siemens
◌	< 1 siemens
✳	Questionable anomaly
△	EM magnetite response
□	Culture



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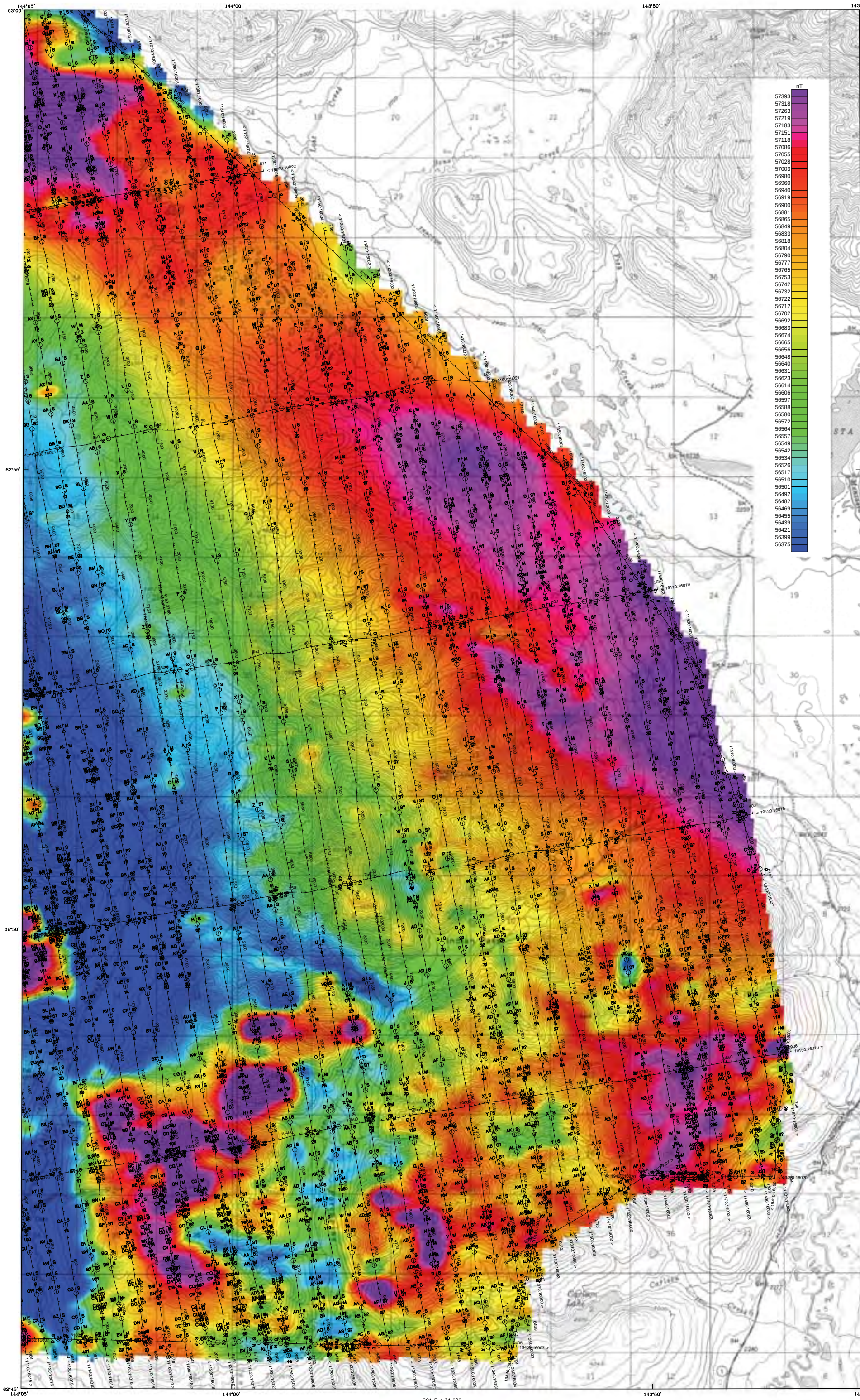

Base from U.S. Geological Survey Gulkana D-1, 1978; Nabesna D-6, 1969; Quadrangles, Alaska

SCALE 1:31,680

CONTOUR INTERVAL 100 FEET
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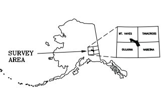

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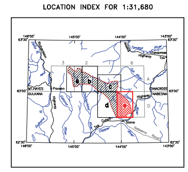
PARTS of GULKANA D-1 and NABESNA D-6 QUADRANGLES

by
Laurel E. Burns, Fugro Airborne Surveys Corp., and Stevens Exploration Management Corp.
2009

LOCATION INDEX FOR 1:31,680



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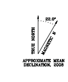

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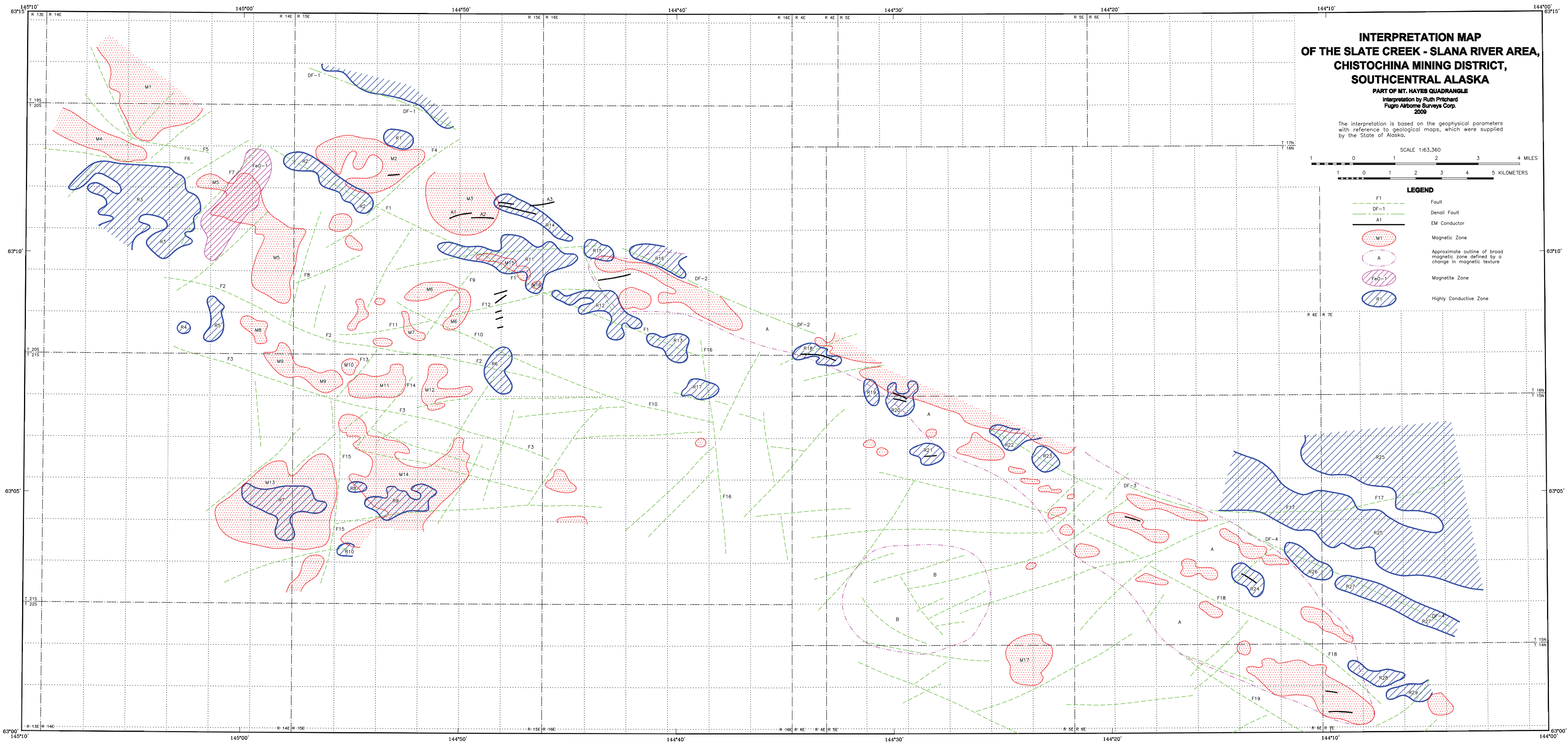
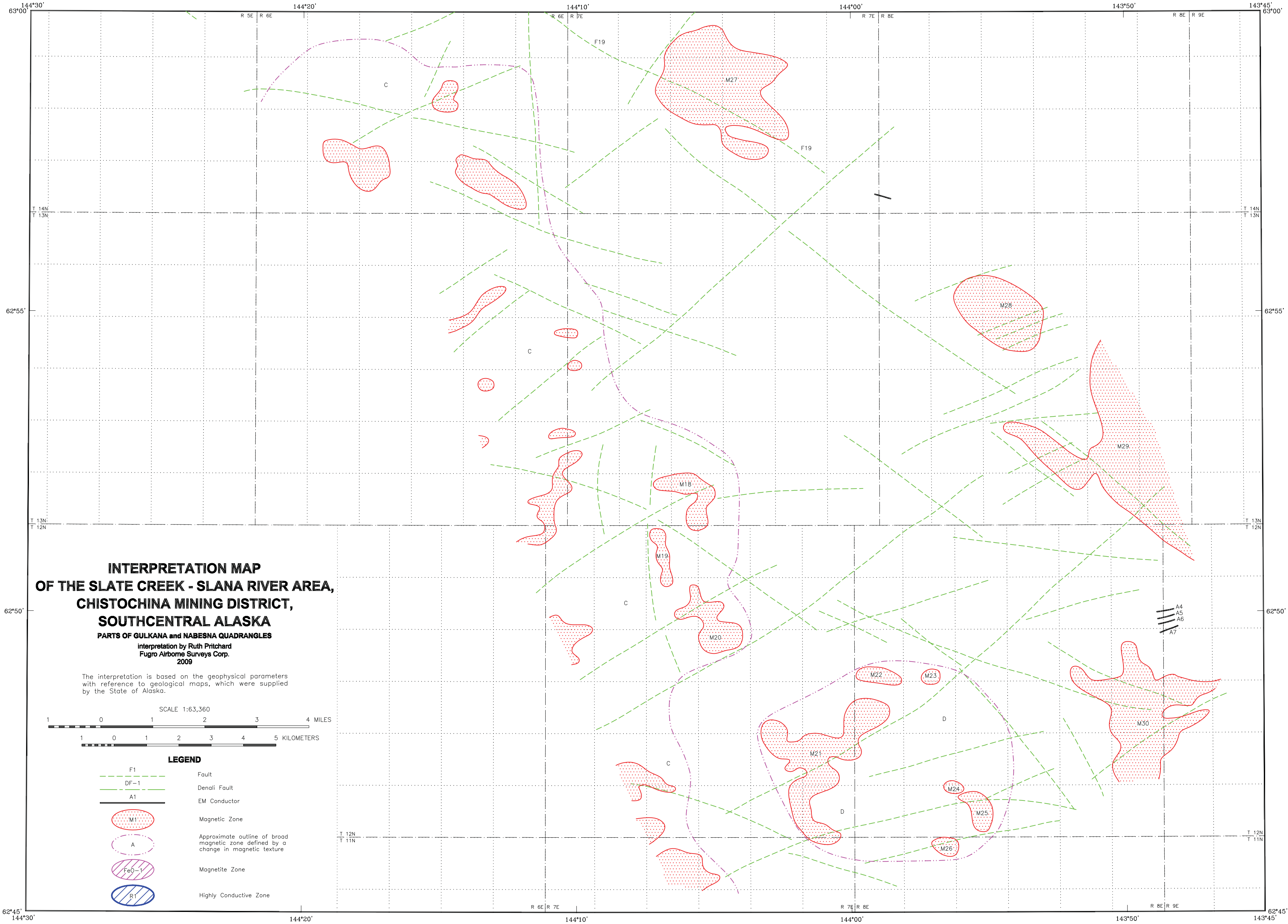
ALASKA DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS

GEOPHYSICAL REPORT 2009-2-2A





INTERPRETATION MAP OF THE SLATE CREEK - SLANA RIVER AREA, CHISTOCHINA MINING DISTRICT, SOUTHCENTRAL ALASKA

PARTS OF GULKANA and NABESNA QUADRANGLES

interpretation by Ruth Pritchard
Fugro Airborne Surveys Corp.
2009

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

SCALE 1:63,360

1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS

LEGEND

F1	Fault
DF-1	Denali Fault
A1	EM Conductor
M1	Magnetic Zone
A	Approximate outline of broad magnetic zone defined by a change in magnetic texture
FeO-1	Magnetite Zone
R1	Highly Conductive Zone