

# **WRANGELLIA ELECTROMAGNETIC AND MAGNETIC AIRBORNE GEOPHYSICAL SURVEY DATA COMPILATION**

Burns, L.E., Barefoot, J.D., Naibert, T.J., and Fugro Geoservices Inc.

**Geophysical Report 2018-8**

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., and Fugro Geoservices Inc., 2019, Wrangellia electromagnetic and magnetic airborne geophysical survey data compilation: Alaska Division of Geological & Geophysical Surveys Geophysical Report 2018-8.

<http://doi.org/10.14509/29848>



# **WRANGELLIA ELECTROMAGNETIC AND MAGNETIC AIRBORNE GEOPHYSICAL SURVEY DATA COMPILATION**

Burns, L.E.,<sup>1</sup> Barefoot, J.D.,<sup>1</sup> Naibert, T.J.,<sup>1</sup> and Fugro Geoservices Inc.

## **ABSTRACT**

This geophysical survey is located in southcentral Alaska in the Valdez Creek mining district, about 185 kilometers south of Fairbanks, Alaska and about 175 kilometers northeast of Anchorage, Alaska. Frequency domain electromagnetic and magnetic data were collected with the DIGHEMV system from June to August 2013. A total of 10,547.2 line kilometers were collected covering 3464.0 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 and to detect zones of conductive mineralization. Mineralization in the survey area includes magmatic Cu-Ni-PGE mineralization hosted by Triassic-age mafic to ultramafic dikes and sills. Vein, porphyry, and skarn type mineralization occur in association with Late-Cretaceous to early Tertiary intrusions in the area, including the Zackly Au-Cu skarn and Au-bearing quartz veins in the headwaters of the Valdez Creek placer mine. Additionally, epigenetic Cu mineralization occurs with Nikolai basalt throughout the region. 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) and Strategic and Critical Minerals Assessment Capital Improvement programs and Millrock Exploration Corporation.

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

**AVAILABLE DATA**

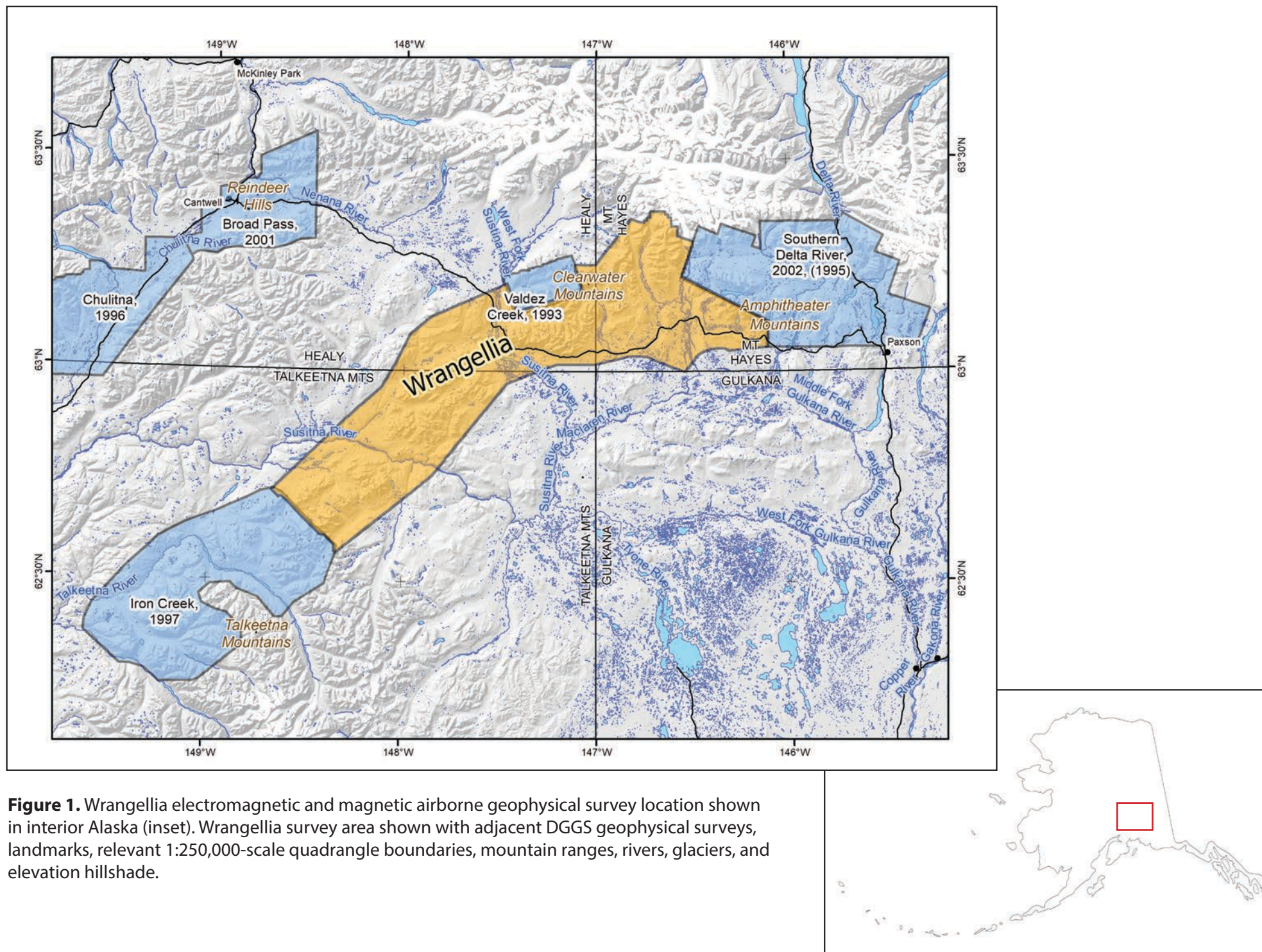
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databases_geosoft	contractor and DGGS	Geosoft format database of final line data, other Geosoft format databases
documents	contractor and DGGS	Project and field reports, survey background information, gridded data explanations, other documentation
grids_ermapper	contractor	Geographically registered gridded data, ER Mapper ERS format
grids_geosoft	contractor and DGGS	Geosoft-format binary grids, these grids can be viewed in ESRI ArcMap using a free plugin from Geosoft, or a free viewer available from Geosoft
images_registered	DGGS	GeoTiff format images of all gridded data
kmz	contractor	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.

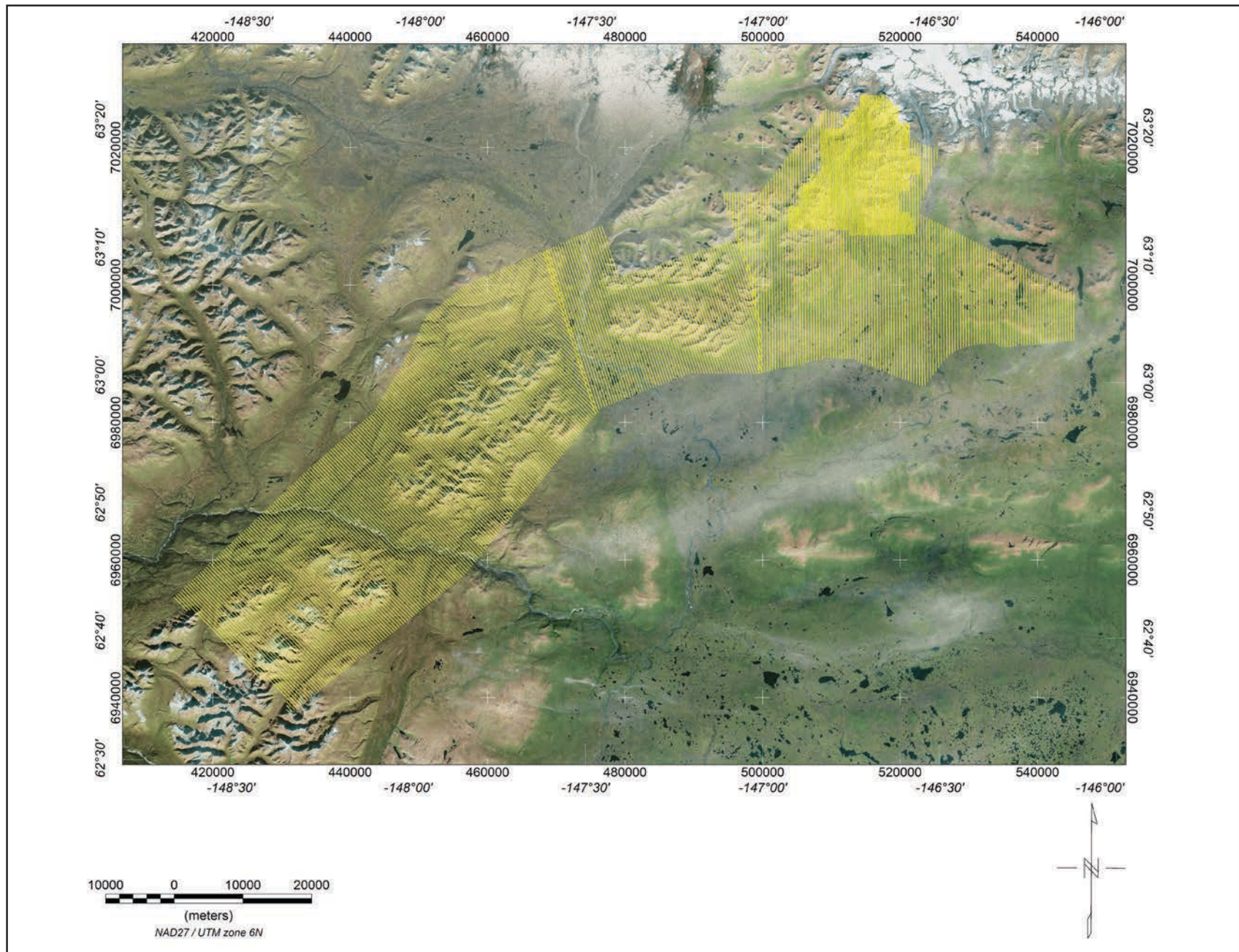
Geoterrex-Dighem, Fugro Airborne Surveys, Stevens Exploration Management Corp., Pritchard, R.A.,  
Burns, L.E., Emond, A.M., and DGGs Staff, 2016, Sub-regional, merged, gridded airborne geophysical  
data: Alaska Division of Geological & Geophysical Surveys Digital Data Series 12, 1 DVD.  
<http://doi.org/10.14509/29555>





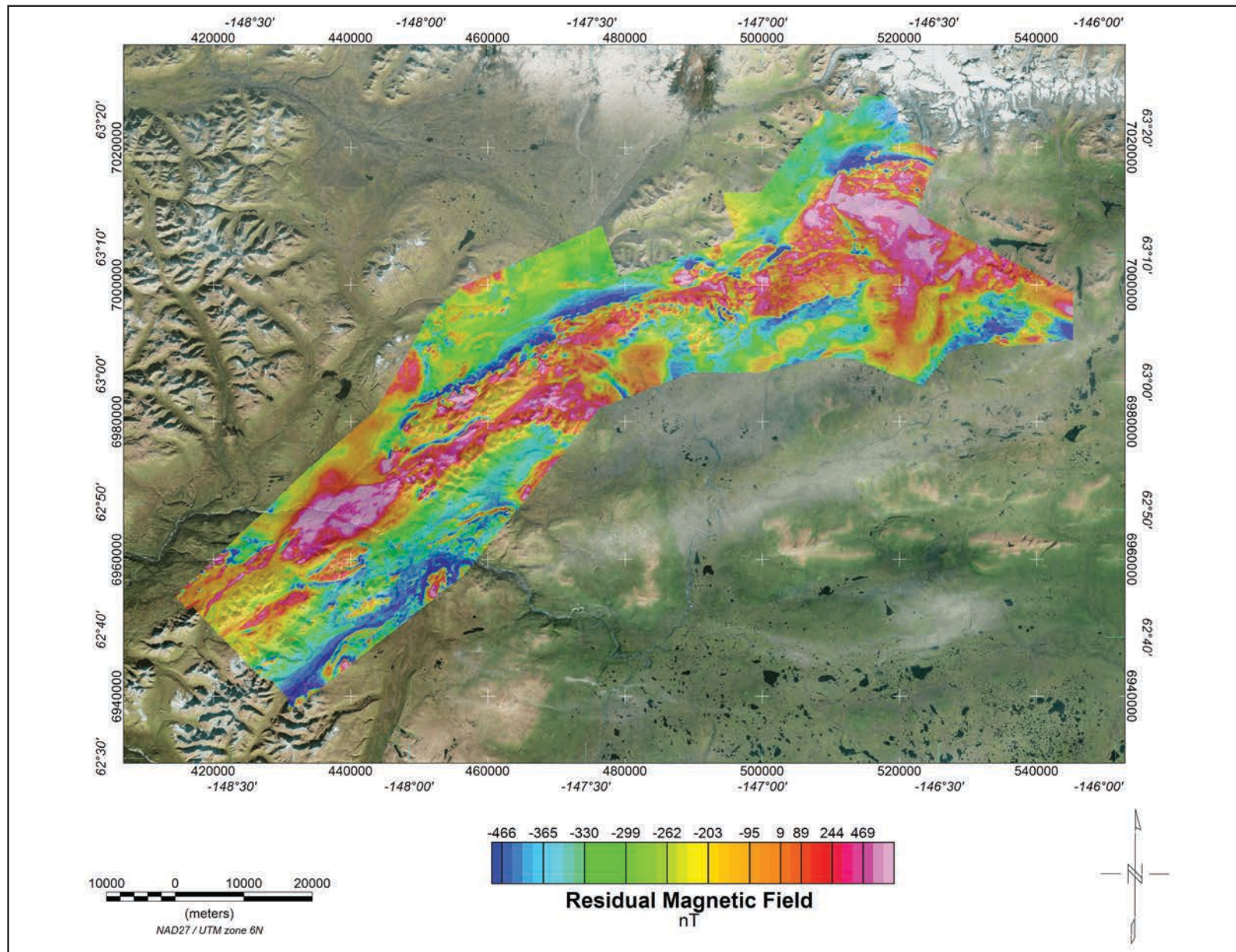
**Figure 1.** Wrangellia electromagnetic and magnetic airborne geophysical survey location shown in interior Alaska (inset). Wrangellia survey area shown with adjacent DGGs geophysical surveys, landmarks, relevant 1:250,000-scale quadrangle boundaries, mountain ranges, rivers, glaciers, and elevation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





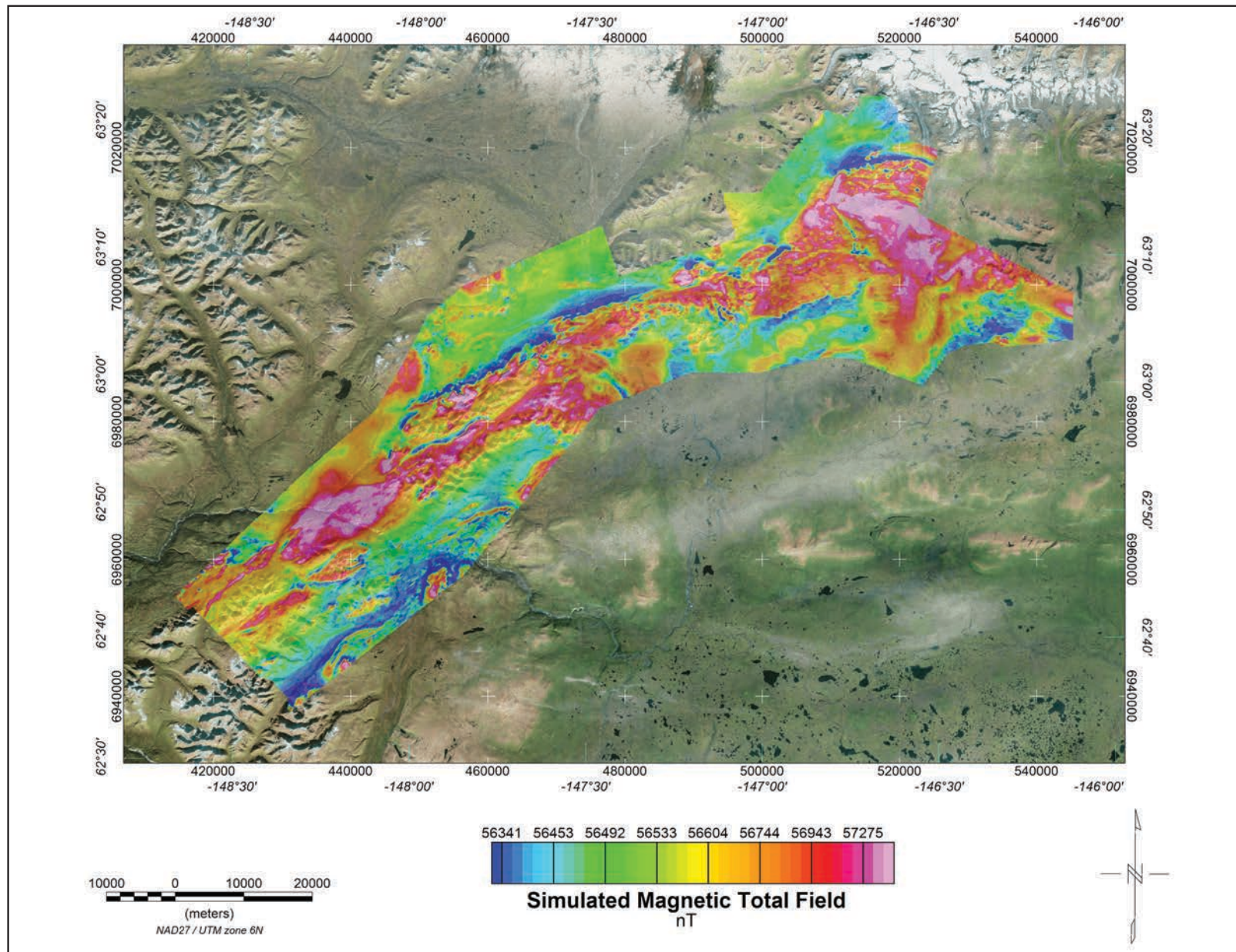
**Figure 2.** Flight path with orthometric image.





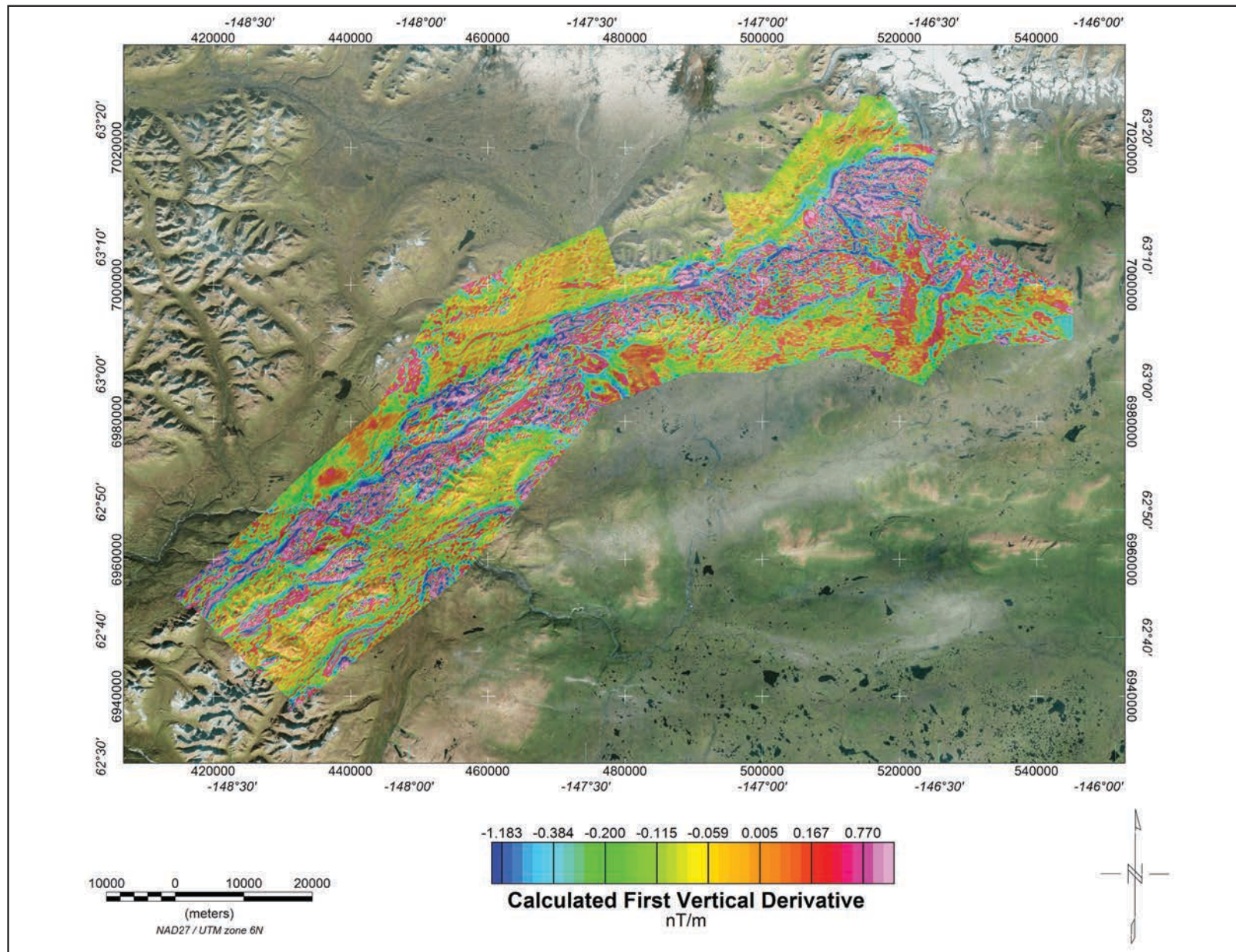
**Figure 3.** The residual magnetic intensity data were created using digitally recorded magnetic total field data from a Fugro D1344 magnetometer with a Scintrex CS3 cesium sensor. Data were collected at a sampling interval of 0.1 seconds. The magnetic data were (1) corrected for diurnal variations by subtracting the digitally recorded base station magnetic data, (2) IGRF corrected (IGRF model 2010, 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. All grids were then resampled from the 80 m cell size down to a 25 m cell size to produce the maps and final grids contained in this publication.





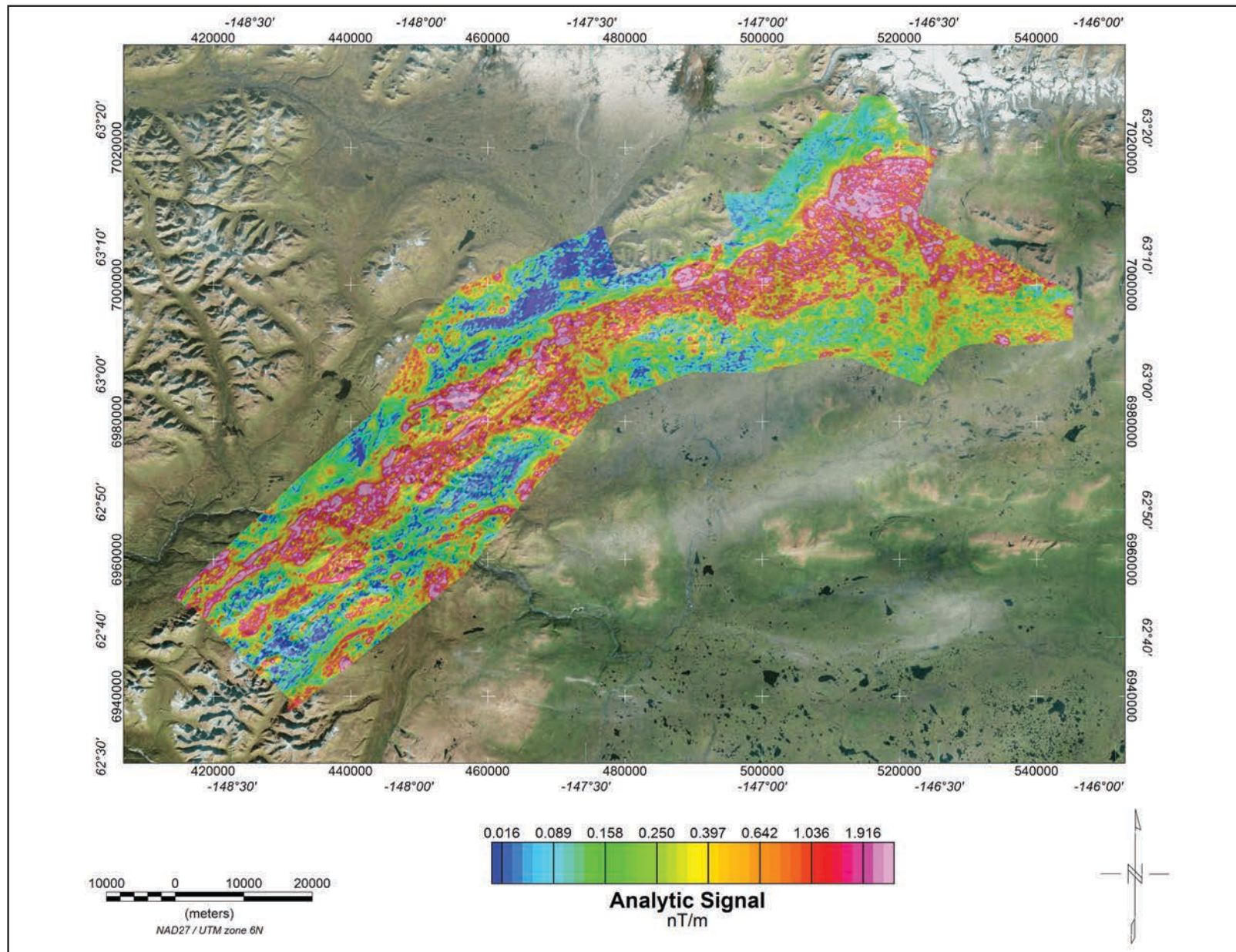
**Figure 4.** The simulated magnetic total field data were created using digitally recorded data from a Fugro D1344 magnetometer with a Scintrex CS3 cesium sensor. Data were collected at a sampling interval of 0.1 seconds. The magnetic data were (1) corrected for diurnal variations by subtracting the digitally recorded base station magnetic data, (2) IGRF corrected (IGRF model 2010, updated for date of flight and altimeter variations), (3) leveled to the tie line data, (4) a constant value of approximately 56,000 nT was added to all data, and (5) interpolated onto a regular 80 m grid using a modified Akima (1970) technique. All grids were then resampled from the 80 m cell size down to a 25 m cell size to produce the maps and final grids contained in this publication.





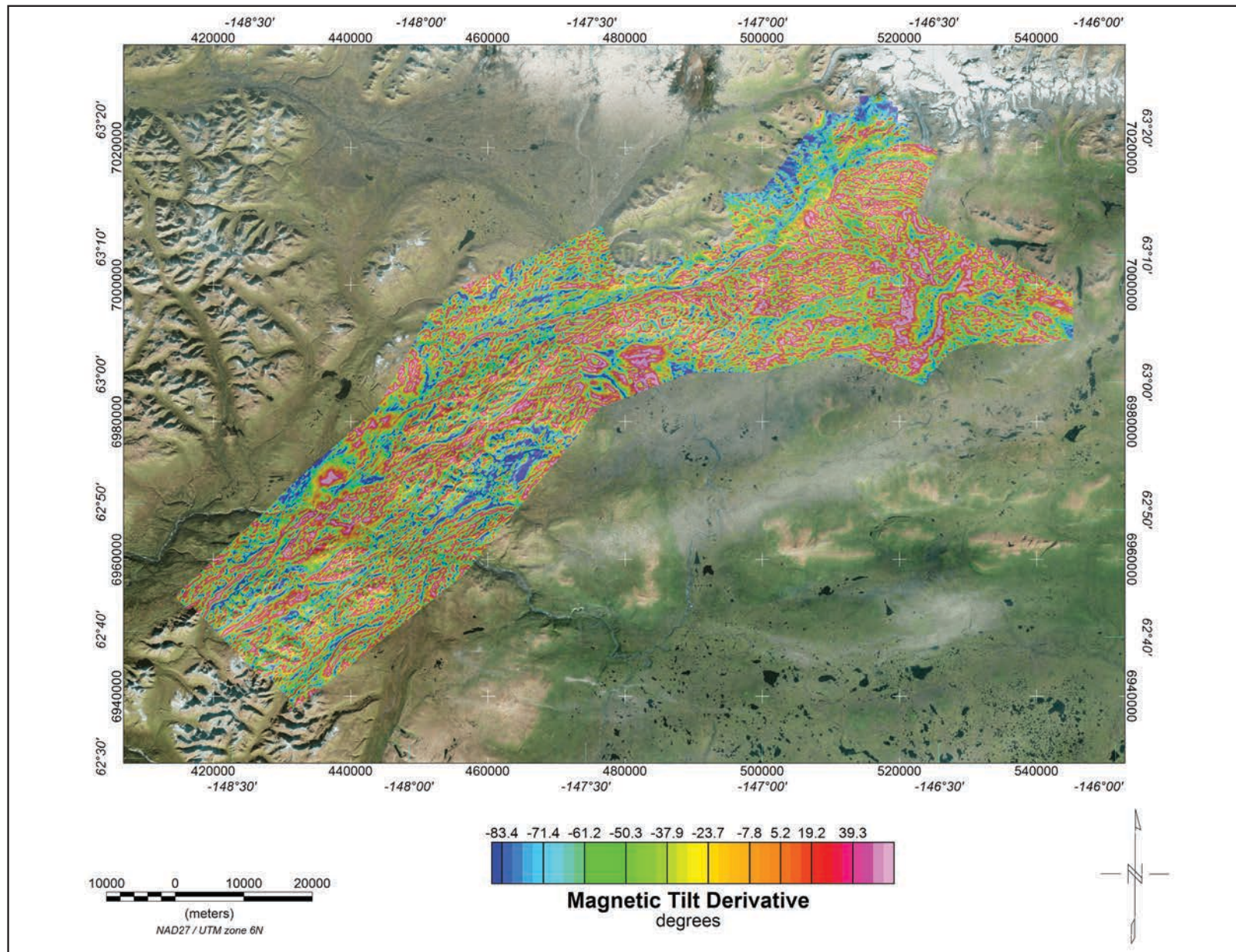
**Figure 5.** The first vertical derivative grid was calculated from the leveled residual magnetic field grid using an FFT base frequency domain filtering algorithm. The resulting first vertical derivative grid provides better definition and resolution of near-surface magnetic units and helps to identify weak magnetic features that may not be evident on the total field data.





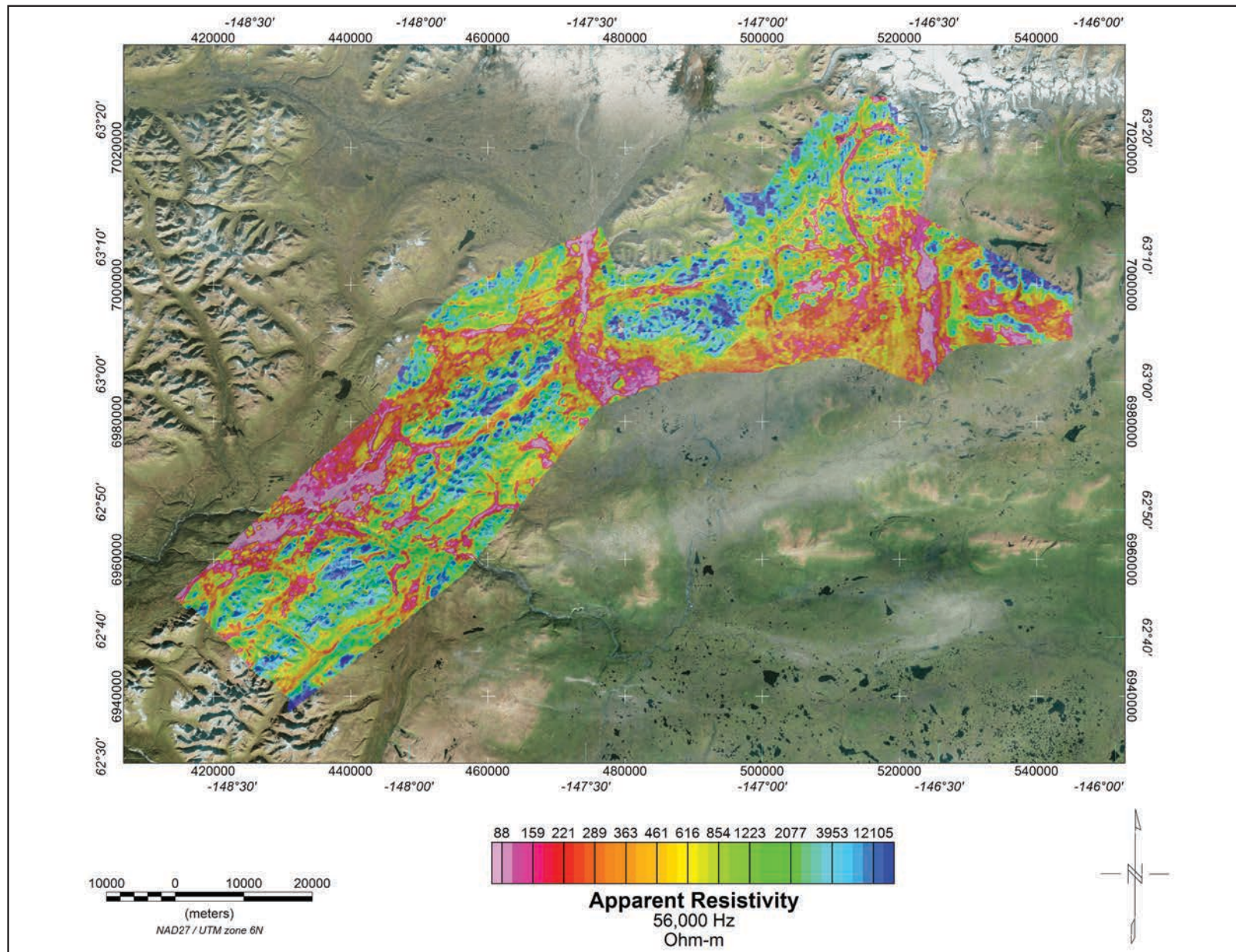
**Figure 6.** Analytic signal is the total amplitude of all directions of magnetic gradient calculated from the sum of the squares of the three orthogonal gradients. Mapped highs in the calculated analytic signal of magnetic parameter locate the anomalous source body edges and corners (such as contacts, 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.





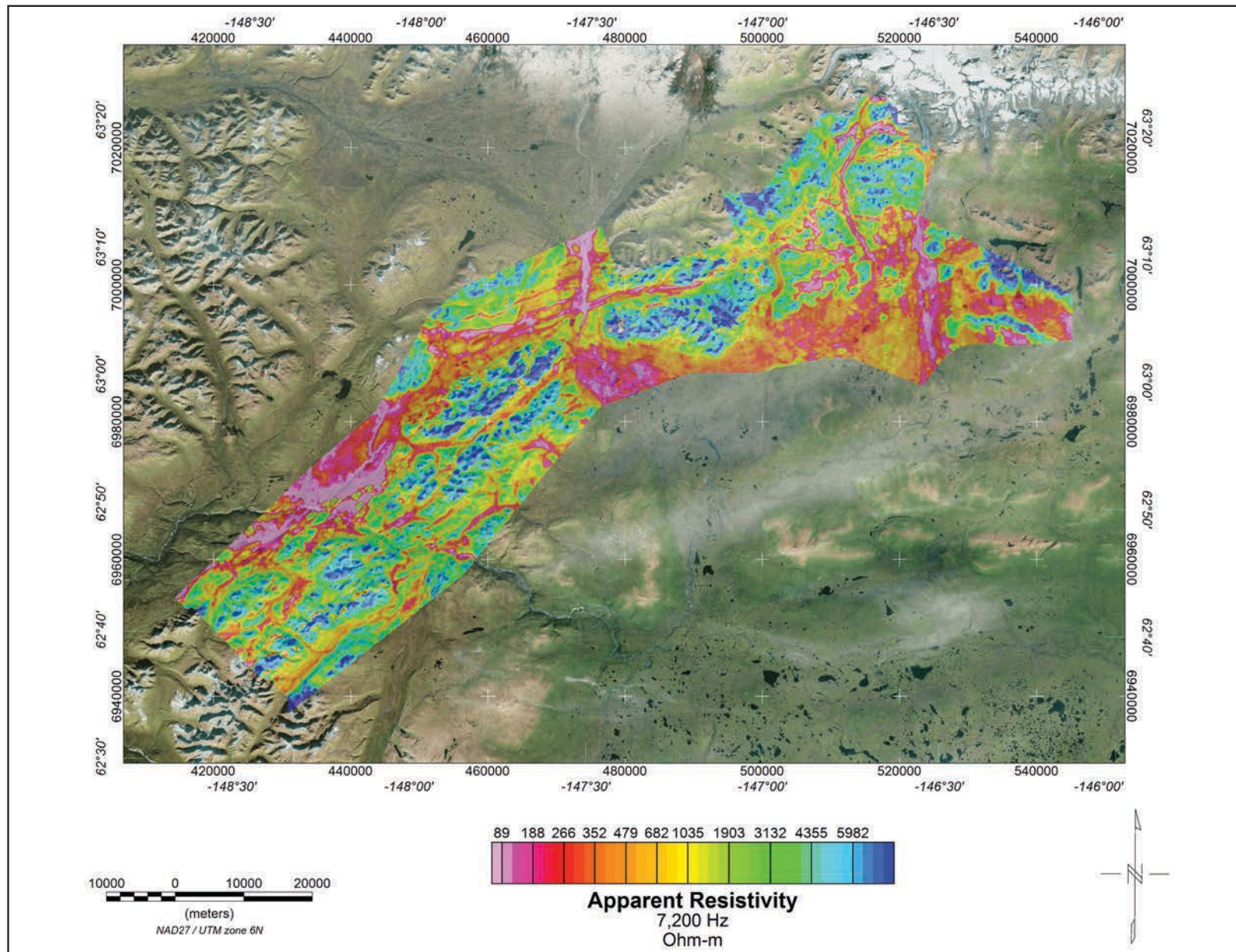
**Figure 7.** The tilt derivative is the angle between the horizontal gradient and the total gradient, which can be used to identify the depth and type of source. The tilt angle is positive over the source, crosses through zero at, or near, the edge of a vertical-sided source, and is negative outside the source region. The tilt derivative has the added advantage of responding equally well to shallow and deep sources and is able to resolve deeper sources that may be masked by larger responses from shallower sources.





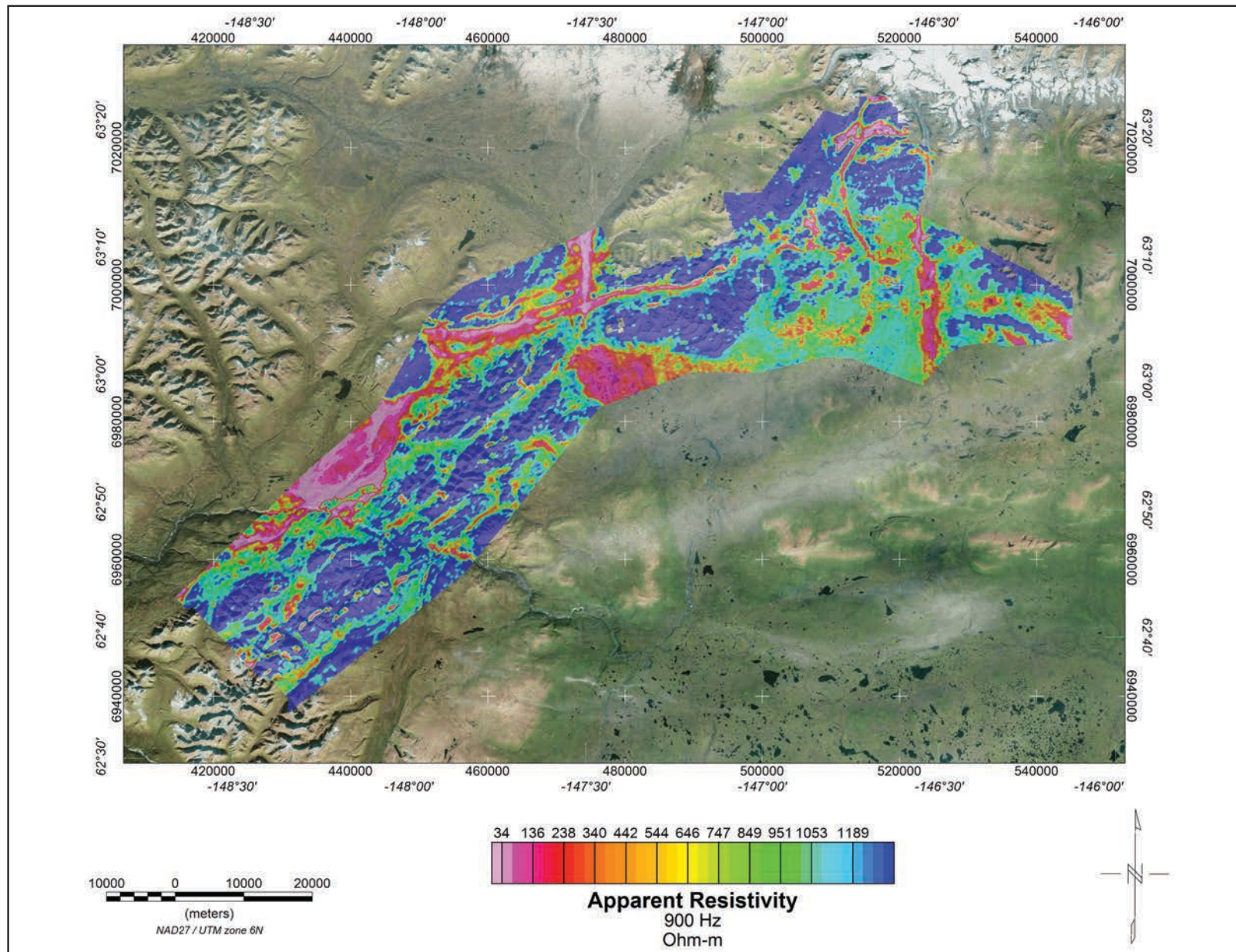
**Figure 8.** The DIGHEM<sup>V</sup> EM system measured inphase and quadrature components at five frequencies. Two vertical coaxial coil-pairs operated at 1000 and 5500 Hz while three horizontal coplanar coil-pairs operated at 900, 7,200 and 56,000 Hz. EM data were sampled at 0.1-second intervals. The 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. All grids were then resampled from the 80 m cell size down to a 25 m cell size to produce the maps and final grids contained in this publication.





**Figure 9.** The DIGHEM<sup>V</sup> 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. All grids were then resampled from the 80 m cell size down to a 25 m cell size to produce the maps and final grids contained in this publication.





**Figure 10.** The DIGHEM<sup>V</sup> 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. All grids were then resampled from the 80 m cell size down to a 25 m cell size to produce the maps and final grids contained in this publication.

**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/10.14509/29848>.

Map Title	Description
wrangellia_residualmag_topo_map_a.pdf	residual magnetic field grid with topographic base map
wrangellia_residualmag_topo_map_b.pdf	residual magnetic field grid with topographic base map
wrangellia_residualmag_topo_map_c.pdf	residual magnetic field grid with topographic base map
wrangellia_residualmag_topo_map_d.pdf	residual magnetic field grid with topographic base map
wrangellia_residualmag_contours_plss_map_a.pdf	residual magnetic field grid with contours and public land survey system base layer
wrangellia_residualmag_contours_plss_map_b.pdf	residual magnetic field grid with contours and public land survey system base layer
wrangellia_residualmag_contours_plss_map_c.pdf	residual magnetic field grid with contours and public land survey system base layer
wrangellia_residualmag_contours_plss_map_d.pdf	residual magnetic field grid with contours and public land survey system base layer
wrangellia_calculated1vd_topo_map_a.pdf	calculated first vertical derivative of the magnetic field grid with topographic base map
wrangellia_calculated1vd_topo_map_b.pdf	calculated first vertical derivative of the magnetic field grid with topographic base map
wrangellia_calculated1vd_topo_map_c.pdf	calculated first vertical derivative of the magnetic field grid with topographic base map
wrangellia_calculated1vd_topo_map_d.pdf	calculated first vertical derivative of the magnetic field grid with topographic base map
wrangellia_analyticsignal_topo_map_a.pdf	analytic signal grid with topographic base map
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wrangellia_analyticsignal_topo_map_d.pdf	analytic signal grid with topographic base map
wrangellia_analyticsignal_contours_plss_map_a.pdf	analytic signal grid with contours and public land survey system base layer
wrangellia_analyticsignal_contours_plss_map_b.pdf	analytic signal grid with contours and public land survey system base layer
wrangellia_analyticsignal_contours_plss_map_c.pdf	analytic signal grid with contours and public land survey system base layer
wrangellia_analyticsignal_contours_plss_map_d.pdf	analytic signal grid with 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/10.14509/29848>.

Map Title	Description
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wrangellia_tiltderivative_contours_topo_map_b.pdf	magnetic tilt derivative grid with contours and topographic base map
wrangellia_tiltderivative_contours_topo_map_c.pdf	magnetic tilt derivative grid with contours and topographic base map
wrangellia_tiltderivative_contours_topo_map_d.pdf	magnetic tilt derivative grid with contours and topographic base map
wrangellia_residualmag_and_tiltderivative_topo_map_a.pdf	color shadow residual magnetic field grid with magnetic tilt derivative contours and topographic base map
wrangellia_residualmag_and_tiltderivative_topo_map_b.pdf	color shadow residual magnetic field grid with magnetic tilt derivative contours and topographic base map
wrangellia_residualmag_and_tiltderivative_topo_map_c.pdf	color shadow residual magnetic field grid with magnetic tilt derivative contours and topographic base map
wrangellia_residualmag_and_tiltderivative_topo_map_d.pdf	color shadow residual magnetic field grid with magnetic tilt derivative contours and topographic base map
wrangellia_res56khz_topo_map_a.pdf	56,000 Hz coplanar apparent resistivity grid with topographic base map
wrangellia_res56khz_topo_map_b.pdf	56,000 Hz coplanar apparent resistivity grid with topographic base map
wrangellia_res56khz_topo_map_c.pdf	56,000 Hz coplanar apparent resistivity grid with topographic base map
wrangellia_res56khz_topo_map_d.pdf	56,000 Hz coplanar apparent resistivity grid with topographic base map
wrangellia_res56khz_contours_plss_map_a.pdf	56,000 Hz coplanar apparent resistivity grid with contours and public land survey system base layer
wrangellia_res56khz_contours_plss_map_b.pdf	56,000 Hz coplanar apparent resistivity grid with contours and public land survey system base layer
wrangellia_res56khz_contours_plss_map_c.pdf	56,000 Hz coplanar apparent resistivity grid with contours and public land survey system base layer
wrangellia_res56khz_contours_plss_map_d.pdf	56,000 Hz coplanar apparent resistivity grid with contours and public land survey system base layer
wrangellia_res7200hz_topo_map_a.pdf	7,200 Hz coplanar apparent resistivity grid with topographic base map
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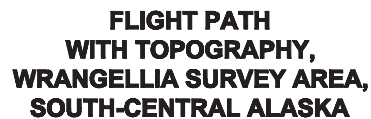
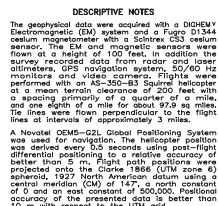
**Table 1, continued.** Copies of the following maps are included at the end of this booklet. The low-resolution, page-size maps included in this booklet are intended to be used as a search tool and are not the final product. Large-scale, full-resolution versions of each map are available to download on this publication's citation page: <http://doi.org/10.14509/29848>.

Map Title	Description
wrangellia_res7200hz_contours_plss_map_a.pdf	7,200 Hz coplanar apparent resistivity grid with contours and public land survey system base layer
wrangellia_res7200hz_contours_plss_map_b.pdf	7,200 Hz coplanar apparent resistivity grid with contours and public land survey system base layer
wrangellia_res7200hz_contours_plss_map_c.pdf	7,200 Hz coplanar apparent resistivity grid with contours and public land survey system base layer
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wrangellia_res900hz_topo_map_b.pdf	900 Hz coplanar apparent resistivity grid with topographic base map
wrangellia_res900hz_topo_map_c.pdf	900 Hz coplanar apparent resistivity grid with topographic base map
wrangellia_res900hz_topo_map_d.pdf	900 Hz coplanar apparent resistivity grid with topographic base map
wrangellia_res900hz_contours_plss_map_a.pdf	900 Hz coplanar apparent resistivity grid with contours and public land survey system base layer
wrangellia_res900hz_contours_plss_map_b.pdf	900 Hz coplanar apparent resistivity grid with contours and public land survey system base layer
wrangellia_res900hz_contours_plss_map_c.pdf	900 Hz coplanar apparent resistivity grid with contours and public land survey system base layer
wrangellia_res900hz_contours_plss_map_d.pdf	900 Hz coplanar apparent resistivity grid with contours and public land survey system base layer
wrangellia_flightlines_topo_map_a.pdf	flight lines with topographic base map
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wrangellia_residualmag_and_emanomalies_detailed_topo_map_b.pdf	residual magnetic field grid and detailed electromagnetic anomalies with topographic base map
wrangellia_residualmag_and_emanomalies_detailed_topo_map_c.pdf	residual magnetic field grid and detailed electromagnetic anomalies with topographic base map
wrangellia_residualmag_and_emanomalies_detailed_topo_map_d.pdf	residual magnetic field grid and detailed electromagnetic anomalies with topographic base map

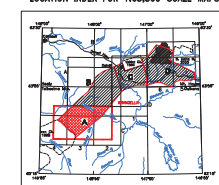
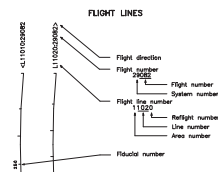
**Table 1, continued.** Copies of the following maps are included at the end of this booklet. The low-resolution, page-size maps included in this booklet are intended to be used as a search tool and are not the final product. Large-scale, full-resolution versions of each map are available to download on this publication's citation page: <http://doi.org/10.14509/29848>.

Map Title	Description
wrangellia_residualmag_and_emanomalies_detailed_topo_map_e.pdf	residual magnetic field grid and detailed electromagnetic anomalies with topographic base map
wrangellia_residualmag_and_emanomalies_detailed_topo_map_f.pdf	residual magnetic field grid and detailed electromagnetic anomalies with topographic base map
wrangellia_residualmag_and_emanomalies_detailed_topo_map_g.pdf	residual magnetic field grid and detailed electromagnetic anomalies with topographic base map
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wrangellia_interpretation_plss_map_d.pdf	interpretation based on geophysical data with public land survey system base layer
wrangellia_interpretation_residualmag_plss_map_a.pdf	interpretation based on geophysical data with residual magnetic grid and public land survey system base layer
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wrangellia_interpretation_residualmag_plss_map_d.pdf	interpretation based on geophysical data with residual magnetic grid and public land survey system base layer





by  
Laurel E. Burns, CGG, and Fugro GeoServices, Inc.  
2014

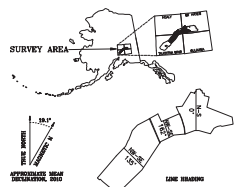


## SURVEY HISTORY

This map was compiled and drawn under contract between the State of Alaska, Department of Natural Resources, Division of Geological & Geophysical Surveys (DGGGS) and Fugro Inc. The DGGGS has collected geophysical data for the area were acquired and processed by CGG in 2013 and 2014. Previously, DGGGS had collected seismic reflection data. The survey are shown in the location map by dashed lines, survey name, and date of publication. The Alaska Department of Natural Resources and the Legislature as part of the Alaska Strategic and Critical Minerals Assessment Program, the Alaska Department of Natural Resources Geospatial and Geological Mineral Inventory Program, Milrock Exploration Corporation's offshore infrastructure portion of the assessment shown above as denser hatching.

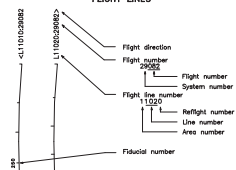
All data and maps produced to date from this survey are available in digital format on DVD for a nominal fee of \$750 per CD-ROM or \$900 per DVD-ROM (order #9709-3707), and are downloadable for free from the DGGGS website ([www.dggs.alaska.gov/pubs](http://www.dggs.alaska.gov/pubs)). Maps are also available for purchase at a nominal fee. Data files are viewable online at the website [AlaskaADP.com](http://AlaskaADP.com).





## PARTS OF THE TALKEETNA MTNS, HEALY, AND MT HAYES QUADRANGLES

## FLIGHT LINES



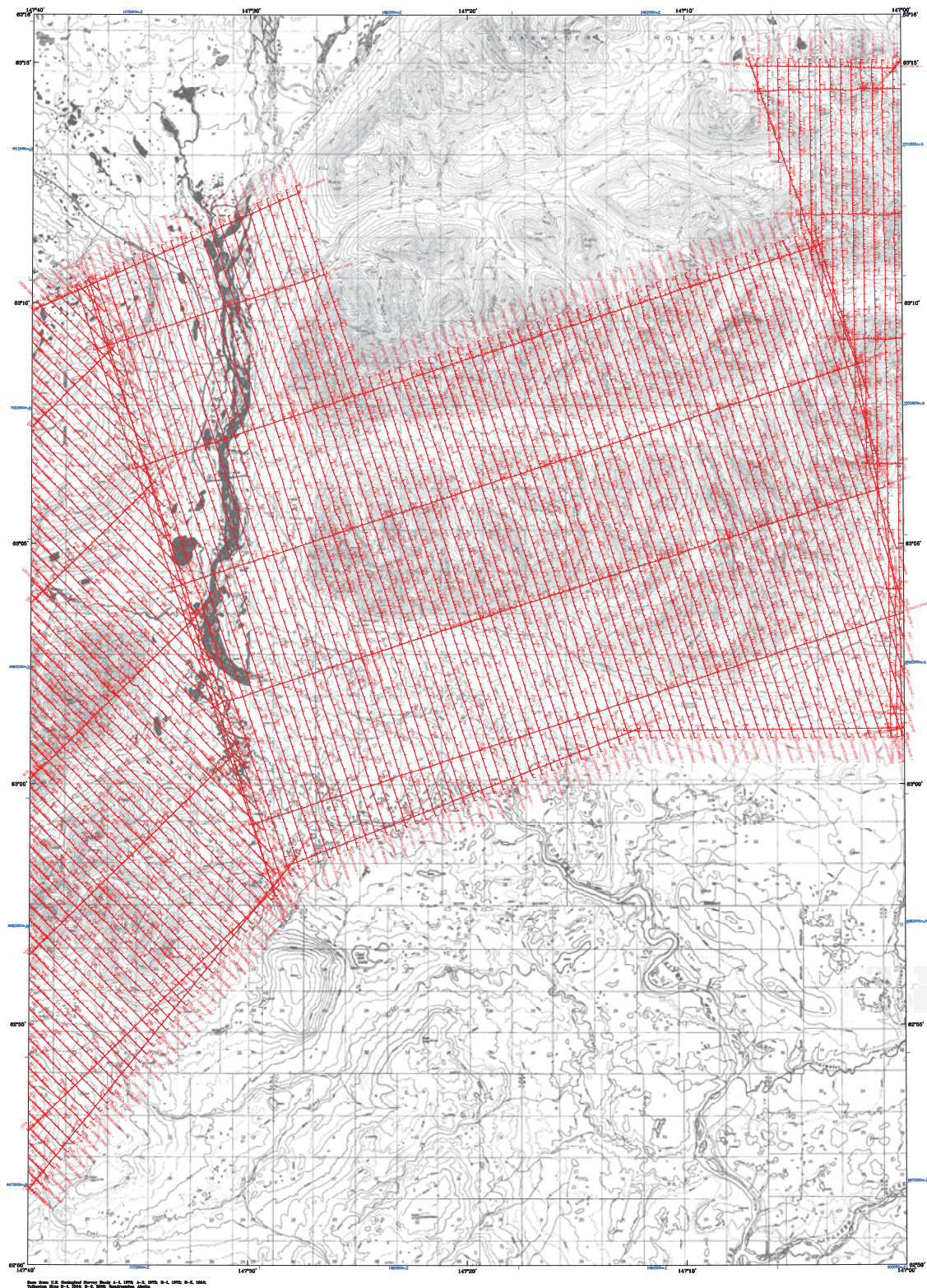
The geophysical data were acquired with a DIGHAM<sup>®</sup> Electromagnetic (EM) system and a Fugro D1100<sup>®</sup> ocean magnetometer with a Schlumberger CS3 cesium magnetometer. The EM system was towed by a ship at a flow rate of 100 feet. In addition the system included altimeters, GPS navigation system, 80/60 Hz monitors and video cameras. Flights were made at a mean terrain clearance of 200 feet with a maximum clearance of 300 feet. The flight track was one and one-half of a mile for about 99 sq miles. The flight track was made of 1000 ft wide flight lines at intervals of approximately 3 miles.

A Novatel OEMS-G2L Global Positioning System was used for navigation. The helicopter position was determined by a GPS receiver and a differential positioning to a relative accuracy of about 10 m. The flight path was projected onto the Clarke 1866 UTM zone 6, NAD 83, 1927 North American datum using a datum shift of 10 m and an east constant of 500,000. Positional errors in the projection were less than 10 m with respect to the UTM grid.

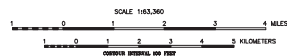
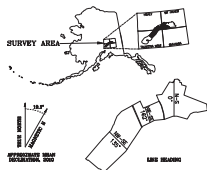
This map has been compiled and drawn and in contract between the State of Alaska, Department of Natural Resources, Division of Geological & Geophysical Surveys (DGGG) and the U.S. Geological Survey (USGS). The geophysical data for the area were acquired and processed by CGG in 2013 and 2014. Previously acquired survey data are shown in the location map by dashed lines, survey name, and date of publication. The map was prepared by the Alaska Division of Geological & Geophysical Surveys as part of the Alaska Strategic and Critical Minerals Inventory Program, in cooperation with the Alaska Airborne Geophysical and Geological Mineral Inventory Program, Milrock Exploration Corporation (Milrock), and the USGS. A portion of the area shown above as dashed hatching.

All data and maps produced to date from this survey are available in digital format on DVD for a nominal fee. The data are available in the following formats: 1970s-3707, and are downloadable for free from the DGGG website ([www.dggs.alaska.gov/pubs/](http://www.dggs.alaska.gov/pubs/)). Maps are available online at the website in Adobe Acrobat .PDF





Map from U.S. Geological Survey, 1:50,000, U.S. GEO. S-4, 1976; S-4, 1976; S-4, 1976; S-4, 1976.



## FLIGHT PATH WITH TOPOGRAPHY, WRANGELLIA SURVEY AREA, SOUTH-CENTRAL ALASKA

PARTS OF THE TALKIEETNA MTNS, HEALY, AND MT HAYES QUADRANGLES

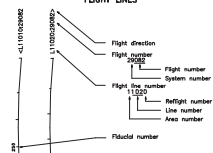
by  
Laural E. Burns, CGG, and Fugro Geoservices, Inc.  
2014

### DESCRIPTIVE NOTES

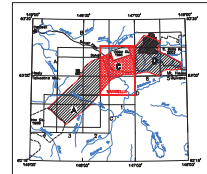
The geophysical data were acquired with a DIGHEM<sup>®</sup> Electromagnetic (EM) system and a Fugro D1344 cesium magnetometer with a Schriber C3 cesium sensor. The EM and magnetic data were flown at a height of 100 feet. In addition, the survey collected data from two laser altimeters, GPS navigation system, 50/60 Hz monitors and video cameras. Flights were performed with an AS-350-B3 Squirrel helicopter at a mean terrain clearance of 200 feet with a spacing primarily of a quarter of a mile, and one eighth of a mile for about 9.8 sq miles. The lines were flown perpendicular to the flight lines at intervals of approximately 3 miles.

A Novatel OEM5-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 2 m. Flight path positions were projected onto the NAD83 datum (UTM zone 18N) using the 1983 datum. The datum is based on the central meridian (CM) of 147° 0' north constant of 0 and an east constant of 100,000. Positional accuracy of the presented data is better than 10 m with respect to the UTM grid.

### FLIGHT LINES



### LOCATION INDEX FOR 1:63,360-SCALE MAPS



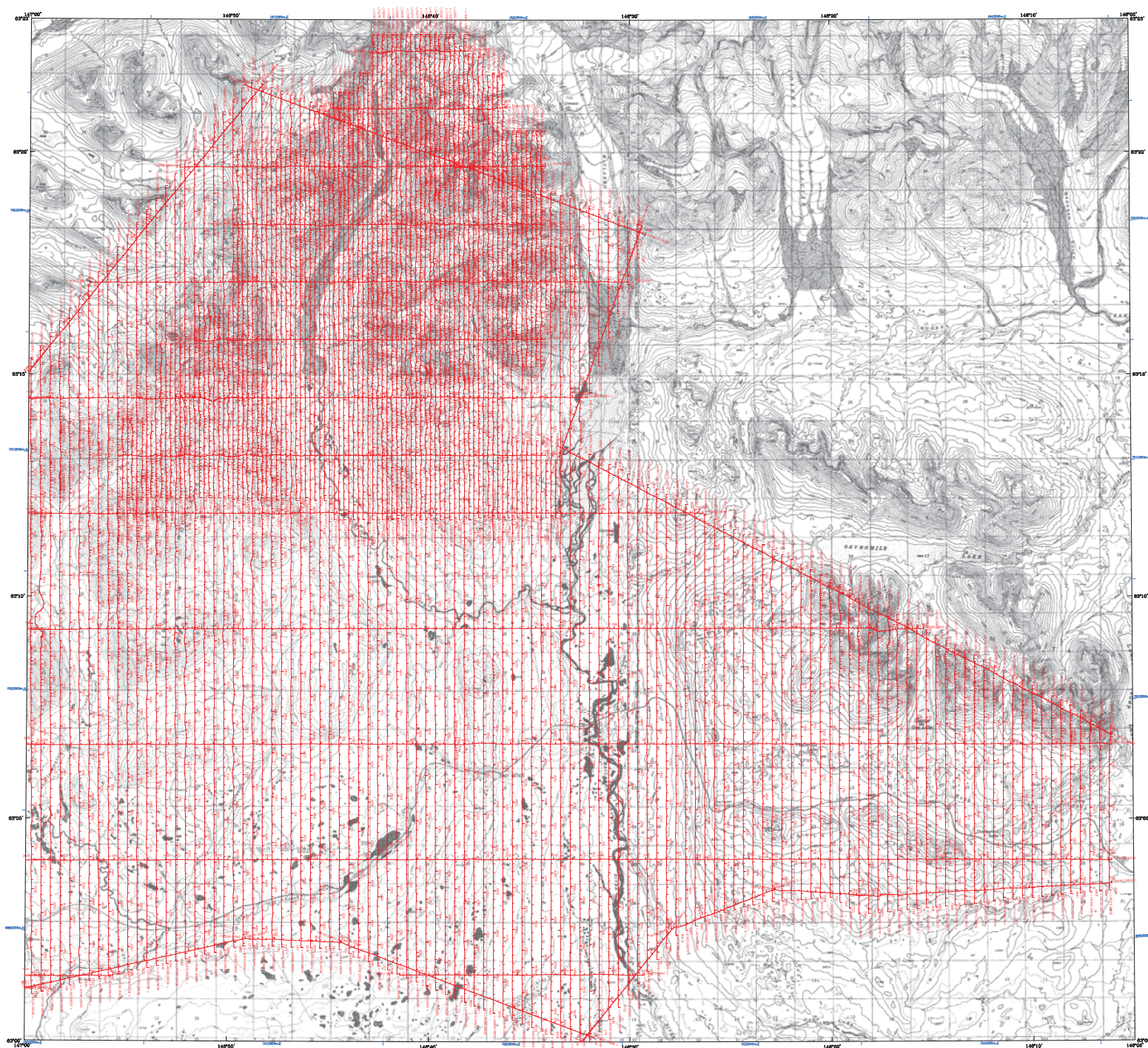
### SURVEY HISTORY

This map has been compiled and shown under contract between the State of Alaska, Department of Natural Resources, Division of Geological & Geophysical Surveys (DGGGS), and Fugro Geoservices, Inc. Airborne geophysical data for the area were compiled and processed by CGG in 2013 and 2014. Previously flown DGGGS surveys adjacent to the current survey are shown in the location map by dashed lines, survey names, and date of publication.

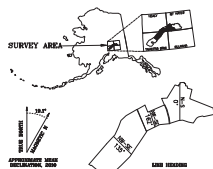
The project was funded by the Alaska State Legislature as part of the Alaska Strategic and Critical Minerals Assessment project, which is part of the Alaska Airborne Geophysical and Geophysical Mineral Inventory Project. The project was funded by the Alaska State Legislature as part of the Alaska Strategic and Critical Minerals Assessment project, which is part of the Alaska Airborne Geophysical and Geophysical Mineral Inventory Project.

All data and maps produced to date from this survey are available in digital format in PDF for a nominal fee through DGGGS, 3354 College Road, Fairbanks, Alaska, 99709-3707 and are downloadable for free from the DGGGS website ([www.dgggs.alaska.gov/pubs](http://www.dgggs.alaska.gov/pubs)). Maps are also available on paper through the DGGGS office and are viewable online at the website in Adobe Acrobat .PDF file format.





U.S. Geological Survey, Alaska Division, 415 North 3rd Street, Anchorage, Alaska 99503



SCALE 1:63,360  
1 2 3 4 MILES  
1 2 3 4 KILOMETERS

## FLIGHT PATH WITH TOPOGRAPHY, WRANGELLIA SURVEY AREA, SOUTH-CENTRAL ALASKA

PARTS OF THE TALKEETNA MTNS, HEALY, AND MT HAYES QUADRANGLES

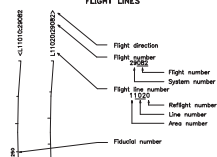
by  
Laurel E. Burns, CGG, and Fugro GeoServices, Inc.  
2014

### DESCRIPTIVE NOTES

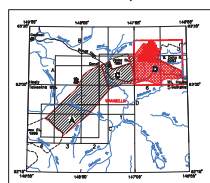
The geophysical data were acquired with a DIGHM™ Electromagnetic (EM) system and a Fugro D1344 cesium magnetometer with a Schriber CS3 cesium sensor. The EM and magnetic sensors were flown at a height of 100 feet. In addition to the survey recorded data from rotor and laser altimeters, GPS navigation system, 50/60 Hz monitors and video cameras. Flights were performed with an AS-350-83 Spirit helicopter at a mean terrain clearance of 200 feet with a spacing of 1/4 mile for a quarter of a mile, and one eighth of a mile for about 97.9 sq miles. The 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 1 m. Flight path positions were projected onto the Clarke 1866 (UTM Zone 6) spheroid, 1927 North American Datum, and 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.

### FLIGHT LINES



### LOCATION INDEX FOR 1:63,360-SCALE MAPS

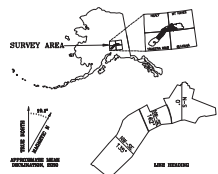


### SURVEY HISTORY

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 Fugro GeoServices, Inc. Airborne geophysical data for the area were acquired and processed by CGG in 2013 and 2014. Previously flown DGGG surveys adjacent to the current survey are shown in the location map by dashed lines, survey name, and date of publication. The project was funded by the Alaska Strategic and Critical Minerals Assessment project, which is part of the Alaska Airborne Geophysical and Geological Mineral Inventory Program. Milrock Exploration Corporation contributed inflight data for a portion of the area shown above as dense hatching.

All data and maps produced to date from this survey are available in digital format to DNO for distribution through DGGG, 3354 College Road, Fairbanks, Alaska, 99709-1707, and are downloadable for free from the DGGG website ([www.dggg.alaska.gov/pubs/](http://www.dggg.alaska.gov/pubs/)). Maps are also available on paper through the DGGG office, and are viewable online at the website in Adobe Acrobat .PDF file format.





The geophysical data were acquired with a DIGHY<sup>®</sup> Electromagnetic (EM) system and a Fugro D3300<sup>®</sup> cesium magnetometer with a Schriev CS3 cesium magnetometer. The EM system was towed by a ship at a height of 100 feet, in addition the magnetometer was towed by a ship at a height of 100 feet. GPS navigation system, 50/60 Hz monitors and video cameras. Flights were made at a mean terrain clearance of 200 feet with a maximum clearance of 300 feet. The flight track was one eighth of a mile for about 97.9 sq miles. The lines were flown perpendicular to the flight track and were spaced at 200 feet.

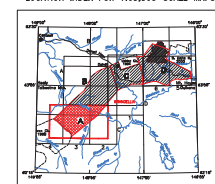
A Novatel OEMS-2 Global Positioning System was used for navigation. The helicopter position was determined by a GPS receiver and a differential positioning to a relative accuracy of better than 0.5 m. Flight path positions were determined by a GPS receiver and a differential positioning to a relative accuracy of better than 0.5 m. The flight path positions were determined by a GPS receiver and a differential positioning to a relative accuracy of better than 0.5 m. The flight path positions were determined by a GPS receiver and a differential positioning to a relative accuracy of better than 0.5 m.



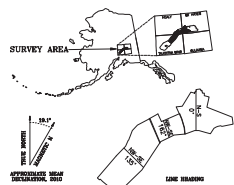
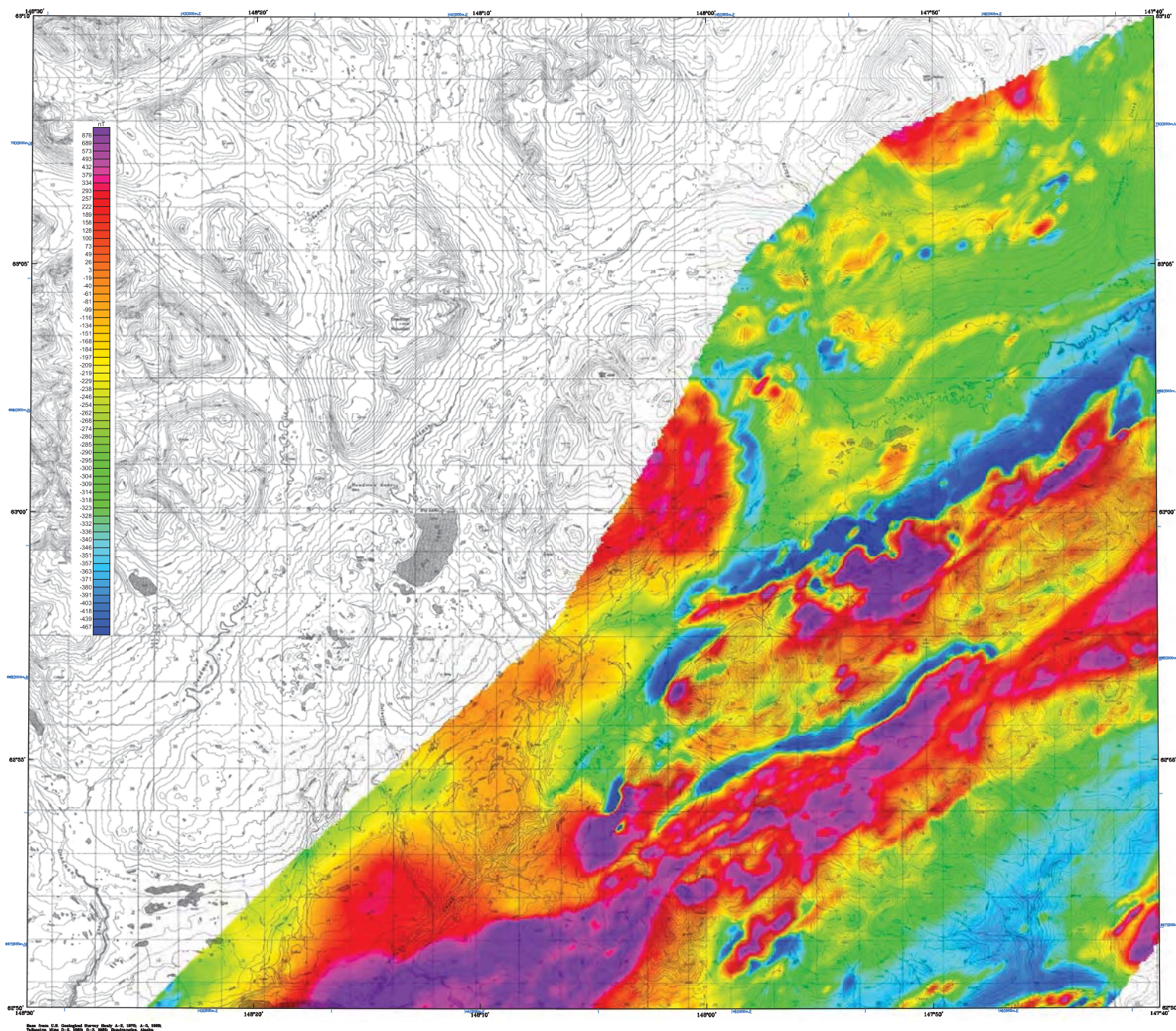
by  
Laurel E. Burns, CGG, and Fugro GeoServices, Inc.  
2014

The magnetic total field data were processed using digitally recorded data from a Fugro D1344 magnetic survey system. Seismic 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 used for date of flight and 100 km diameter variations), (3) leveled to the base line data, and (4) interpolated onto a regular 80 m grid using a modified Aitken (1970) technique. All grids were then resampled from the 80 m cell size down to a 25 m cell size to produce the maps and final grids contained in this publication.

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.

[illegible]

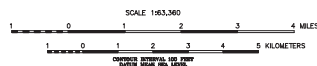




## DESCRIPTIVE NOTES

The geophysical data were acquired with a DIGHEM Electromagnetic (EM) system and a Fugro D1344 cesium magnetometer with a Schriber CS3 cesium sensor. The EM and magnetic sensors were flown at a height of 100 feet. In addition the survey recorded data from radar and laser altimeters, GPS navigation system, 50/60 Hz monitors and video camera. Flights were performed with an AS-350-83 Saurhel helicopter at a mean terrain clearance of 200 feet with a spacing primarily of a quarter of a mile, and one eighth of a mile for about 97.0 as miles. The lines were flown perpendicular to the flight lines at intervals of approximately 3 miles.

A Novatel OEM5-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 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.



## RESIDUAL MAGNETIC FIELD WITH TOPOGRAPHY, WRANGELLIA SURVEY AREA, SOUTH-CENTRAL ALASKA

PARTS OF THE TALKKEETNA MTNS, HEALY, AND MT HAYES QUADRANGLES

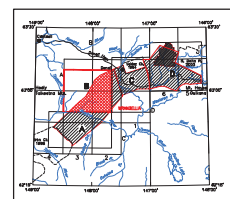
by  
Laurel E. Burns, CGG, and Fugro GeoServices, Inc.  
2014

## RESIDUAL MAGNETIC FIELD

The magnetic total field data were processed using digitally recorded data from a Fugro D1344 magnetometer with a Schriber CS3 cesium 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 2010, updated for date of flight and altimeter variations), (3) leveled to the tie line data, and (4) interpolated onto a regular 40 m grid using a modified Akima (1970) technique. All grids were then resampled from the 80 m cell size down to a 20 m cell size to produce the maps and final grids contained in this publication.

Alkms, W. 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.

## LOCATION INDEX FOR 1:63,360-SCALE MAPS

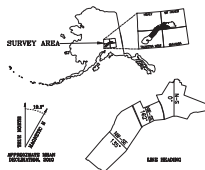
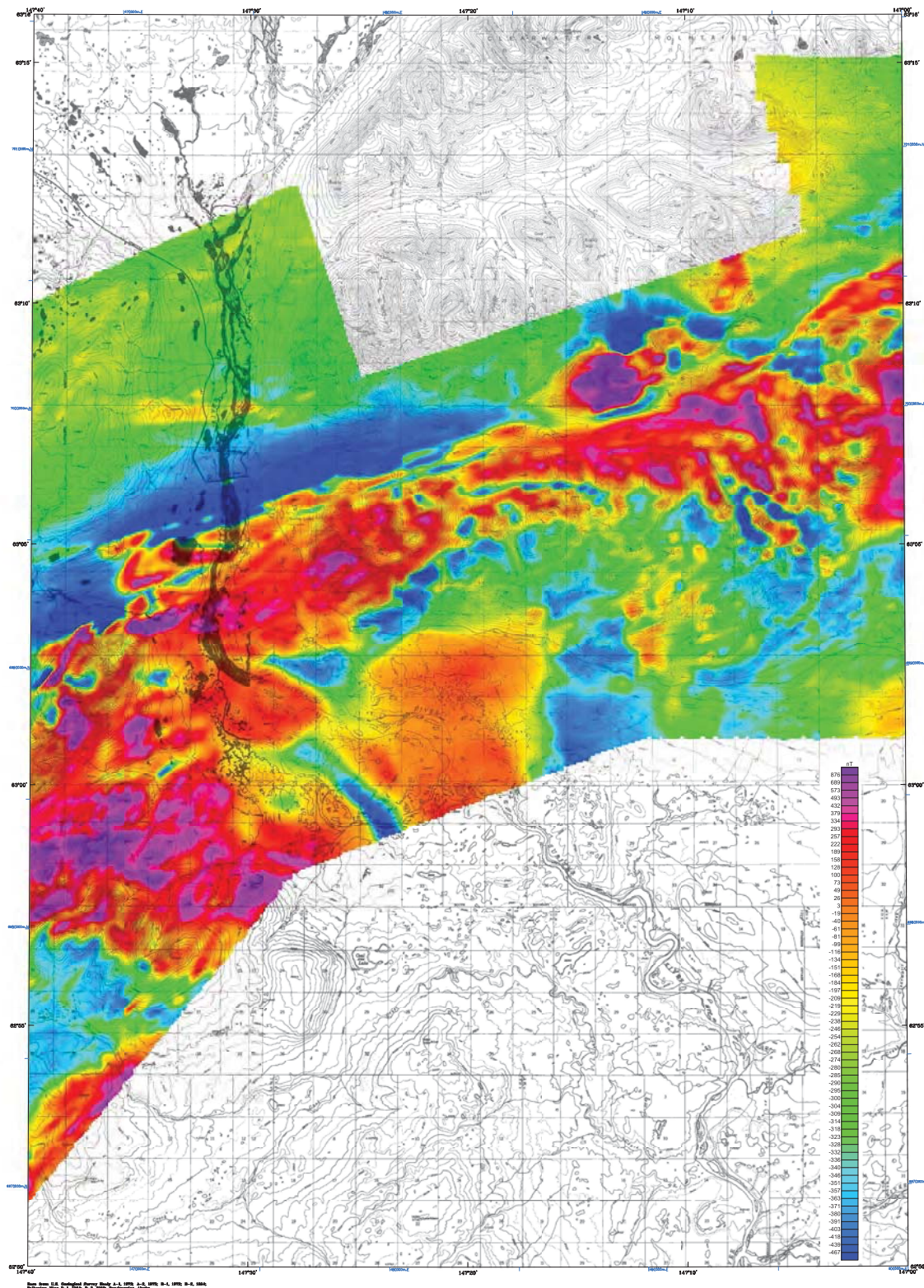


## SURVEY HISTORY

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 Fugro GeoServices, Inc. Airborne geophysical data for the area were acquired and processed by CGG in 2013 and 2014. Previously flown DGGG surveys adjacent to the survey are shown in the location map by dashed lines, survey name, and date of publication. The project was funded by the Alaska State Legislature as part of the Alaska Strategic and Critical Minerals Assessment project, which is part of the Alaska Airborne Geophysical and Geological Mineral Inventory Program. Milrock Exploration Corporation contributed initial data for a portion of the area shown above as denser halftone.

All data and maps produced to date from this survey are available in digital format on DVD for a nominal fee through DGGG, 3354 College Road, Fairbanks, Alaska, 99709-3707, and are downloadable free from the DGGG website ([www.dggg.alaska.gov/pubs](http://www.dggg.alaska.gov/pubs)). Maps are also available on paper through the DGGG office, and are viewable online at the website in Adobe Acrobat PDF file format.





## DESCRIPTIVE NOTES

The geophysical data were acquired with a DIGHEM<sup>®</sup> Electromagnetic (EM) system and a Fugro D1344 cesium magnetometer with a Schriber C3 cesium sensor. The EM and magnetic data were flown at a height of 100 m. In addition, the survey collected data from a 100 m line altimeter, GPS navigation system, DG/60 Hz motion and clock control. Flights were performed with an AS-350-B3 Squirrel helicopter at a mean terrain clearance of 200 feet with a spacing primarily of a quarter of a mile, and one eighth of a mile for about 9.8 miles. The 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 2 m. Flight path deviations were projected onto the UTM 1806 (UTM zone 18) coordinate system. The datum is the North American Datum of 1983 (NAD83), with a north constant of 0 and an east constant of 600,000. Positional accuracy of the presented data is better than 10 m with respect to the UTM grid.

## RESIDUAL MAGNETIC FIELD WITH TOPOGRAPHY, WRANGELLIA SURVEY AREA, SOUTH-CENTRAL ALASKA

PARTS OF THE TALKEETNA MTS., HEALY, AND MT HAYES QUADRANGLES

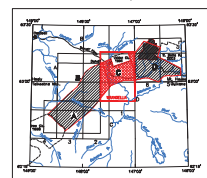
by  
Laurie E. Burns, CGG, and Fugro Geoservices, Inc.  
2014

## RESIDUAL MAGNETIC FIELD

The magnetic total field data were processed using digitally recorded data from a Fugro D1344 cesium magnetometer with a Schriber C3 cesium 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 magnetic data, (2) corrected for diurnal variations, (3) leveled to the tie line data, and (4) interpolated onto a regular 80 m grid using a modified Akima (1970) technique. All data were then resampled from the 80 m cell size down to a 25 m cell size to produce the maps and final data contained in this publication.

Alaska, N. 149° 15' W. A true north of interpretation and a scale bar of 1:63,360. The map is in the UTM 1806 zone.

## LOCATION INDEX FOR 1:63,360-SCALE MAPS



## 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 Fugro Geoservices, Inc. Airborne geophysical data for the area were acquired and processed by CGG in 2013 and 2014. Previously flown DGGGS surveys adjacent to the current survey are shown in the location map by dashed lines, survey names, and date of publication. The project was funded by the Alaska State Legislature as part of the Alaska Strategic and Critical Minerals Assessment project, which is part of the Alaska Airborne Geophysical and Geophysical Mineral Inventory (AAGGI) project. The project is a continuation of the AAGGI project, which was initiated in 2008. The project is a continuation of the AAGGI project, which was initiated in 2008. The project is a continuation of the AAGGI project, which was initiated in 2008.



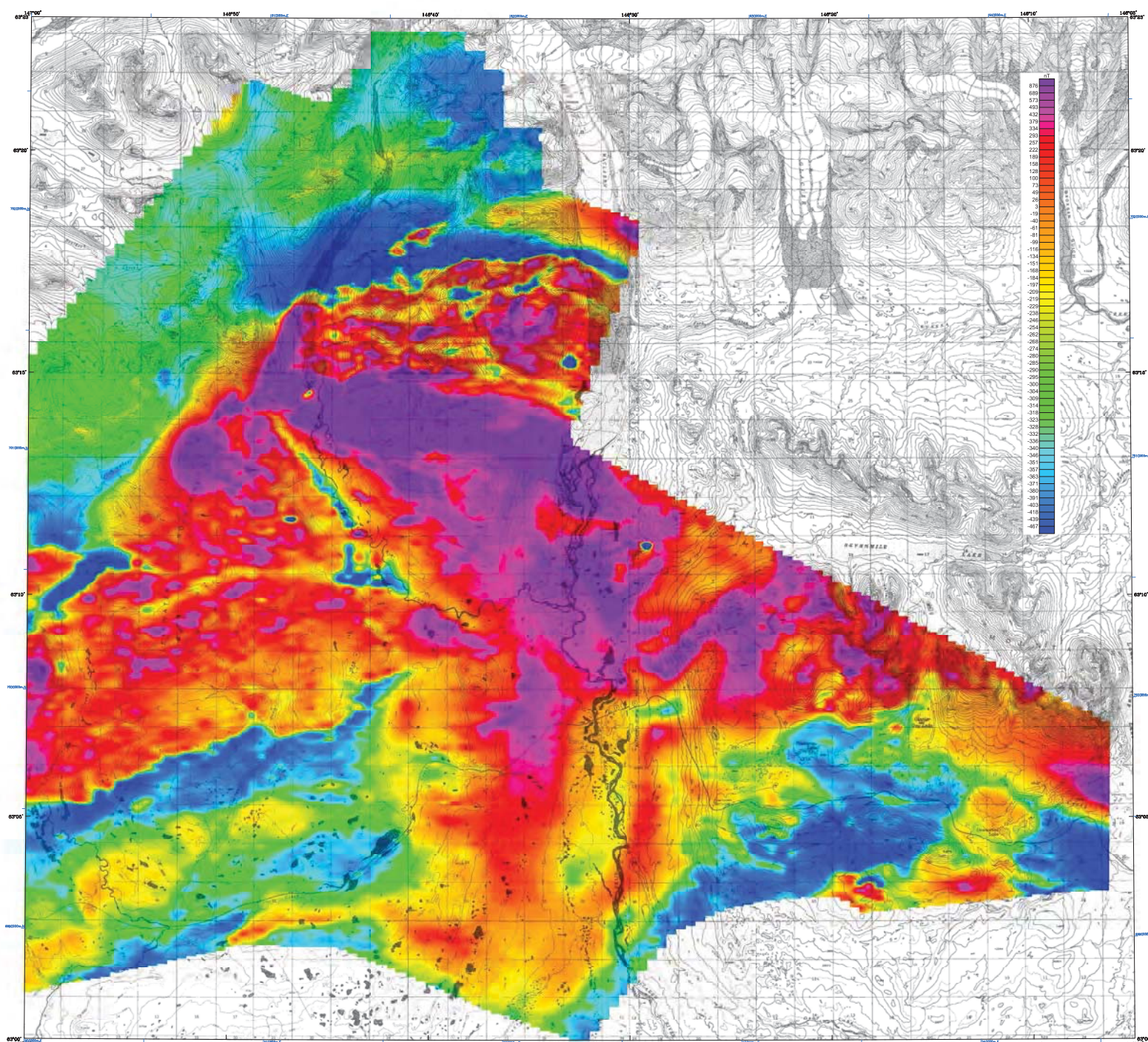
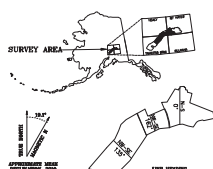


FIG. 1. Residual Magnetic Field with Topography, Wrangellia Survey Area, South-Central Alaska. Scale 1:63,360. Map Date 10/10/14.



#### DESCRIPTIVE NOTES

The geophysical data were acquired with a DIGHEM<sup>®</sup> Electromagnetic (EM) system and a Fugro D1344 cesium magnetometer with a Schriber CS3 cesium sensor. The EM and magnetic sensors were flown at a height of 100 feet. In addition the survey recorded data from rotor and laser altimeters, GPS navigation system, 50/60 Hz monitors and video cameras. Flights were performed with an AS-350-83 Spirit helicopter at a mean terrain clearance of 200 feet with a spacing interval of a quarter of a mile, and one eighth of a mile for about 97.9 sq miles. The 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 1 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° 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.

SCALE 1:63,360  
0 1 2 3 4 MILES  
0 1 2 3 4 KILOMETERS

## RESIDUAL MAGNETIC FIELD WITH TOPOGRAPHY, WRANGELLIA SURVEY AREA, SOUTH-CENTRAL ALASKA

PARTS OF THE TALKEETNA MTS., HEALY, AND MT. HAYES QUADRANGLES

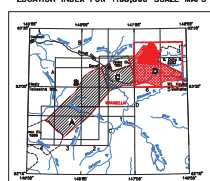
by  
Laurel E. Burns, CGG, and Fugro Geoservices, Inc.  
2014

#### RESIDUAL MAGNETIC FIELD

The magnetic total field data were processed using digitally recorded data from a Fugro D1344 magnetometer with a Schriber CS3 cesium 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 model 2010, 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. All grids were then resampled from the 80 m cell size down to a 25 m cell size to produce the maps and final grids contained in this publication.

Alaska, N. 1970. A new method of interpretation of magnetic maps of Alaska. *Geophysical Research Letters*, v. 1, p. 100-102.

#### LOCATION INDEX FOR 1:63,360-SCALE MAPS

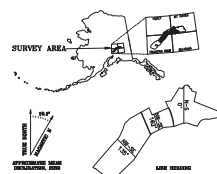
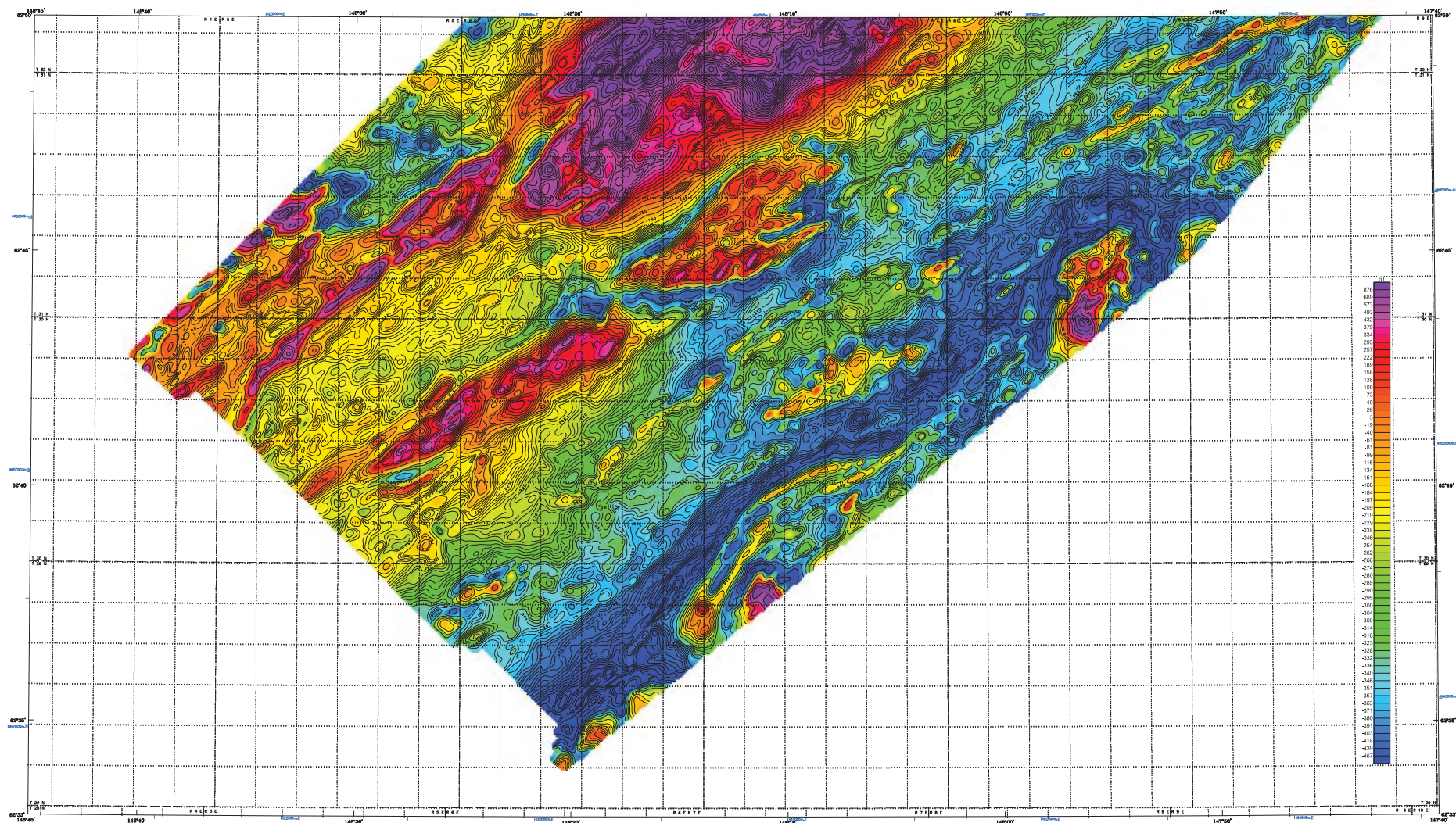


#### SURVEY HISTORY

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 Fugro Geoservices, Inc. Airborne geophysical data for the area were acquired and processed by CGG in 2013 and 2014. Previously flown DGGG surveys adjacent to the current survey are shown in the location map by dashed lines, survey names, and date of publication. The project was funded by the Alaska State Legislature as part of the Alaska Strategic and Critical Minerals Assessment project, which is part of the Alaska Airborne Geophysical and Geological Mineral Inventory Program. Mirnick Exploration Corporation contributed inflight data for a portion of the area shown above as dashed indicies.

All data and maps produced to date from this survey are available in digital format as PDF by a nominal fee through DGGG, 3354 College Road, Fairbanks, Alaska, 99709-1707, and are downloadable for free from the DGGG website ([www.dggg.alaska.gov/pubs/](http://www.dggg.alaska.gov/pubs/)). Maps are also available on paper through the DGGG office, and are viewable online at the website in Adobe Acrobat .PDF file format.





## DESCRIPTIVE NOTES

The geophysical data were acquired with a DIGHV Electromagnetic (EM) system and a Fugro D1344 cesium magnetometer with a Schriber CS3 cesium sensor. The EM and magnetic sensors were flown at a height of 100 feet. In addition to the survey recorded data from radar and laser altimeters, GPS navigation data, 50/60 Hz monitors and video cameras. Flights were performed with an AS-300B3 Twin Otter helicopter at a mean terrain clearance of 200 feet with a spacing primarily of a square grid of 0.5 miles, and one eighth of a mile for about 97.9 sq miles. The lines were flown perpendicular to the flight lines at intervals of approximately 3 miles.

A Novatel CMRS-220, Global Positioning System was used for navigation. The helicopter position was derived using a 3-axis differential positioning system with a relative accuracy of better than 5 m. Flight path locations were projected onto the Clarke 1866 (UTM zone 8) 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.

## RESIDUAL MAGNETIC FIELD

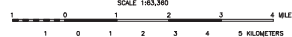
The magnetic total field data were processed using digitally recorded data from a Fugro D1344 magnetometer with a Schriber CS3 cesium sensor. Data were collected at a sampling interval of 0.1 seconds. The magnetic data were (1) corrected for diurnal variations by subtraction of the digitally recorded base station magnetic data, (2) IGRF corrected (IGRF model 2010, 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 (1972) technique. All grids were then resampled from the 80 m cell size down to a 25 m cell size to produce the mosaic and final grids contained in this publication.

NOTE: As of 1970, a new method of interpolation and gridding using a 25 m cell size was used. The new method is described in the Alaska Division of Geological & Geophysical Surveys, 2014, 1-2A, p. 1-2A-10.

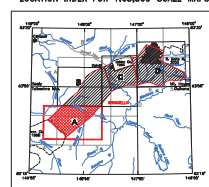
## RESIDUAL MAGNETIC FIELD WITH DATA CONTOURS, WRANGELLIA SURVEY AREA, SOUTH-CENTRAL ALASKA

PARTS OF THE TALKIEITHA MTNS, HEALY, AND MT HAYES QUADRANGLES

by  
Lauri E. Burns, CQG, and Fugro GeoServices, Inc.  
2014



## LOCATION INDEX FOR 1:63,360-SCALE MAPS

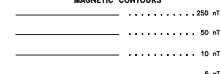


## SURVEY HISTORY

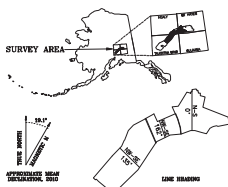
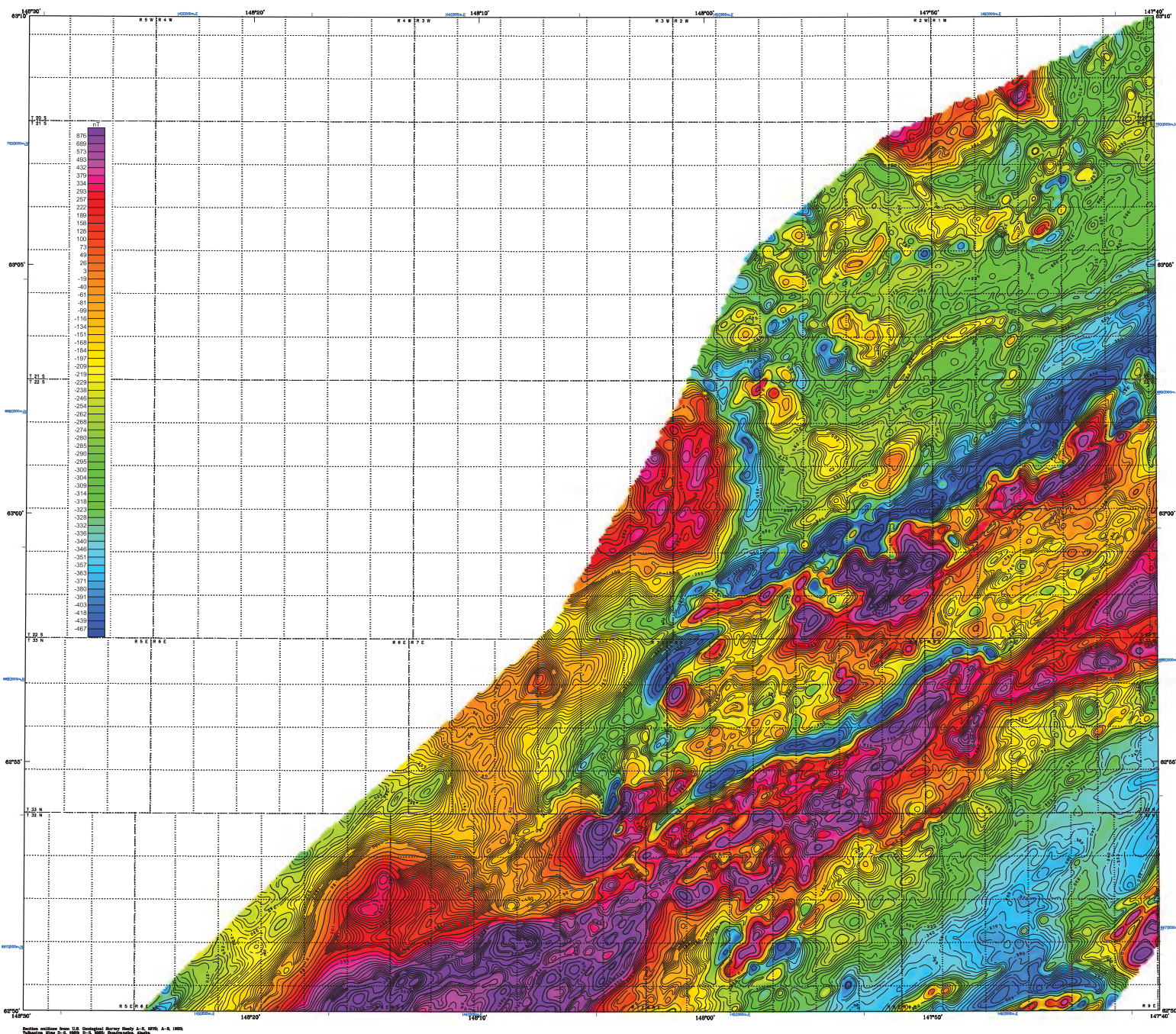
This map has been compiled and drawn under contract between the State of Alaska, Department of Natural Resources, Division of Geological & Geophysical Surveys (DGGGS), and Fugro GeoServices, Inc. Airborne geophysical data for the area were acquired and processed by DGGGS in 2013 and 2014. Previous flown DGGGS surveys adjacent to the current survey are shown in the location map by dashed lines, survey name, and date of publication. The project was funded by the Alaska State Legislature as part of the Alaska Strategic and Critical Minerals Assessment project, which is part of the Alaska Airborne Geophysical and Geological Mineral Inventory Program. Fugro GeoServices, Inc. contributed Infill data for a portion of the area shown above as denser basing.

All data and maps produced to date from this survey are available in digital format on DVD for a nominal fee through DGGGS, 3354 College Road, Fairbanks, Alaska, 99709-3757, and are downloadable for free from the DGGGS website ([www.dgggs.alaska.gov/pubs](http://www.dgggs.alaska.gov/pubs)). Maps are also available on paper through the DGGGS office and are available online at the website in Adobe Acrobat (.PDF) file format.

## MAGNETIC CONTOURS







## DESCRIPTIVE NOTES

The geophysical data were acquired with a DIGHEM<sup>®</sup> 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 radar and laser altimeters, GPS navigation system, 50/60 Hz monitors and video cameras. Flights were performed with an AS-350-83 Sauroi helicopter at a mean terrain clearance of 200 feet with a spacing primarily of a quarter of a mile, and one eighth of a mile for about 97.0 miles. The lines were flown perpendicular to the flight lines at intervals of approximately 3 miles.

A Novatel OEM5-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 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.

## RESIDUAL MAGNETIC FIELD

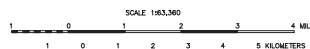
The magnetic total field data were processed using digitally recorded data from a Fugro D1344 magnetometer with a Scintrex CS3 cesium sensor. Data were collected at a sampling interval of 0.1 seconds. The magnetic data were (1) corrected for diurnal variations by subtraction of the digitally recorded base station magnetic data, (2) IGRF corrected (IGRF model 2010, updated for date of flight and altitude variations), (3) leveled to the tie line data, and (4) interpolated onto a regular 80 m grid using a modified Akima (1970) technique. All grids were then resampled from the 80 m cell size down to a 25 m cell size to produce the maps and final grids contained in this publication.

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. 6, p. 589-602.

## RESIDUAL MAGNETIC FIELD WITH DATA CONTOURS, WRANGELLIA SURVEY AREA, SOUTH-CENTRAL ALASKA

PARTS OF THE TALKEETNA MTNS, HEALY, AND MT HAYES QUADRANGLES

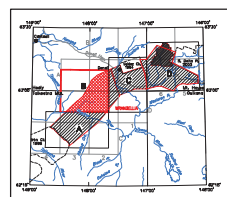
by  
Laurel E. Burns, CGG, and Fugro GeoServices, Inc.  
2014



## MAGNETIC CONTOURS

.....	250 nT
.....	50 nT
.....	10 nT
.....	5 nT

## LOCATION INDEX FOR 1:63,360-SCALE MAPS

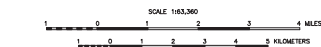


## SURVEY HISTORY

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 Fugro GeoServices, Inc. Airborne geophysical data for the area were acquired and processed by CGG in 2013 and 2014. Previously flown DGGGS surveys adjacent to the current survey are shown in the location map by dashed lines, survey names, and date of publication. The project was funded by the Alaska State Legislature as part of the Alaska Strategic and Critical Minerals Assessment project, which is part of the Alaska Airborne Geophysical and Geological Mineral Inventory Program. Milrock Exploration Corporation contributed initial data for a portion of the area shown above as denser hatchings.

All data and maps produced to date from this survey are available in digital format on DVD for a nominal fee through DGGGS, 3354 College Road, Fairbanks, Alaska, 99709-3707, and are downloadable for free from the DGGGS website ([www.dggs.alaska.gov/pubs](http://www.dggs.alaska.gov/pubs)). Maps are also available on paper through the DGGGS office, and are viewable online at the website in Adobe Acrobat (.PDF) file format.





## PARTS OF THE TALKEETNA MTS., HEALY, AND MT HAYES QUADRANGLES

### DESCRIPTIVE NOTES

[illegible]

The magnetic total field data were processed using digitally recorded data from a Fugro D1344 2000 series magnetometer. Samples 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 2010, updated for date of flight and instrument variations), (3) leveled to the tie data, and (4) interpolated onto a regular 80 m grid using a modified Akima (1970) technique. All grids were then resampled from the 80 m cell size down to a 25 m cell size to produce the maps and final grids contained in this publication.

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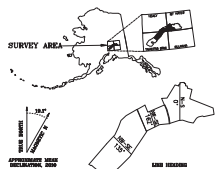
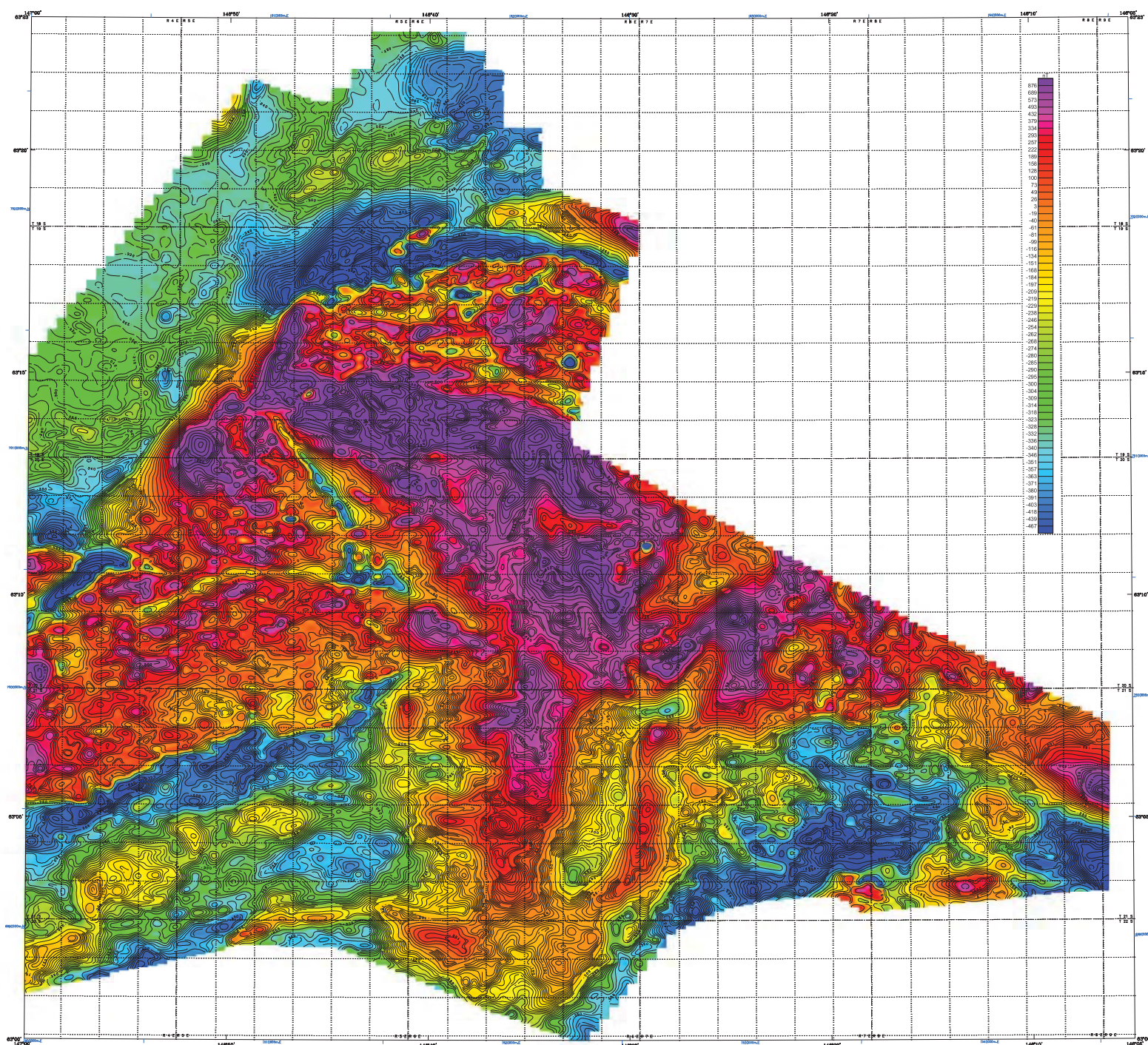
Aikins, H., 1970, A new method of interpolation and smooth curve fitting based on local procedures: *Journal of the Association*

**SURVEY HISTORY**

This map is based on the geologic and geophysical data collected between the State of Alaska, Department of Natural Resources, Division of Geological & Geophysical Surveys and the U.S. Geological Survey. The geologic and geophysical data for the area were acquired and processed by CGG in 2013 and 2014. Previously published maps of the area are shown in the map legend. The survey are shown in the location map by dashed lines, survey name, and date of publication. The map is available on the Alaska Department of Natural Resources, Division of Geological & Geophysical Surveys website as part of the Alaska Strategic and Critical Minerals Inventory project. The project is a joint effort between Alaska Airborne Geophysical and Geological Mineral Inventory Program, Milrock Exploration Corporation and the U.S. Geological Survey. The portion of the map shown above as denser highlighting.

All data and maps produced from this survey are available on the Alaska Department of Natural Resources, Division of Geological & Geophysical Surveys, 3354 College Road, Fairbanks, Alaska, 99709-3707, and are downloadable for free from the Alaska Department of Natural Resources website. The data are also available on paper through the DGGS office, and are viewable online at the website in Adobe Acrobat (.PDF) files.





## DESCRIPTIVE NOTES

The geophysical data were acquired with a DIGHM™ Electromagnetic (EM) system and a Fugro D1344 cesium magnetometer with a Schlumberger CS cesium sensor. The EM and magnetic sensors were flown at a height of 100 feet. In addition, the survey recorded data from radar and laser altimeters, GPS navigation system, 50/60 Hz monitors and video cameras. Flights were performed with an AS-350-83 Spirit helicopter at a mean terrain clearance of 200 feet with a spacing of 0.1 mile for about 97.9 square miles. The 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 location was derived every 0.5 seconds using post-flight differential positioning to a relative accuracy of better than 1 m. The 2011 data were projected onto the Clarke 1866 (UTM zone 6) datum, 1927 datum using 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.

## RESIDUAL MAGNETIC FIELD

The magnetic total field data were processed using digitally recorded data from a Fugro D1344 cesium magnetometer with a Schlumberger CS cesium 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 2010, updated for date of flight and altimeter variations), (3) leveled to the line data, and (4) interpolated onto a regular 80 m grid using a modified Adams (1970) technique. All grids were then resampled from the 80 m cell size down to a 25 m cell size to produce the maps and final grids contained in this publication.

Adams, R., 1970. A new method of interpolating grid-point values of magnetic intensity. *Journal of Geophysical Research*, 75, 6675-6682.

# RESIDUAL MAGNETIC FIELD WITH DATA CONTOURS, WRANGELLIA SURVEY AREA, SOUTH-CENTRAL ALASKA

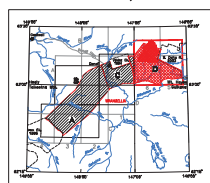
PARTS OF THE TALKEETNA MTNS, HEALY, AND MT HAYES QUADRANGLES

by  
Laurel E. Burns, CGG, and Fugro GeoServices, Inc.  
2014

## MAGNETIC CONTOURS

.....	250 nT
.....	50 nT
.....	10 nT
.....	5 nT

## LOCATION INDEX FOR 1:63,360-SCALE MAPS



## 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 Fugro GeoServices, Inc. Airborne geophysical data for the area were acquired and processed by CGG in 2013 and 2014. Previously flown DGGG surveys adjacent to the current survey are shown in the location map by dashed lines, survey names, and date of publication. The project was funded by the Alaska State Legislature as part of the Alaska Strategic and Critical Minerals Assessment project, which is part of the Alaska Airborne Geophysical and Geological Mineral Inventory Program. Milrock Exploration Corporation contributed inflight data for a portion of the area shown at a lesser scale.

All data and maps produced to date from this survey are available as digital files on DVD for a nominal fee through DGGG, 3354 College Road, Fairbanks, Alaska, 99709-1207, and are available for free from the DGGG website ([www.dggg.alaska.gov/pubs/](http://www.dggg.alaska.gov/pubs/)). Maps are also available on paper through the DGGG office, and are viewable online at the website in Adobe Acrobat PDF file format.



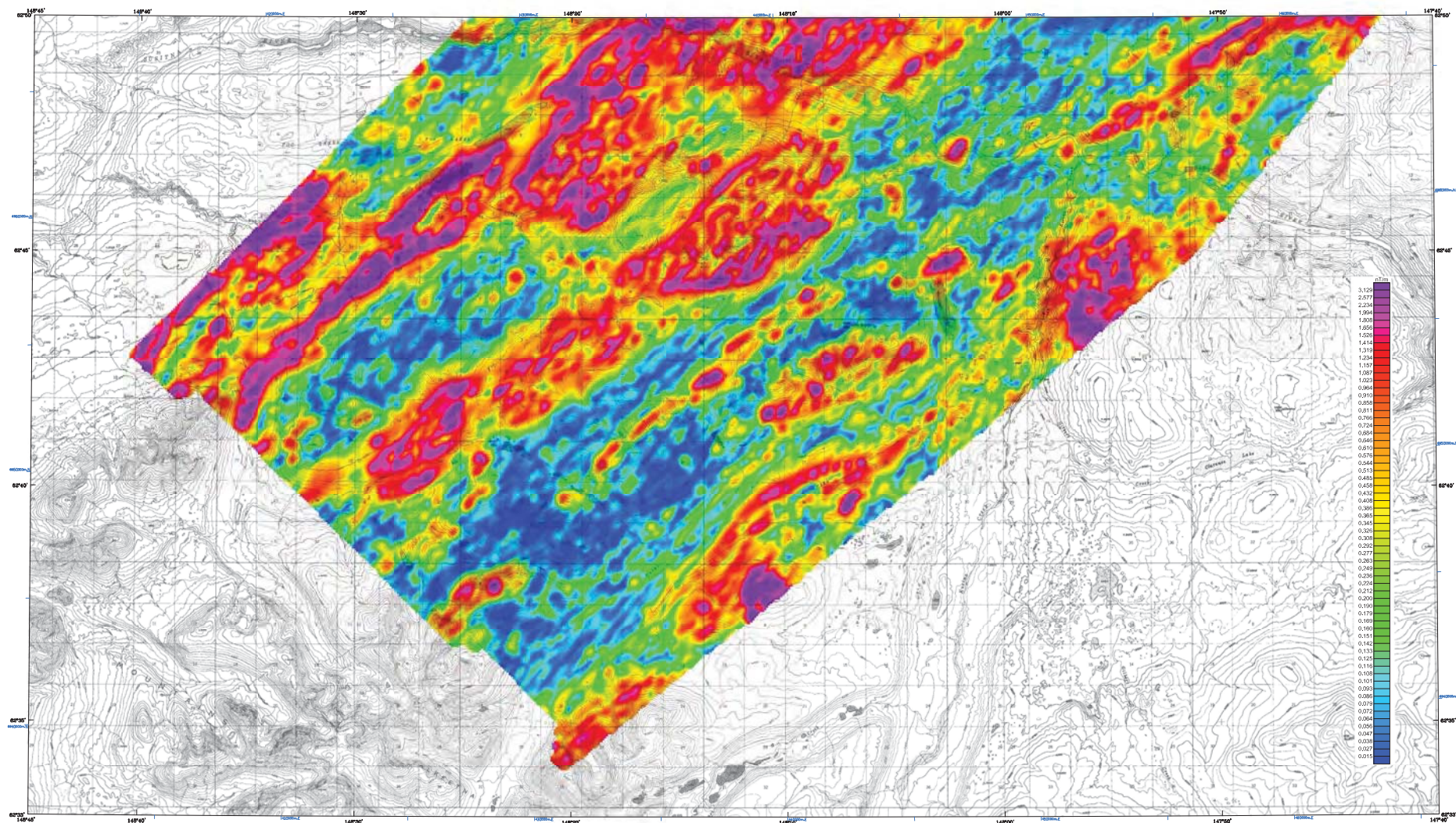
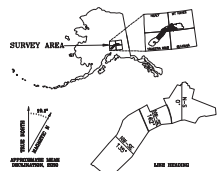


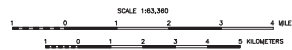
FIG. 1. ANALYTIC SIGNAL WITH TOPOGRAPHY, WRANGELLIA SURVEY AREA, SOUTH-CENTRAL ALASKA. SCALE 1:63,360. D-1, 1988.



#### DESCRIPTIVE NOTES

The geophysical data were acquired with a DIGHEM Electromagnetic (EM) system and a Fugro D-1544 cesium magnetometer with a Schriber CS3 cesium sensor. The EM and magnetic sensors were flown at a height of 100 feet. In addition the survey recorded data from radar and other instruments. GPS navigation system, 50/40 Hz monitors and video cameras. Flights were performed with an AS-300B3 Super Puma helicopter at a mean terrain clearance of 200 feet with a spacing primarily of a quarter of a mile, and one eighth of a mile for about 87.9 sq miles. The lines were flown perpendicular to the flight lines at intervals of approximately 3 miles.

A Novatel OEM-221, Global Positioning System was used for navigation. The helicopter position was derived every 3.3 seconds using post-flight differential positioning to a relative accuracy of better than 5 m. Flights were made using the 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.



## ANALYTIC SIGNAL WITH TOPOGRAPHY, WRANGELLIA SURVEY AREA, SOUTH-CENTRAL ALASKA

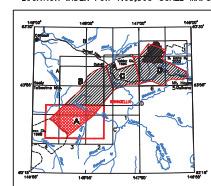
PARTS OF THE TALKIEITHA MTNS, HEALY, AND MT HAYES QUADRANGLES

by  
Lauri E. Burns, CGG, and Fugro Geoservices, Inc.  
2014

#### ANALYTIC SIGNAL

Analytic signal is the total amplitude of all directions of magnetic gradient calculated from the sum of the squares of the three orthogonal gradients. Maped highs in the calculated analytic signal of magnetic parameter locate the anomalous source body edges and corners (e.g., contacts, fault/shear zones, etc.). Analytic signal maxima are located directly over faults and contacts, regardless of structural dip, and independently of the direction of the induced and/or remanent magnetizations.

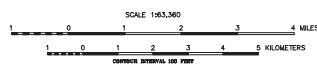
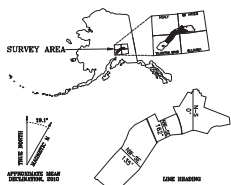
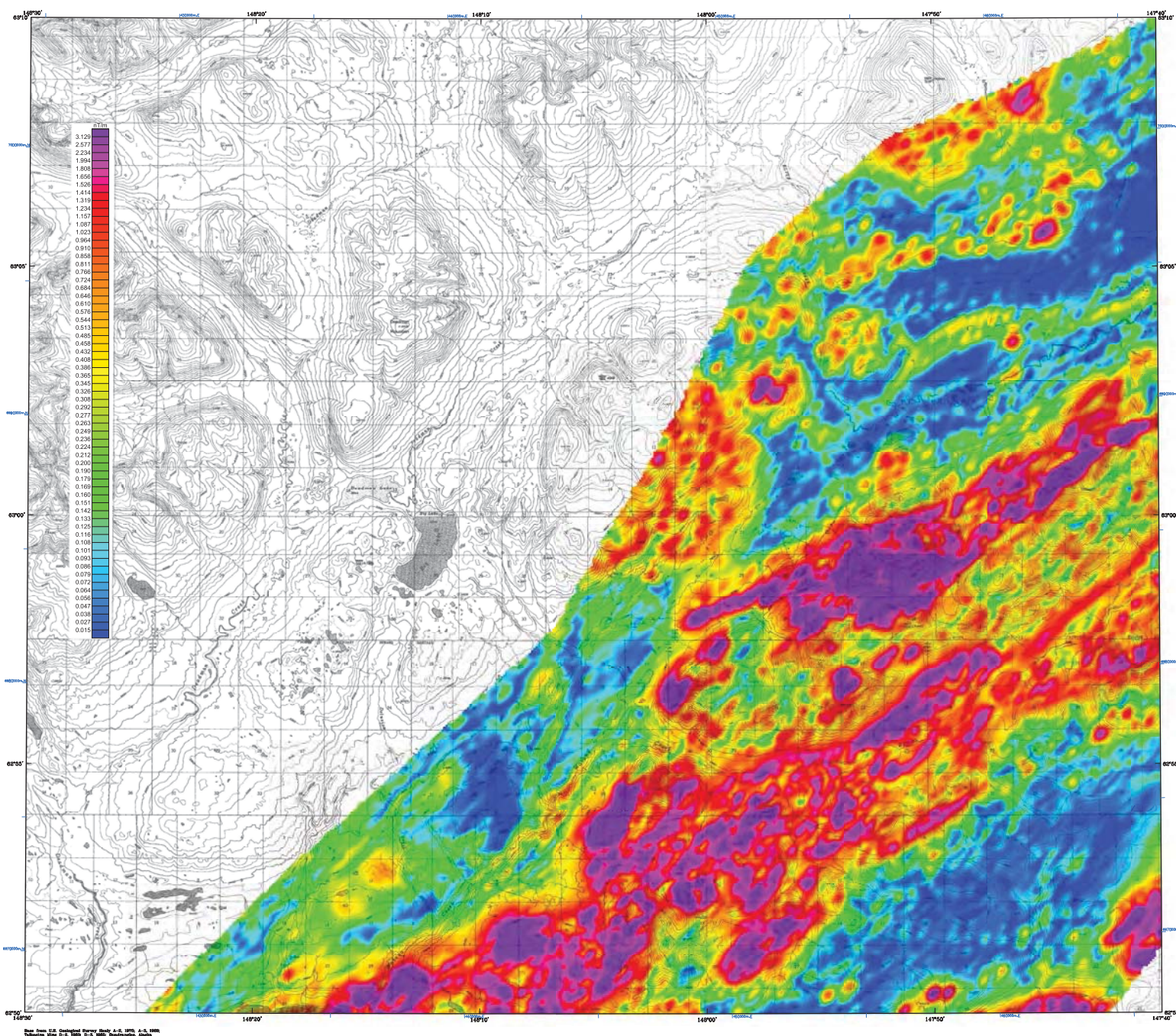
#### LOCATION INDEX FOR 1:63,360-SCALE MAPS



#### 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 Fugro Geoservices, Inc. Airborne geophysical data for the area were acquired and processed by CGG in 2013 and 2014. Previously flown DGGGS surveys adjacent to the current survey are shown in the location map by dashed lines, survey name, and date of publication. The project was funded by the Alaska State Legislature as part of the Alaska Strategic and Critical Minerals Assessment project, which is part of the Alaska Airborne Geophysical and Geological Mineral Inventory Program. Alaska Exploration Corporation contributed Infill data for a portion of the area shown above as denser shading. All data and maps produced to date from this survey are available in digital format on DVD for a nominal fee through DGGGS, 3304 College Road, Fairbanks, Alaska, 99709-3757, and are downloadable for free from the DGGGS website ([www.dgggs.alaska.gov/pubs](http://www.dgggs.alaska.gov/pubs)). Maps are also available on paper through the DGGGS office, and on website online at the website in Adobe Acrobat (.PDF) file format.





## ANALYTIC SIGNAL WITH TOPOGRAPHY, WRANGELLIA SURVEY AREA, SOUTH-CENTRAL ALASKA

PARTS OF THE TALKIETNA MTNS, HEALY, AND MT HAYES QUADRANGLES

by  
Laurel E. Burns, CGG, and Fugro GeoServices, Inc.  
2014

### DESCRIPTIVE NOTES

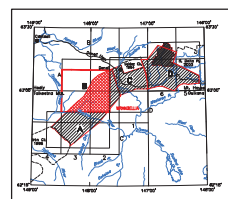
The geophysical data were acquired with a DIGHEM Electromagnetic (EM) system and a Fugro D1344 cesium magnetometer with a Schlumberger CS3 cesium sensor. The EM and magnetic sensors were flown at a height of 100 feet. In addition the survey recorded data from radar and laser altimeters, GPS navigation system, 50/60 Hz monitors and video camera. Flights were performed with an AS-350-83 Saurhel helicopter at a mean terrain clearance of 200 feet with a spacing primarily of a quarter of a mile, and one eighth of a mile for about 97.9 miles. The lines were flown perpendicular to the flight lines at intervals of approximately 3 miles.

A Novatel OEM5-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 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.

### ANALYTIC SIGNAL

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 (e.g., contacts, fault/shear zones, etc.). Analytic signal maxima are located directly over faults and contacts, regardless of structural dip, and independently of the direction of the induced and/or remanent magnetizations.

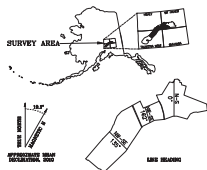
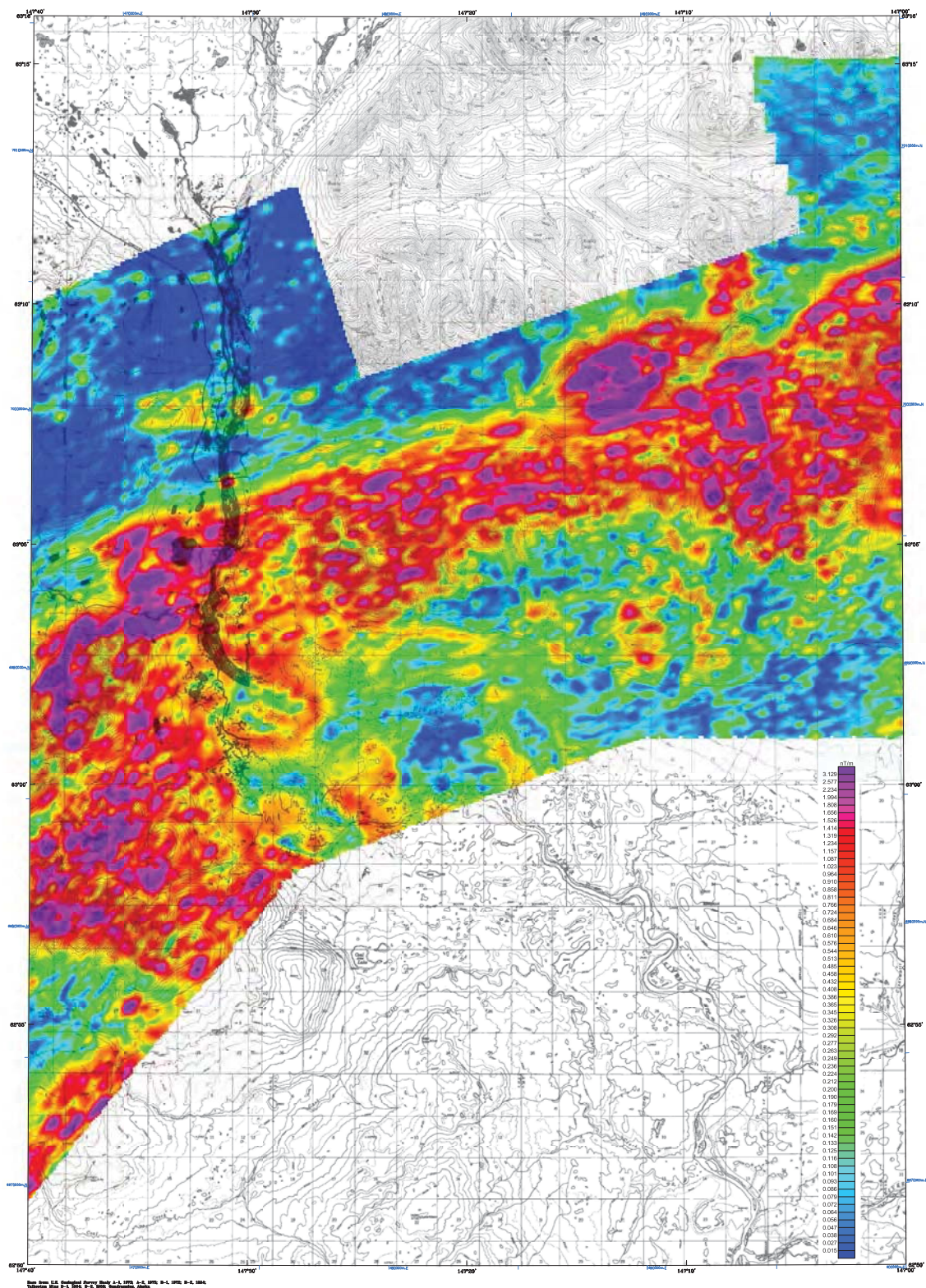
### LOCATION INDEX FOR 1:63,360-SCALE MAPS



### 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 Fugro GeoServices, Inc. Airborne geophysical data for the area were acquired and processed by CGG in 2013 and 2014. Previously flown DGGG surveys adjacent to the current survey are shown in the location map by dashed lines, survey name, and date of publication. The project was funded by the Alaska State Legislature as part of the Alaska Strategic and Critical Minerals Assessment project, which is part of the Alaska Airborne Geophysical and Geological Mineral Inventory Program. Milrock Exploration Corporation contributed initial data for a portion of the area shown above as denser hatching. All data and maps produced to date from this survey are available in digital format on DVD for a nominal fee through DGGG, 3354 College Road, Fairbanks, Alaska, 99709-3707, and are downloadable for free from the DGGG website ([www.dggg.alaska.gov/pubs](http://www.dggg.alaska.gov/pubs)). Maps are also available on paper through the DGGG office, and are viewable online at the website in Adobe Acrobat PDF file format.

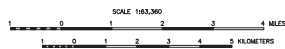




#### DESCRIPTIVE NOTES

The geophysical data were acquired with a DIGHEM<sup>®</sup> Electromagnetic (EM) system and a Fugro D1344 cesium magnetometer with a Schriber C3 cesium sensor. The EM and magnetic sensors were flown at a height of 100 feet. In addition, the survey included a GPS navigation system, 50/60 Hz monitors and data control. Flights were performed with an AS-350-B3 Squirrel helicopter at a mean terrain clearance of 200 feet with a spacing primarily of a quarter of a mile, and one eighth of a mile for about 9.0 miles. The 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 2 m. Flight path locations were projected onto the UTM 18N datum (UTM zone 18N, 1975 datum) and datum adjustment to central meridian (CM) of 147° 0' north constant of 0 and an east constant of 100,000. Positional accuracy of the presented data is better than 10 m with respect to the UTM grid.



## ANALYTIC SIGNAL WITH TOPOGRAPHY, WRANGELLIA SURVEY AREA, SOUTH-CENTRAL ALASKA

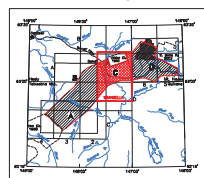
PARTS OF THE TALKEETNA MTS., HEALY, AND MT HAYES QUADRANGLES

by  
Lauri E. Burns, CGG, and Fugro GeoServices, Inc.  
2014

#### ANALYTIC SIGNAL

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 (e.g., contacts, fault/shear zones, etc.). Analytic signal maxima are located directly over faults and contacts, regardless of structural dip, and independently of the direction of the induced and/or remanent magnetizations.

#### LOCATION INDEX FOR 1:63,360-SCALE MAPS

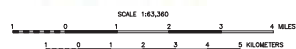


#### SURVEY HISTORY

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 Fugro GeoServices, Inc. Airborne geophysical data for the area were acquired and processed by CGG in 2013 and 2014. Previously flown DGGGS surveys (adjacent to the current survey) are shown in the location map by dashed lines, survey names, and date of publication. The project was funded by the Alaska State Legislature as part of the Alaska Strategic and Critical Assets Assessment project, which is part of the Alaska Airborne Geological and Geophysical Mineral Inventory Project. The project was a cooperative effort between the State of Alaska and Fugro GeoServices, Inc. contributed in full data for a portion of the area shown above in detail.

All data and maps produced to date from this survey are available in digital form to the public through DGGGS, 3354 College Road, Fairbanks, Alaska, 99709-3707 and are downloadable for free from the DGGGS website ([www.dgggs.alaska.gov/pub/](http://www.dgggs.alaska.gov/pub/)). Maps are also available on paper through the DGGGS office and are viewable online at the website in Adobe Acrobat PDF file format.



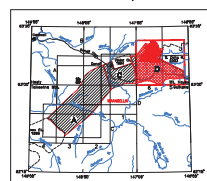


## PARTS OF THE TALLEKETA MTS., HEALY, AND MT HAYES QUADRANGLES

ANALYTIC SIGNAL

**ANALYTIC SIGNAL**

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 (e.g., contacts, fault/shear zones, etc.). Analytic signal maxima are located directly over faults and contacts, regardless of structural dip, and independently of the direction of the induced  $N_0/H_0$  remanent magnetization.



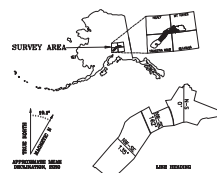
## SURVEY HISTORY

**SURVEY HISTORY**

This map has been compiled and drawn under contract between the State of Alaska and the U.S. Geological Survey, Division of Geological & Geophysical Surveys (DGGS), and Fugro GeoServices, Inc. Airborne geophysical data were collected in 2013 and 2014, processed by CGG in 2013 and 2014. Previously flown DGGS surveys adjacent to the current survey are shown in light gray. Survey lines, survey name, and date of publication are shown in the table below. The Alaska State Legislature as part of the Alaska Strategic and Critical Minerals Assessment project, which is part of the Alaska Strategic and Critical Minerals Assessment Inventory Program, Milrock Exploration Corporation contributed infill data for a portion of the area shown.

All data and maps produced to date from this survey are available in digital format on DVD for a nominal fee. The data are available in the following formats: 99709-3707, and are downloadable for free from the DGGS website ([www.dggs.alaska.gov/pubs](http://www.dggs.alaska.gov/pubs)). Maps are available in the following formats: 99709-3707, and are viewable online at the website in Adobe Acrobat .PDF format.



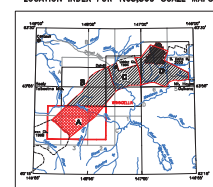


## PARTS OF THE TALKEETNA MTNS. HEALY. AND MT HAYES QUADRANGLES

by  
Laurel E. Burns, CGG, and Fugro GeoServices, Inc.  
2014

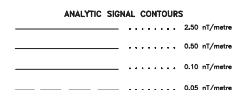
The geophysical data were acquired with a DIGHEW Electromagnetic (EM) system (Figure 1) and a Fugro 0144 cesium magnetometer (Sintrex CS3 cesium sensor). The EM and magnetic sensors were flown at a height of 100 feet. In addition the survey recorded data from radar and laser altimeters, GPS navigation system, 50/60 Hz magnetic and video cameras. The data were performed with an AS-350-B3 Squirrel helicopter at a mean terrain clearance of 200 feet with a spacing primarily of a quarter of a mile, and one eighth of a mile for about 97.9 square miles. There were 1000 magnetic lines, 1000 flight lines at intervals of approximately 3 miles.

**ANALYTIC SIGNAL**  
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 (e.g., contacts, fault/shear zones, etc.). Analytic signal maxima are located directly over faults and contacts, regardless of structural dip, and independently of the direction of the induced and/or remanent magnetizations.

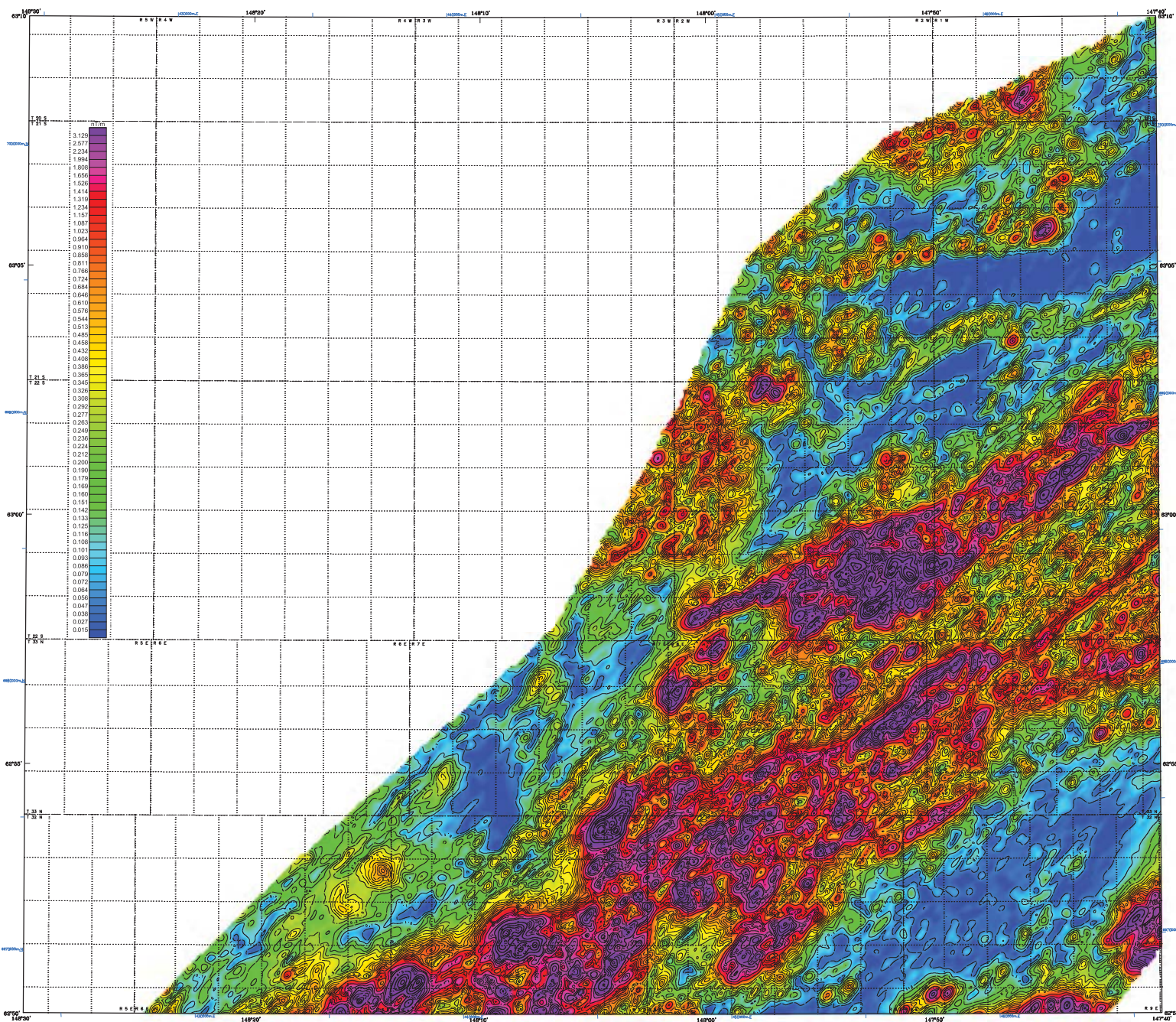


This map has been compiled and drawn under contract from the State of Alaska, Department of Natural Resources, Division of Geological & Geophysical Surveys. Data from the Fairbanks Area Geophysical Survey, a geological data project for the area were acquired and processed by CGG in 2013 and 2014. Previously, data from the Fairbanks Area Geophysical Survey were shown in the location map by dashed lines. The project was funded by the Alaska State Legislature as part of the Alaska Strategic and Critical Minerals Program, and the Alaska Department of Natural Resources Airborne Geophysical and Geological Mineral Inventory Program. Milrock Exploration Corporation provided the final data. A portion of the area shown above as denser hatching.

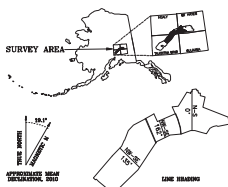
All data and maps produced to date from this survey are available for download from the Alaska Department of Natural Resources, 3330 College Road, Fairbanks, Alaska, 99709-5707, and are downloadable for free from the Alaska Department of Natural Resources website. They are also available on paper through the DGG's office, and are available online at the website in Adobe Acrobat, PDF file format.







Office of the State Geologist, Alaska Division of Geological & Geophysical Surveys  
 Produced under the Alaska Division of Geological & Geophysical Surveys, Alaska Division of Geological & Geophysical Surveys, Alaska Division of Geological & Geophysical Surveys



#### DESCRIPTIVE NOTES

The geophysical data were acquired with a DIGHEM<sup>®</sup> Electromagnetic (EM) system and a Fugro D1344 cesium magnetometer with a Schlumberger CS3 cesium sensor. The EM and magnetic sensors were flown at a height of 100 feet. In addition to the survey recorded data from radar and laser altimeters, GPS navigation system, 50/60 Hz monitors and video cameras. Flights were performed with an AS-350-83 Squirrel helicopter at a mean terrain clearance of 200 feet with a spacing primarily of a quarter of a mile, and one eighth of a mile for about 97.9 sq miles. The lines were flown perpendicular to the flight lines at intervals of approximately 3 miles.

A Novatel OEM5-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 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.

#### ANALYTIC SIGNAL

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 (e.g., contacts, fault/strain zones, etc.). Analytic signal mapping are located directly over faults and contacts, regardless of structural dip, and independently of the direction of the induced and/or remanent magnetizations.

SCALE 1:63,360  
 1 0 1 2 3 4 MILES  
 1 0 1 2 3 4 KILOMETERS

## ANALYTIC SIGNAL WITH DATA CONTOURS, WRANGELLIA SURVEY AREA, SOUTH-CENTRAL ALASKA

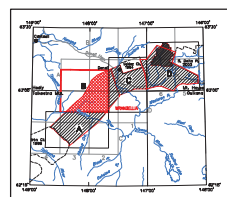
PARTS OF THE TALKEETNA MTNS, HEALY, AND MT HAYES QUADRANGLES

by  
 Laurel E. Burns, CGG, and Fugro GeoServices, Inc.  
 2014

#### ANALYTIC SIGNAL CONTOURS

..... 2.50 nT/metre  
 ..... 0.50 nT/metre  
 ..... 0.10 nT/metre  
 ..... 0.05 nT/metre

#### LOCATION INDEX FOR 1:63,360-SCALE MAPS

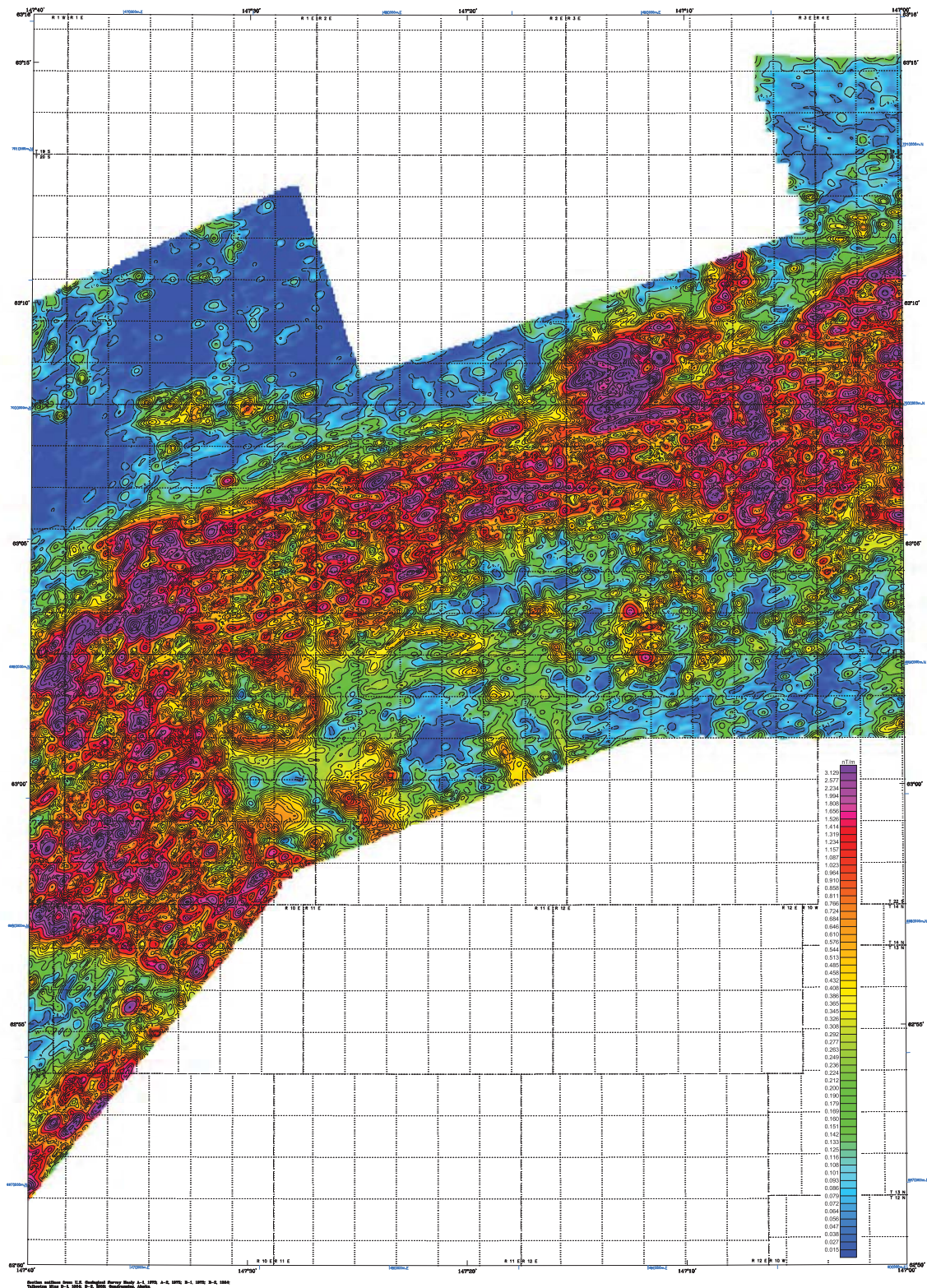


#### SURVEY HISTORY

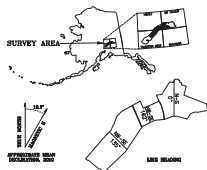
This map has been compiled and drawn under contract between the State of Alaska, Department of Natural Resources, Division of Geological & Geophysical Surveys (DGGGS), and Fugro GeoServices, Inc. Airborne geophysical data for the area were acquired and processed by CGG in 2013 and 2014. Previously flown DGGGS surveys, pertinent to the current survey are shown in the location map by dashed lines, survey name, and date of publication. The project was funded by the Alaska State Legislature as part of the Alaska Strategic and Critical Minerals Assessment project, which is part of the Alaska Airborne Geophysical and Geological Mineral Inventory Program. Mineral Exploration Corporation contributed initial data for a portion of the area shown above as denser halftone.

All data and maps produced to date from this survey are available in digital format on DVD for a nominal fee through DGGGS. 3504 College Road, Fairbanks, Alaska, 99709-3707, and are downloadable for free from the DGGGS website ([www.dgggs.alaska.gov/pubs](http://www.dgggs.alaska.gov/pubs)). Maps are also available on paper through the DGGGS office, and are viewable online at the website in Adobe Acrobat (.PDF) file format.





Scale: 1:100,000. Data: 2014. Survey: 2014. Map: 2014.



#### DESCRIPTIVE NOTES

The geophysical data were acquired with a DIGHEM<sup>®</sup> Electromagnetic (EM) system and a Fugro D1344 cesium magnetometer with a Schriber C31 cesium sensor. The EM and magnetic sensors were flown at a height of 100 feet. In addition, the survey collected data from radio and laser altimeters, GPS navigation system, 50/60 Hz monitors and video camera. Flights were performed with an AS-350-B3 Squirrel helicopter at a mean terrain clearance of 200 feet with a spacing primarily of a quarter of a mile, and one eighth of a mile for about 9.8 sq miles. The 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 2 m. Flight path locations were projected onto the Clarke 1886 (UTM zone 5) coordinate system using a datum shift of 1970 to 1983. The datum shift was applied to the central meridian (CM) of 147° 0' north constant of 0 and an east constant of 600,000. Positional accuracy of the presented data is better than 10 m with respect to the UTM grid.

#### ANALYTIC SIGNAL

Analytic signal is the total amplitude of all directions of magnetic gradient calculated from the sum of the squares of the three orthogonal gradients. Analytic signal in the calculated analytic signal of magnetic parameter boris the anomalous source body edges and corners (e.g., contacts, fault/shear zones, etc.). Analytic signal maxima are located directly over faults and contacts, regardless of structural dip, and independently of the direction of the induced and/or remanent magnetizations.

#### ANALYTIC SIGNAL CONTOURS

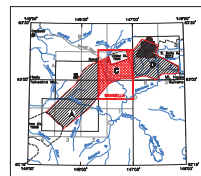
..... 2.00 nT/metre  
..... 0.50 nT/metre  
..... 0.10 nT/metre  
..... 0.05 nT/metre

## ANALYTIC SIGNAL WITH DATA CONTOURS, WRANGELLIA SURVEY AREA, SOUTH-CENTRAL ALASKA

PARTS OF THE TALKIEETNA MTS., HEALY, AND MT HAYES QUADRANGLES

by  
Laural E. Burns, OGS, and Fugro GeoServices, Inc.  
2014

#### LOCATION INDEX FOR 1:63,360-SCALE MAPS

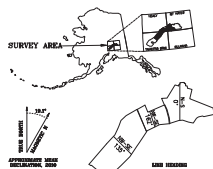
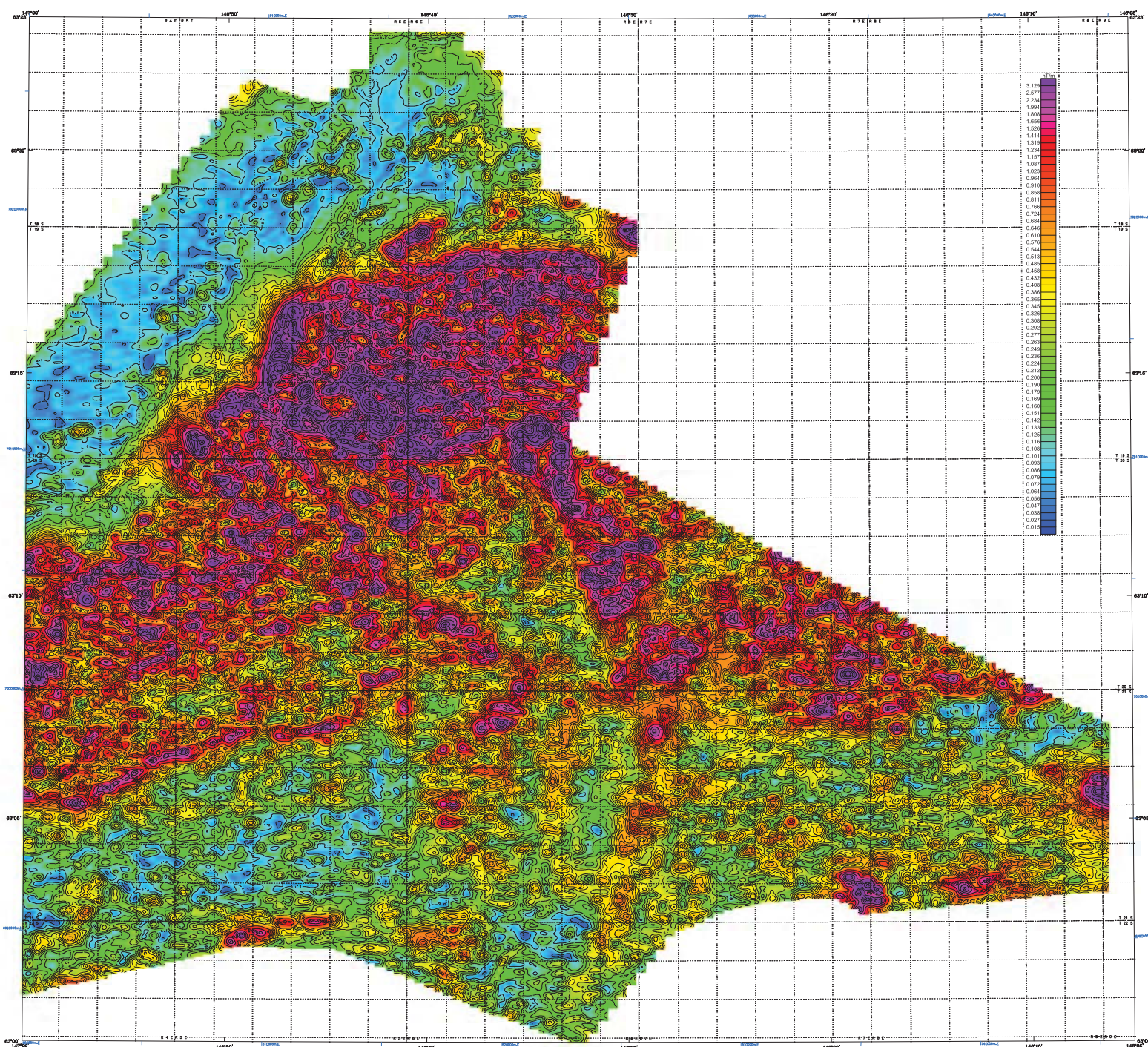


#### SURVEY HISTORY

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 Fugro GeoServices, Inc. Airborne geophysical data for the area were acquired and processed by DGGGS in 2013 and 2014. Previously flown DGGGS surveys adjacent to the current survey are shown in the location map by dashed lines, survey names, and date of publication. The project was funded by the Alaska State Legislature as part of the Alaska Strategic and Critical Minerals Assessment project, which is part of the Alaska Airborne Geophysical and Geospatial Mineral Inventory Program. Fugro GeoServices, Inc. and Geospatial Information Corporation contributed in-fill data for a portion of the area shown above as a courtesy.

All data and maps produced to date from this survey are available in digital format in DGGGS for a nominal fee through DGGGS, 3354 College Road, Fairbanks, Alaska, 99709-3701 and are downloadable for free from the DGGGS website ([www.dgggs.alaska.gov/pub](http://www.dgggs.alaska.gov/pub)). Maps are also available on paper through the DGGGS office, and are viewable online at the website in Adobe Acrobat (.PDF) file format.





## DESCRIPTIVE NOTES

The geophysical data were acquired with a DIGHM™ Electromagnetic (EM) system and a Fugro D1344 cesium magnetometer with a Schriber CS3 cesium sensor. The EM and magnetic sensors were flown at a height of 100 feet. In addition the survey recorded data from radar and laser altimeters, GPS navigation system, 50/60 Hz monitors and video cameras. Flights were performed with an AS-350-83 Spirit helicopter at a mean terrain clearance of 200 feet with a spacing of 1/2 mile and a line spacing of 1/4 mile. The 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 location was derived every 0.5 seconds using post-flight differential positioning to a relative accuracy of better than 1 m. The flight path coordinates were projected onto the Clarke 1866 (UTM zone 6) datum, 1927 North American datum using a central meridian (CM) of 147° 0' north constant (N) and an east constant of 500,000. Positional accuracy of the presented data is better than 10 m with respect to the UTM grid.

## ANALYTIC SIGNAL

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 (e.g., contacts, fault/shear zones, etc.). Analytic signal maxima are located directly over faults and contacts, regardless of structural dip, and independently of the direction of the induced and/or remanent magnetizations.

SCALE 1:63,360

1 2 3 4 MILES

1 2 3 4 KILOMETERS

# ANALYTIC SIGNAL WITH DATA CONTOURS, WRANGELLIA SURVEY AREA, SOUTH-CENTRAL ALASKA

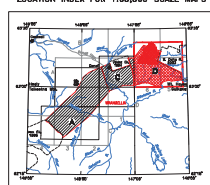
PARTS OF THE TALKEETNA MTNS, HEALY, AND MT HAYES QUADRANGLES

by  
Laurel E. Burns, CCG, and Fugro Geoservices, Inc.  
2014

## ANALYTIC SIGNAL CONTOURS

..... 2.50 nT/metre  
..... 0.50 nT/metre  
..... 0.10 nT/metre  
..... 0.05 nT/metre

## LOCATION INDEX FOR 1:63,360-SCALE MAPS

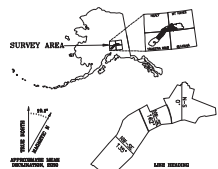
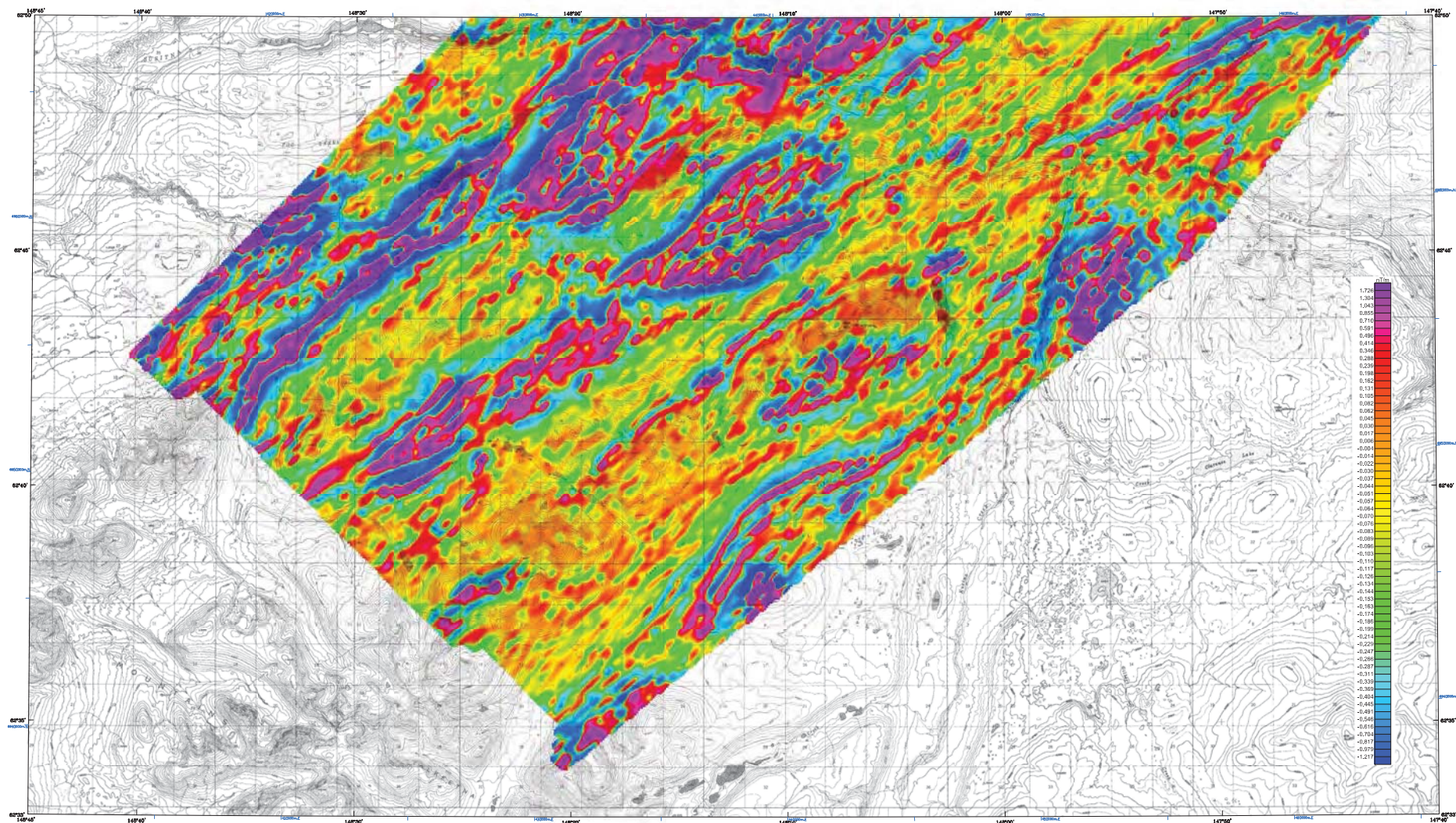


## SURVEY HISTORY

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 Fugro Geoservices, Inc. Airborne geophysical data for the area were acquired and processed by CCG in 2013 and 2014. Previously flown DGGG surveys adjacent to the current survey are shown in the location map by dashed lines, survey name, and date of publication. The project was funded by the Alaska State Legislature as part of the Alaska Strategic and Critical Minerals Assessment project, which is part of the Alaska Airborne Geophysical and Geological Mineral Inventory Program. Milrock Exploration Corporation contributed inflight data for a portion of the area shown close to the coast.

All data and maps produced to date from this survey are available in digital format and/or on microfiche through DGGG, 3354 College Road, Fairbanks, Alaska, 99709-1077, and are downloadable for free from the DGGG website ([www.dggg.alaska.gov/pubs](http://www.dggg.alaska.gov/pubs)). Maps are also available on paper through the DGGG office, and are viewable online at the website in Adobe Acrobat .PDF file format.





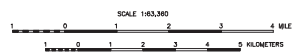
## DESCRIPTIVE NOTES

The geophysical data were acquired with a DIGHMV Electromagnetic (EM) system and a Fugro D1344 cesium magnetometer with a Schriber CS3 cesium sensor. The EM and magnetic sensors were flown at a height of 100 feet. In addition the survey recorded data from radar and other sensors using navigation systems, DGPS, GPS, and video cameras. Flights were performed with an RQ-22B Stinson helicopter at a mean terrain clearance of 200 feet with a spacing primarily of a square of a mile, and one eighth of a mile for about 97.9 sq miles. The lines were flown perpendicular to the flight lines at intervals of approximately 3 miles.

A Novatel OEM-221, Global Positioning System was used for navigation. The helicopter position was derived every 0.3 seconds using real-time differential positioning to a relative accuracy of better than 5 m. Flight lines 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.

## COLOR BAR HISTOGRAM

Approximately 98% of the first vertical derivative of the magnetic field for the Wrangellia Survey Area dataset lie within the range displayed on the color bar. Data values actually range from -12.298 nT/m (dark blue) to about 23.335 nT/m (magenta).



# **FIRST VERTICAL DERIVATIVE OF THE MAGNETIC FIELD WITH TOPOGRAPHY, WRANGELLIA SURVEY AREA, SOUTH-CENTRAL ALASKA**

PARTS OF THE TALKIEITHA MTNS, HEALY, AND MT HAYES QUADRANGLES

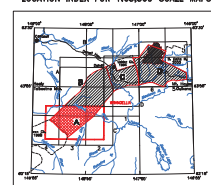
by  
Laurel E. Burns, CCG, and Fugro GeoServices, Inc.  
2014

FIRST VERTICAL DERIVATIVE OF  
THE MAGNETIC FIELD

The magnetic total field data were processed using digitally recorded data from a Fugro D1344 magnetometer with a Schriber CS3 cesium 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) IIRF corrected (IIRF model 2015, updated for data of flight and altimeter variations), (3) leveled to the tie line data, and (4) interpolated onto a regular 80 m grid using a modified Aina (1970) technique. All grids were then resampled from the 80 m cell size down to a 25 m cell size to produce the maps and final grids contained in this publication. 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.

Alaska, in 1983, a final method of interpretation and maps were published in the *Journal of the Association of Geophysical Geophysicists*, 12, no. 4, p. 168-170.

## LOCATION INDEX FOR 1:63,360-SCALE MAPS

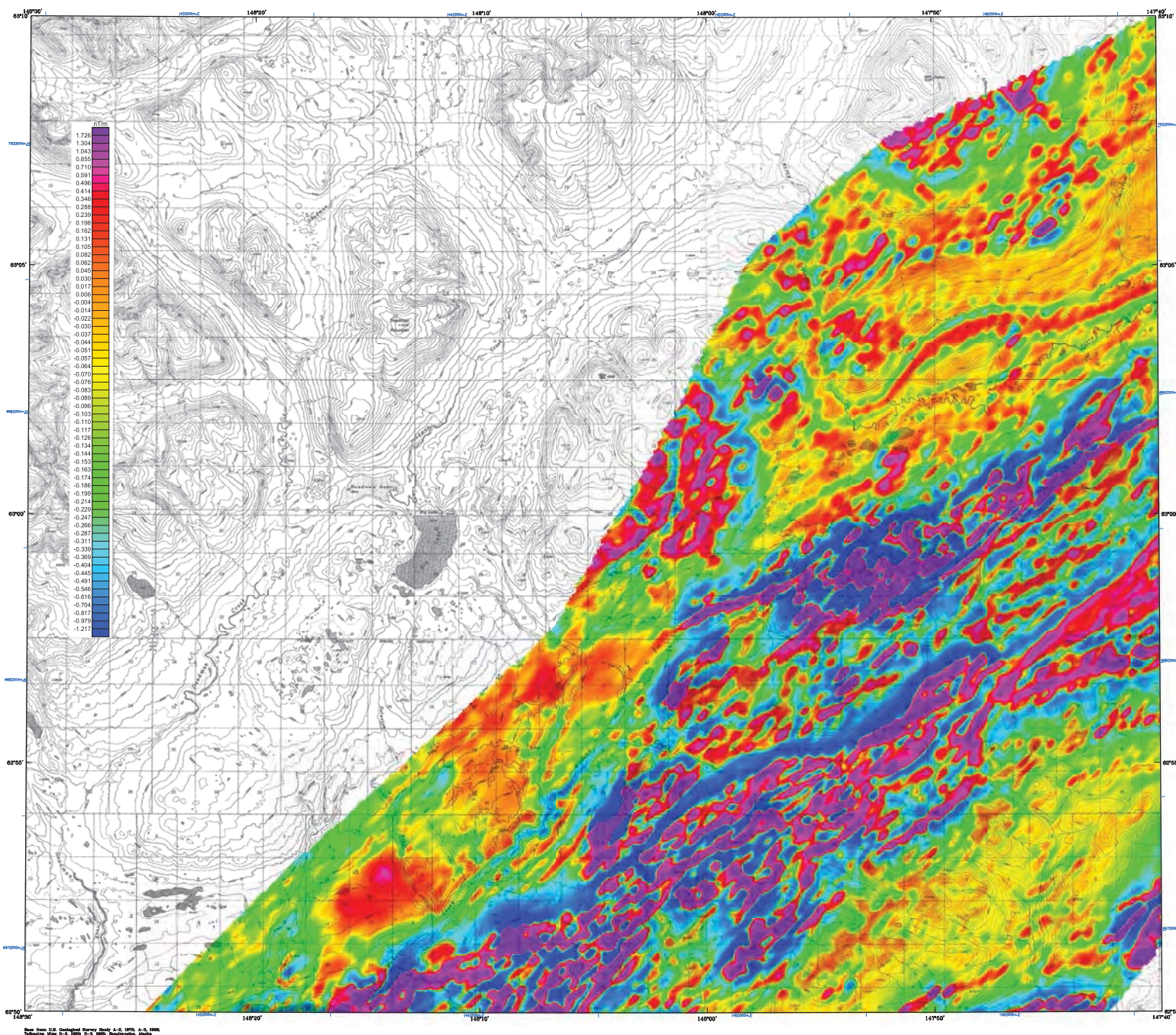


## SURVEY HISTORY

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 Fugro GeoServices, Inc. Airborne geophysical data for the area were acquired and processed by DGGGS in 2012 and 2014. Previous flown DGGGS surveys adjacent to the current survey are shown in the location map by colored lines, survey name, and date of publication. The project was funded by the Alaska State Legislature as part of the Alaska Strategic and Critical Minerals Assessment project, which is part of the Alaska Airborne Geophysical and Geological Mineral Inventory Program. Mineral Exploration Corporation contributed inflight data for a portion of the area shown above as denser basins.

All data and maps produced to date from this survey are available in digital format on DVD for a nominal fee through DGGGS, 3354 College Road, Fairbanks, Alaska, 99709-3757, and are downloadable for free from the DGGGS website ([www.dgggs.alaska.gov/pubs](http://www.dgggs.alaska.gov/pubs)). Maps are also available on paper through the DGGGS office and are available online at the website in Adobe Acrobat (.PDF) file format.

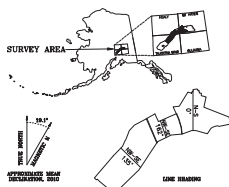




# **FIRST VERTICAL DERIVATIVE OF THE MAGNETIC FIELD WITH TOPOGRAPHY, WRANGELLIA SURVEY AREA, SOUTH-CENTRAL ALASKA**

PARTS OF THE TALLEKTNA MTNS, HEALY, AND MT HAYES QUADRANGLES

by  
Laurel E. Burns, CGG, and Fugro GeoServices, Inc.  
2014



## **DESCRIPTIVE NOTES**

The geophysical data were acquired with a DIGHEM Electromagnetic (EM) system and a Fugro D1344 cesium magnetometer with a Schlumberger CS3 cesium sensor. The EM and magnetic sensors were flown at a height of 100 feet. In addition the survey recorded data from radar and laser altimeters, GPS navigation system, 50/60 Hz monitors and video cameras. Flights were performed with an AS-350-83 Squirrel helicopter at a mean terrain clearance of 200 feet with a spacing primarily of a quarter of a mile, and one eighth of a mile for about 97.8 miles. The lines were flown perpendicular to the flight lines at intervals of approximately 3 miles.

A Novatel OEM5-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 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° and 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.

## **COLOR BAR HISTOGRAM**

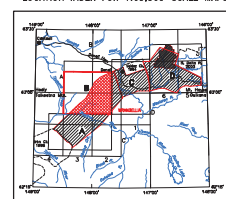
Approximately 98% of the first vertical derivative of the magnetic field for the Wrangellia Survey Area dataset is within the range displayed on the color bar. Data values actually range from -12.296 nT/m (dark blue) to about 23.335 nT/m (magenta).

## **FIRST VERTICAL DERIVATIVE OF THE MAGNETIC FIELD**

The magnetic total field data were processed using digitally recorded data from a Fugro D1344 magnetometer with a Schlumberger CS3 cesium 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 2010, 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. All grids were then resampled from the 80 m cell size down to a 25 m cell size to produce the maps and final grids contained in this publication. 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.

Alaska, U.S. 1970. A new method of interpretation and analysis using digital data on local processing. *Journal of the Association of Geophysical Geophysicists*, v. 17, no. 4, p. 688-692.

## **LOCATION INDEX FOR 1:63,360-SCALE MAPS**

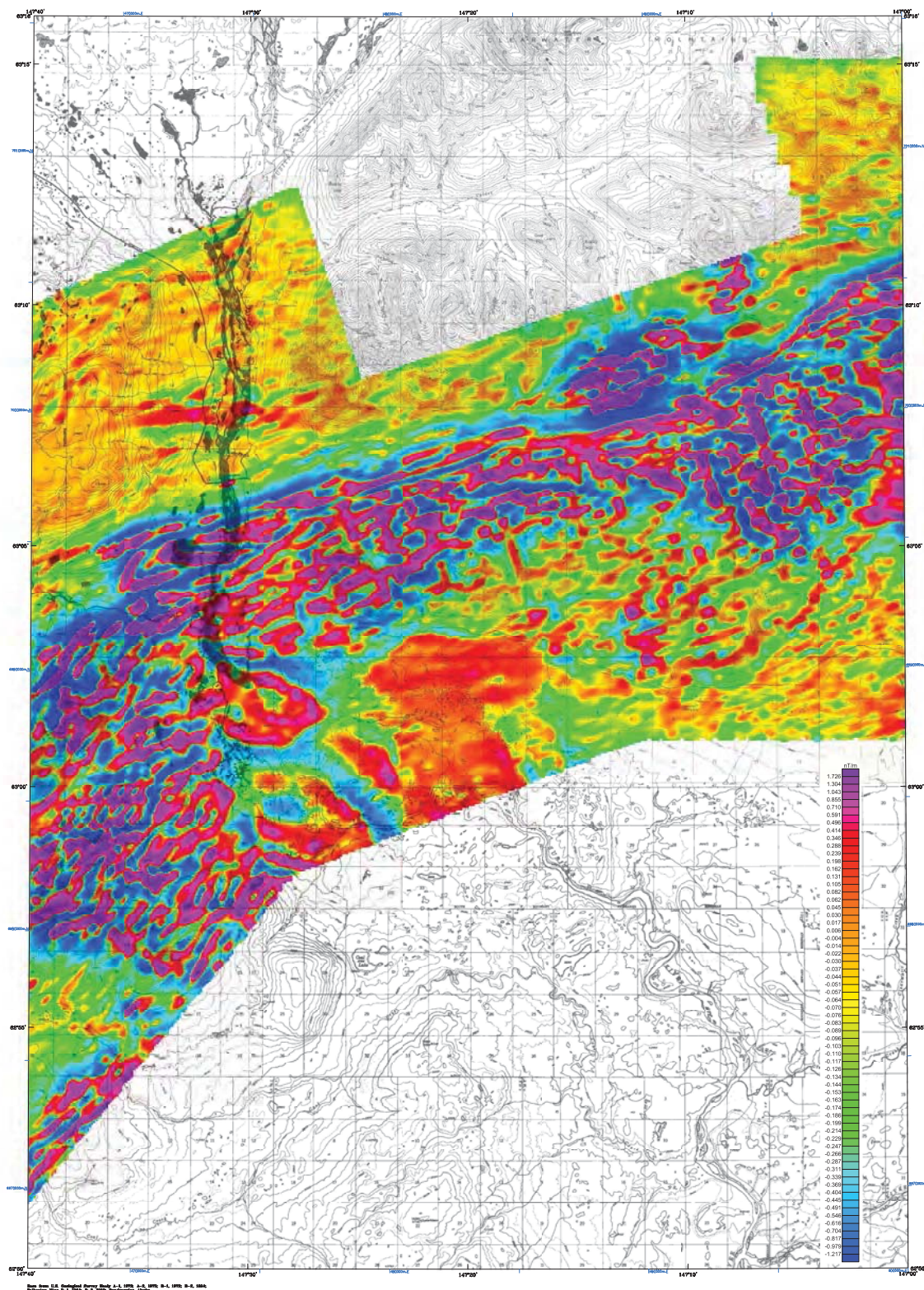


## **SURVEY HISTORY**

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 Fugro GeoServices, Inc. Airborne geophysical data for the area were acquired and processed by CGG in 2013 and 2014. Previously flown DGGG surveys adjacent to the current survey are shown in the location map by dashed lines, survey name, and date of publication. The project was funded by the Alaska State Legislature as part of the Alaska Strategic and Critical Minerals Assessment project, which is part of the Alaska Airborne Geophysical and Geological Mineral Inventory Program. Milrock Exploration Corporation contributed initial data for a portion of the area shown above as dashed halftone.

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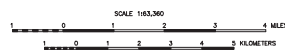
## DESCRIPTIVE NOTES

The geophysical data were acquired with a DIGHEM<sup>®</sup> Electromagnetic (EM) system and a Fugro D1344 cesium magnetometer with a Schlumberger CSJ cesium sensor. The EM and magnetic data were flown at a height of 100 feet. In addition, the survey included data from a Fugro D1344 cesium magnetometer, GPS navigation system, DG/60 Hz monitors and data converter. Flights were performed with an AS-350-B3 Squirrel helicopter at a mean terrain clearance of 200 feet with a spacing primarily of a quarter of a mile, and one eighth of a mile for about 9.8 sq miles. The 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 1 m. Flight path positions were projected onto the Clarke 1866 (UTM zone 5) coordinate system. The datum used was the 1977 North American datum, based on central meridian (CM) of 147° 0' north constant of 0 and an east constant of 160,000. Positional accuracy of the presented data is better than 10 m with respect to the UTM grid.

## COLOR BAR HISTOGRAM

Approximate size of the first vertical derivative of the magnetic field for the Wrangellia Survey Area derived by within the color displayed on the color bar. Data values actually range from -12,298 nT/m (dark blue) to about 25,335 nT/m (orange).



# **FIRST VERTICAL DERIVATIVE OF THE MAGNETIC FIELD WITH TOPOGRAPHY, WRANGELLIA SURVEY AREA, SOUTH-CENTRAL ALASKA**

PARTS OF THE TALLEETNA MTNS, HEALY, AND MT HAYES QUADRANGLES

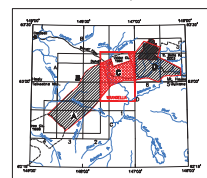
by  
Lauri E. Burns, OGS, and Fugro Geoservices, Inc.  
2014

FIRST VERTICAL DERIVATIVE OF  
THE MAGNETIC FIELD

The magnetic total field data were processed using digitally recorded data from a Fugro D1344 cesium magnetometer with a Schlumberger CSJ cesium 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 data from the magnetic data, (2) GPS corrected (GPS mode 2010), (3) leveled to the tie line data, and (4) interpolated onto a regular 80 m grid using a modified Akima (1970) technique. All grids were then resampled from the 80 m cell size down to a 25 m cell size to produce the maps and final grids contained in this publication. 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.

Alaska, 1:500,000 scale, the position of the present map, main name of the survey, and the position of the present map, main name of the survey, and the position of the present map, main name of the survey.

## LOCATION INDEX FOR 1:63,360-SCALE MAPS

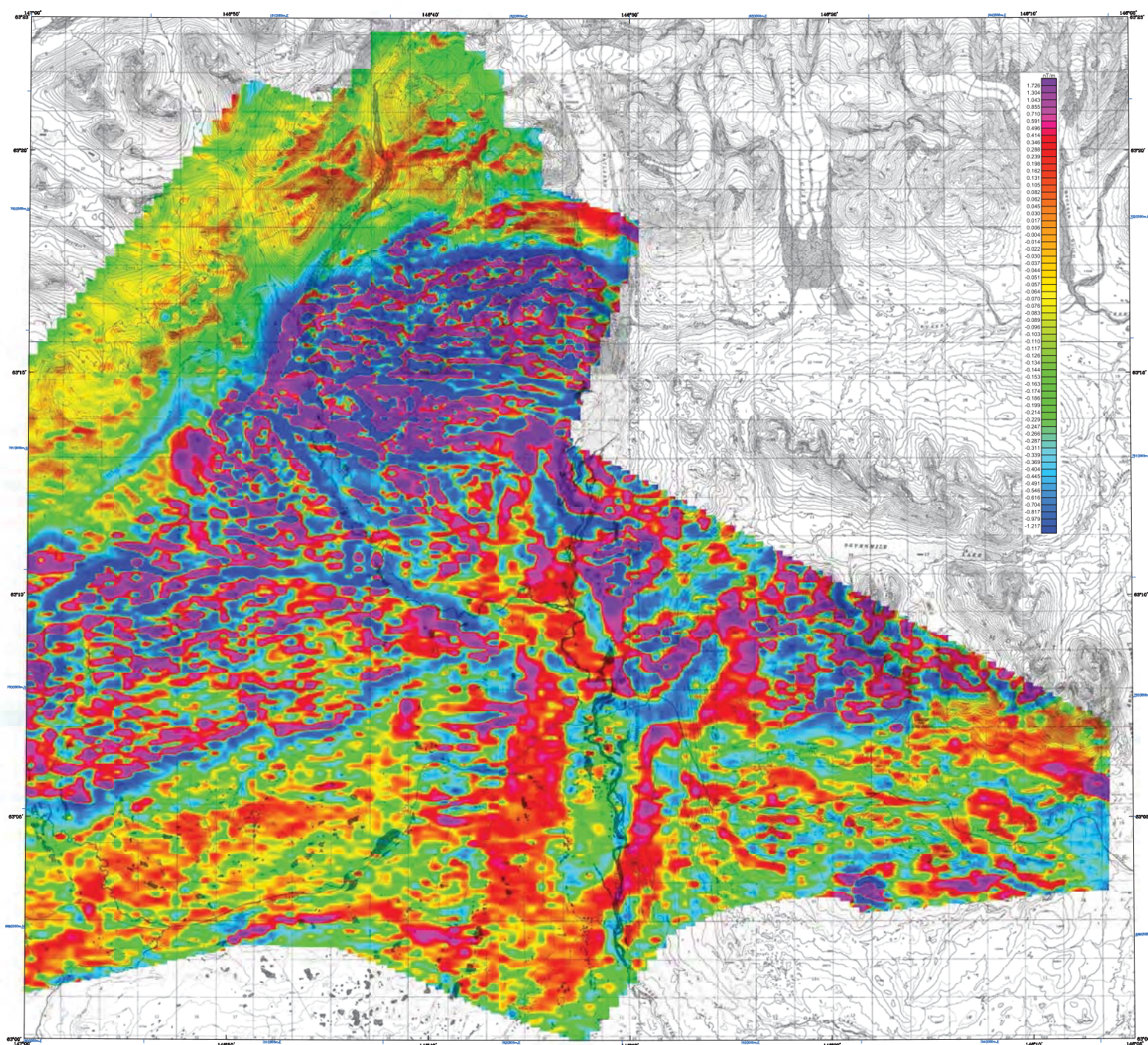


## SURVEY HISTORY

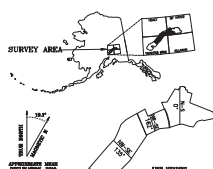
This map has been compiled and shown under contract between the State of Alaska, Department of Natural Resources, Division of Geological & Geophysical Surveys (DGGGS), and Fugro Geoservices, Inc. Airborne geophysical data for the area were acquired and processed by DGGGS in 2013 and 2014. Previously flown DGGGS surveys (collected to the current survey) are shown in the location map by dashed lines, survey names, and date of publication.

The project was funded by the Alaska State Legislature as part of the Alaska Strategic and Critical Assets Airborne Geophysical and Geophysical (ASAGG) program. The project was funded by the Alaska State Legislature as part of the Alaska Strategic and Critical Assets Airborne Geophysical and Geophysical (ASAGG) program. The project was funded by the Alaska State Legislature as part of the Alaska Strategic and Critical Assets Airborne Geophysical and Geophysical (ASAGG) program.





U.S. GEOLOGICAL SURVEY, BULLETIN 1464-A, 1965, 1-5, 100A



**DESCRIPTIVE NOTES**

The geophysical data were acquired with a dighem Electromagnetic (EM) system and a Fugro D1344 cesium magnetometer with a Schriber CS3 cesium sensor. The EM and magnetic sensors were flown at a height of 100 feet. In addition the survey recorded data from rotor and laser altimeters, GPS navigation system, 50/60 Hz monitors and video cameras. Flights were performed with an AS-350-33 Super helicopter at a mean terrain clearance of 200 feet with a spacing primary of a quarter of a mile, and one eighth of a mile for about 97.9 sq miles. The lines were flown perpendicular to the flight lines at intervals of approximately 3 miles.

A Novatel OEM4-C2L Global Positioning System was used for navigation. The helicopter location was derived every 0.5 seconds using post-flight differential positioning to a relative accuracy of better than 1 m. Flight path locations were projected onto the Clarke 1866 (UTM zone 6) projection, 1927 North American datum using a central meridian (CM) of 147° a north constant of 0 and an east constant of 900,000. Positional accuracy of the presented data is better than 10 m with respect to the UTM grid.

SCALE 1:63,360  
1 2 3 4 MILES  
1 2 3 4 KILOMETERS

# **FIRST VERTICAL DERIVATIVE OF THE MAGNETIC FIELD WITH TOPOGRAPHY, WRANGELLIA SURVEY AREA, SOUTH-CENTRAL ALASKA**

PARTS OF THE TALKEETNA MTNS, HEALY, AND MT HAYES QUADRANGLES

by  
Laurel E. Burns, CGG, and Fugro Geoservices, Inc.  
2014

## **THE MAGNETIC FIELD**

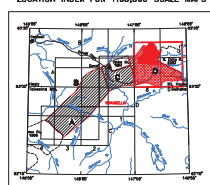
The magnetic total field data were processed using digitally recorded data from a Fugro D1344 magnetometer with a Schriber CS3 cesium sensor. Data were collected at a sampling interval of 0.1 seconds. The magnetic data were (1) corrected for diurnal variations by subtraction of the digitally recorded base station magnetic data, (2) IGRF corrected (IGRF model 2010), updated for data 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. All grids were then resampled from the 80 m cell size down to a 25 m cell size to produce the maps and final grids contained in this publication. 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.

Alma, R., 1970, A method of interpolation and smoothing of 2D magnetic data, *Geophysics*, v. 35, p. 108-110.

## **COLOR BAR HISTOGRAM**

Approximately 98% of the first vertical derivative of the magnetic field for the Wrangellia Survey Area dataset lie within the range displayed on the color bar. Data values actually range from -12,298 nT/m (dark blue) to about 23,335 nT/m (magenta).

## **LOCATION INDEX FOR 1:63,360-SCALE MAPS**

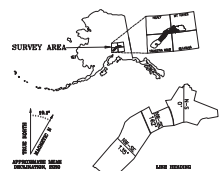
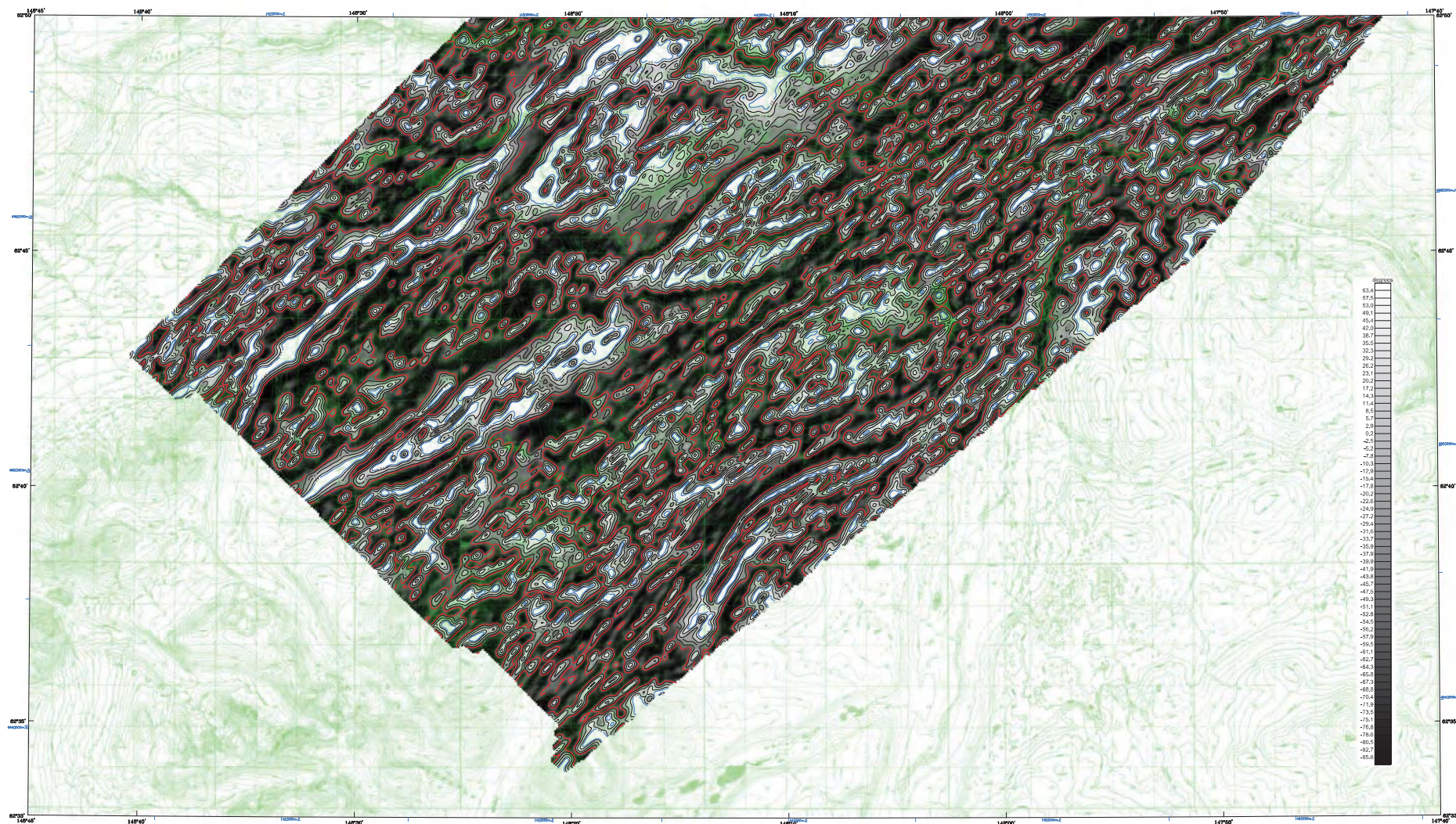


## **SURVEY HISTORY**

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 Fugro Geoservices, Inc. Airborne geophysical data for the area were acquired and processed by CGG in 2013 and 2014. Previously flown DGGG surveys adjacent to the current survey are shown in the location map by dashed lines, survey name, and date of publication. The project was funded by the Alaska State Legislature as part of the Alaska Strategic and Critical Minerals Assessment project, which is part of the Alaska Airborne Geophysical and Geological Mineral Inventory Program. Mirrork Exploration Corporation contributed inflit data for a portion of the area shown at a denser interval.

All data and maps produced to date from this survey are available in digital format on DVD for a nominal fee through DGGG, 3354 College Road, Fairbanks, Alaska, 99709-1007, and are downloadable for free from the DGGG website ([www.dggg.alaska.gov/public](http://www.dggg.alaska.gov/public)). Maps are also available on paper through the DGGG office, and are viewable online at the website in Adobe Acrobat .PDF file format.





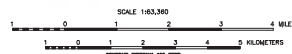
## DESCRIPTIVE NOTES

The geophysical data were acquired with a DIGHEM Electromagnetic (EM) system and a Fugro D1344 cesium magnetometer with a Schriew CS3 cesium sensor. The EM and magnetic sensors were flown at a height of 100 feet. In addition the survey recorded data from radar and laser altimeters, GPS navigation system, 30/60 Hz monitors and video cameras. Flights were performed with an 80-300-83 Survey helicopter at a mean terrain clearance of 200 feet with a spacing primarily of a quarter of a mile, and one eighth of a mile for about 97.9 sq miles. The lines were flown perpendicular to the flight lines at intervals of approximately 3 miles.

A Novatel OEM4-C21, Global Positioning System was used for navigation. The helicopter position was derived every 0.3 seconds using real-time 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.

## MAGNETIC TILT DERIVATIVE

The tilt derivative is the angle between the horizontal gradient & the total gradient, which is useful for identifying the depth & type of source. The tilt angle is positive over the source, crosses through zero at, or near, the edge of a vertical sided source, and is negative outside the source region. It has the added advantage of responding equally well to shallow and deep sources and is able to resolve deeper sources that may be masked by larger responses from shallower sources.

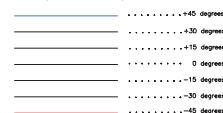


## MAGNETIC TILT DERIVATIVE WITH TOPOGRAPHY AND DATA CONTOURS, WRANGELLIA SURVEY AREA, SOUTH-CENTRAL ALASKA

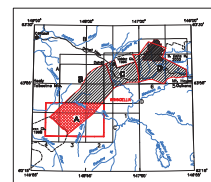
PARTS OF THE TALKIEETHNA MTNS, HEALY, AND MT HAYES QUADRANGLES

by  
Lauri E. Burns, CGG, and Fugro Geoservices, Inc.  
2014

## MAGNETIC TILT DERIVATIVE CONTOURS



## LOCATION INDEX FOR 1:63,360-SCALE MAPS

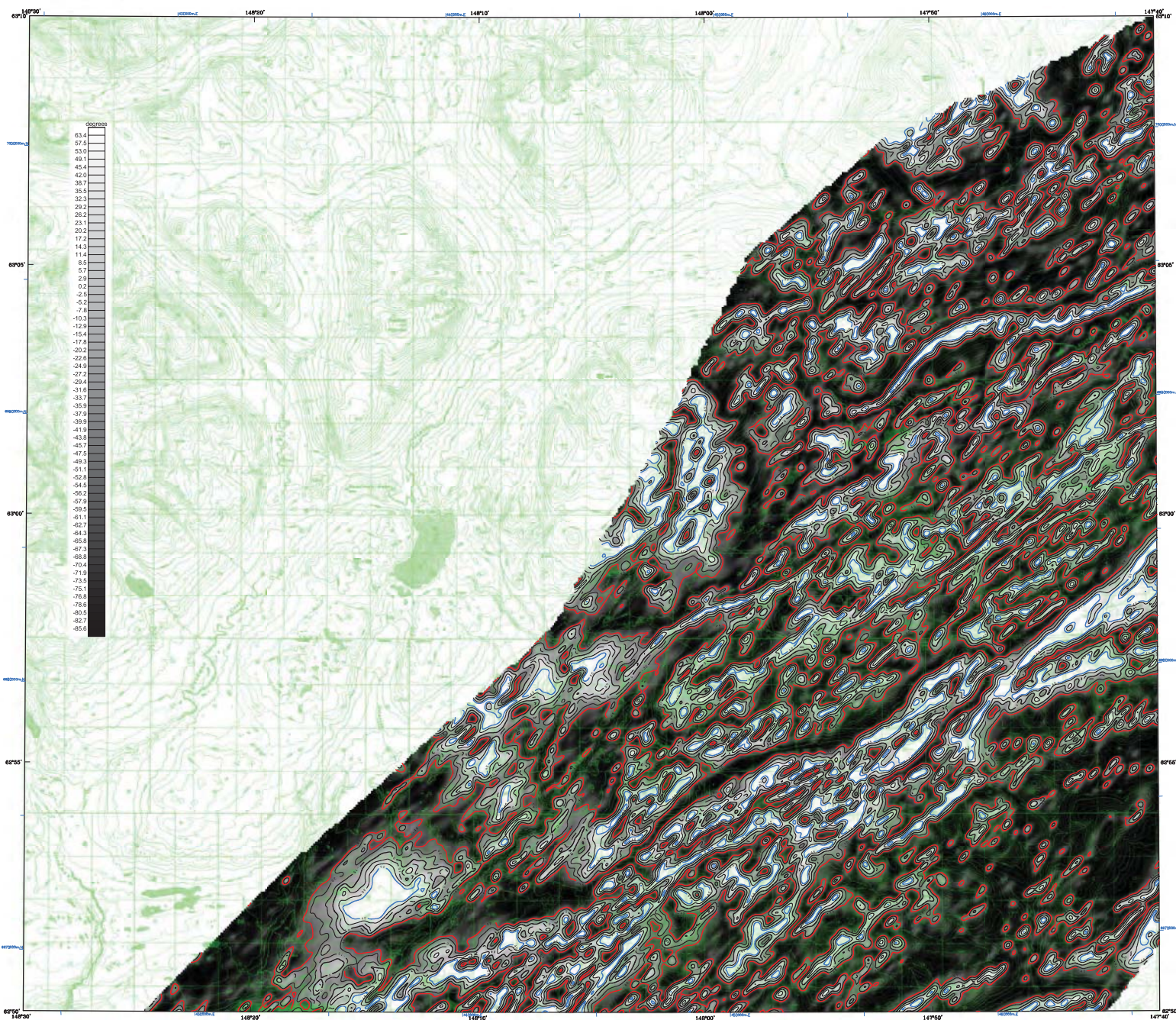


## SURVEY HISTORY

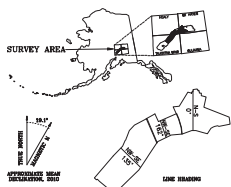
This map has been compiled and drawn under contract between the State of Alaska Department of Natural Resources, Division of Geological & Geophysical Surveys (DGGGS), and Fugro Geoservices, Inc. Airborne geophysical data for the area were acquired and processed by CGG in 2013 and 2014. Previous flown DGGGS surveys adjacent to the current survey are shown in the location map by dashed lines, survey name, and date of publication. The project was funded by the Alaska State Legislature as part of the Alaska Strategic and Critical Minerals Assessment project, which is part of the Alaska Airborne Geophysical and Geological Mineral Inventory Program. Mineral Exploration Corporation contributed Infill data for a portion of the area shown above as denser basins.

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Derived from U.S. Standard Survey Data (A.S. 1983, A.S. 1985)  
Datum: North American Datum 1983  
Projection: UTM  
Scale: 1:63,360



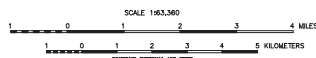
## DESCRIPTIVE NOTES

The geophysical data were acquired with a DIGHEM Electromagnetic (EM) system and a Fugro D1344 cesium magnetometer with a Schlumberger CS3 cesium sensor. The EM and magnetic sensors were flown at a height of 100 feet. In addition the survey recorded data from radar and laser altimeters, GPS navigation system, 50/60 Hz monitors and video cameras. Flights were performed with an AS-350-83 Squirrel helicopter at a mean terrain clearance of 200 feet with a spacing primarily of a quarter of a mile, and one eighth of a mile for about 97.6 sq miles. The lines were flown perpendicular to the flight lines at intervals of approximately 3 miles.

A Novatel OEM5-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 3 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.

## MAGNETIC TILT DERIVATIVE

The tilt derivative is the angle between the horizontal gradient & the total gradient, which is useful for identifying the depth & type of source. The tilt angle is positive over the source, crosses through zero at, or near, the edge of a vertical sided source, and is negative outside the source region. It has the added advantage of responding equally well to shallow and deep sources and is able to resolve deeper sources that may be masked by larger responses from shallower sources.

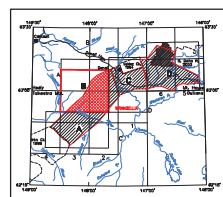


## MAGNETIC TILT DERIVATIVE WITH TOPOGRAPHY AND DATA CONTOURS, WRANGELLIA SURVEY AREA, SOUTH-CENTRAL ALASKA

PARTS OF THE TALKKEETNA MTNS, HEALY, AND MT HAYES QUADRANGLES

by  
Laurel E. Burns, CGG, and Fugro GeoServices, Inc.  
2014

## LOCATION INDEX FOR 1:63,360-SCALE MAPS

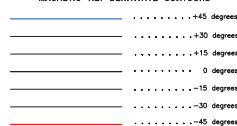


## SURVEY HISTORY

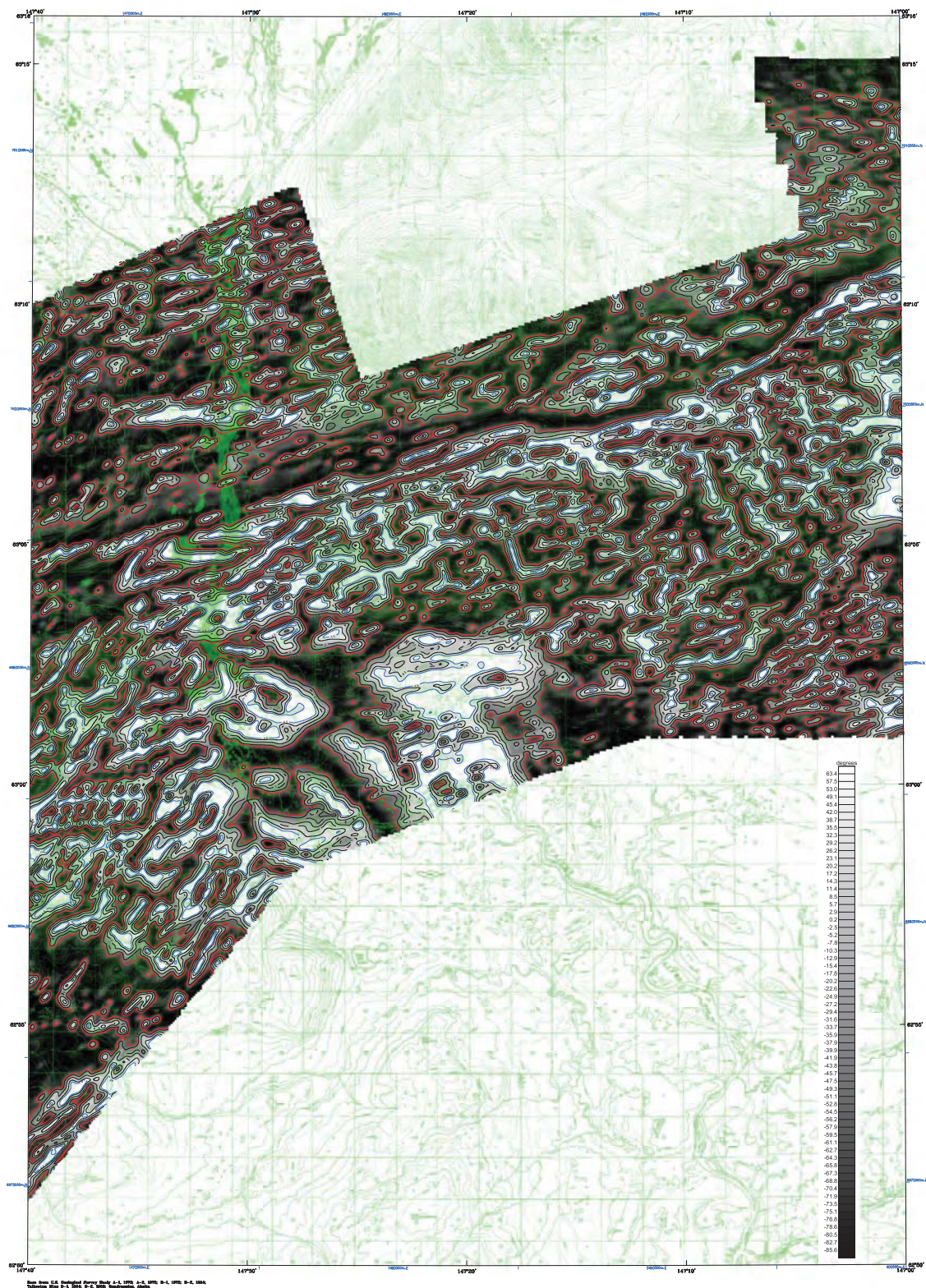
This map has been compiled and drawn under contract between the State of Alaska, Department of Natural Resources, Division of Geological & Geophysical Surveys (DGGG), and Fugro GeoServices, Inc. Airborne geophysical data for the area were acquired and processed by CGG in 2013 and 2014. Previously flown DGGG surveys adjacent to the current survey are shown in the location map by dashed lines, survey name, and date of publication. The project was funded by the Alaska State Legislature as part of the Alaska Strategic and Critical Minerals Assessment project, which is part of the Alaska Airborne Geophysical and Geological Mineral Inventory Program. Milrock Exploration Corporation contributed initial data for a portion of the area shown above as denser hatching.

All data and maps produced to date from this survey are available in digital format on DVD for a nominal fee through DGGG, 3354 College Road, Fairbanks, Alaska, 99709-3707, and are downloadable for free from the DGGG website ([www.dggg.alaska.gov/pubs](http://www.dggg.alaska.gov/pubs)). Maps are also available on paper through the DGGG office, and are viewable online at the website in Adobe Acrobat .PDF file format.

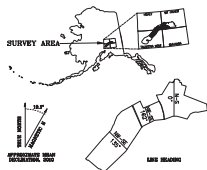
## MAGNETIC TILT DERIVATIVE CONTOURS







Map Scale: 1:63,360. Data: 1:63,360. Contour Interval: 10.0 ft. Contour Interval: 10.0 ft. Contour Interval: 10.0 ft.



## MAGNETIC TILT DERIVATIVE WITH TOPOGRAPHY AND DATA CONTOURS, WRANGELLIA SURVEY AREA, SOUTH-CENTRAL ALASKA

PARTS OF THE TALKEETNA MTNS, HEALY, AND MT HAYES QUADRANGLES

by  
Laural E. Burns, OGS, and Fugro Geoservices, Inc.  
2014

### DESCRIPTIVE NOTES

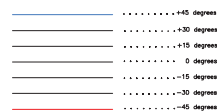
The geophysical data were acquired with a DIGHEM<sup>®</sup> Electromagnetic (EM) system and a Fugro D1344 cesium magnetometer with a Schriber C3 cesium sensor. The EM and magnetic sensors were flown at a height of 100 feet. In addition, the survey recorded data on roll and yaw sensors. GPS navigation system, DG/60 Hz monitors and data control. Flights were performed with an AS-350-B3 Squirrel helicopter at a mean terrain clearance of 200 feet with a spacing primarily of a quarter of a mile, and one eighth of a mile for about 9.0 miles. The 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 2 m. Flight path positions were projected onto the NAD83 datum (UTM zone 18Q) and the datum was converted to the datum of the central meridian (CM) of 147° 0' north constant of 0 and an east constant of 600,000. Positional accuracy of the presented data is better than 10 m with respect to the UTM grid.

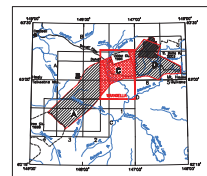
### MAGNETIC TILT DERIVATIVE

The tilt derivative is the angle between the horizontal gradient & the total gradient, which is useful for identifying the depth & type of source. The tilt angle is positive only for sources, closest through area of near, the edge of a vertical sheet source, and is negative outside the source region. It has the added advantage of responding equally well to shallow and deep sources and is able to resolve deeper sources that may be masked by larger responses from shallower sources.

### MAGNETIC TILT DERIVATIVE CONTOURS



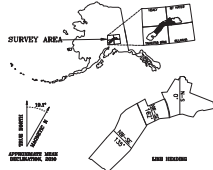
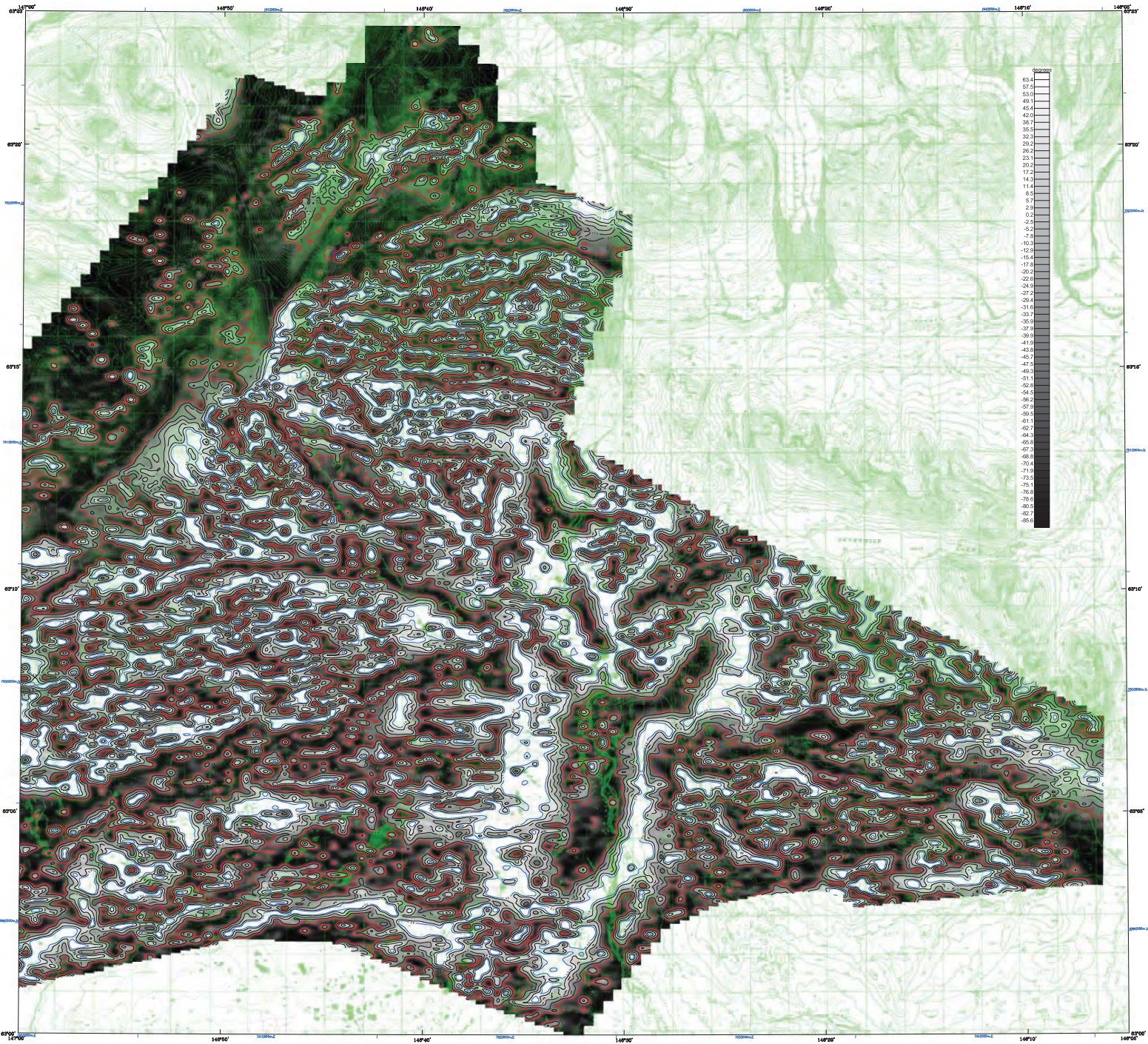
### LOCATION INDEX FOR 1:63,360-SCALE MAPS



### 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 Fugro Geoservices, Inc. Airborne geophysical data for the area were acquired and processed by DGGGS in 2013 and 2014. Previously flown DGGGS surveys adjacent to the current survey are shown in the location map by dashed lines, survey names, and date of publication. The project was funded by the Alaska State Legislature as part of the Alaska Strategic and Critical Minerals Assessment project, which is part of the Alaska Airborne Geophysical and Geospatial Mineral Inventory Project. Fugro Geoservices, Inc. contributed initial data for a portion of the area shown above as dense hatching. All data and maps produced to date from this survey are available in PDF format for a nominal fee through DGGGS, 3354 College Road, Fairbanks, Alaska, 99709-3707 and are downloadable for free from the DGGGS website ([www.dgggs.alaska.gov/pub/](http://www.dgggs.alaska.gov/pub/)). Maps are also available on paper through the DGGGS office and are viewable online at the website in Adobe Acrobat (.PDF) file format.





**DESCRIPTIVE NOTES**

The geophysical data were acquired with a DigiEMF Electromagnetic (EM) system and a Fugro D1344 cesium magnetometer with a Schriber CS3 cesium sensor. The EM and magnetic sensors were flown at a height of 100 feet. In addition the survey recorded data from rotor and laser altimeters, GPS navigation system, 50/60 Hz monitors and video cameras. Flights were performed with an AS-350-33 Spirit helicopter at a mean terrain clearance of 200 feet with a spacing interval of a quarter of a mile, and one eighth of a mile for about 97.9 sq miles. The 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 location was derived every 0.5 seconds using post-flight differential positioning to a relative accuracy of better than 1 m. The flight path locations were projected onto the Clarke 1866 (UTM zone 6) system, UTM projection, using a north constant meridian (CM) of 147° a north constant of 600,000. Positional accuracy of the presented data is better than 10 m with respect to the UTM grid.

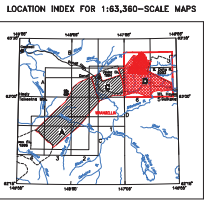
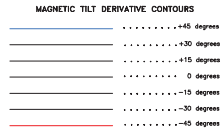
# MAGNETIC TILT DERIVATIVE WITH TOPOGRAPHY AND DATA CONTOURS, WRANGELLIA SURVEY AREA, SOUTH-CENTRAL ALASKA

PARTS OF THE TALKEETNA MTNS, HEALY, AND MT HAYES QUADRANGLES

by  
Laurel E. Burns, CCG, and Fugro Geoservices, Inc.  
2014

## MAGNETIC TILT DERIVATIVE

The tilt derivative is the angle between the horizontal gradient and the total gradient, which is useful for identifying the depth & type of source. The tilt angle is positive when the source crosses through away at or near, the edge of a vertical sided source, and is negative outside the source region. It has the added advantage of responding equally well to shallow and deep sources and is due to resolve deeper sources that may be masked by larger responses from shallower sources.

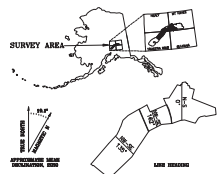


**SURVEY HISTORY**

This map has been compiled and drawn under contract between the State of Alaska, Department of Natural Resources, Division of Geological & Geophysical Surveys (DGGG), and Fugro Geoservices, Inc. Airborne geophysical data for the area were acquired and processed by CCG in 2013 and 2014. Previously flown DGGG surveys adjacent to the current survey are shown on the location map by dashed lines, survey name, and date of publication. The project was funded by the Alaska 2014 Legislature as part of the Alaska Strategic and Critical Minerals Assessment project, which is part of the Alaska Airborne Geophysical and Geological Mineral Inventory Program. Milrock Exploration Corporation contributed inflight data for a portion of the area shown above as dashed outlines.

All data and maps produced to date from this survey are available in digital format on DVD by a nominal fee through DGGG, 3354 College Road, Fairbanks, Alaska, 99709-1077, and are downloadable for free from the DGGG website ([www.dggg.alaska.gov/pubs/](http://www.dggg.alaska.gov/pubs/)). Maps are also available on paper through the DGGG office, and are viewable online at the website in Adobe Acrobat .PDF file format.





## PARTS OF THE TALKEETNA MTNS. HEALY. AND MT HAYES QUADRANGLES

by  
Laurel E. Burns, CGG, and Fugro GeoServices, Inc.  
2014

Sun Azimuth: 0 degrees; Sun Inclination: 45 degrees

### DESCRIPTIVE NOTES

The geophysical data were acquired with a DIGHEMY Electromagnetic (EM) system and a Fugro D1344 magnetometer. The EM system was equipped with a 100 m sensor. The EM and magnetic sensors were flown at a height of 100 feet, in addition the survey recorded data from radar and laser altimeters, GPS navigation system, 50/60 Hz monitors and a 100 ft. flight wheel. The flights were performed with an AS-350-B3 Squirrel helicopter at a mean terrain clearance of 200 feet with a spacing primarily of a quarter of a mile, with a flight height of 100 feet. The flight lines were flown perpendicular to the flight lines at intervals of approximately 3 miles.

A Novatel OEM5-G2L Global Positioning System was used for navigation. The helicopter position was derived every 10 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 0.999 601 337 and a scale factor of 0.999 601 337. The horizontal accuracy of the presented data is better than 10 m with respect to the UTM grid.

### RESIDUAL MAGNETIC FIELD

The magnetic total field data were processed using digitally recorded data from a Fugro D1344 magnetometer with a sampling interval of 0.34 s. The magnetic data were (1) corrected for diurnal variations by subtraction of the digitally recorded base station magnetic data, (2) IGRF corrected (IGRF model 2010, updated for date of flight and declination variations), (3) leveled to the tie line data, and (4) interpolated onto a regular 80 m grid using a modified Akima (1970) technique. All grids were then resampled from the 80 m cell size down to a 25 m cell size to produce the maps and final grids contained in this publication.

Alima, 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.

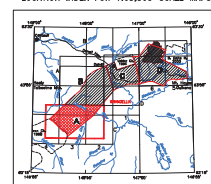
## MAGNETIC TILT DERIVATIVE

The tilt derivative is the angle between the horizontal gradient & the total gradient, which is useful for identifying the depth & type of source. The tilt angle is positive over the source, crosses through zero at, or near, the edge of a vertical sided source, and is negative outside the source region. It has the added advantage of responding equally well to shallow and deep sources and is able to resolve deeper sources that may be masked by larger responses from shallower sources.

## MAGNETIC TILT DERIVATIVE CONTOURS



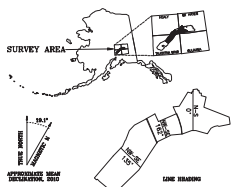
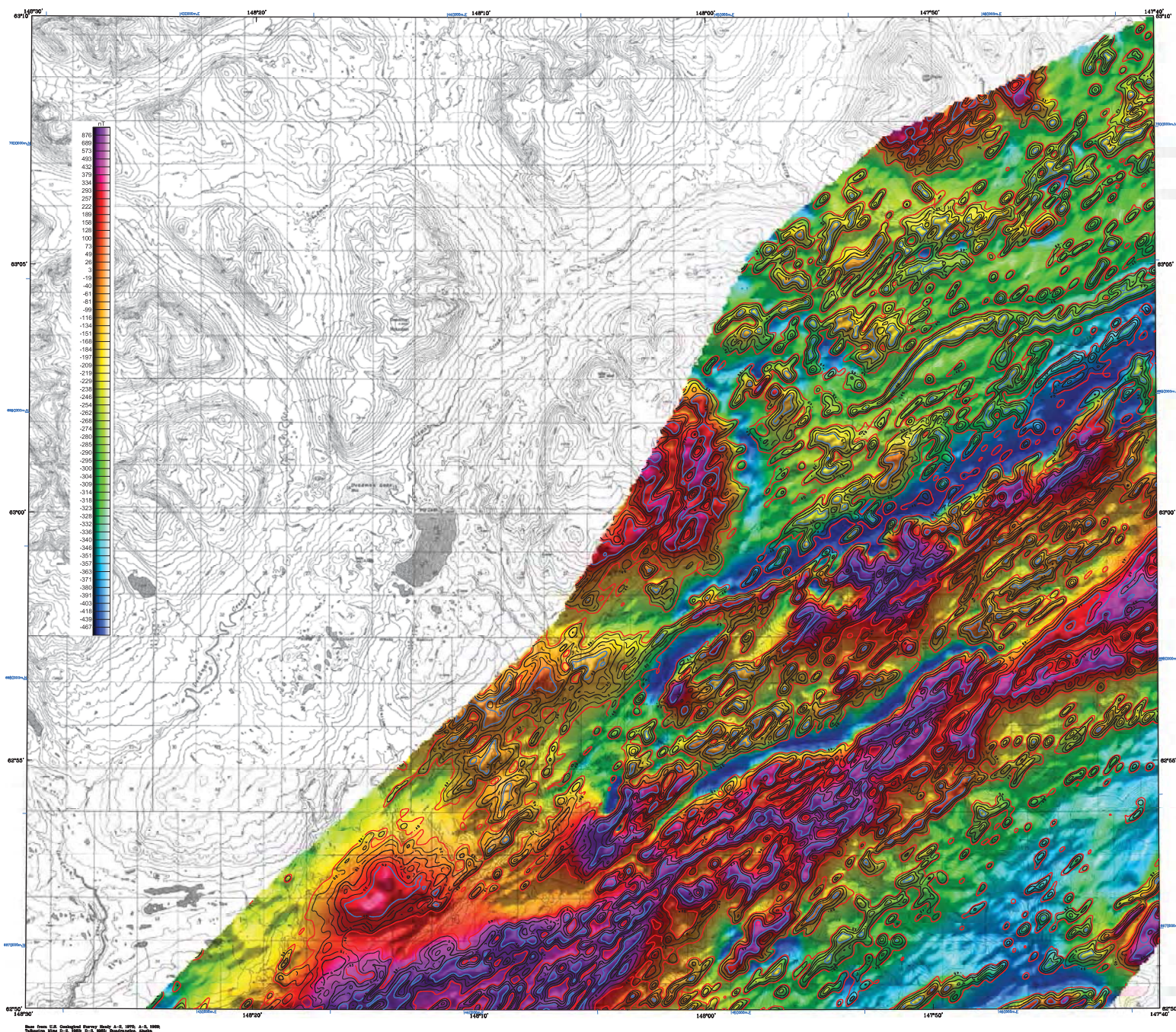
## LOCATION INDEX FOR 1:63,360-SCALE MAPS



## SURVEY HISTORY

[illegible]





## DESCRIPTIVE NOTES

The geophysical data were acquired with a DIGHEM<sup>®</sup> 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 radar and laser altimeters, GPS navigation system, 50/60 Hz monitors and video camera. Flights were performed with an AS-350-83 Super Puma helicopter at a mean terrain clearance of 200 feet with a spacing primarily of a quarter of a mile, and one eighth of a mile for about 97.6 miles. The lines were flown perpendicular to the flight lines at intervals of approximately 3 miles.

A Novatel OEM3-G2L Global Positioning System was used for navigation. The helicopter position was derived 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 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.

## RESIDUAL MAGNETIC FIELD

The magnetic total field data were processed using digitally recorded data from a Fugro D1344 magnetometer with a Scintrex CS3 cesium 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 2010, updated for date of flight and kilometer variations), (3) leveled to the tie line data, and (4) interpolated onto a regular 80 m grid using a modified Akima (1970) technique. All grids were then resampled from the 80 m cell size down to a 20 m cell size to produce the maps and final grids contained in this publication.

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.

by  
Laurel E. Burns, CGG, and Fugro GeoServices, Inc.  
2014

Sun Azimuth: 0 degrees; Sun Inclination: 45 degrees

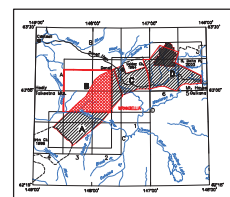
## MAGNETIC TILT DERIVATIVE

The tilt derivative is the angle between the horizontal gradient & the total gradient, which is useful for identifying the depth & type of source. The tilt angle is positive over the source, crosses through zero at, or near, the edge of a vertical sided source, and is negative outside the source region. It has the added advantage of responding equally well to shallow and deep sources and is able to resolve deeper sources that may be masked by larger responses from shallower sources.

## MAGNETIC TILT DERIVATIVE CONTOURS

.....	+45 degrees
.....	+30 degrees
.....	+15 degrees
.....	0 degrees
.....	-15 degrees
.....	-30 degrees
.....	-45 degrees

## LOCATION INDEX FOR 1:63,360-SCALE MAPS

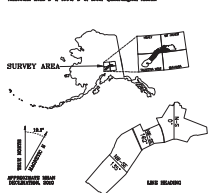
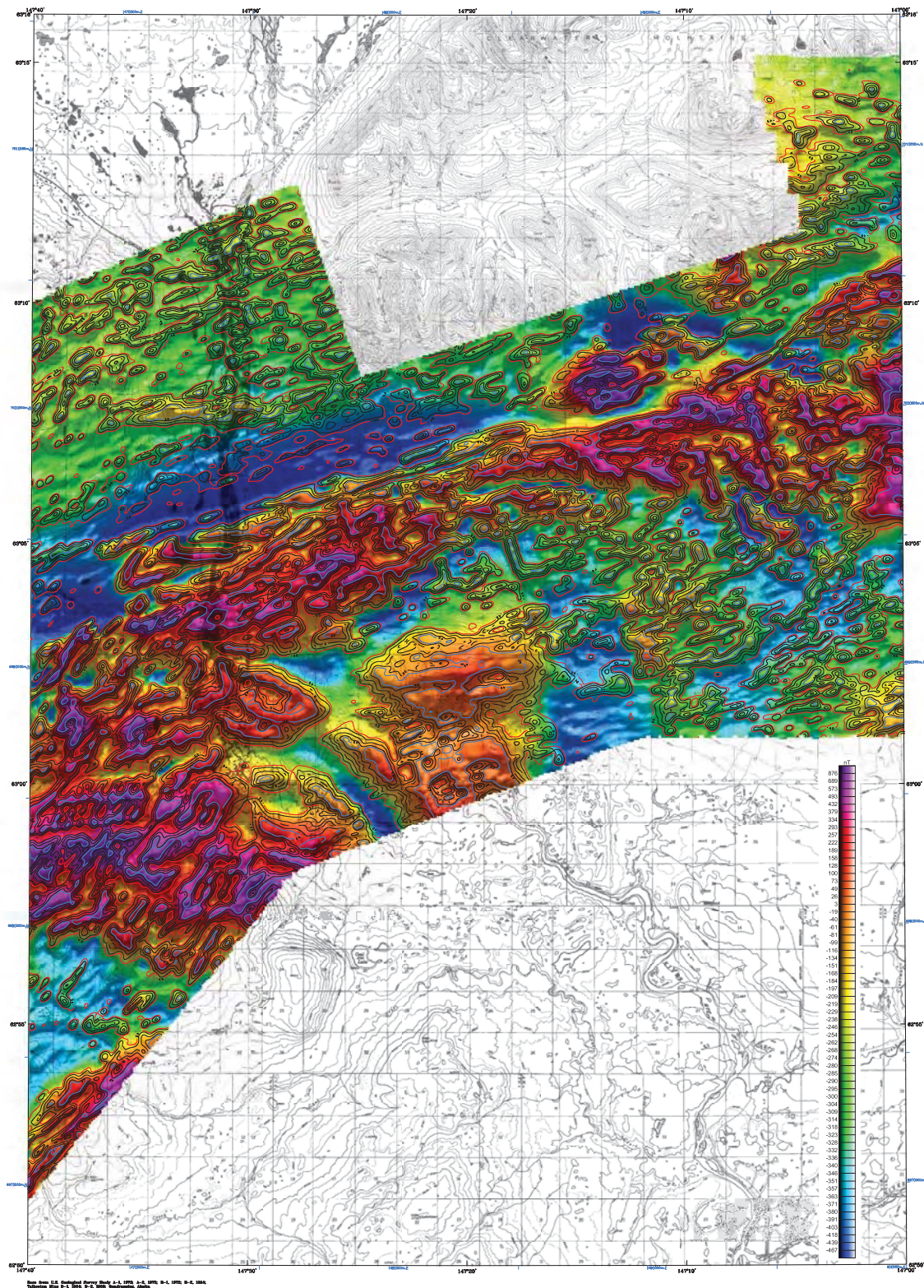


## SURVEY HISTORY

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 Fugro GeoServices, Inc. Airborne geophysical data for the area were acquired and processed by CGG in 2013 and 2014. Previously flown DGGGS surveys adjacent to the current survey are shown in the location map by dashed lines, survey name, and date of publication. The project was funded by the Alaska State Legislature as part of the Alaska Strategic and Critical Minerals Assessment project, which is part of the Alaska Airborne Geophysical and Geological Mineral Inventory Program. Milrock Exploration Corporation contributed until data for a portion of the area shown above as dashed hatching.

All data and maps produced to date from this survey are available in digital format on DVD for a nominal fee through DGGGS, 3354 College Road, Fairbanks, Alaska, 99709-3707, and are downloadable for free from the DGGGS website ([www.dgggs.alaska.gov/pubs](http://www.dgggs.alaska.gov/pubs)). Maps are also available on paper through the DGGGS office, and are viewable online at the website in Adobe Acrobat PDF file format.





## COLOR SHADOW RESIDUAL MAGNETIC FIELD WITH MAGNETIC TILT DERIVATIVE DATA CONTOURS, WRANGELLIA SURVEY AREA, SOUTH-CENTRAL ALASKA

PARTS OF THE TALKIEHTNA MTS., HEALY, AND MT HAYES QUADRANGLES

by  
Laurie E. Burns, OGS, and Fugro GeoServices, Inc.  
2014

Sun Azimuth: 0 degrees; Sun Inclination: 45 degrees

### DESCRIPTIVE NOTES

The geophysical data were acquired with a DIGHEM<sup>®</sup> Electromagnetic (EM) system and a Fugro D1344 cesium magnetometer with a Schriber C3 cesium sensor. The EM and magnetic data were flown at a height of 100 feet. In addition, the survey collected data using a Fugro D1344 cesium magnetometer, GPS navigation system, 50/60 Hz monitors and data converter. Flights were performed with an AS-350-B3 Squirrel helicopter at a mean terrain clearance of 200 feet with a spacing primarily of a quarter of a mile, and one eighth of a mile for about 9.0 sq miles. The 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 position was derived every 0.5 seconds using post-flight differential positioning to a relative accuracy of better than 1 m. Flight path positions were projected onto the datum 1980 (UTM zone 5) and the datum 1927 (Alaska Albers) 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.

### RESIDUAL MAGNETIC FIELD

The magnetic total field data were processed using digitally recorded data from a Fugro D1344 cesium magnetometer with a Schriber C3 cesium 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 2010, updated for date of flight and allimeter variations), (3) leveled to the tie line data, and (4) interpolated onto a regular 80 m grid using a modified Akne (1970) technique. All grids were then resampled from the 80 m cell size down to a 20 m cell size to produce the maps and final grids contained in this publication.

Notes: In 1927, a new system of measurement of magnetic force was adopted. The unit of magnetic intensity is now the oersted (Oe) instead of the gauss (G). The unit of magnetic flux is now the maxwell (Mx) instead of the line (L).

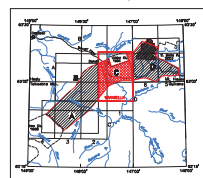
### MAGNETIC TILT DERIVATIVE

The tilt derivative is the angle between the horizontal gradient & the total gradient, which is useful for identifying the depth & type of source. The tilt angle is positive when the source is located beneath the line, near the edge of a vertical sheet source, and is negative when the source is located beneath the line, away from the edge of a vertical sheet source. It has the advantage of responding equally well to shallow and deep sources and is able to resolve deeper sources that may be masked by larger responses from shallower sources.

### MAGNETIC TILT DERIVATIVE CONTOURS

..... +45 degrees  
..... +30 degrees  
..... +15 degrees  
..... 0 degrees  
..... -15 degrees  
..... -30 degrees  
..... -45 degrees

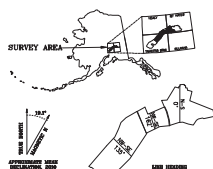
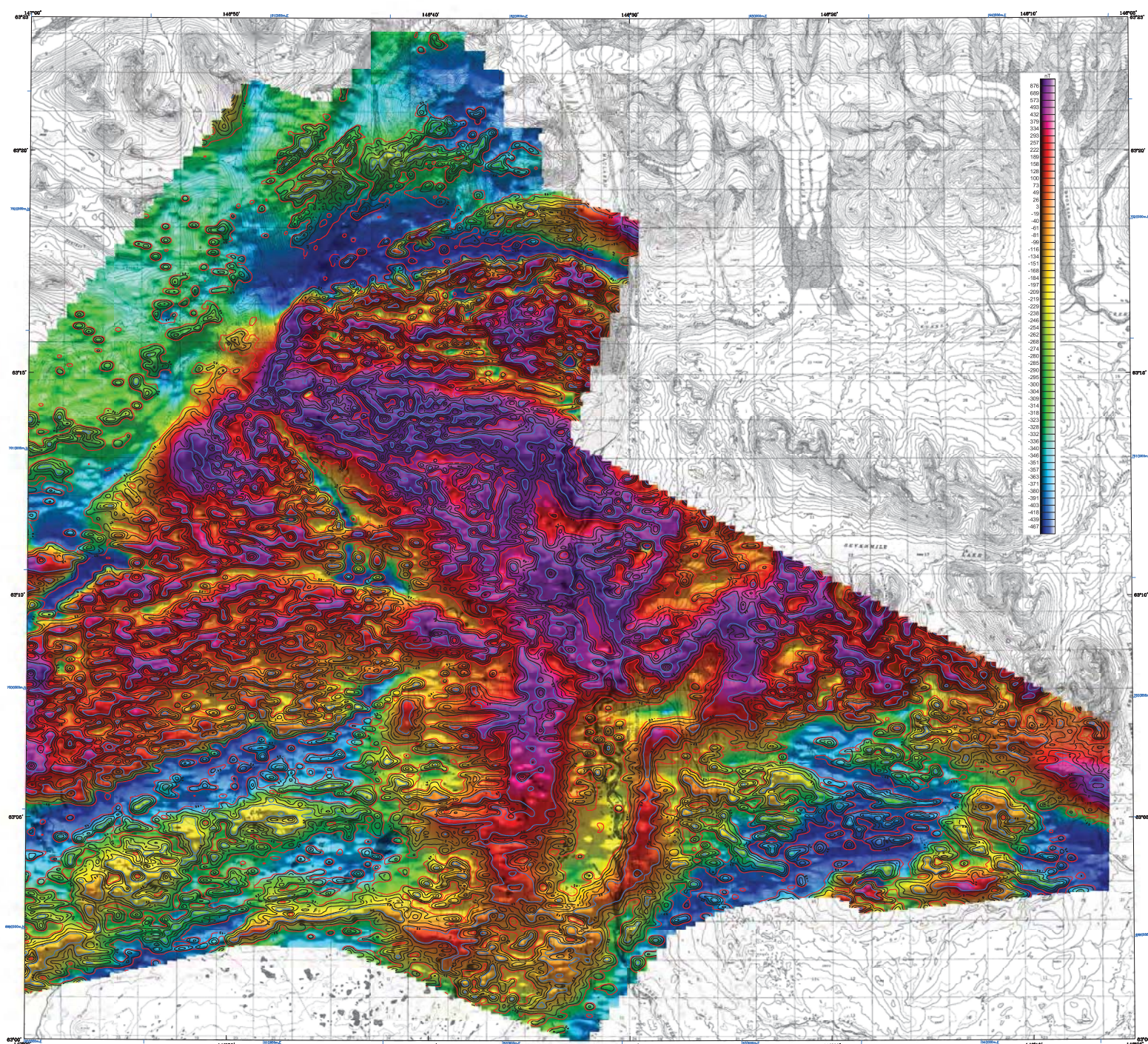
### LOCATION INDEX FOR 1:63,360-SCALE MAPS



### SURVEY HISTORY

This map has been compiled and shown under contract between the State of Alaska, Department of Natural Resources, Division of Geological & Geophysical Surveys (DGGGS), and Fugro GeoServices, Inc. Airborne geophysical data for the area were acquired and processed by DGGGS in 2013 and 2014. Previously flown DGGGS surveys adjacent to the current survey are shown in the location map by dashed lines, survey names, and date of publication. The project was funded by the Alaska State Legislature as part of the Alaska Strategic and Critical Alaska Airborne Geophysical and Geophysical Mineral Resource Assessment project, which is part of the Alaska Airborne Geophysical and Geophysical Mineral Resource Assessment project. The project is a continuation of the Alaska Airborne Geophysical and Geophysical Mineral Resource Assessment project. All data and maps produced to date from this survey are available online at the Alaska Division of Geological & Geophysical Surveys website (www.dgggs.alaska.gov/pub). Maps are also available on paper through the DGGGS office and are available online at the website in Adobe Acrobat PDF file format.





## DESCRIPTIVE NOTES

The geophysical data were acquired with a DIGHM Electromagnetic (EM) system and a Fugro D1344 cesium magnetometer with a Schlumberger CS3 cesium sensor. The EM and magnetic sensors were flown at a height of 100 feet. In addition the survey recorded data from rotor and laser altimeters, GPS navigation system, 50/60 Hz monitors and video cameras. Flights were performed with an AS-350-33 Spirit helicopter at a mean terrain clearance of 200 feet with a spacing of 1 mile for about 97.9 sq miles. The 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 location was derived every 0.5 seconds using post-flight differential positioning to a relative accuracy of better than 10 m. The data were then projected onto the Clarke 1866 (UTM zone 6) datum and an east constant of 500,000. Positional accuracy of the presented data is better than 10 m with respect to the UTM grid.

## RESIDUAL MAGNETIC FIELD

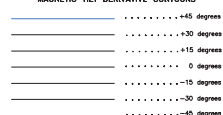
The magnetic total field data were processed using digitally recorded data from a Fugro D1344 magnetometer with a Schlumberger CS3 cesium sensor. Data were collected at a sampling interval of 0.1 seconds. The magnetic data were (1) corrected for diurnal variations by subtraction of the digitally recorded base station magnetic data, (2) IGRF corrected (IGRF model 2010, 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. All grids were then reprojected from the 80 m cell size down to a 25 m cell size to produce the maps and final grids contained in this publication.

Alm, H., 1970. A new method of interpolation and smoothing of geophysical data. *Journal of Geophysical Research*, v. 75, no. 4, p. 568-574.

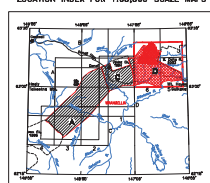
## MAGNETIC TILT DERIVATIVE

The tilt derivative is the angle between the horizontal gradient in the total gradient, which is useful for identifying the depth & type of source. The tilt angle is positive over the source region through zero at, or near, the edge of a vertical sided source, and is negative over the source region. It has the added advantage of responding equally well to shallow and deep sources and is able to resolve deeper sources that may be masked by larger responses from shallower sources.

## MAGNETIC TILT DERIVATIVE CONTOURS



## LOCATION INDEX FOR 1:63,360-SCALE MAPS



## 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 Fugro Geoservices, Inc. Airborne geophysical data for the area were acquired and processed by DGGG in 2013 and 2014. Previously flown DGGG surveys adjacent to the current survey are shown in the location map by dashed lines, survey name, and date of publication. The project was funded by the Alaska State Legislature as part of the Alaska Strategic and Critical Minerals Assessment project which is part of the Alaska Airborne Geophysical and Geological Mineral Inventory Program. Mirnick Exploration Corporation contributed tilt data for a portion of the area shown above as denser isolines.

All data and maps produced to date from this survey are available in digital format for a nominal fee through DGGG, 3354 College Road, Fairbanks, Alaska, 99709-1707, and are downloadable for free from the DGGG website ([www.dggg.alaska.gov/pubs/](http://www.dggg.alaska.gov/pubs/)). Maps are also available on paper through the DGGG office, and are viewable online at the website in Adobe Acrobat .PDF file format.

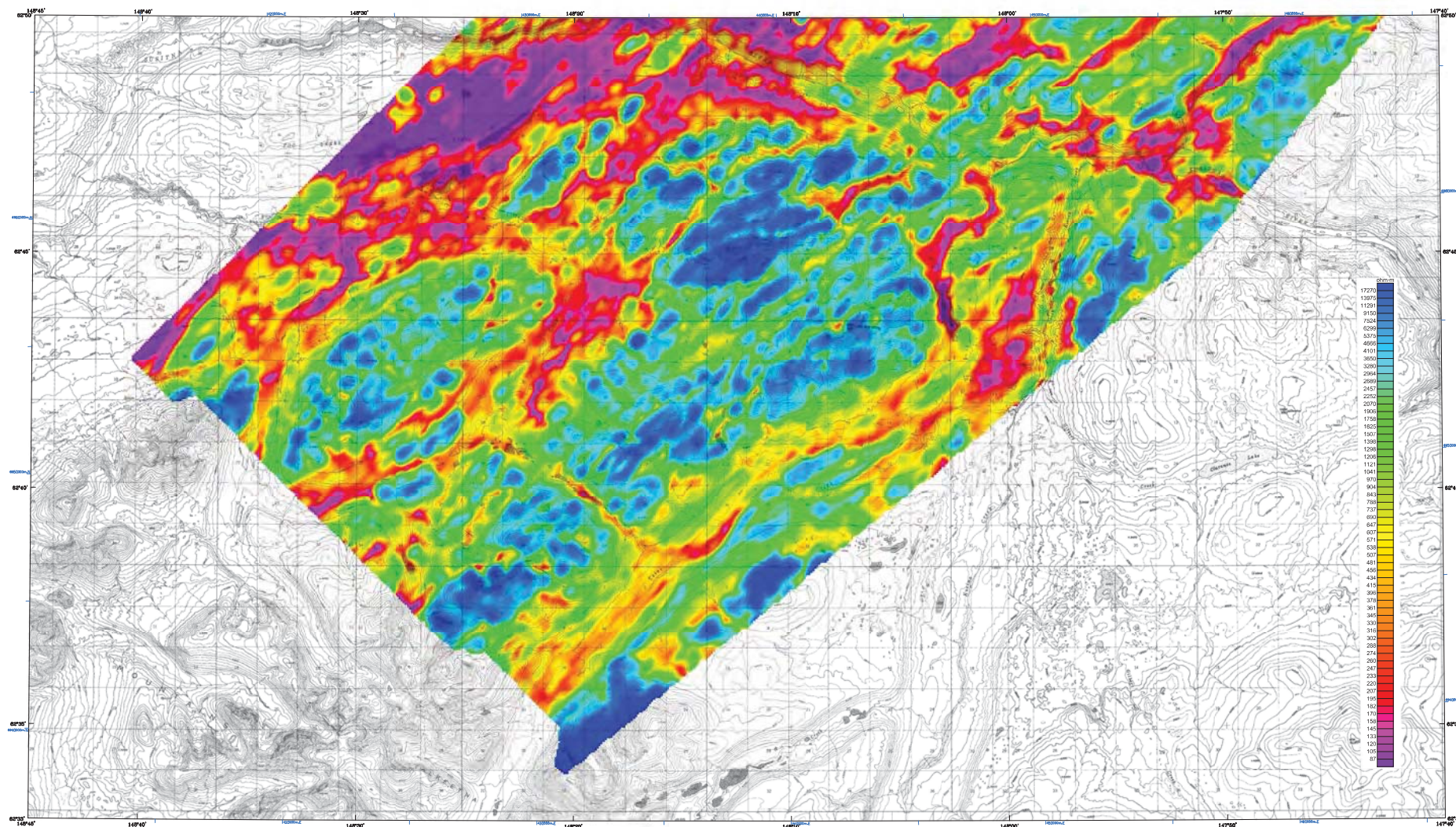
# COLOR SHADOW RESIDUAL MAGNETIC FIELD WITH MAGNETIC TILT DERIVATIVE DATA CONTOURS, WRANGELLIA SURVEY AREA, SOUTH-CENTRAL ALASKA

PARTS OF THE TALKEETNA MTNS, HEALY, AND MT HAYES QUADRANGLES

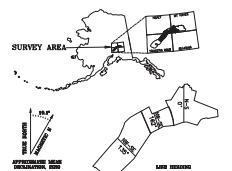
by  
Laurel E. Burns, CGG, and Fugro Geoservices, Inc.  
2014

Sun Azimuth: 0 degrees; Sun Inclination: 45 degrees





U.S. GEOLOGICAL SURVEY, RESTON, VA 20192-1199  
 1:63,360 SCALE MAPS  
 1:63,360 SCALE MAPS  
 1:63,360 SCALE MAPS



#### DESCRIPTIVE NOTES

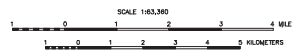
The geophysical data were acquired with a DIGHEM Electromagnetic (EM) system and a Fugro D1344 cesium magnetometer with a Schriber CS3 cesium sensor. The EM and magnetic sensors were flown at a height of 100 feet. In addition the survey recorded data from radar and other sensors. GPS navigation system, 307.60 Hz, monitors and video cameras. Flights were performed with an R-300-23 Super helicopter at a mean terrain clearance of 200 feet with a spacing primary of a quarter of a mile, and one eighth of a mile for about 97.9 sq miles. The lines were flown perpendicular to the flight lines at intervals of approximately 3 miles.

A Novatel OEM-221 Global Positioning System was used for navigation. The helicopter position was derived every 0.3 seconds using post-flight differential positioning to a relative accuracy of better than 0.5 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.

#### RESISTIVITY

The DIGHEM™ EM system measured inphase and quadrature components of the response. The vertical coiled coil-pairs operated at 1000 and 5000 Hz while three horizontal coiled 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-impedance model. The data were interpolated onto a regular 80 m grid using a modified Akima (1970) technique. All grids were then resampled from the 80 m cell size down to a 25 m cell size to produce the maps and final grids contained in this publication.

AKIMA, H., 1970, A new method of interpolation and smooth curve fitting applied to some geophysical problems, Journal of the Association of Computing Machinery, v. 17, no. 4, p. 589-602.

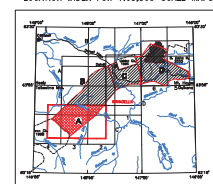


## 56,000 Hz COPLANAR APPARENT RESISTIVITY WITH TOPOGRAPHY, WRANGELLIA SURVEY AREA, SOUTH-CENTRAL ALASKA

PARTS OF THE TALKIEETHA MTNS, HEALY, AND MT HAYES QUADRANGLES

by  
 Laurel E. Burns, CCG, and Fugro GeoServices, Inc.  
 2014

#### LOCATION INDEX FOR 1:63,360-SCALE MAPS



#### SURVEY HISTORY

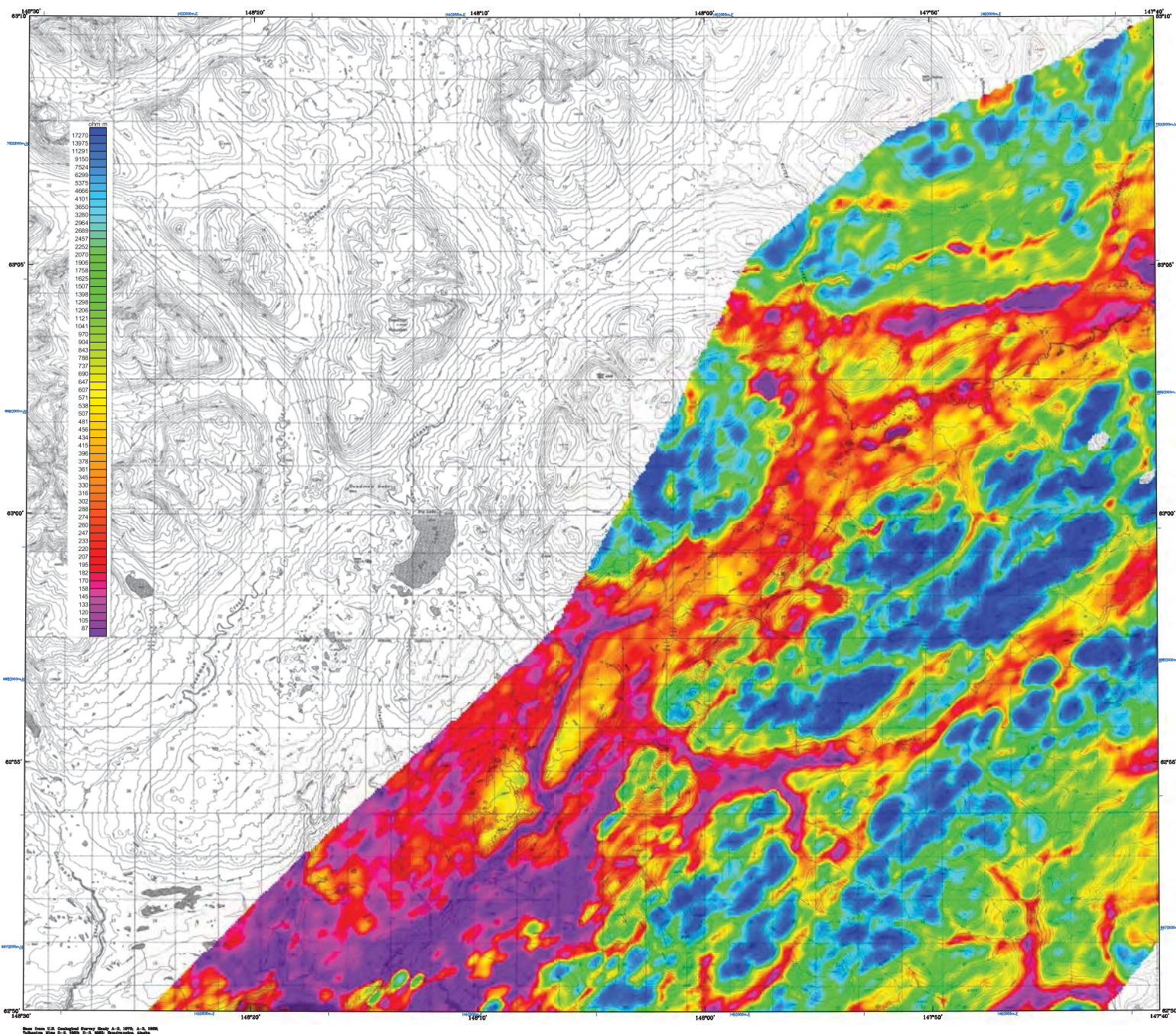
This map has been compiled and drawn under contract between the State of Alaska Department of Natural Resources, Division of Geological & Geophysical Surveys (DGGGS), and Fugro GeoServices, Inc. Airborne geophysical data for the area were acquired and processed by DGGGS in 2013 and 2014. Previously flown DGGGS surveys adjacent to the current survey are shown in the location map. Previous lines, survey names, and date of publication. The project was funded by the Alaska State Legislature as part of the Alaska Strategic and Critical Minerals Assessment project, which is part of the Alaska Airborne Geophysical and Geological Mineral Inventory Program. Alaska Exploration Corporation contributed Infill data for a portion of the area shown above as denser basing.

All data and maps produced to date from this survey are available in digital format on DVD for a nominal fee through DGGGS, 3354 College Road, Fairbanks, Alaska, 99709-3757, and are downloadable for free from the DGGGS website ([www.dgggs.alaska.gov/pubs](http://www.dgggs.alaska.gov/pubs)). Maps are also available on paper through the DGGGS office and are available online at the website in Adobe Acrobat (.PDF) file format.

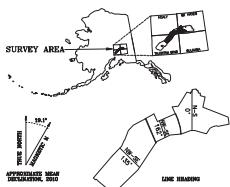
#### RESISTIVITY ALTITUDE LIMITS

In areas where the EM bird height exceeded 150 m, resistivity was not calculated. This avoids meaningless resistivity calculations due to small signals where the helicopter flew higher to avoid cultural objects or for safety reasons. Blank areas in the grids were created where zones of high flying correlated over more than one survey line.





Derived from U.S. Geological Survey Data A-1, 1993, A-1, 1993  
 Revision Date 2-1-2004 2-1-2004 Geographic Data



SCALE 1:63,360  
 1 0 1 2 3 4 MILES  
 1 0 1 2 3 4 KILOMETERS  
 COPIED INTERVAL 100 YD  
 SURVEY AREA 100 YD

## 56,000 Hz COPLANAR APPARENT RESISTIVITY WITH TOPOGRAPHY, WRANGELLIA SURVEY AREA, SOUTH-CENTRAL ALASKA

PARTS OF THE TALKIETNA MTNS, HEALY, AND MT HAYES QUADRANGLES

by  
 Laurel E. Burns, CGG, and Fugro GeoServices, Inc.  
 2014

### DESCRIPTIVE NOTES

The geophysical data were acquired with a DIGHEM<sup>®</sup> Electromagnetic (EM) system and a Fugro D1344 cesium magnetometer with a Schlumberger CS3 cesium sensor. The EM and magnetic sensors were flown at a height of 100 feet. In addition the survey recorded data from radar and laser altimeters, GPS navigation system, 50/60 Hz monitors and video cameras. Flights were performed with an AS-350-83 Squirrel helicopter at a mean terrain clearance of 200 feet with a spacing primarily of a quarter of a mile, and one eighth of a mile for about 97.8 miles. The lines were flown perpendicular to the flight lines at intervals of approximately 3 miles.

A Novatel OEM5-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 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.

### RESISTIVITY

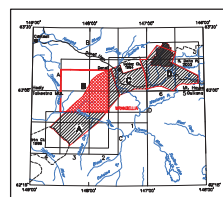
The DIGHEM<sup>®</sup> EM system measured inphase and quadrature components at five frequencies, two vertical coplanar coils operated at 1000 and 5000 Hz while three horizontal coplanar coils operated at 800, 7200 and 56,000 Hz. EM data were sampled at 0.1 second intervals. The EM system responds to 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. All grids were then resampled from the 80 m cell size down to a 20 m cell size to produce the mosaic and final grids contained in this publication.

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. 6, p. 589-602.

### RESISTIVITY ALTITUDE LIMITS

In areas where the EM bird height exceeded 150 m, resistivity was not calculated. This avoids meaningless resistivity calculations due to small signals where the helicopter flew higher to avoid cultural objects or for safety reasons. Blank areas in the grids were created where zones of high flying correlated over more than one survey line.

### LOCATION INDEX FOR 1:63,360-SCALE MAPS

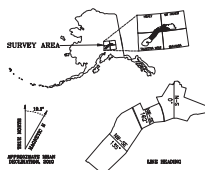


### SURVEY HISTORY

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 Fugro GeoServices, Inc. Airborne geophysical data for the area were acquired and processed by CGG in 2013 and 2014. Previously flown DGGGS surveys adjacent to the survey are shown in the location map by dashed lines, survey name, and date of publication. The project was funded by the Alaska State Legislature as part of the Alaska Strategic and Critical Minerals Assessment project, which is part of the Alaska Airborne Geophysical and Geological Mineral Inventory Program. Mirrored Exploration Corporation contributed initial data for a portion of the area shown above as denser hatching.

All data and maps produced to date from this survey are available in digital format on DVD for a nominal fee through DGGGS, 3354 College Road, Fairbanks, Alaska, 99709-3707, and are downloadable for free from the DGGGS website ([www.dgggs.alaska.gov/pubs](http://www.dgggs.alaska.gov/pubs)). Maps are also available on paper through the DGGGS office, and are viewable online at the website in Adobe Acrobat .PDF file format.





## PARTS OF THE TALLEKETA MTS., HEALY, AND MT HAYES QUADRANGLES

by  
Laurel E. Burns, CGG, and Fugro GeoServices, Inc.  
2014

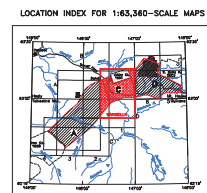
The geographical data were acquired with a Digital DSC-1000 GPS receiver and a DigiMap 31444 cesium ion magnetometer with a Schriener CS3 cesium ion magnetometer. The survey was conducted at low tide at a height of 100 feet. In addition the survey recorded data from radar altimeters, a Raytheon AN/APR-76 100/20 Hz HF radio altimeter, and video cameras. Flights were made at a mean terrain clearance of about 200 feet with a maximum clearance of 300 feet. The flight track covered a distance of approximately one and one eighth of a mile for about 97.9 sq miles. The lines were flown perpendicular to the flight track.

A Novatel OEMS-22L Global Positioning System was used for navigation. The helicopter position was determined by differential positioning to a relative accuracy of less than 5 m. Flight path positions were obtained by integrating the velocity measurements of the inertial sensor system (INS) of the helicopter, 1927 North American datum using as reference the WGS84 datum. The horizontal accuracy of the presented data is better than 10 m and on east constant of 500,000m. Positional accuracy of the presented data is better than 10 m.

The DIGHEM<sup>®</sup> EM system measured inphase and quadrature components of the frequencies of two vertical coils and three horizontal coils. The vertical coils were spaced three horizontal coplanar coils—pairs operated at 900, 7200 and 56,000 Hz. EM data were sampled at 0.1 m intervals along the profile. The horizontal coils are conductors, conductive overdrives, and cultural sources. Apparent resistivity is generated from the inphase and quadrature component of the coplanar 56,000 Hz using the apparent resistivity ratio (AR) technique (Hanna, 1974). Interpolated onto a regular 80 m grid using a modified ANNA (1970) technique. All grids were then resampled from the 80 m cell size down to a 25 m cell size to produce the maps and final grids contained in this publication.

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.

In areas where the EM bird height exceeded 150 m, resistivity was not calculated. This avoids meaningless resistivity calculations due to small signals where the helicopter flew higher to avoid cultural objects or for safety reasons. Blank areas in the grids were created where zones of high flying correlated over more than one survey line.



**SURVEY HISTORY**

This map was compiled from numerous reports and contracts between the State of Alaska, Department of Natural Resources, Division of Geological & Geophysical Surveys and the U.S. Geological Survey. The majority of the geophysical data for the area were acquired and processed by CGG in 2013 and 2014. Previously published maps of the area are available in the map area survey are shown in the location map by dashed lines, survey name, and date of publication. The map was compiled by the Alaska Department of Natural Resources, Division of Geological & Geophysical Surveys as part of the Alaska Strategic and Critical Minerals Inventory project. The project was funded by the Alaska Airborne Geophysical and Geological Mineral Inventory Program, Milrock Exploration Corporation and the U.S. Geological Survey. The map is a portion of the survey shown above as denser halftone.

All data and maps produced from this survey are available on CD-ROM. The CD-ROM is located at the address: CGGS, 3354 College Road, Fairbanks, Alaska, 99709-3707, and are downloadable for free from the U.S. Geological Survey ([www.gutenberg.gov](http://www.gutenberg.gov)). The data are also available on paper through the DGGS office, and are viewable online at the website in Adobe Acrobat (.PDF file).



[illegible]

### RESISTIVITY

The DIGHEM<sup>®</sup> 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 m intervals over a 100 m by 100 m area. Data were collected from conductive overburden, and cultural sources. Apparent resistivity is generated from the inphase and quadrature component of the coplanar 56,000 Hz using the coplanar pair high frequency technique. The data were interpolated onto a regular 80 m grid using a modified Akima (1970) technique. All grids were then resampled from the 80 m cell size down to a 25 m cell size to produce the maps and final grids contained in this

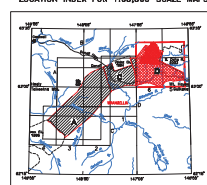
Aldma, H., 1970, A new method of interpolation and smooth curve fitting based on local procedures. *Journal of the Association of Computing Machinery*, v. 17, no. 4, p. 589-602.

## PARTS OF THE TALLEETNA MTNS, HEALY, AND MT HAYES QUADRANGLES

by  
Laurel E. Burns, CGG, and Fugro GeoServices, Inc.  
2014

RESISTIVITY ALTITUDE LIMITS

In areas where the EM bird height exceeded 150 m, resistivity was not calculated. This avoids meaningless resistivity calculations due to small signals where the helicopter flew higher to avoid cultural objects or for safety reasons. Blank areas in the grids were created where zones of high flying correlated over more than one survey line.



## SURVEY HISTORY

**SURVEY HISTORY**

This map has been compiled and drawn under contract between the State of Alaska and the U.S. Geological Survey, Division of Geological & Geophysical Surveys (DGGS), and Fugro GeoServices, Inc. Airborne geophysical data were collected by Fugro GeoServices and processed by CGG in 2013 and 2014. Previously flown DGGS surveys adjacent to the current survey are shown in light gray. The map includes survey lines, survey name, and date of publication. The map was prepared by the Alaska Division of Geological & Geophysical Surveys as part of the Alaska Strategic and Critical Minerals Assessment project, which is part of the Alaska Division of Geological & Geophysical Surveys' Inventory Program. Milrock Exploration Corporation contributed inflit data for a portion of the area shown.

All data and maps produced to date from this survey are available in digital format on DVD for a nominal fee. The data are available in a variety of formats, including 99709-3707, and are downloadable for free from the DGGS website ([www.dggs.alaska.gov/pubs](http://www.dggs.alaska.gov/pubs)). Maps are available in a variety of formats, including PDF, and are viewable online at the website in Adobe Acrobat .PDF format.





### DESCRIPTIVE NOTES

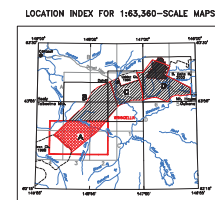
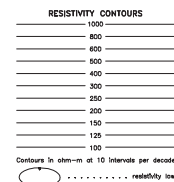
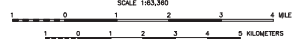
### RESISTIVITY

The DIGHEM<sup>®</sup> EM system measured inphase and quadrature components at five frequencies. Two vertical coaxial coil-pairs operated at 1000 and 5500 Hz while three horizontal 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 components at 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. All grids were then resampled from the 80 m cell size down to a 25 m cell size to produce the maps and final grids contained in this presentation.

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.

PARTS OF THE TALKEETNA MTNS. HEALY. AND MT HAYES QUADRANGLES

by  
Laurel E. Burns, CGG, and Fugro GeoServices, Inc.  
2014



## SURVEY HISTORY

This map is being compiled and drawn under contract from the State of Alaska, Department of Natural Resources, Division of Geological & Geophysical Surveys. The Alaska State Fund (ASFS) has funded the ASGS geophysical data for the area were acquired and processed in ASGS 2011 and 2014. Previously, ASGS DGGs were compiled to the same scale. The survey are shown in the location map by dashed lines. The DGGs are available for download from the project website funded by the Alaska State Legislature as part of the Alaska Strategic and Critical Minerals Inventory Program, Alaska Department of Natural Resources, Division of Geological and Geophysical Surveys, Alaska Airborne Geophysical and Geological Mineral Inventory Program. Mineral Exploration Corporation (MEC) has provided the information for the area shown above as denser hatching.





## PARTS OF THE TALKEETNA MTNS. HEALY, AND MT HAYES QUADRANGLES

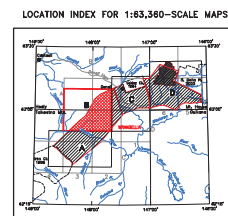
by  
Laurel E. Burns, CGG, and Fugro GeoServices, Inc.  
2014

in areas where the EM bird height exceeded 150 m, resistivity was not calculated. This avoids meaningless resistivity calculations due to small signals where the helicopter flew higher to avoid cultural objects or for safety reasons. Blank areas in the grids were created where zones of high flying correlated over more than one survey line.

The geophysical data were acquired with a DIGHEM Electromagnetic (EM) system and a Furor D1344 computer system with a 386SX 33 MHz central processor. The EM and magnetic sensors were flown at a height of 100 feet. In addition the survey recorded data from radar and laser altimeters, GPS navigation system, 50/60 Hz monitors and video cameras. Flights were performed with an AS-350B3 Squirrel helicopter at a mean terrain clearance of 200 feet with a spacing primarily of a quarter of a mile, and one eighth of a mile for about 97.9 sq miles. Tie lines were flown perpendicular to the flight

The DIGHEM<sup>TM</sup> EM system measured inphase and quadrature components at four frequencies. The 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 sec intervals. EM data were collected from 100 mV conductors, conductive overburden, and cultural sources. Apparent resistivity is generated from the inphase and quadrature component of the coplanar 56,000 Hz using the phase shift EM algorithm (Kohner and Korte, 1976) interpolated onto a regular 80 m grid using a modified Akima (1970) technique. All grids were then resampled from the 80 m cell size down to a 25 m cell size to produce the maps and final grids contained in this publication.

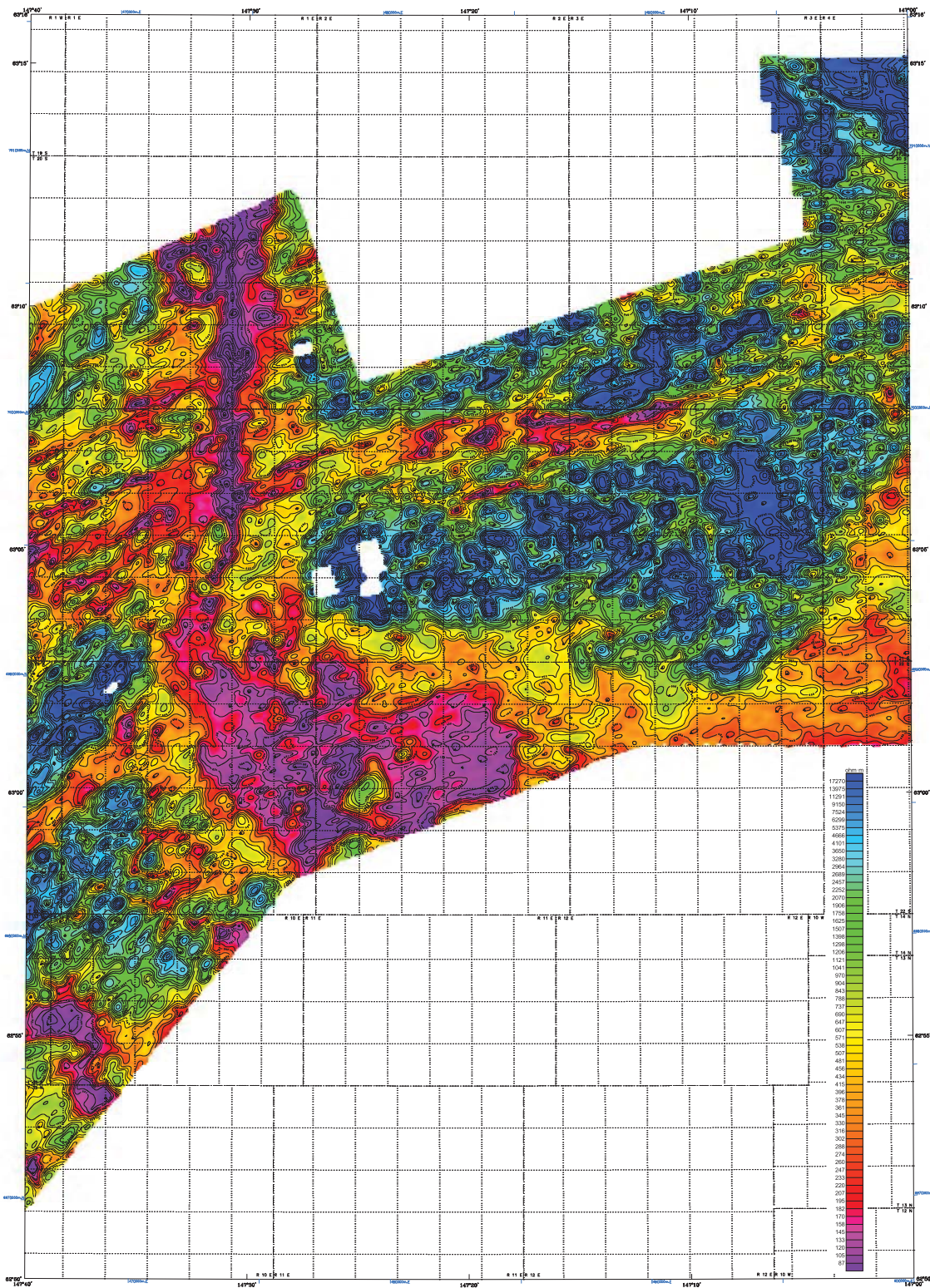
Akima, H., 1970, A new method of interpolation and smooth curve fitting based on local procedures. *Journal of the Association of Computing Machinery*, 17, 589-602.



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 Fugro Inc. Seismic data were collected by geophysical data for the area were acquired and processed by Fugro in 2001. The data were previously used by DGGS survey adjacent to the proposed survey are shown in the location map by dashed lines. The project was funded by the Alaska State Legislature as part of the Alaska Strategic and Critical Minerals Assessment. The project was also funded by the Alaska Airborne Geophysical and Geological Mineral Inventory Program, Milrock Exploration Corporation. The map shows the portion of the map that is shown above as denser hatching.

All data and maps produced to date from this survey are available on CD-ROM. The data are available through DGGS, 3354 College Road, Fairbanks, Alaska, 99709-3707, and are downloadable for free from the website <http://www.dggs.alaska.gov>. The data are also available on paper through the DGGS office, and are viewable online at the website in Adobe Acrobat .PDF file format.





Resistivity Altitude Limits

In areas where the EM bird height exceeded 150 m, resistivity was not calculated. The wide meandering resistivity contours are due to small angles where the helicopter flew higher to avoid cultural objects or for safety reasons. Dark areas in the plot were areas where zones of high flying correlated over more than one survey line.

#### DESCRIPTIVE NOTES

The geophysical data were acquired with a DIGHM<sup>®</sup> Electromagnetic (EM) system and a Fugro D1344 cesium magnetometer with a Schlumberger C31 cesium sensor. The EM and magnetic data were flown at a height of 100 feet. In addition, the survey included data from two 100 m and 150 m diameter GPS navigation systems. Flights were performed with an AS-350-B3 Squirrel helicopter at a mean terrain clearance of 200 feet with a spacing primarily of a quarter of a mile, and one eighth of a mile for about 9.8 sq miles. The 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 1 m. Flight path data were projected onto the UTM 18N datum (UTM zone 18N, 1983 datum). The map is projected on the UTM 18N datum, with a central meridian (CM) of 147° 0' north constant of 0 and an east constant of 600,000. Horizontal accuracy of the presented data is better than 10 m with respect to the UTM grid.

## 56,000 Hz COPLANAR APPARENT RESISTIVITY WITH DATA CONTOURS, WRANGELLIA SURVEY AREA, SOUTH-CENTRAL ALASKA

PARTS OF THE TALKETNA MTNS, HEALY, AND MT HAYES QUADRANGLES

by  
Laural E. Burns, CGG, and Fugro Geoservices, Inc.  
2014

#### RESISTIVITY

The DIGHM<sup>®</sup> EM system measured in-phase and quadrature components of the frequency. Two vertical coplanar 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 in-phase and quadrature components of the response. A 200 m grid was generated from the 80 m cell size down to a 25 m cell size to produce the maps and final grids contained in this publication.

Alaska, N. 1983, is a true projection of Alaska and a north map of 100 meters. The map is projected on the UTM 18N datum, with a central meridian (CM) of 147° 0' north constant of 0 and an east constant of 600,000. Horizontal accuracy of the presented data is better than 10 m with respect to the UTM grid.

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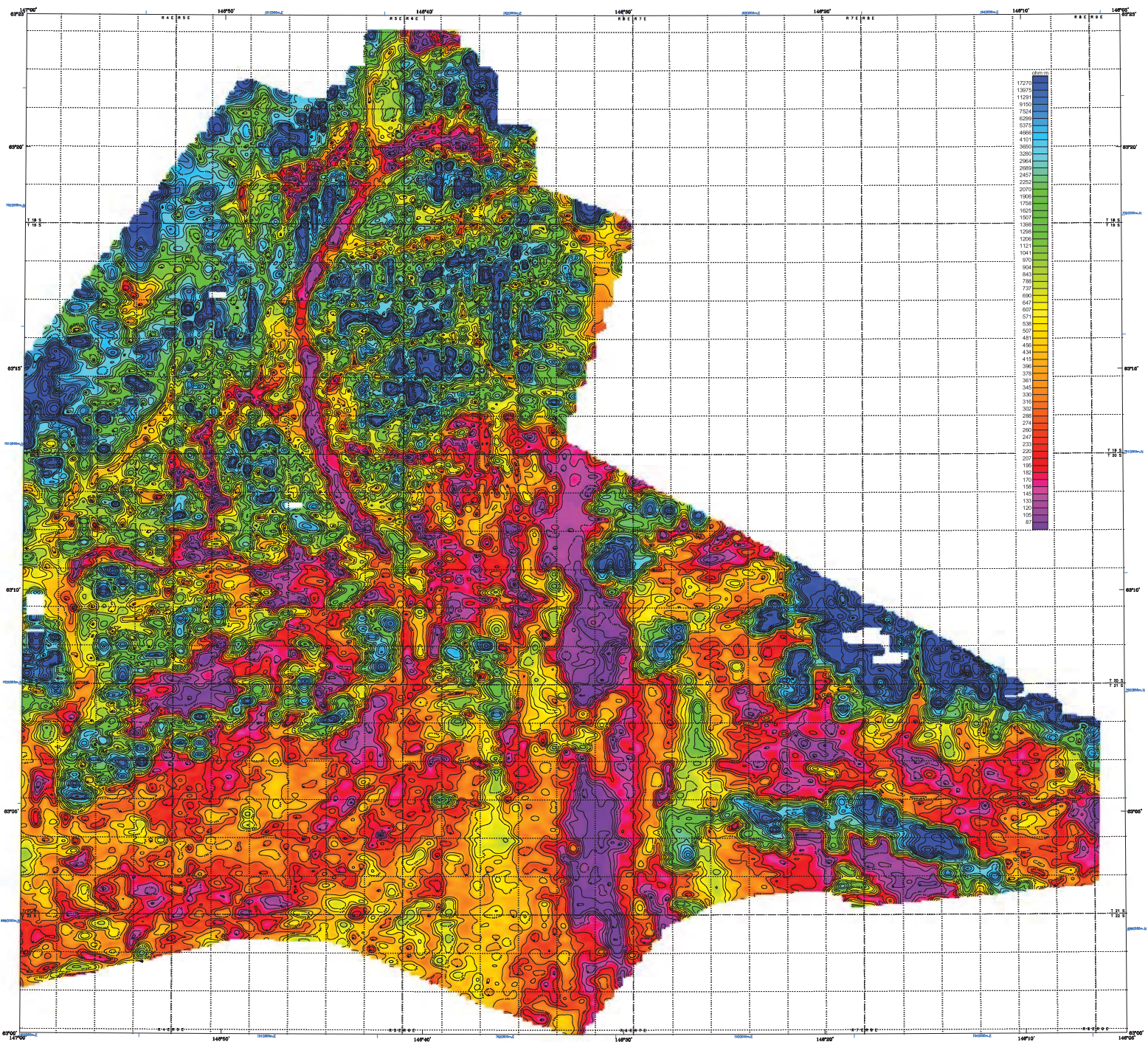
UTM 18N

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UTM





## RESISTIVITY ALTITUDE LIMITS

In areas where the EM bird height exceeded 150 m, resistivity was not calculated. This avoids meaningless resistivity calculations due to small signals where the helicopter flew higher to avoid cultural objects or for safety reasons. Blank areas in the grid were created where zones of high flying correlated over more than one survey line.

## DESCRIPTIVE NOTES

The geophysical data were acquired with a DIGHEM<sup>®</sup> Electromagnetic (EM) system and a Fugro D1344 cesium magnetometer with a Schlumberger C31 cesium sensor. The EM and magnetic sensors were flown at a height of 100 feet. In addition to the survey recorded data from rotor and laser altimeters, GPS navigation system, 50/60 Hz monitors and video cameras, flight logs were performed with an AS-350-B3 Spirit helicopter at a mean terrain clearance of 200 feet with one eighth of a mile for about 97.9 sq miles. The 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 location was derived every 0.5 seconds using post-flight differential positioning to a relative accuracy of better than 10 m. The 2011 data were projected onto the Clarke 1866 (UTM zone 6) datum, and the 2014 data were projected onto a central meridian (CM) of 147° a north constant of 147° and an east constant of 500,000. Positional accuracy of the presented data is better than 10 m with respect to the UTM grid.

## RESISTIVITY

The DIGHEM<sup>®</sup> EM system measured in-phase and quadrature components at five frequencies. Two vertical coiled coil-pairs operated at 1000 and 5000 Hz while three horizontal coplanar coil-pairs operated at 900, 7200 and 56,000 Hz. EM data were sampled at 5.1 second intervals. The EM system responded to bedrock conductors, conductive overburden, and cultural sources. Apparent resistivity is generated from in-phase 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. All grids were then resampled from the 80 m cell size down to a 25 m cell size to produce the maps and final grids contained in this publication.

Alm, H. 1970. A new method of interpolating 2-D cross curves of resistivity sections. p. 115-124. In: 2nd-24th.

by  
Lauri E. Burns, CCG, and Fugro Geoservices, Inc.  
2014

## 56,000 Hz COPLANAR APPARENT RESISTIVITY WITH DATA CONTOURS, WRANGELLIA SURVEY AREA, SOUTH-CENTRAL ALASKA

PARTS OF THE TALKEETNA MTNS, HEALY, AND MT HAYES QUADRANGLES

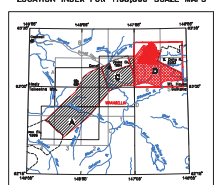


## RESISTIVITY CONTOURS

1000
800
600
500
400
300
250
200
150
100

Contours in ohm-m at 10 intervals per decade  
..... relatively low

## LOCATION INDEX FOR 1:63,360-SCALE MAPS



## 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 Fugro Geoservices, Inc. Airborne geophysical data for the area were acquired and processed by CCG in 2013 and 2014. Preliminary flown DGGG surveys adjacent to the current survey are shown in the location map by dashed lines, survey name, and date of publication. The project was funded by the Alaska State Legislature as part of the Alaska Strategic and Critical Minerals Assessment project, which is part of the Alaska Airborne Geophysical and Geological Mineral Inventory Program. Milrock Exploration Corporation contributed inflight data for a portion of the area shown at a lesser scale.

All data and maps produced to date from this survey are available in digital format on DVD for a nominal fee through DGGG, 3354 College Road, Fairbanks, Alaska, 99709-1077, and are distributed for free from the DGGG website ([www.dggg.alaska.gov/pubs](http://www.dggg.alaska.gov/pubs)). Maps are also available on paper through the DGGG office, and are viewable online at the website in Adobe Acrobat .PDF file format.



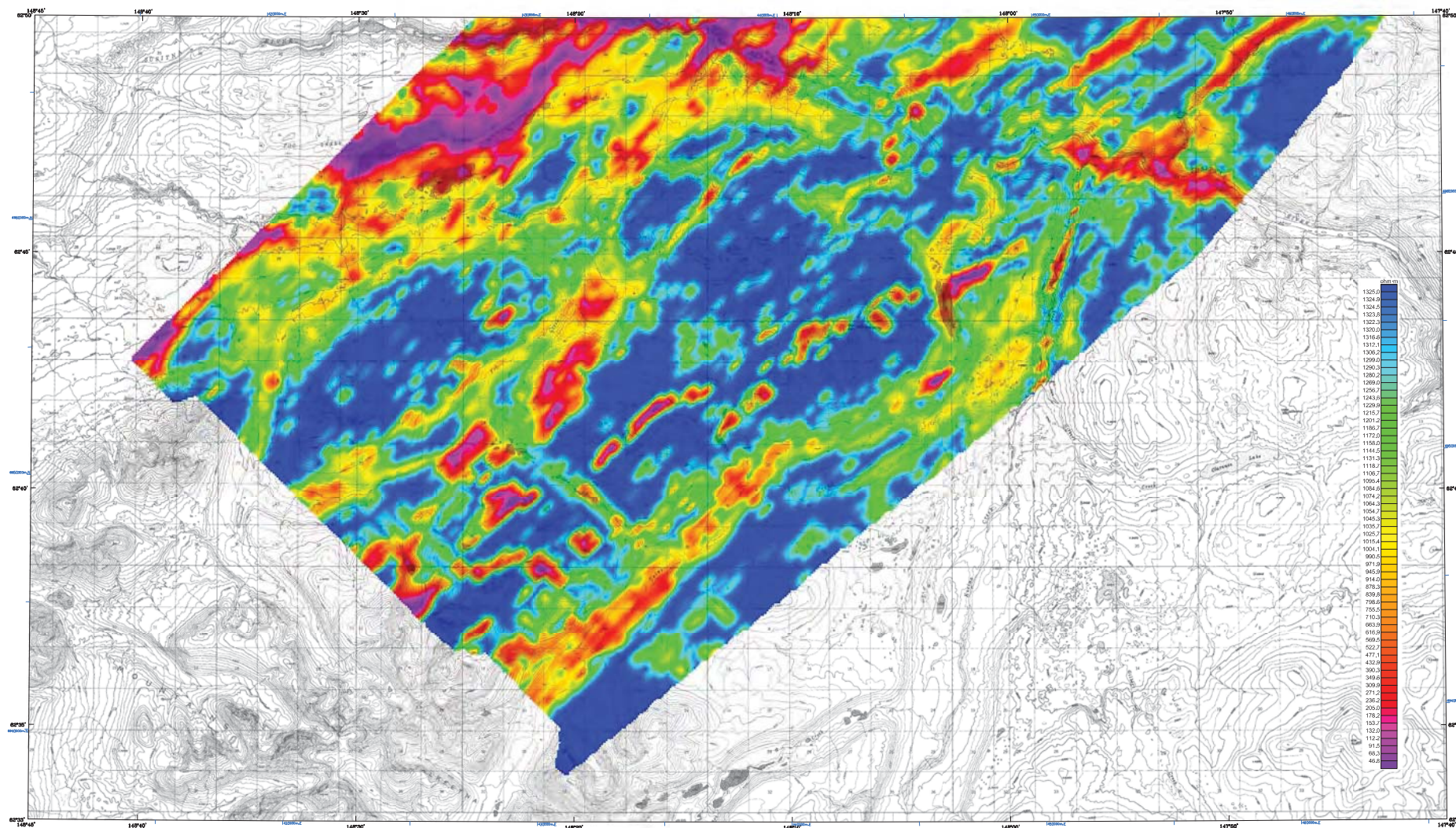
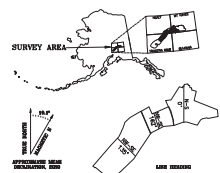


FIG. 1. 900 Hz COPLANAR APPARENT RESISTIVITY WITH TOPOGRAPHY, WRANGELLIA SURVEY AREA, SOUTH-CENTRAL ALASKA. SCALE 1:63,360. D-4, 1988.



#### DESCRIPTIVE NOTES

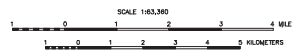
The geophysical data were acquired with a DIGHEM Electromagnetic (EM) system and a Fugro D-3544 cesium magnetometer with a Schriew CS3 cesium sensor. The EM and magnetic sensors were flown at a height of 100 feet. In addition the survey recorded data from radar and laser altimeters, GPS navigation system, 307/80 Hz monitors and video cameras. Flights were performed with an R-300-23 Super helicopter at a mean terrain clearance of 200 feet with a spacing primary of a quarter of a mile, and one eighth of a mile for about 97.9 sq miles. The lines were flown perpendicular to the flight lines at intervals of approximately 3 miles.

A Novatel OEM-221 Global Positioning System was used for navigation. The helicopter position was derived every 0.3 seconds using post-flight differential positioning to a relative accuracy of better than 0.5 m. Flight height readings 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.

#### RESISTIVITY

The DIGHEM EM system measured inphase and quadrature components of the response. The vertical coiled coil-pairs operated at 1000 and 5000 Hz while three horizontal coiled coil-pairs operated at 900, 7200 and 56,000 Hz. EM data were sampled at 0.1 second intervals. The EM system responds to tectonic 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-type, half space model. The data were interpolated onto a regular 80 m grid using a modified Adams (1970) technique. All grids were then resampled from the 80 m cell size down to a 25 m cell size to produce the maps and final grids contained in this publication.

ADAMS, W. W. 1970. A new method of interpolation and smooth curve fitting applied to topographic maps. Journal of the Association of Computing Machinery, v. 17, no. 4, p. 1049-1052.

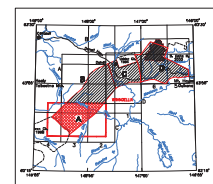


## 900 Hz COPLANAR APPARENT RESISTIVITY WITH TOPOGRAPHY, WRANGELLIA SURVEY AREA, SOUTH-CENTRAL ALASKA

PARTS OF THE TALKIEHTNA MTNS, HEALY, AND MT HAYES QUADRANGLES

by  
Lauri E. Burns, CCG, and Fugro Geoservices, Inc.  
2014

#### LOCATION INDEX FOR 1:63,360-SCALE MAPS



#### SURVEY HISTORY

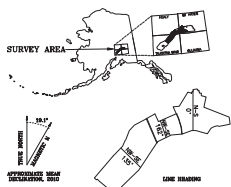
This map has been compiled and drawn under contract between the State of Alaska Department of Natural Resources, Division of Geological & Geophysical Surveys (DGGGS), and Fugro Geoservices, Inc. Airborne geophysical data for the area were acquired and processed by DGGGS in 2013 and 2014. Previous flown DGGGS surveys adjacent to the current survey are shown in the location map for colored lines, survey names, and date of publication. The project was funded by the Alaska State Legislature as part of the Alaska Strategic and Critical Minerals Assessment project, which is part of the Alaska Airborne Geophysical and Geological Mineral Inventory Program. Fugro Geoservices Corporation contributed InSAR data for a portion of the area shown above as dashed lines.

All data and maps produced to date from this survey are available in digital format on DVD for a nominal fee through DGGGS, 3354 College Road, Fairbanks, Alaska, 99709-3757, and are downloadable for free from the DGGGS website ([www.dgggs.alaska.gov/pubs](http://www.dgggs.alaska.gov/pubs)). Maps are also available on paper through the DGGGS office and are available online at the website in Adobe Acrobat (.PDF) file format.

#### RESISTIVITY ALTITUDE LIMITS

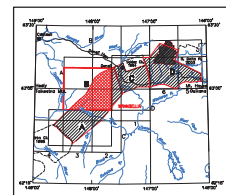
In areas where the EM bird height exceeded 150 m, resistivity was not calculated. This avoids meaningless resistivity calculations due to small signals where the helicopter flew higher to avoid cultural objects or for safety reasons. Blank areas in the grids were created where zones of high flying correlated over more than one survey line.





## PARTS OF THE TALKEETNA MTNS, HEALY, AND MT HAYES QUADRANGLES

LOCATION INDEX FOR 1:63,360-SCALE MAPS



### RESISTIVITY

The DIGHEM<sup>®</sup> EM system measured inphase and quadrature components at frequencies of 1000 and 5500 Hz using three horizontal coplanar coil-pairs operated at 1000, 7200 and 56,000 Hz. EM data were sampled at 0.1 sec intervals. EM data were collected from 1000 to 56,000 Hz conductors, conductive overburden, and cultural sources. Apparent resistivity is generated from the inphase and quadrature component of the coplanar 56,000 Hz using the  $\rho_a = 1000 \times Z_{in}/I$  relationship. The data were then interpolated onto a regular 80 m grid using a modified Akima (1970) technique. All grids were then resampled from the 80 m cell size down to a 25 m cell size to produce the maps and final grids contained in this publication.

### RESISTIVITY ALTITUDE LIMITS

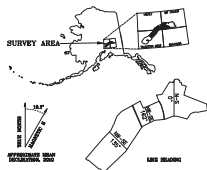
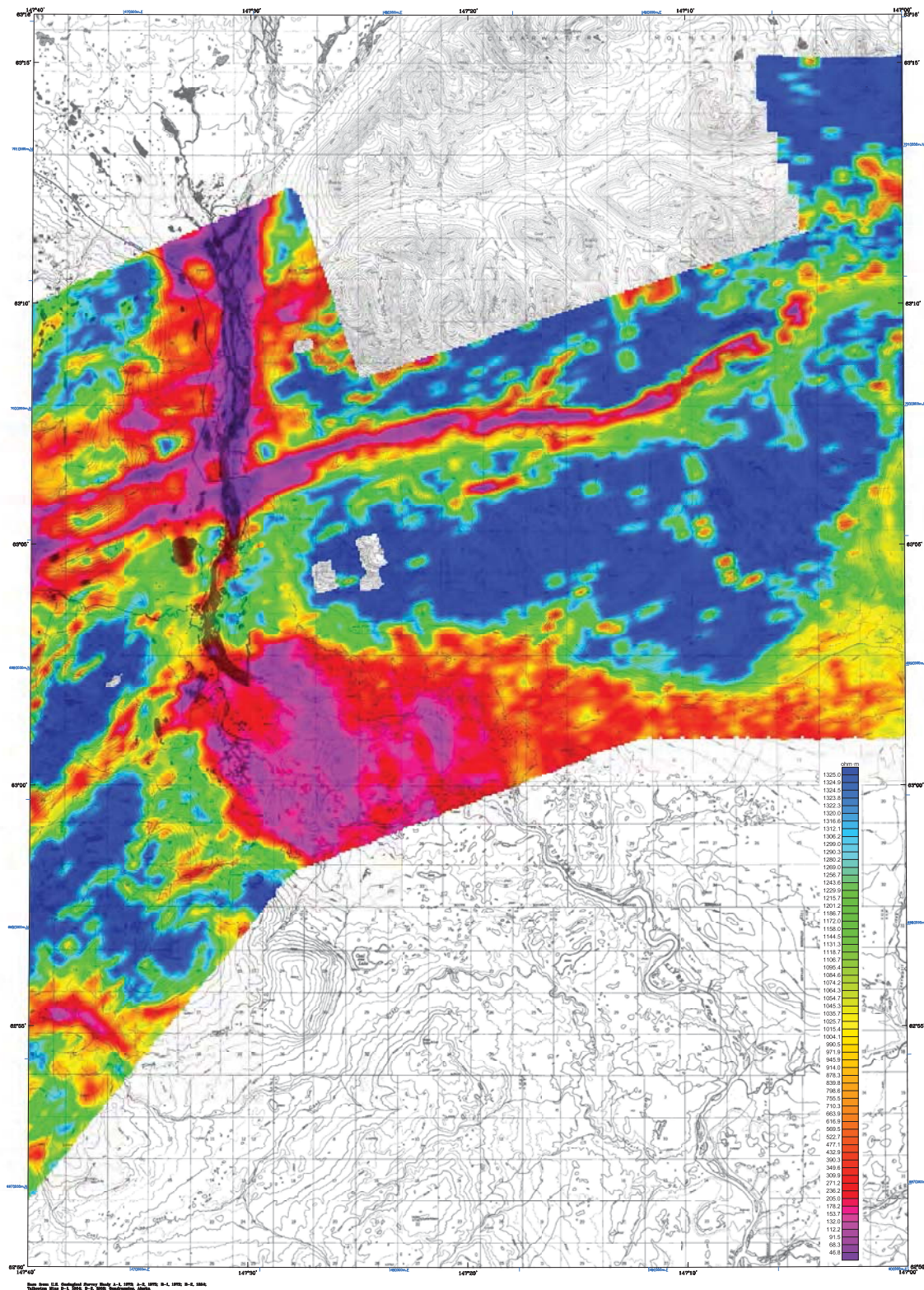
In areas where the EM bird height exceeded 150 m, resistivity was not calculated. This avoids meaningless resistivity calculations due to small signals where the helicopter flew higher to avoid cultural objects or for safety reasons. Blank areas in the grids were created where zones of high flying correlated over more than one survey line.

## SURVEY HISTORY

This map has been compiled and drawn under contract between the State of Alaska, Department of Natural Resources, Division of Geological & Geophysical Surveys and the U.S. Geological Survey. The geologic and geological data for the area were acquired and processed by CGG in 2013 and 2014. Previously published maps and associated data of publication date are shown in the location map by dashed lines. This survey was part of the State of Alaska's ongoing work funded by the U.S. Department of the Interior, Bureau of Land Management, Alaska Legislature as part of the Alaska Strategic and Critical Minerals Initiative. It is also part of the Alaska Department of Alaska Airborne Geophysics and Exploration Mineral Inventory Program, Milrock Exploration Corporation and the U.S. Geological Survey. A portion of the area shown above as denser hatching.

All data and maps produced to date from this survey are available online at the following URL: [http://www.dnrg.alaska.gov/GS/3354\\_College\\_Road\\_Fairbanks\\_Alaska\\_99708-3707](http://www.dnrg.alaska.gov/GS/3354_College_Road_Fairbanks_Alaska_99708-3707), and are downloadable for free from the Alaska Department of Natural Resources website. They are also available on paper through the DGGS office, and are viewable online at the website in Adobe Acrobat .PDF file format.





## 900 Hz COPLANAR APPARENT RESISTIVITY WITH TOPOGRAPHY, WRANGELLIA SURVEY AREA, SOUTH-CENTRAL ALASKA

PARTS OF THE TALKEETNA MTS., HEALY, AND MT HAYES QUADRANGLES

by  
Laura E. Burns, OGS, and Fugro GeoServices, Inc.  
2014

### DESCRIPTIVE NOTES

The geophysical data were acquired with a DIGHEM<sup>®</sup> Electromagnetic (EM) system and a Fugro D1344 cesium magnetometer with a Schriber C3 cesium sensor. The EM and magnetic data were flown at a height of 100 m. In addition, the survey collected data from a Fugro D1344 cesium magnetometer and a Fugro D1344 cesium sensor. The data were collected with an AS-350-B3 Squirrel helicopter at a mean terrain clearance of 200 feet with a spacing primarily of a quarter of a mile, and one eighth of a mile for about 9.8 miles. The 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 1 m. Flight path coordinates were projected onto the UTM 18N datum (UTM zone 18N, 1977 datum) using a datum shift of 147° 0' north constant (CM) of 147° 0' north constant of 0 and an east constant of 160,000. Positional accuracy of the presented data is better than 10 m with respect to the UTM grid.

### RESISTIVITY

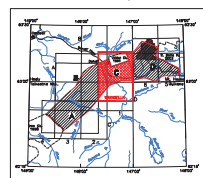
The DIGHEM<sup>®</sup> EM system measured in-phase and quadrature components at the frequencies. Two vertical coiled coils were operated at 1000 and 5000 Hz with three horizontal coplanar coil-pairs operated at 900, 7200 and 56,000 Hz. EM data were sampled at 0.1 second intervals. The EM system responds to bedrock conductors, conductive overburden, and cultural sources. Apparent resistivity is generated from the in-phase and quadrature component of the coplanar EM data using the pseudo-layer half space model. The data were interpolated onto a regular 80 m grid using a modified Akima (1970) technique. All grids were then resampled from the 80 m cell size down to a 25 m cell size to produce the maps and final grids contained in this publication.

Altitude is 1985, a sea level datum. All elevations are in feet. The datum is the North American Datum of 1983 (NAD 83).

### RESISTIVITY ALTITUDE LIMITS

In areas where the EM bird height exceeded 150 m, resistivity was not calculated. This avoids meaningless resistivity calculations due to small depths where the helicopter flew higher to avoid cultural objects or for safety reasons. Blank areas in the grids were created where zones of high flying correlated over more than one survey line.

### LOCATION INDEX FOR 1:63,360-SCALE MAPS



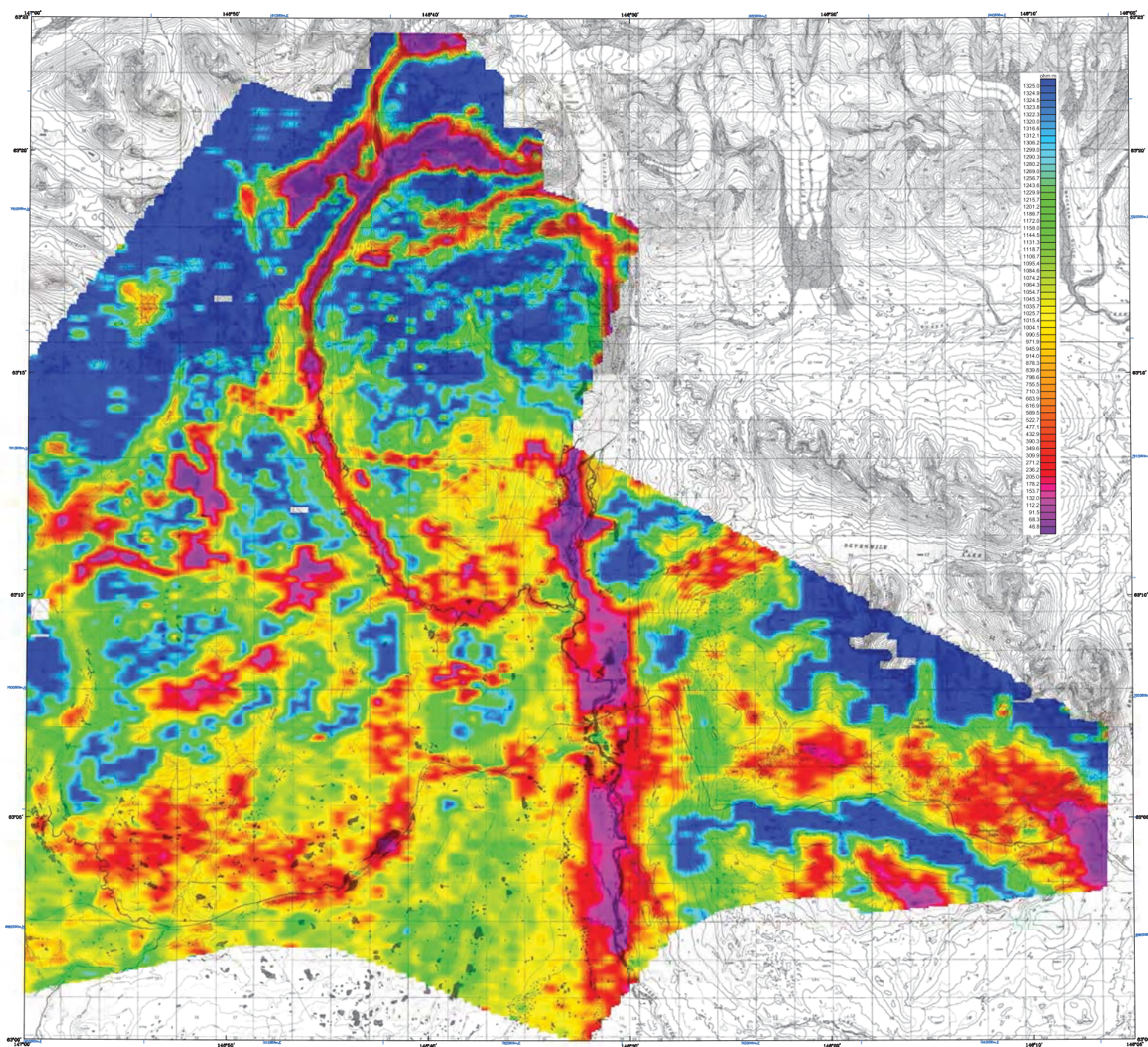
### SURVEY HISTORY

This map has been compiled and shown under contract between the State of Alaska, Department of Natural Resources, Division of Geological & Geophysical Surveys (DGGGS), and Fugro GeoServices, Inc. Airborne geophysical data for the area were acquired and processed by DGGGS in 2013 and 2014. Previously flown DGGGS surveys (collected to the current survey) are shown in the location map by dashed lines, survey names, and date of publication.

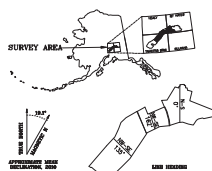
The project was funded by the Alaska State Legislature as part of the Alaska Strategic and Critical Minerals Assessment project, which is part of the Alaska Airborne Geophysical and Geophysical Mineral Inventory Project. The project was funded by the Alaska State Legislature as part of the Alaska Strategic and Critical Minerals Assessment project, which is part of the Alaska Airborne Geophysical and Geophysical Mineral Inventory Project.

All data and maps produced to date from this survey are available in digital format to the public. Maps are available through DGGGS, 3354 College Road, Fairbanks, Alaska, 99709-3707 and are downloadable for free from the DGGGS website ([www.dgggs.alaska.gov/pubs](http://www.dgggs.alaska.gov/pubs)). Maps are also available on paper through the DGGGS office, and are available online at the website in Adobe Acrobat (.PDF) file format.





U.S. GEOLOGICAL SURVEY, RESTON, VA 20196-1298



#### DESCRIPTIVE NOTES

The geophysical data were acquired with a DIGHEM<sup>®</sup> Electromagnetic (EM) system and a Fugro D1344 cesium magnetometer with a Schriber CS3 cesium sensor. The EM and magnetic sensors were flown at a height of 100 feet. In addition the survey recorded data from rotor and laser altimeters, GPS navigation system, 50/60 Hz monitors and video cameras. Flights were performed with an AS-350-B3 Spirit helicopter at a mean terrain clearance of 200 feet with a spacing of 0.1 mile for about 97.9 sq miles. The 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 1 m. Flight path positions were projected onto the Clarke 1866 (UTM zone 6) datum, 122° North American datum, a central meridian (CM) of 142° 4' 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.

#### RESISTIVITY

The DIGHEM<sup>®</sup> 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 900, 7200 and 56,200 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 56,200 Hz using the pseudo-layer half space model. The data were interpolated onto a regular 80 m grid using a modified Akima (1970) technique. All grids were then resampled from the 80 m cell size down to a 25 m cell size to produce the maps and final grids contained in this publication.

Akima, H., 1970, A new method of interpolation, *SIAM Journal on Numerical Analysis*, v. 7, p. 808-820.

by  
Laurel E. Burns, CCG, and Fugro Geoservices, Inc.  
2014

## 900 Hz COPLANAR APPARENT RESISTIVITY WITH TOPOGRAPHY, WRANGELLIA SURVEY AREA, SOUTH-CENTRAL ALASKA

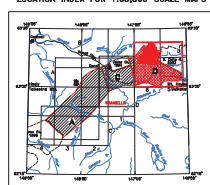
PARTS OF THE TALKEETNA MTNS, HEALY, AND MT HAYES QUADRANGLES

by  
Laurel E. Burns, CCG, and Fugro Geoservices, Inc.  
2014

#### RESISTIVITY ALTITUDE LIMITS

In areas where the EM bird height exceeded 150 m, resistivity was not calculated. This avoids meaningless resistivity calculations due to small signals where the helicopter flew higher to avoid cultural objects or for safety reasons. Blank areas in the grids were created where zones of high flying correlated over more than one survey line.

#### LOCATION INDEX FOR 1:63,360-SCALE MAPS

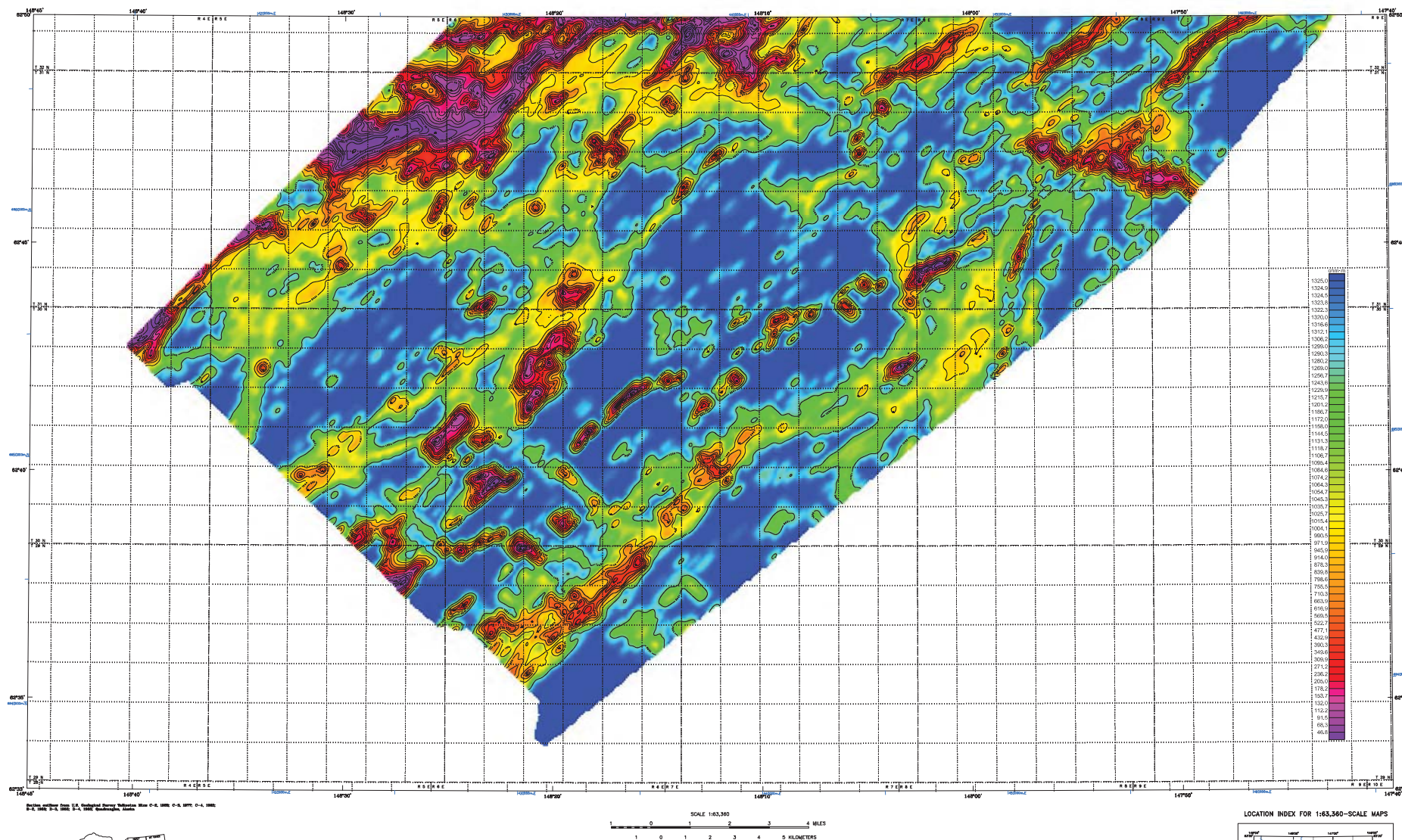


#### SURVEY HISTORY

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 Fugro Geoservices, Inc. Airborne geophysical data for the area were acquired and processed by CCG in 2013 and 2014. Previously flown DGGG surveys adjacent to the current survey are shown in gray, and date of publication. The project was funded by the Alaska State Legislature as part of the Alaska Strategic and Critical Minerals Assessment, a project which is part of the Alaska Airborne Geophysical and Geological Mineral Inventory Program. Mirraco Exploration Corporation contributed inflit data for a portion of the area shown close to census locality.

All data and maps produced to date from this survey are available in digital format on disk for acquisition fee through DGGG, 3354 College Road, Fairbanks, Alaska, 99709-1207, and are downloadable for free through the DGGG website ([www.dggg.alaska.gov/pubs/](http://www.dggg.alaska.gov/pubs/)). Maps are also available on paper through the DGGG office, and are viewable online at the website in Adobe Acrobat .PDF file format.





## RESISTIVITY ALTITUDE LIMITS

In areas where the EM bird height exceeded 180 m, resistivity was not calculated. The resistivity contours were calculated using a relative accuracy of better than 5 m. Resistivity contours 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.

## DESCRIPTIVE NOTES

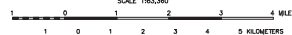
The geophysical data were acquired with a DIOHEM<sup>®</sup> Electromagnetic (EM) system and a Fugro D1344 cesium magnetometer with a Schriev CS3 cesium sensor. The EM and magnetic sensors were flown at a height of 100 feet. In addition to the survey recorded data from radar and laser altimeters, GPS navigation systems, 50/500 monitors and video cameras. Flights were performed with an R44-400 helicopter at a mean terrain clearance of 200 feet with a spacing primarily of a square grid of 0.1 mile and one eighth of a mile for about 97.9 sq miles. The lines were flown perpendicular to the flight lines at intervals of approximately 3 miles.

A Novatel CM4S-C21, Global Positioning System was used for navigation. The helicopter platform was derived 5.3 second interval high differential positioning to a relative accuracy of better than 5 m. Right ascension 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.

## RESISTIVITY

The DIOHEM<sup>®</sup> EM system measured in-phase and quadrature components of the frequency two vertical coil-coupled system at 1000 and 5000 Hz using three horizontal coil-coupled system at 900, 7200 and 56,000 Hz. EM data were sampled at 0.1 second intervals. The EM system responds to bedrock, conductive overburden, and cultural sources. Apparent resistivity is generated from the in-phase and quadrature component of the system 9000 Hz using the pseudo-layer half space model. The data were interpolated onto a regular 80 m grid using a modified Akima (1970) technique. All data were then resampled from the 80 m cell size down to a 25 m cell size to produce the maps and final grids contained in this publication.

Alaska, in 1975, a new method of interpolation and spatial noise reduction to data processing during the Association of Computing Machinery, v. 11, no. 4, p. 649-652.



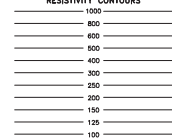
## 900 Hz COPLANAR APPARENT RESISTIVITY WITH DATA CONTOURS, WRANGELLIA SURVEY AREA, SOUTH-CENTRAL ALASKA

PARTS OF THE TALKIEHTNA MTNS, HEALY, AND MT HAYES QUADRANGLES

by  
Laural E. Burns, CGG, and Fugro GeoServices, Inc.  
2014



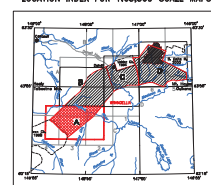
## RESISTIVITY CONTOURS



Contours in ohm-m at 10 intervals per decade

— reliability low

## LOCATION INDEX FOR 1:63,360-SCALE MAPS

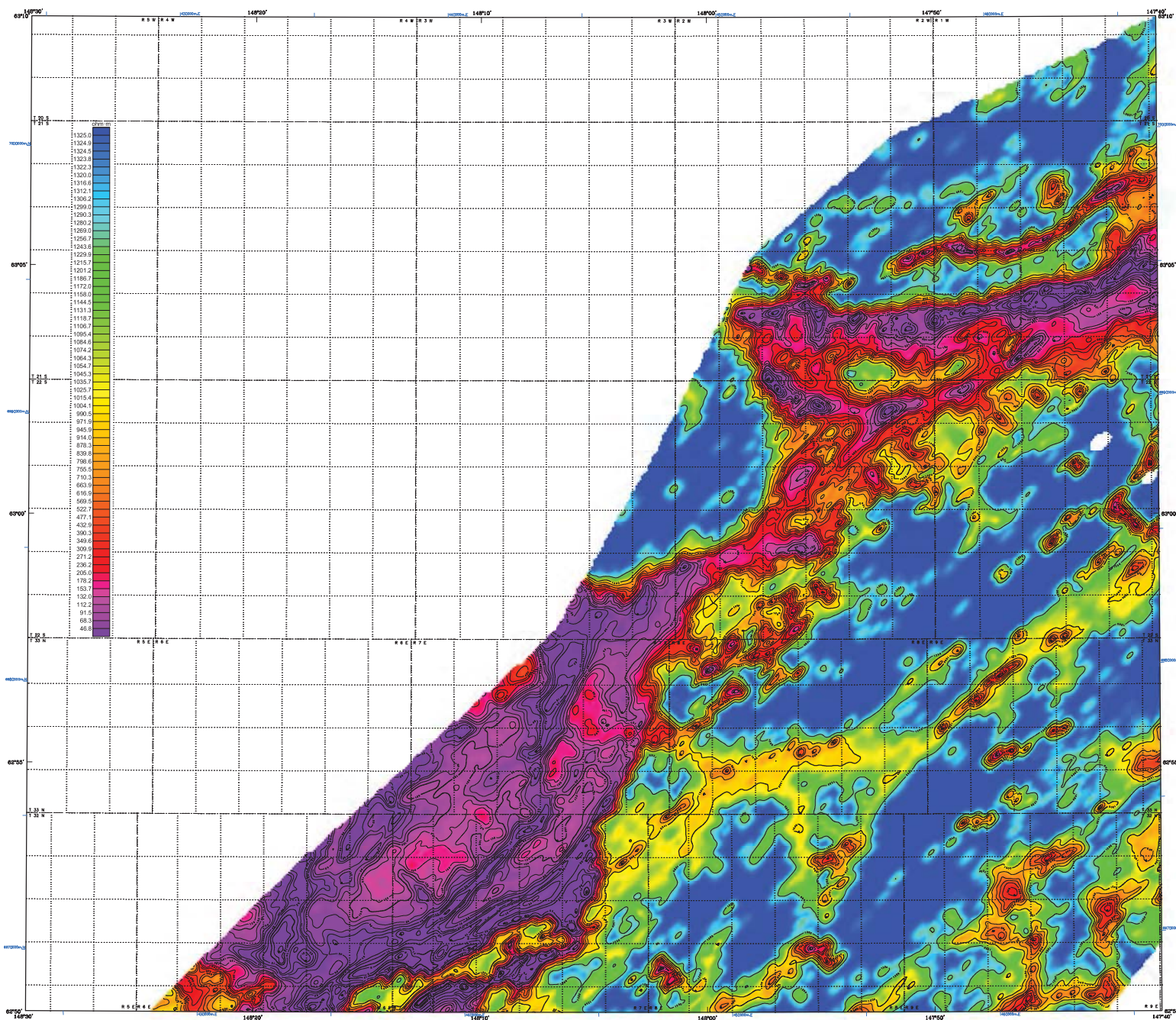


## SURVEY HISTORY

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 Fugro GeoServices, Inc. Airborne geophysical data for the area were acquired and processed by CGG in 2013 and 2014. Previous flown DGGGS surveys adjacent to the current survey are shown in the location map by dashed lines, survey name, and date of publication. This project was funded by the Alaska State Legislature as part of the Alaska Strategic and Critical Minerals Assessment project, which is part of the Alaska Airborne Geophysical and Geological Mineral Inventory Program. Alaska Exploration Corporation contributed infill data for a portion of the area shown above as dashed lines.

All data and maps produced to date from this survey are available in digital format on DVD for a nominal fee through DGGGS, 3354 College Road, Fairbanks, Alaska, 99709-3757, and are downloadable for free from the DGGGS website ([www.dgggs.alaska.gov/pubs](http://www.dgggs.alaska.gov/pubs)). Maps are also available on paper through the DGGGS office and are available online at the website in Adobe Acrobat (.PDF) file format.





## RESISTIVITY ALTITUDE LIMITS

In areas where the EM bird height exceeded 150 m, resistivity was not calculated. This avoids meaningless resistivity calculations due to small signals where the helicopter flies higher to avoid cultural objects or for safety reasons. Blank areas in the grids were created where zones of high flying correlated over more than one survey line.

## DESCRIPTIVE NOTES

The geophysical data were acquired with a DIGHEM<sup>®</sup> Electromagnetic (EM) system and a Fugro D1344 cesium magnetometer with a Schlumberger CS3 cesium sensor. The EM and magnetic sensors were flown at a height of 100 feet. In addition the survey recorded data from radar and laser altimeters, GPS navigation system, 50/60 Hz monitors and video cameras. Flight lines were performed with an AS-350-83 Squirrel helicopter at a mean terrain clearance of 200 feet with a spacing primarily of a quarter of a mile, and one eighth of a mile for about 97.6 miles. The lines were flown perpendicular to the flight lines at intervals of approximately 3 miles.

A Novatel OEM5-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 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.

## RESISTIVITY

The DIGHEM<sup>®</sup> EM system measured inphase and quadrature components at five frequencies. Two vertical coplanar coil-pairs operated at 1000 and 5000 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 9000 Hz using the pseudo-layer half space model. The data were interpolated onto a regular 80 m grid using a modified Akima (1970) technique. All grids were then resampled from the 80 m cell size down to a 20 m cell size to produce the maps and final grids contained in this publication.

Alkema, 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. 588-600.

by  
Laurel E. Burns, CGG, and Fugro GeoServices, Inc.  
2014

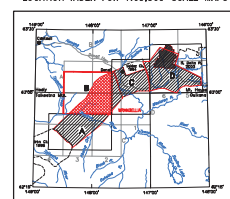
SCALE 1:63,360

1 0 1 2 3 4 MILES  
1 0 1 2 3 4 5 KILOMETERS

## 900 Hz COPLANAR APPARENT RESISTIVITY WITH DATA CONTOURS, WRANGELLIA SURVEY AREA, SOUTH-CENTRAL ALASKA

PARTS OF THE TALKEETNA MTNS, HEALY, AND MT HAYES QUADRANGLES

## LOCATION INDEX FOR 1:63,360-SCALE MAPS

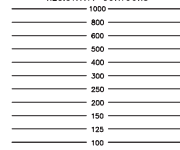


## SURVEY HISTORY

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 Fugro GeoServices, Inc. Airborne geophysical data for the area were acquired and processed by CGG in 2013 and 2014. Previously flown DGGG surveys collected to the current survey are shown in the location map by dashed lines, survey name, and date of publication. The project was funded by the Alaska State Legislature as part of the Alaska Strategic and Critical Minerals Assessment project, which is part of the Alaska Airborne Geophysical and Geological Mineral Inventory Program. Mirrored Exploration Corporation contributed initial data for a portion of the area shown above as denser halftone.

All data and maps produced to date from this survey are available in digital format on DVD for a nominal fee through DGGG, 3354 College Road, Fairbanks, Alaska, 99709-3707, and are downloadable for free from the DGGG website ([www.dggg.alaska.gov/pubs](http://www.dggg.alaska.gov/pubs)). Maps are also available on paper through the DGGG office, and are viewable online at the website in Adobe Acrobat .PDF file format.

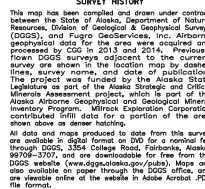
## RESISTIVITY CONTOURS



Contours in ohm-m at 10 intervals per decade

..... resistivity low







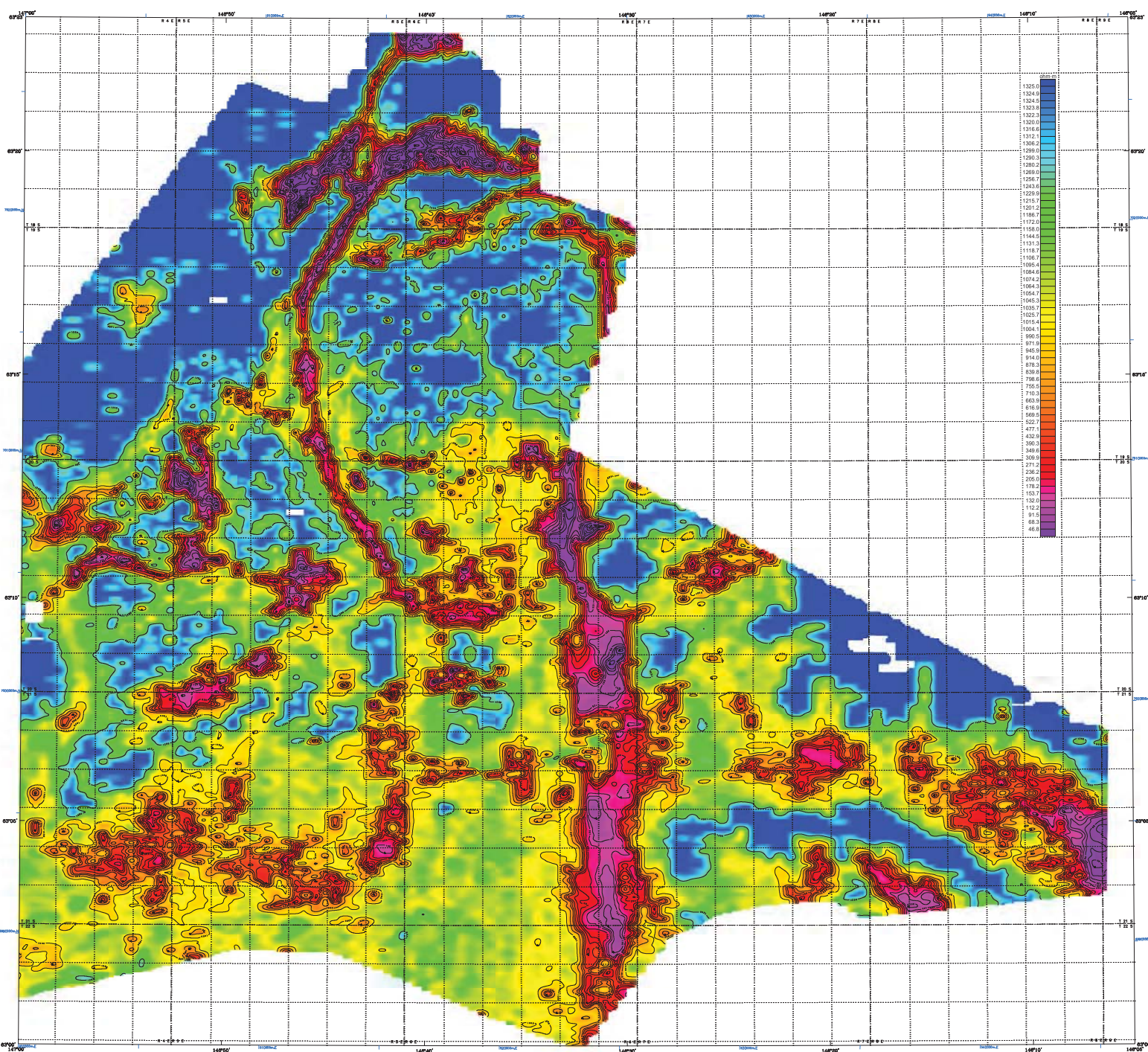


Figure 1: 900 Hz COPLANAR APPARENT RESISTIVITY with data contours and Wrangellia Survey Area, South-Central Alaska.



#### RESISTIVITY ALTITUDE LIMITS

In areas where the EM bird height exceeded 150 m, resistivity was not calculated. This avoids meaningless resistivity calculations due to small signals where the helicopter flew higher to avoid cultural objects or for safety reasons. Blank areas in the grid were created where zones of high flying correlated over more than one survey line.

#### DESCRIPTIVE NOTES

The geophysical data were acquired with a DIGHEM<sup>®</sup> Electromagnetic (EM) system and a Fugro D1344 cesium magnetometer with a Schintex CS3 cesium sensor. The EM and magnetic sensors were flown at a height of 100 feet. In addition the survey recorded data from rotor and laser altimeters, GPS navigation system, 50/60 Hz monitors and video cameras. Flights were performed with an AS-350-B3 Spirit helicopter at a mean terrain clearance of 200 feet with three horizontal coplanar coils operated at 900, 720 and 560 Hz. EM data were sampled at 5.1 second intervals. The EM system responds to bedrock conductors, conductive overburden, and cultural sources. Apparent resistivity is generated from in-phase and quadrature components 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. All grids were then resampled from the 80 m cell size down to a 25 m cell size to produce the maps and find grids contained in this publication.

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 1 m. All data were projected onto the Clarke 1866 (UTM zone 6) projection, 12.5 m grid, with a north constant of 147° and a north constant of 500,000. Positional accuracy of the presented data is better than 10 m with respect to the UTM grid.

#### RESISTIVITY

The DIGHEM<sup>®</sup> EM system measured in-phase and quadrature components at five frequencies. Two vertical coiled coil-pairs operated at 1000 and 5000 Hz while three horizontal coplanar coils operated at 900, 720 and 560 Hz. EM data were sampled at 5.1 second intervals. The EM system responds to bedrock conductors, conductive overburden, and cultural sources. Apparent resistivity is generated from in-phase and quadrature components 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. All grids were then resampled from the 80 m cell size down to a 25 m cell size to produce the maps and find grids contained in this publication.

Altma, H. 1970. A new method of interpolating 2-D cross-sections of geophysical sections. p. 115-124. In: J. R. Smith, Jr. (ed.), *Geophysical Methods*. American Institute of Mining, Metallurgical and Petroleum Engineers, New York.

by  
Laurel E. Burns, CCG, and Fugro Geoservices, Inc.  
2014

Figure 1: 900 Hz COPLANAR APPARENT RESISTIVITY with data contours and Wrangellia Survey Area, South-Central Alaska.

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Figure 1: 900 Hz COPLANAR APPARENT RESISTIVITY with data contours and Wrangellia Survey Area, South-Central Alaska.

## 900 Hz COPLANAR APPARENT RESISTIVITY WITH DATA CONTOURS, WRANGELLIA SURVEY AREA, SOUTH-CENTRAL ALASKA

PARTS OF THE TALKEETNA MTNS, HEALY, AND MT HAYES QUADRANGLES

by  
Laurel E. Burns, CCG, and Fugro Geoservices, Inc.  
2014

Figure 1: 900 Hz COPLANAR APPARENT RESISTIVITY with data contours and Wrangellia Survey Area, South-Central Alaska.

Figure 1: 900 Hz COPLANAR APPARENT RESISTIVITY with data contours and Wrangellia Survey Area, South-Central Alaska.

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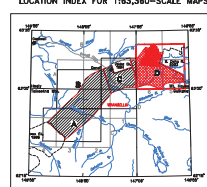
Figure 1: 900 Hz COPLANAR APPARENT RESISTIVITY with data contours and Wrangellia Survey Area, South-Central Alaska.

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Figure 1: 900 Hz COPLANAR APPARENT RESISTIVITY with data contours and Wrangellia Survey Area, South-Central Alaska.

#### LOCATION INDEX FOR 1:63,360-SCALE MAPS

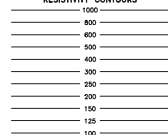


#### SURVEY HISTORY

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 Fugro Geoservices, Inc. All geophysical data for the area were acquired and processed by CCG in 2013 and 2014. Previous flown DGGG surveys adjacent to the current survey are shown on the location map by dashed lines, survey names, and date of publication. The project was funded by the Alaska State Legislature as part of the Alaska Strategic and Critical Minerals Assessment project, which is part of the Alaska Division of Geological & Geophysical Surveys (DGGG) Mineral Inventory Program. Fugro Geoservices, Inc. contributed inflight data for a portion of the area shown on the location map.

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#### RESISTIVITY CONTOURS



Contours in ohm-m at 10 intervals per decade  
..... resistivity low





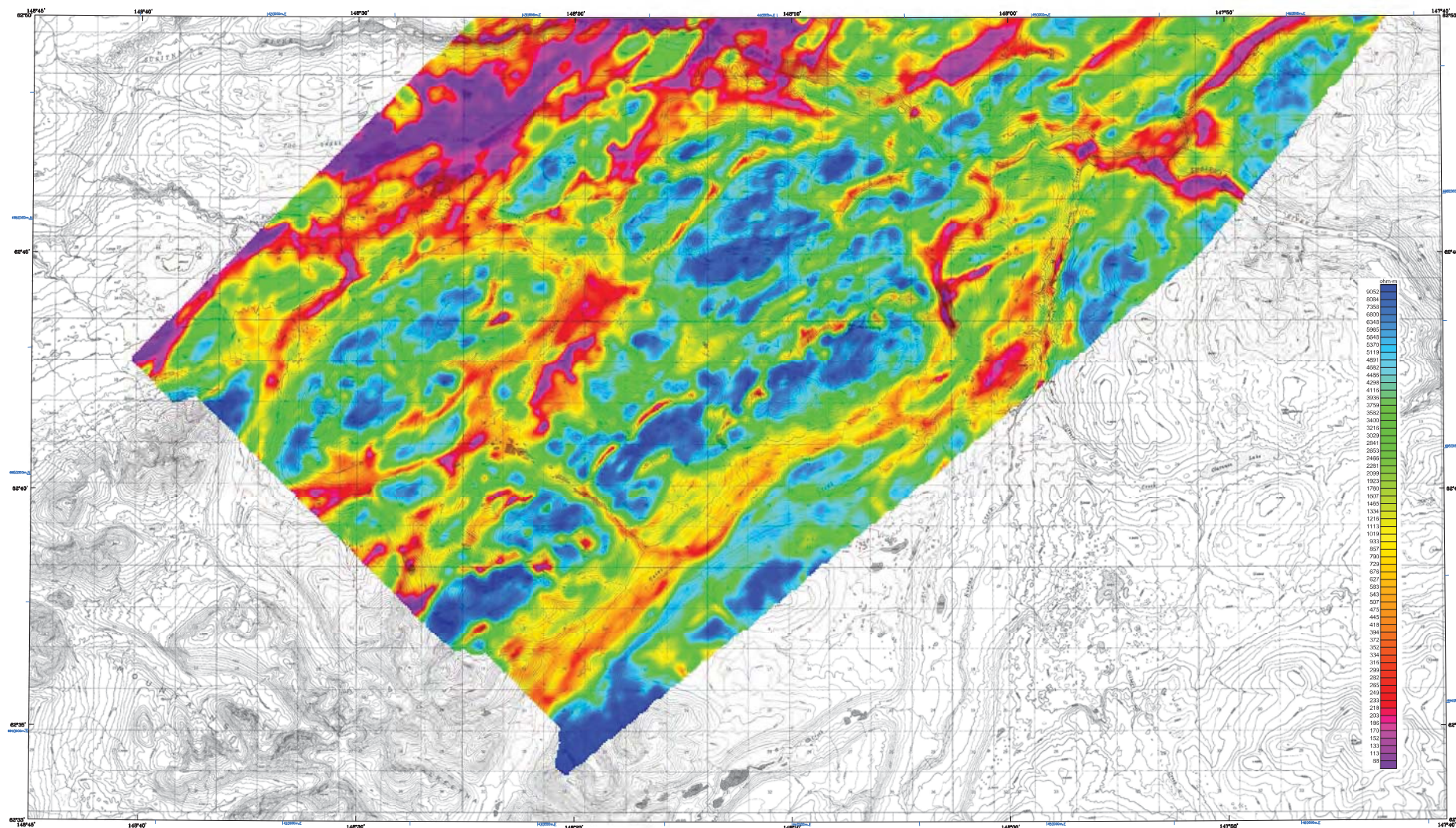
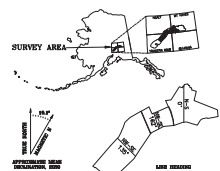


FIG. 100A. 7200 Hz COPLANAR APPARENT RESISTIVITY WITH TOPOGRAPHY, WRANGELLIA SURVEY AREA, SOUTH-CENTRAL ALASKA. SCALE 1:63,360. D-4, 100A.



#### DESCRIPTIVE NOTES

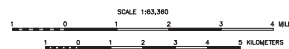
The geophysical data were acquired with a DIGHEM Electromagnetic (EM) system and a Fugro D1344 cesium magnetometer with a Schlumberger CS3 cesium sensor. The EM and magnetic sensors were flown at a height of 100 feet. In addition the survey recorded data from radar and laser altimeters, GPS navigation system, 307/80 Hz monitors and video cameras. Flights were performed with an AS-350B3 Super Puma helicopter at a mean terrain clearance of 200 feet with a spacing primarily of a quarter of a mile, and one eighth of a mile for about 97.9 sq miles. The lines were flown perpendicular to the flight lines at intervals of approximately 3 miles.

A Novatel OEM-421 Global Positioning System was used for navigation. The helicopter position was derived every 0.3 seconds using post-flight differential positioning to a relative accuracy of better than 0.5 m. Flight altitudes 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.

#### RESISTIVITY

The DIGHEM™ EM system measured inphase and quadrature components of the response. The vertical coplanar coil-pairs operated at 1000 and 5000 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-impedance half space model. The data were interpolated onto a regular 80 m grid using a modified Akima (1970) technique. All grids were then resampled from the 80 m cell size down to a 25 m cell size to produce the mosaic and final grid contained in this publication.

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. 6, p. 589-602.

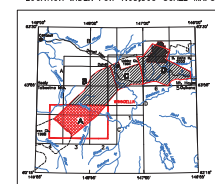


## 7200 Hz COPLANAR APPARENT RESISTIVITY WITH TOPOGRAPHY, WRANGELLIA SURVEY AREA, SOUTH-CENTRAL ALASKA

PARTS OF THE TALKIEETHA MTS, HEALY, AND MT HAYES QUADRANGLES

by  
Lauri E. Burns, CGG, and Fugro Geoservices, Inc.  
2014

#### LOCATION INDEX FOR 1:63,360-SCALE MAPS



#### SURVEY HISTORY

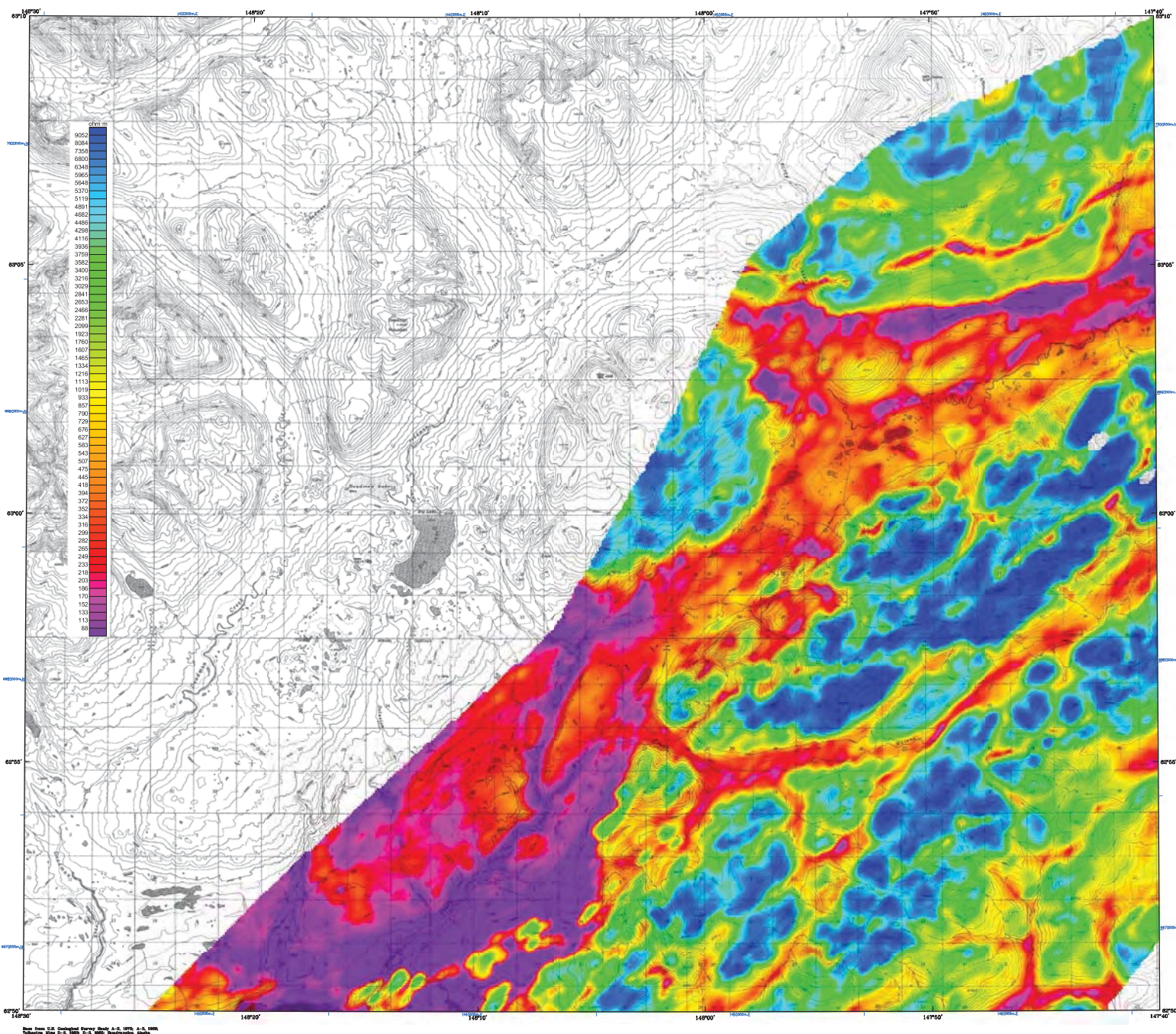
This map has been compiled and drawn under contract between the State of Alaska Department of Natural Resources, Division of Geological & Geophysical Surveys (DGGGS), and Fugro Geoservices, Inc. Airborne geophysical data for the area were acquired and processed by CGG in 2013 and 2014. Previously flown DGGGS surveys adjacent to the current survey are shown in the location map in dashed lines, survey name, and date of publication. The project was funded by the Alaska State Legislature as part of the Alaska Strategic and Critical Minerals Assessment project, which is part of the Alaska Airborne Geophysical and Geological Mineral Inventory Program. Airborne Exploration Corporation contributed InSAR data for a portion of the area shown above as dashed shading.

All data and maps produced to date from this survey are available in digital format on DVD for a nominal fee through DGGGS, 3354 College Road, Fairbanks, Alaska, 99709-3757, and are downloadable for free from the DGGGS website ([www.dgggs.alaska.gov/pubs](http://www.dgggs.alaska.gov/pubs)). Maps are also available on paper through the DGGGS office and are available online at the website in Adobe Acrobat (.PDF) file format.

#### RESISTIVITY ALTITUDE LIMITS

In areas where the EM bird height exceeded 150 m, resistivity was not calculated. This avoids meaningless resistivity calculations due to small signals where the helicopter flew higher to avoid cultural objects or for safety reasons. Blank areas in the grid were created where zones of high flying correlated over more than one survey line.



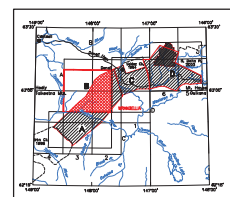


## 7200 Hz COPLANAR APPARENT RESISTIVITY WITH TOPOGRAPHY, WRANGELLIA SURVEY AREA, SOUTH-CENTRAL ALASKA

PARTS OF THE TALKIETNA MTNS, HEALY, AND MT HAYES QUADRANGLES

by  
Laurel E. Burns, CGG, and Fugro GeoServices, Inc.  
2014

### LOCATION INDEX FOR 1:63,360-SCALE MAPS



### 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 Fugro GeoServices, Inc. Airborne geophysical data for the area were acquired and processed by CGG in 2013 and 2014. Previously flown DGGGS surveys adjacent to the survey are shown in the location map by dashed lines, survey name, and date of publication. The project was funded by the Alaska State Legislature as part of the Alaska Strategic and Critical Minerals Assessment project, which is part of the Alaska Airborne Geophysical and Geological Mineral Inventory Program. Mirrored Exploration Corporation contributed initial data for a portion of the area shown above as dashed hatching.

All data and maps produced to date from this survey are available in digital format on DVD for a nominal fee through DGGGS, 3354 College Road, Fairbanks, Alaska, 99709-3707, and are downloadable for free from the DGGGS website ([www.dggs.alaska.gov/pubs](http://www.dggs.alaska.gov/pubs)). Maps are also available on paper through the DGGGS office, and are viewable online at the website in Adobe Acrobat (.PDF) file format.

### RESISTIVITY

The DIGHEM<sup>®</sup> EM system measured inphase and quadrature components at five frequencies, two vertical coplanar coil-pairs operated at 1000 and 5000 Hz while three horizontal coplanar coil-pairs operated at 800, 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. All grids were then resampled from the 80 m cell size down to a 25 m cell size to produce the mosaic and final grids contained in this publication.

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.

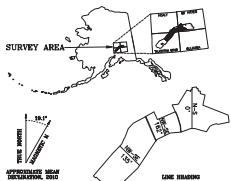
### RESISTIVITY ALTITUDE LIMITS

In areas where the EM bird height exceeded 150 m, resistivity was not calculated. This avoids meaningless resistivity calculations due to small signals where the helicopter flew higher to avoid cultural objects or for safety reasons. Blank areas in the grids were created where zones of high flying correlated over more than one survey line.

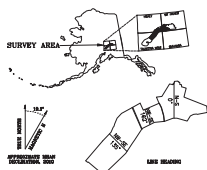
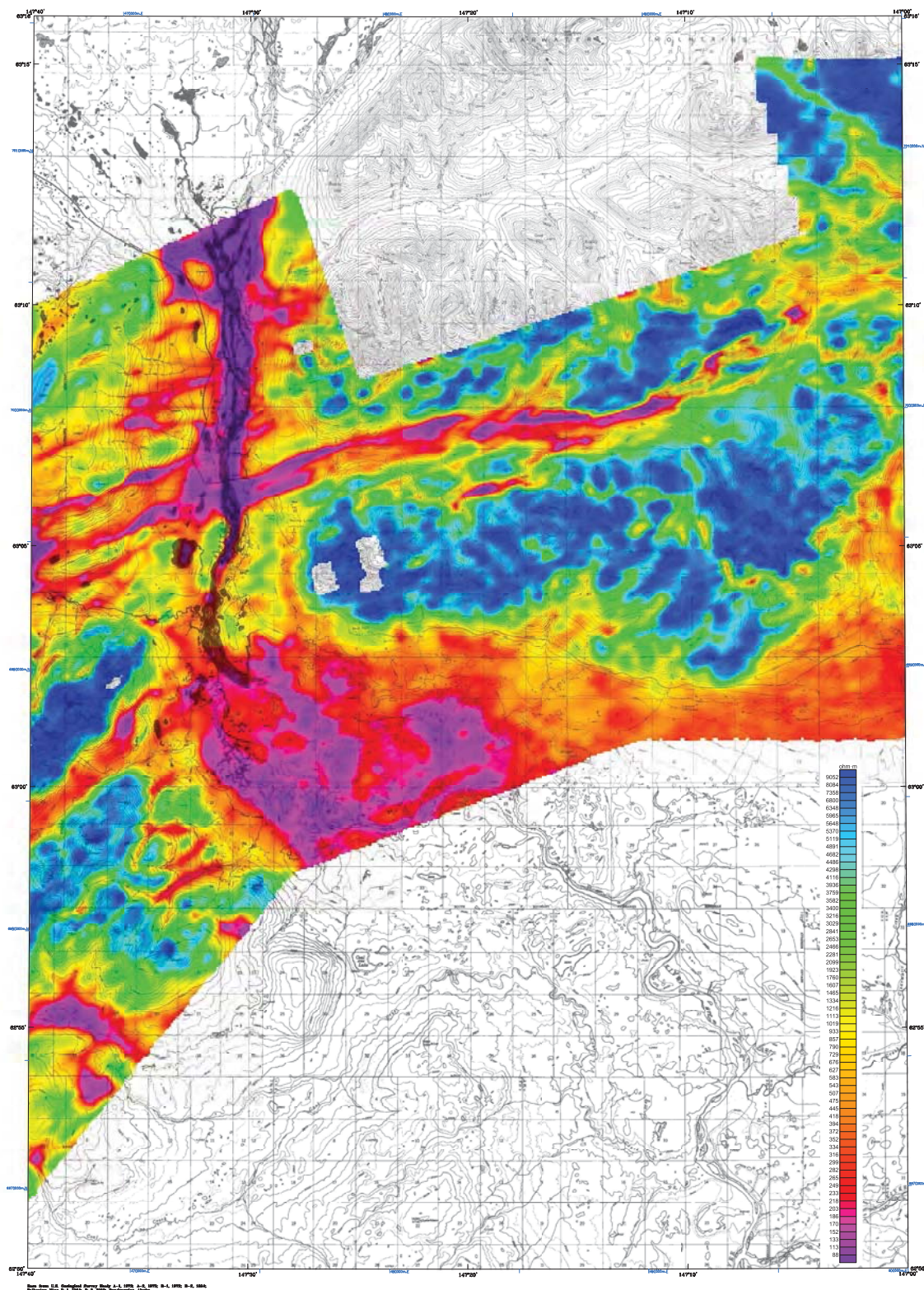
### DESCRIPTIVE NOTES

The geophysical data were acquired with a DIGHEM<sup>®</sup> Electromagnetic (EM) system and a Fugro D1344 cesium magnetometer with a Schlumberger CS3 cesium sensor. The EM and magnetic sensors were flown at a height of 100 feet. In addition the survey recorded data from radar and laser altimeters, GPS navigation system, 50/60 Hz monitors and video cameras. Flights were performed with an AS-350-83 Squirrel helicopter at a mean terrain clearance of 200 feet with a spacing primarily of a quarter of a mile, and one eighth of a mile for about 97.6 miles. The lines were flown perpendicular to the flight lines at intervals of approximately 3 miles.

A Novatel OEM5-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 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.







## 7200 Hz COPLANAR APPARENT RESISTIVITY WITH TOPOGRAPHY, WRANGELLIA SURVEY AREA, SOUTH-CENTRAL ALASKA

PARTS OF THE TALLEKETA MTS, HEALY, AND MT HAYES QUADRANGLES

by  
Laural E. Burns, OGS, and Fugro Geoservices, Inc.  
2014

### DESCRIPTIVE NOTES

The geophysical data were acquired with a DIGHEM<sup>®</sup> Electromagnetic (EM) system and a Fugro D1344 cesium magnetometer with a Schriber C3 cesium sensor. The EM and magnetic data were flown at a height of 100 feet. In addition, the survey included data from a Fugro D1344 cesium magnetometer and a Fugro D1344 cesium sensor. The survey was performed with an AS-350-B3 Squirrel helicopter at a mean terrain clearance of 200 feet with a spacing primarily of a quarter of a mile, and one eighth of a mile for about 9.0 miles. The 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 0.0 seconds using post-flight differential positioning to a relative accuracy of better than 1 m. Flight path coordinates were projected onto the NAD83 datum (NAD 83 datum) using the NAD83 datum. The datum is a central meridian (CM) of 147° 0' north constant of 0 and an east constant of 100,000. Positional accuracy of the presented data is better than 10 m with respect to the UTM grid.

### RESISTIVITY

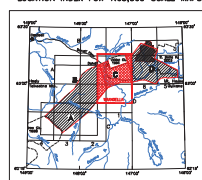
The DIGHEM<sup>®</sup> EM system measured in-phase and quadrature components at the frequencies. Two vertical coiled coils were operated at 1000 and 5000 Hz with three horizontal coplanar coils operated at 900, 7200 and 50,000 Hz. EM data were sampled at 0.1 second intervals. The EM system responds to bedrock conductors, conductive overburden, and cultural sources. Apparent resistivity is generated from the in-phase and quadrature component of the response. The apparent resistivity is generated from the in-phase and quadrature component of the response. The apparent resistivity is generated from the in-phase and quadrature component of the response. The apparent resistivity is generated from the in-phase and quadrature component of the response.

Altitude is 1470. A new method of resistivity data processing was used. The resistivity data were processed using a new method of resistivity data processing. The resistivity data were processed using a new method of resistivity data processing. The resistivity data were processed using a new method of resistivity data processing.

### RESISTIVITY ALTITUDE LIMITS

In areas where the EM bird height exceeded 150 m, resistivity was not calculated. This avoids meaningless resistivity calculations due to small depths where the helicopter flew higher to avoid cultural objects or for safety reasons. Blank areas in the grids were created where zones of high flying correlated over more than one survey line.

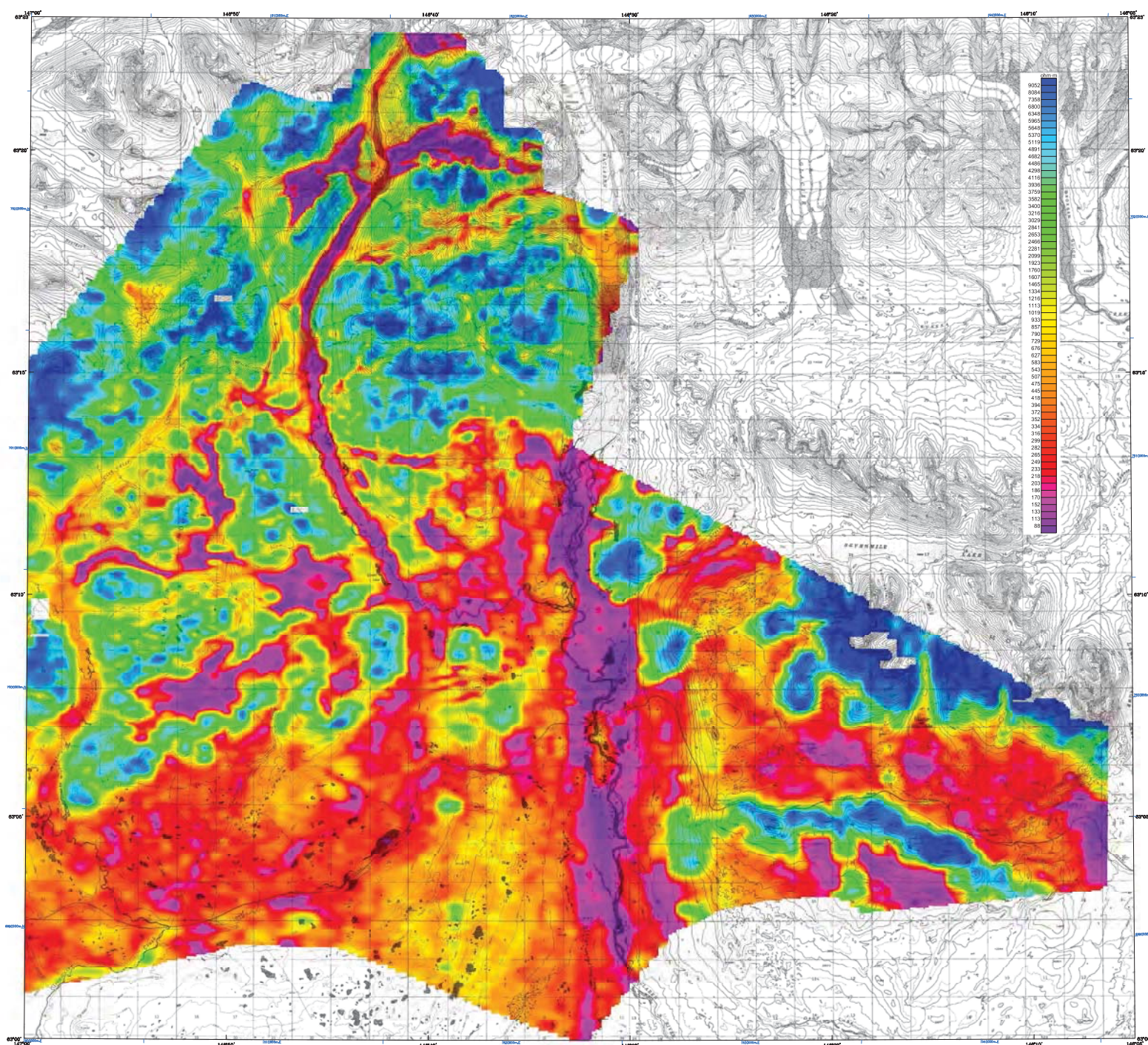
### LOCATION INDEX FOR 1:63,360-SCALE MAPS



### SURVEY HISTORY

This map has been compiled and shown under contract between the State of Alaska, Department of Natural Resources, Division of Geological & Geophysical Surveys (DGGGS), and Fugro Geoservices, Inc. Airborne geophysical data for the area were acquired and processed by DGGGS in 2013 and 2014. Previously flown DGGGS surveys collocated to the current survey are shown in the location map by dashed lines, survey names, and date of publication. The project was funded by the Alaska State Legislature as part of the Alaska Strategic and Critical Minerals Assessment project, which is part of the Alaska Strategic and Critical Minerals Assessment project. The project was funded by the Alaska State Legislature as part of the Alaska Strategic and Critical Minerals Assessment project, which is part of the Alaska Strategic and Critical Minerals Assessment project. The project was funded by the Alaska State Legislature as part of the Alaska Strategic and Critical Minerals Assessment project, which is part of the Alaska Strategic and Critical Minerals Assessment project.





U.S. Geological Survey, Alaska Division, 4150 Delta Drive, Anchorage, Alaska 99508



**DESCRIPTIVE NOTES**

The geophysical data were acquired with a DIGHEM Electromagnetic (EM) system and a Fugro D1344 cesium magnetometer with a Schriber CS3 cesium sensor. The EM and magnetic sensors were flown at a height of 100 feet. In addition the survey recorded data from rotor and laser altimeters, GPS navigation system, 50/60 Hz monitors and video cameras. Flights were performed with an AS-350-33 Super helicopter at a mean terrain clearance of 200 feet with a spacing interval of a quarter of a mile, and one swath of a mile for about 97.9 sq miles. The 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 0.1 m. Flight path positions were projected onto the Clarke 1866 (UTM zone 6) datum. The datum datum used is a north constant (CM) of 147° and a north constant of 0.000000. Positional accuracy of the presented data is better than 10 m with respect to the UTM grid.

**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 800, 7200 and 56200 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 56200 Hz using the pseudo-layer half space model. The data were interpolated onto a regular 80 m grid using a modified Akima (1970) technique. All grids were then resampled from the 80 m cell size down to a 25 m cell size to produce the maps and final grids contained in this publication.

Aluma, H., 1970, A new method of interpolation of a rough curve of geophysical data, in: "The use of computers in geophysics", pp. 117-124, in: "The use of computers in geophysics", pp. 117-124.

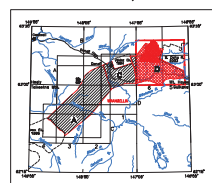
by  
Laurel E. Burns, CCG, and Fugro Geoservices, Inc.  
2014

## 7200 Hz COPLANAR APPARENT RESISTIVITY WITH TOPOGRAPHY, WRANGELLIA SURVEY AREA, SOUTH-CENTRAL ALASKA

PARTS OF THE TALKEETNA MTNS, HEALY, AND MT HAYES QUADRANGLES

SCALE 1:63,360  
0 1 2 3 4 MILES  
0 1 2 3 4 KILOMETERS

LOCATION INDEX FOR 1:63,360-SCALE MAPS



### SURVEY HISTORY

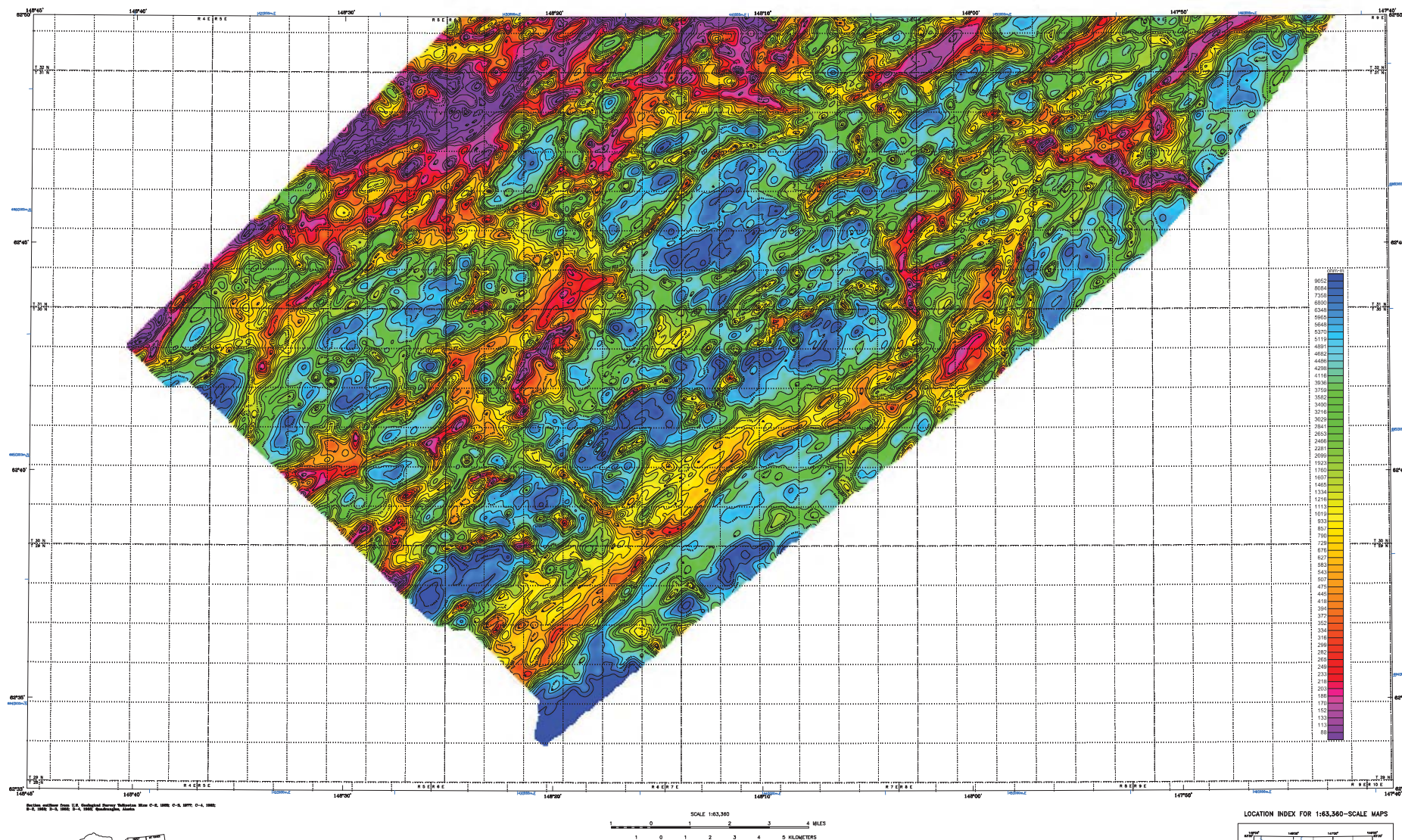
This map has been compiled and drawn under contract between the State of Alaska, Department of Natural Resources, Division of Geological & Geophysical Surveys (DGGG), and Fugro Geoservices, Inc. Airborne geophysical data for the area were acquired and processed by CCG in 2013 and 2014. Previously flown DGGG surveys adjacent to the current survey are shown in the location map by dashed lines. Survey name and date of publication. The project was funded by the Alaska State Legislature as part of the Alaska Strategic and Critical Minerals Assessment project, which is part of the Alaska Airborne Geophysical and Geological Mineral Inventory Program. Mitnick Exploration Corporation contributed inflit data for a portion of the area shown above at a 1:50,000 scale.

All data and maps produced to date from this survey are available in digital format on DVD for download free through DGGG, 3354 College Road, Fairbanks, Alaska, 99709-1077, and are downloadable for free through the DGGG website ([www.dggg.alaska.gov/pubs/](http://www.dggg.alaska.gov/pubs/)). Maps are also available on paper through the DGGG office, and are viewable online at the website in Adobe Acrobat .PDF file format.

**RESISTIVITY ALTITUDE LIMITS**

In areas where the EM bird height exceeded 150 m, resistivity was not calculated. This avoids meaningless resistivity calculations due to small signals where the helicopter flew higher to avoid cultural objects or for safety reasons. Blank areas in the grids were created where zones of high flying correlated over more than one survey line.





## RESISTIVITY ALTITUDE LIMITS

In areas where the EM bird height exceeded 180 m, resistivity was not calculated. The resistivity contours are calculated using a relative accuracy of better than 5 m. Resistivity contours are 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.

## DESCRIPTIVE NOTES

The geophysical data were acquired with a DIOHEM<sup>®</sup> Electromagnetic (EM) system and a Fugro D1344 cesium magnetometer with a Schriew CS3 cesium sensor. The EM and magnetic sensors were flown at a height of 100 feet. In addition the survey recorded data from radar and laser altimeters, GPS navigation systems, 50/60 Hz monitors and video cameras. Flights were performed with an R44-400 helicopter at a mean terrain clearance of 200 feet with a spacing primarily of a square grid of 0.1 miles, and one eighth of a mile for about 97.9 sq miles. The lines were flown perpendicular to the flight lines at intervals of approximately 3 miles.

A Novatel CM4S-C21, Global Positioning System was used for navigation. The helicopter position was derived using a 3.3 second real-time differential positioning to a relative accuracy of better than 5 m. Flight altitudes 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.

## RESISTIVITY

The DIOHEM<sup>®</sup> EM system measured in-phase and quadrature components of the frequency response. The vertical coil-pairs operated at 1000 and 5000 Hz while the horizontal 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, conductive overburden, and cultural sources. Apparent resistivity is generated from the in-phase and quadrature component of the response. The data were interpolated onto a regular 80 m grid using a modified Akima (1970) technique. All grids were then resampled from the 80 m cell size down to a 25 m cell size to produce the maps and final grids contained in this publication.

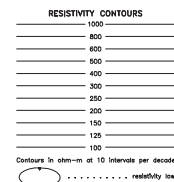
Alaska, in 1975, is the method of interpretation and present rules apply to the entire program. During the development of the program, the following rules were used:

SCALE 1:63,360  
1 2 3 4 MILES  
1 2 3 4 KILOMETERS

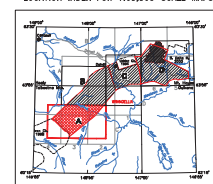
## 7200 Hz COPLANAR APPARENT RESISTIVITY WITH DATA CONTOURS, WRANGELLIA SURVEY AREA, SOUTH-CENTRAL ALASKA

PARTS OF THE TALKIEITHA MTNS, HEALY, AND MT HAYES QUADRANGLES

by  
Laurel E. Burns, CGG, and Fugro GeoServices, Inc.  
2014



## LOCATION INDEX FOR 1:63,360-SCALE MAPS

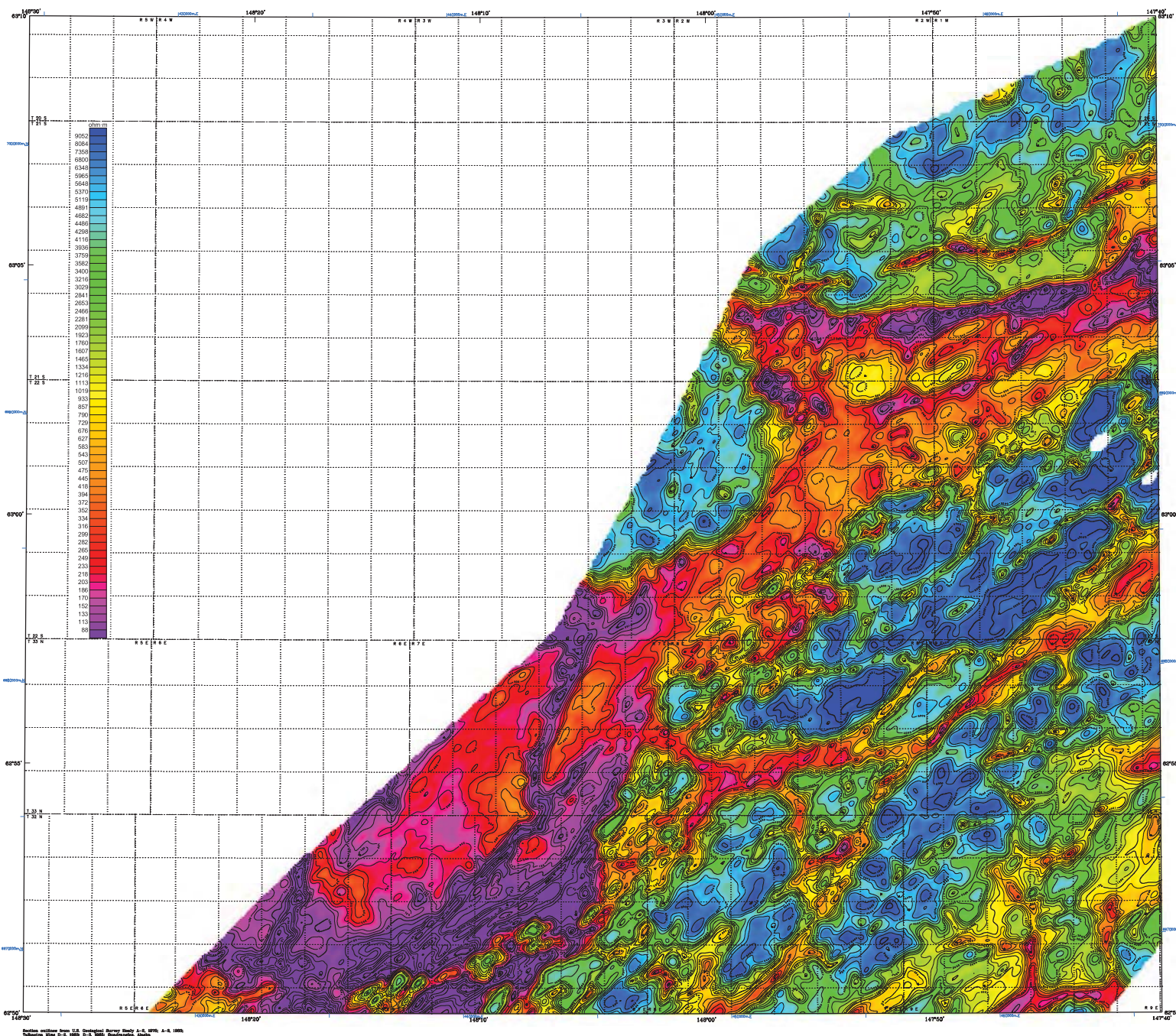


## SURVEY HISTORY

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 Fugro GeoServices, Inc. Previous geophysical data for the area were acquired and processed by CGG in 2013 and 2014. Previous flown DGGGS surveys adjacent to the current survey are shown in the location map by dashed lines, survey name, and date of publication. The project was funded by the Alaska State Legislature as part of the Alaska Strategic and Critical Minerals Assessment project, which is part of the Alaska Airborne Geophysical and Geological Mineral Inventory Program. Alaskan Exploration Corporation contributed infill data for a portion of the area shown above as dashed outlines.

All data and maps produced to date from this survey are available in digital format on DVD for a nominal fee through DGGGS, 3304 College Road, Fairbanks, Alaska, 99709-3707, and are downloadable for free from the DGGGS website ([www.dgggs.alaska.gov/pubs](http://www.dgggs.alaska.gov/pubs)). Maps are also available on paper through the DGGGS office and are available online at the website in Adobe Acrobat (.PDF) file format.





## RESISTIVITY ALTITUDE LIMITS

In areas where the EM bird height exceeded 150 m, resistivity was not calculated. This avoids meaningless resistivity calculations due to small signals where the helicopter flies higher to avoid cultural objects or for safety reasons. Blank areas in the grids were created where zones of high flying correlated over more than one survey line.

## DESCRIPTIVE NOTES

The geophysical data were acquired with a DIGHEM<sup>®</sup> Electromagnetic (EM) system and a Fugro D1344 cesium magnetometer with a Schlumberger CS3 cesium sensor. The EM and magnetic sensors were flown at a height of 100 feet. In addition the survey recorded data from radar and laser altimeters, GPS navigation system, 50/60 Hz monitors and video cameras. Flight lines were performed with an AS-350-83 Squirrel helicopter at a mean terrain clearance of 200 feet with a spacing primarily of a quarter of a mile, and one eighth of a mile for about 97.6 miles. The lines were flown perpendicular to the flight lines at intervals of approximately 3 miles.

A Novatel OEM5-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 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.

## RESISTIVITY

The DIGHEM<sup>®</sup> EM system measured inphase and quadrature components at five frequencies. Two vertical coplanar 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. All grids were then resampled from the 80 m cell size down to a 25 m cell size to produce the maps and final grids contained in this publication.

Alkema, 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. 588-600.

by  
Laurel E. Burns, CGG, and Fugro GeoServices, Inc.  
2014



SCALE 1:63,360  
1 0 1 2 3 4 MILES  
1 0 1 2 3 4 KILOMETERS

## 7200 Hz COPLANAR APPARENT RESISTIVITY WITH DATA CONTOURS, WRANGELLIA SURVEY AREA, SOUTH-CENTRAL ALASKA

PARTS OF THE TALKKEETNA MTNS, HEALY, AND MT HAYES QUADRANGLES

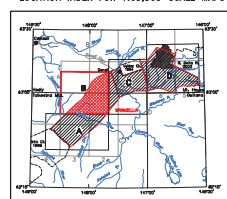
## RESISTIVITY CONTOURS

1000
800
600
500
400
300
250
200
150
125
100

Contours in ohm-m at 10 intervals per decade

..... resistivity low

## LOCATION INDEX FOR 1:63,360-SCALE MAPS



## SURVEY HISTORY

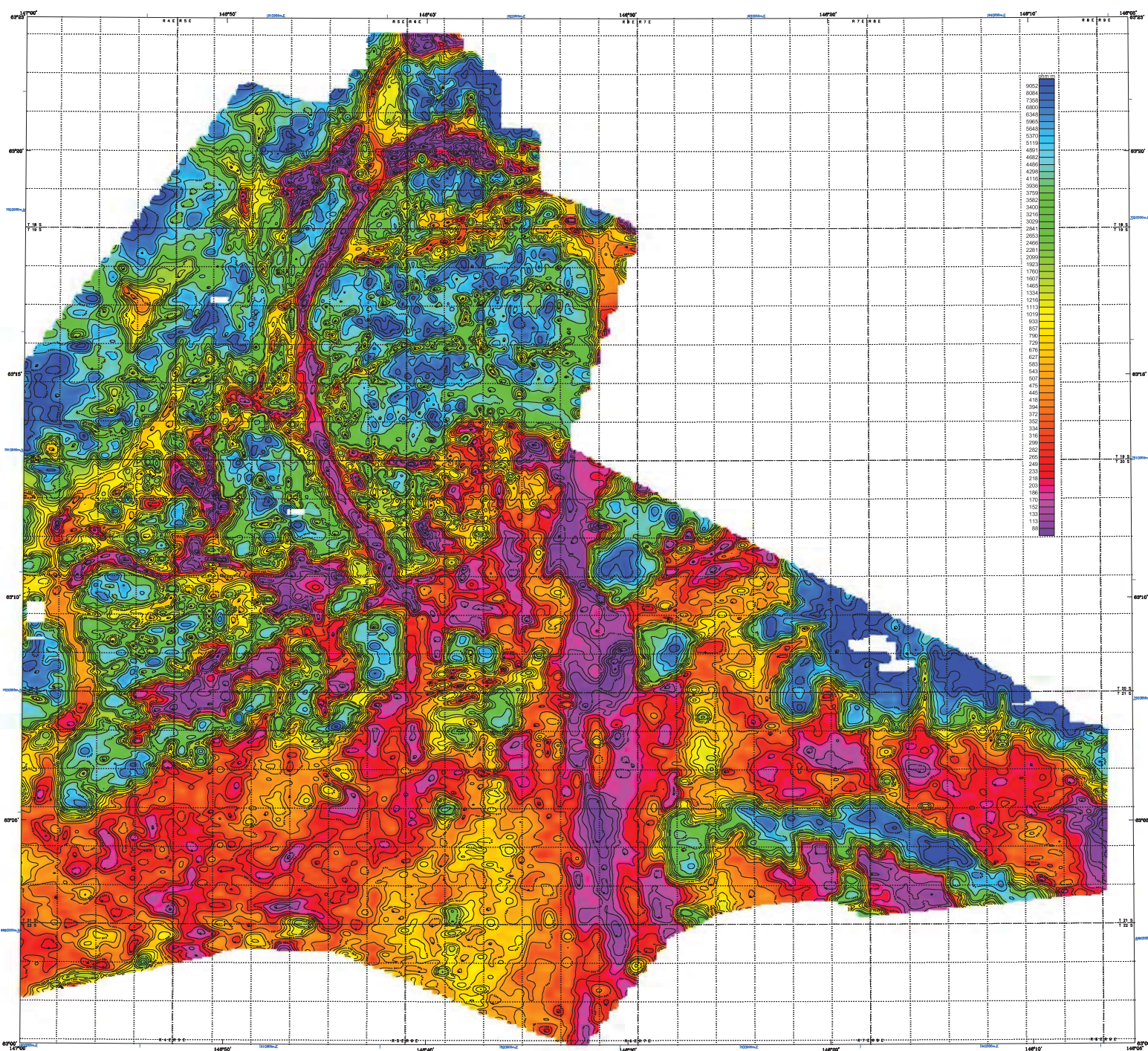
This map has been compiled and drawn under contract between the State of Alaska, Department of Natural Resources, Division of Geological & Geophysical Surveys (DGGG), and Fugro GeoServices, Inc. Airborne geophysical data for the area were acquired and processed by CGG in 2013 and 2014. Previously flown DGGG surveys adjacent to the current survey are shown in the location map by dashed lines, survey name, and date of publication. The project was funded by the Alaska State Legislature as part of the Alaska Strategic and Critical Minerals Assessment project, which is part of the Alaska Airborne Geophysical and Geological Mineral Inventory Program. Milrock Exploration Corporation contributed initial data for a portion of the area shown above as denser halftone.

All data and maps produced to date from this survey are available in digital format on DVD for a nominal fee through DGGG, 3354 College Road, Fairbanks, Alaska, 99709-3707, and are downloadable for free from the DGGG website ([www.dggg.alaska.gov/pubs](http://www.dggg.alaska.gov/pubs)). Maps are also available on paper through the DGGG office, and are viewable online at the website in Adobe Acrobat .PDF file format.









## RESISTIVITY ALTITUDE LIMITS

In areas where the EM bird height exceeded 150 m, resistivity was not calculated. This avoids meaningless resistivity calculations due to small signals where the helicopter flew higher to avoid cultural objects or for safety reasons. Blank areas in the grids were created where zones of high flying correlated over more than one survey line.

## DESCRIPTIVE NOTES

The geophysical data were acquired with a DIGHEM<sup>®</sup> Electromagnetic (EM) system and a Fugro D1344 cesium magnetometer with a Schintex CS3 cesium sensor. The EM and magnetic sensors were flown at a height of 100 feet. In addition the survey recorded data from rotor and laser altimeters, GPS navigation system, 50/60 Hz monitors and video cameras. Flights were performed with an AS-350-33 Spirit helicopter at a mean terrain clearance of 200 feet with three horizontal coplanar coil-pairs operated at 900, 7200 and 56,000 Hz. EM data were sampled at 5.1 second intervals. The EM system responds to bedrock conductors, conductive overburden, and cultural sources. Apparent resistivity is generated from in-phase and quadrature components 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. All grids were then resampled from the 80 m cell size down to a 25 m cell size to produce the maps and final grids contained in this publication.

A Novatel OEM4-G2L Global Positioning System was used for navigation. The helicopter location was derived every 0.5 seconds using post-flight differential positioning to a relative accuracy of better than 10 m. All data were projected onto the Clarke 1866 (UTM zone 6) datum and an east constant of 500,000. Positional accuracy of the presented data is better than 10 m with respect to the UTM grid.

## RESISTIVITY

The DIGHEM<sup>®</sup> EM system measured in-phase and quadrature components at five frequencies. Two vertical coiled coil-pairs operated at 1000 and 5200 Hz while three horizontal coplanar coil-pairs operated at 900, 7200 and 56,000 Hz. EM data were sampled at 5.1 second intervals. The EM system responds to bedrock conductors, conductive overburden, and cultural sources. Apparent resistivity is generated from in-phase and quadrature components 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. All grids were then resampled from the 80 m cell size down to a 25 m cell size to produce the maps and final grids contained in this publication.

Alm, L. 1970. A new method of interpolating 2-D. *Journal of Geophysical Research*, v. 75, no. 4, p. 288-292.

by  
Laurel E. Burns, CCG, and Fugro Geoservices, Inc.  
2014

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2014

Laurel E. Burns, CCG, and Fugro Geoservices, Inc.  
2014

## 7200 Hz COPLANAR APPARENT RESISTIVITY WITH DATA CONTOURS, WRANGELLIA SURVEY AREA, SOUTH-CENTRAL ALASKA

PARTS OF THE TALKEETNA MTNS, HEALY, AND MT HAYES QUADRANGLES

by  
Laurel E. Burns, CCG, and Fugro Geoservices, Inc.  
2014

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2014

Laurel E. Burns, CCG, and Fugro Geoservices, Inc.  
2014

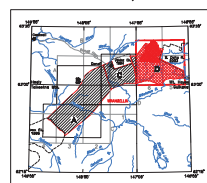
Laurel E. Burns, CCG, and Fugro Geoservices, Inc.  
2014

Laurel E. Burns, CCG, and Fugro Geoservices, Inc.  
2014

Laurel E. Burns, CCG, and Fugro Geoservices, Inc.  
2014

Laurel E. Burns, CCG, and Fugro Geoservices, Inc.  
2014

## LOCATION INDEX FOR 1:63,360-SCALE MAPS



## 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 Fugro Geoservices, Inc. Airborne geophysical data for the area were acquired and processed by CCG in 2013 and 2014. Preliminary flown DGGG surveys adjacent to the current survey are shown in the location map by dashed lines, survey name, and date of publication. The project was funded by the Alaska State Legislature as part of the Alaska Strategic and Critical Minerals Assessment project, which is part of the Alaska Airborne Geophysical and Geological Mineral Inventory Program. Milrock Exploration Corporation contributed inflight data for a portion of the area shown above as dashed lines.

All data and maps produced to date from this survey are available in digital format on DVD for a nominal fee through DGGG, 3354 College Road, Fairbanks, Alaska, 99709-1077, and are downloadable for free from the DGGG website ([www.dggg.alaska.gov/pubs](http://www.dggg.alaska.gov/pubs)). Maps are also available on paper through the DGGG office, and are viewable online at the website in Adobe Acrobat .PDF file format.

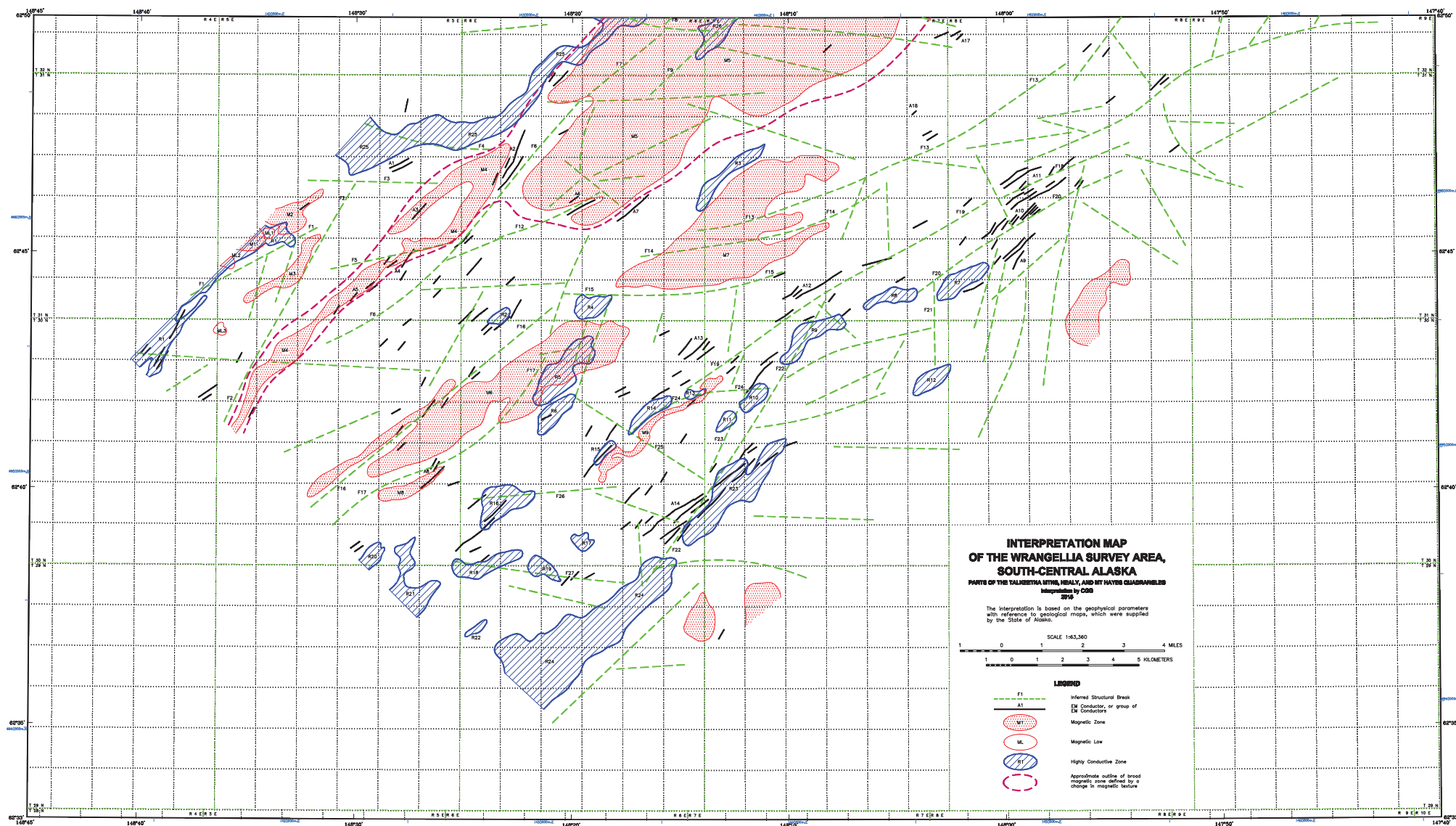
## RESISTIVITY CONTOURS

800
600
500
400
300
250
200
150
100

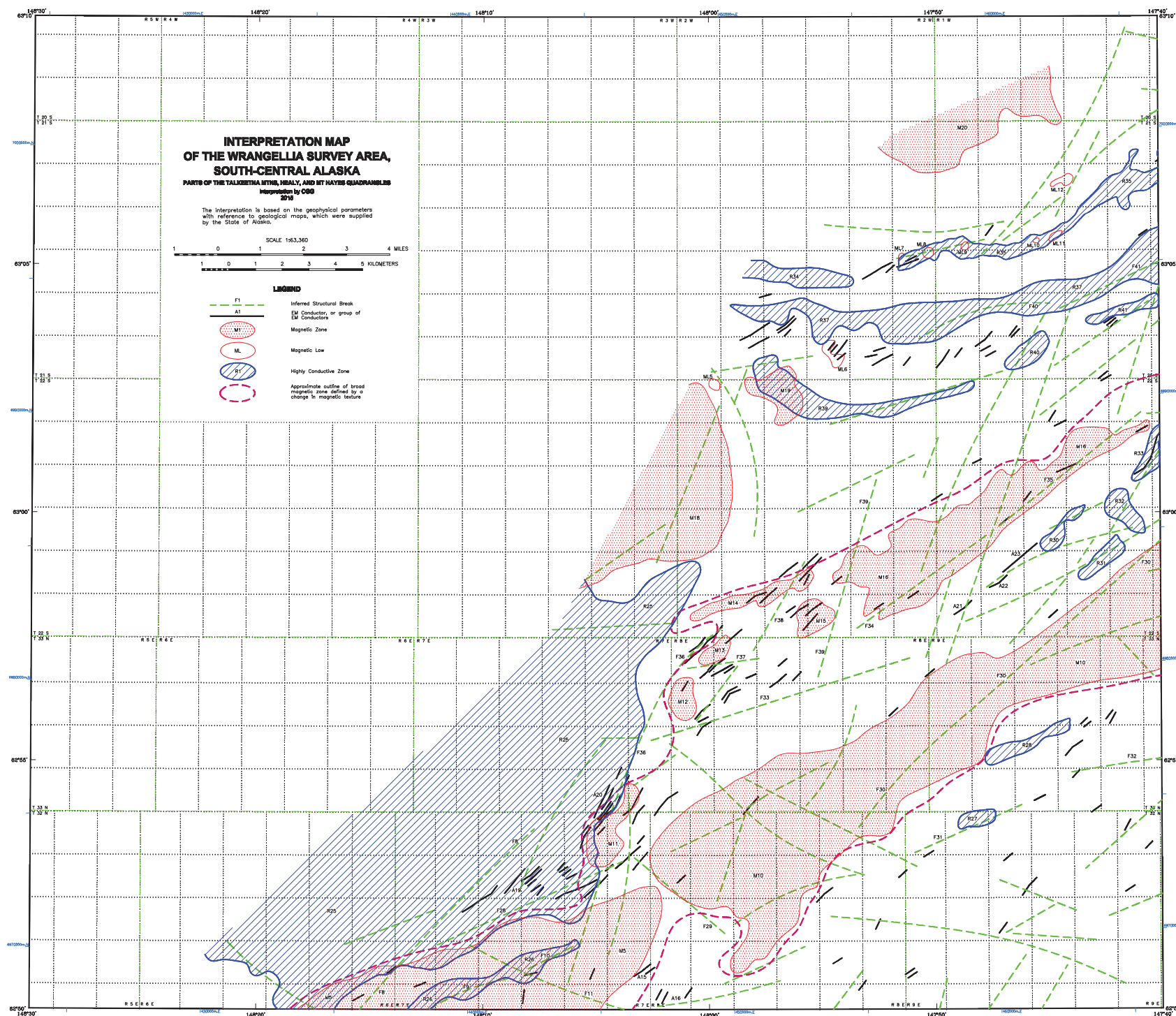
Contours in ohm-m at 10 intervals per decade

..... resistivity low

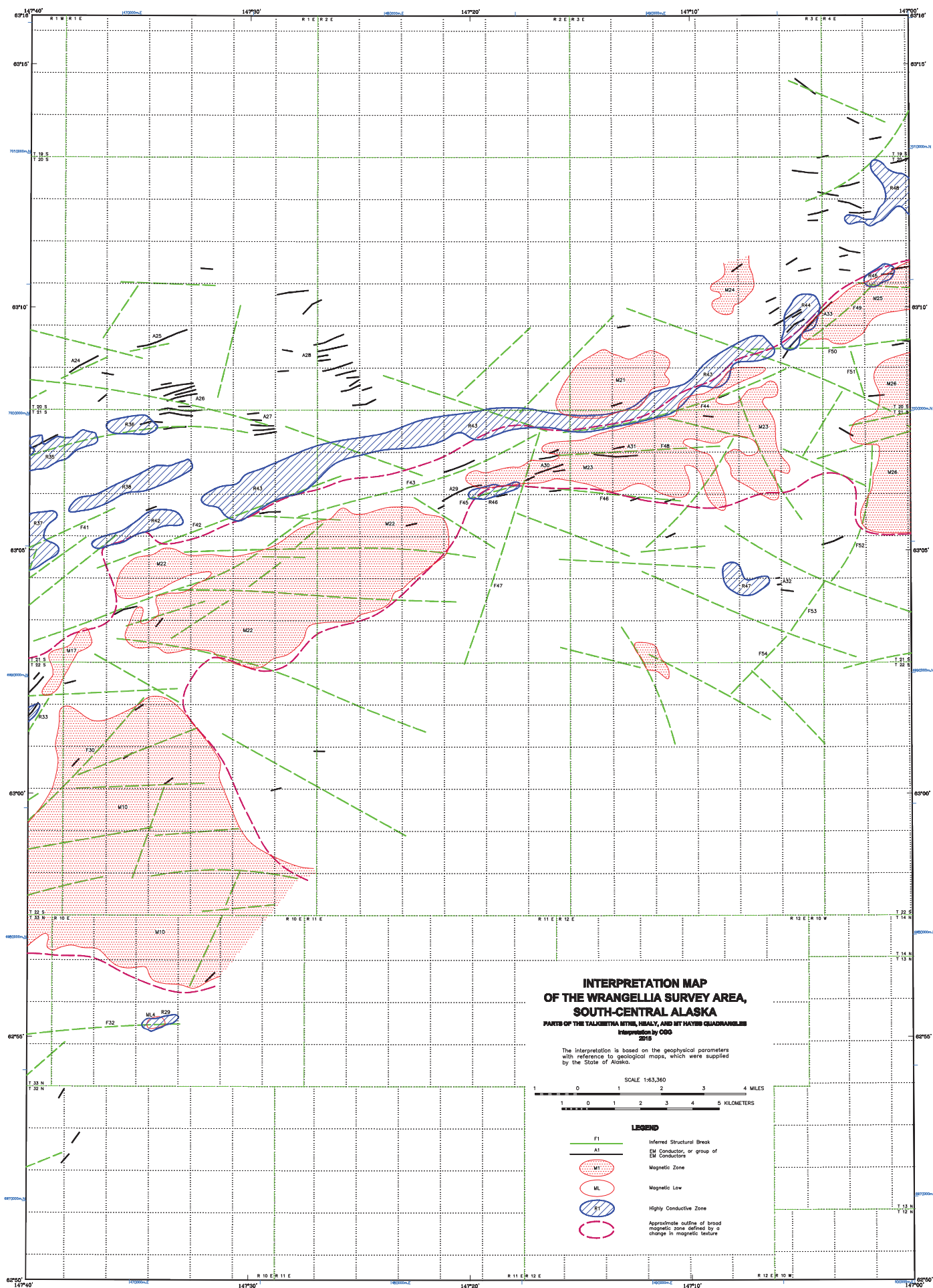




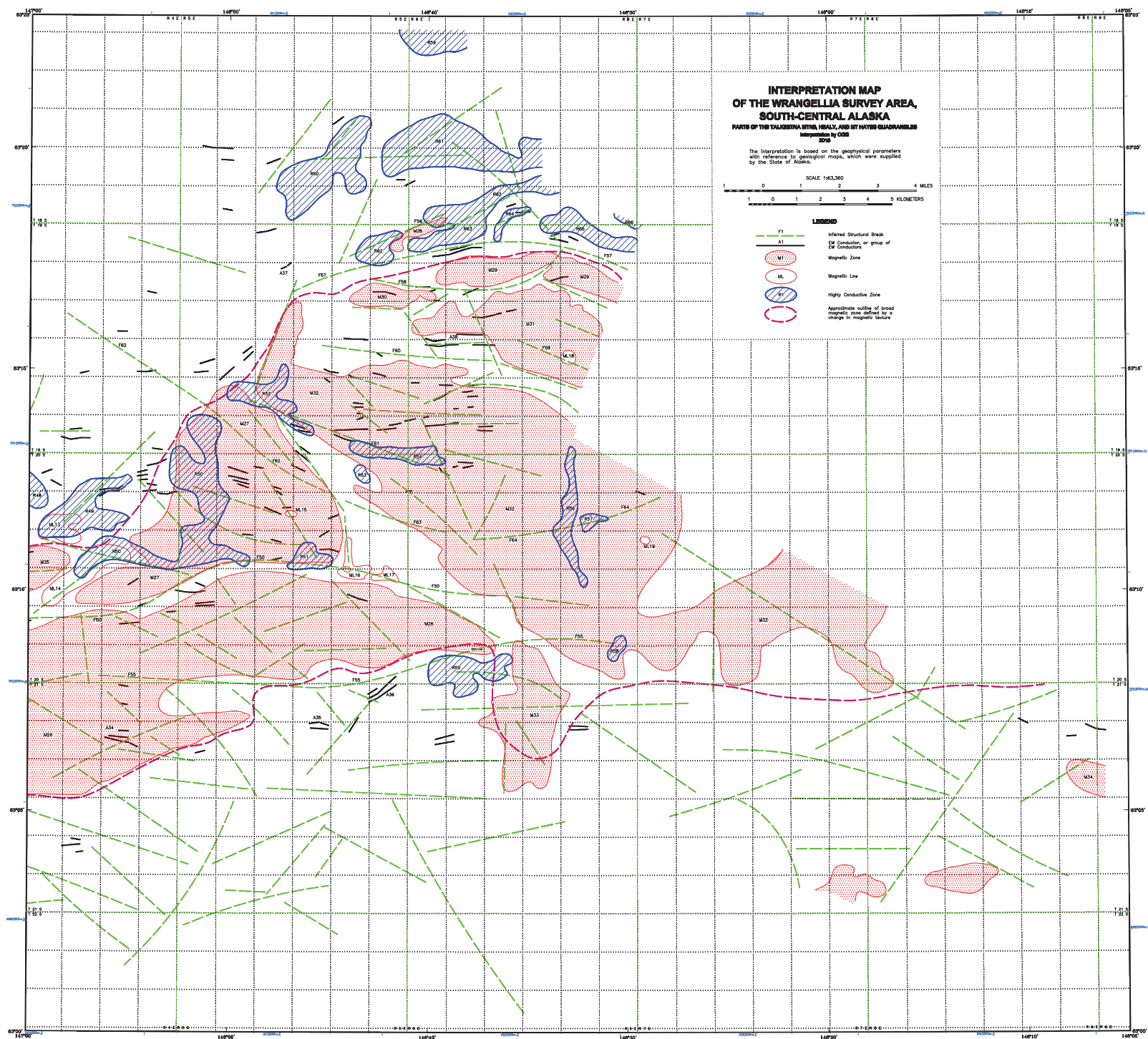




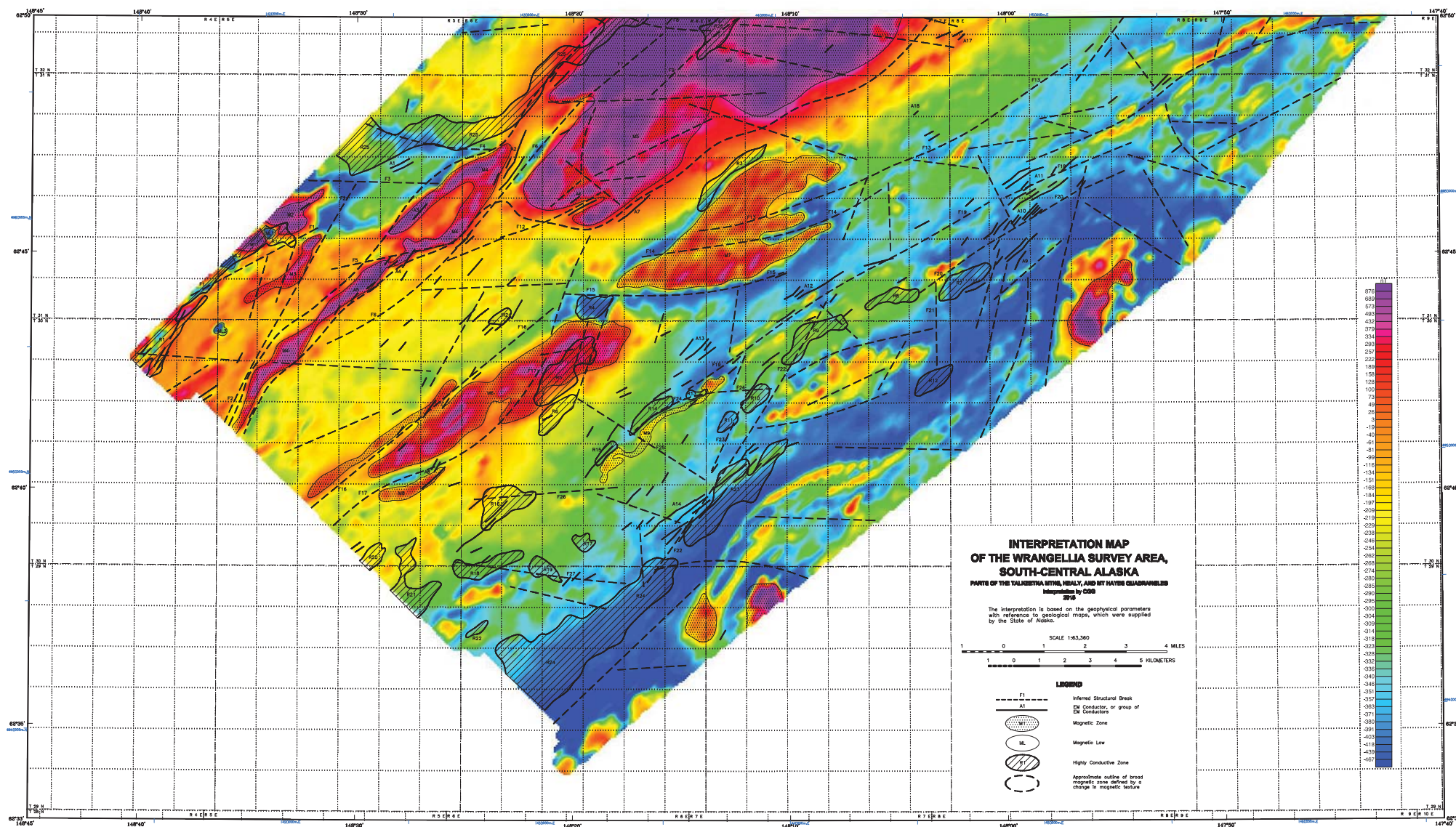




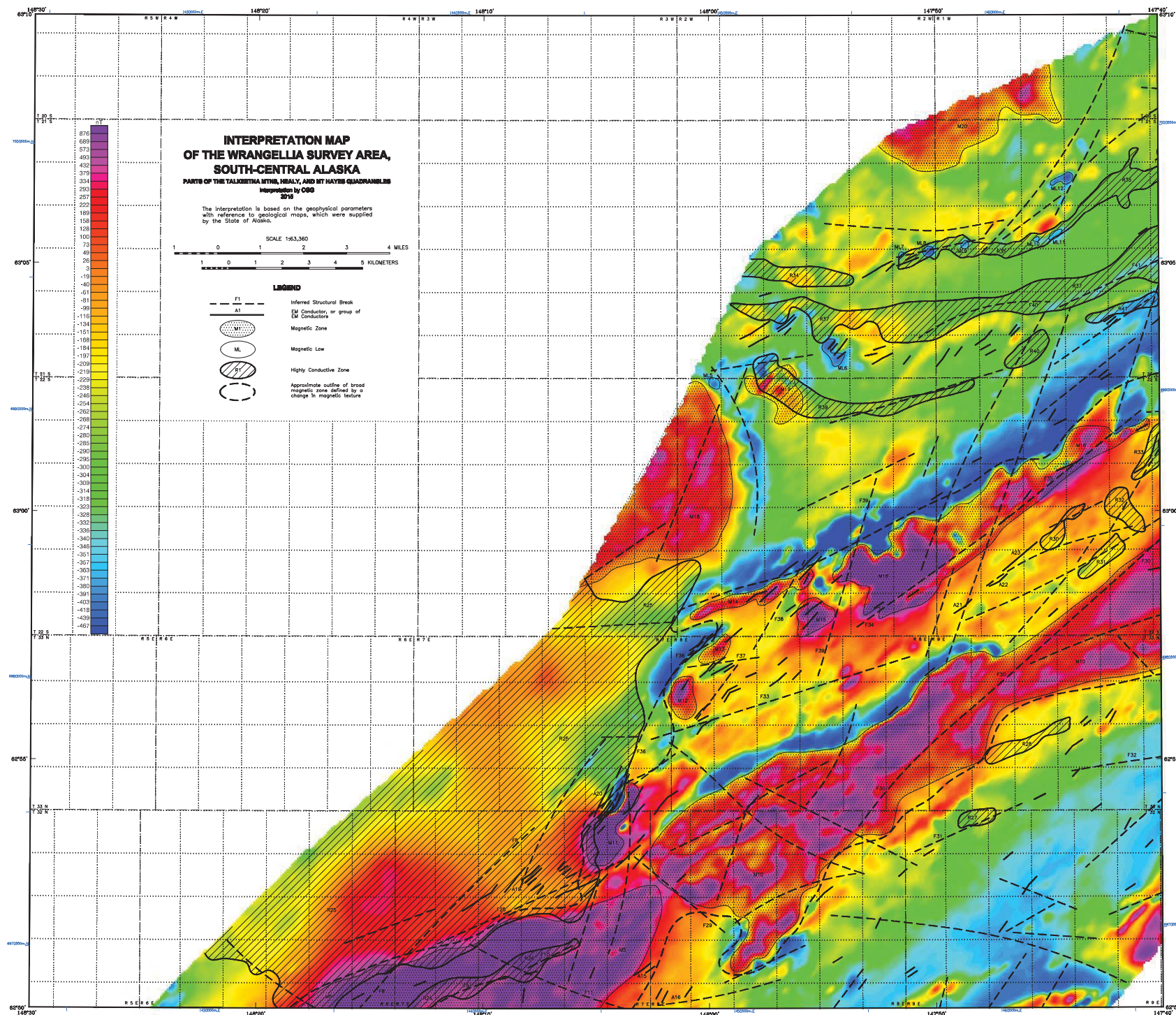




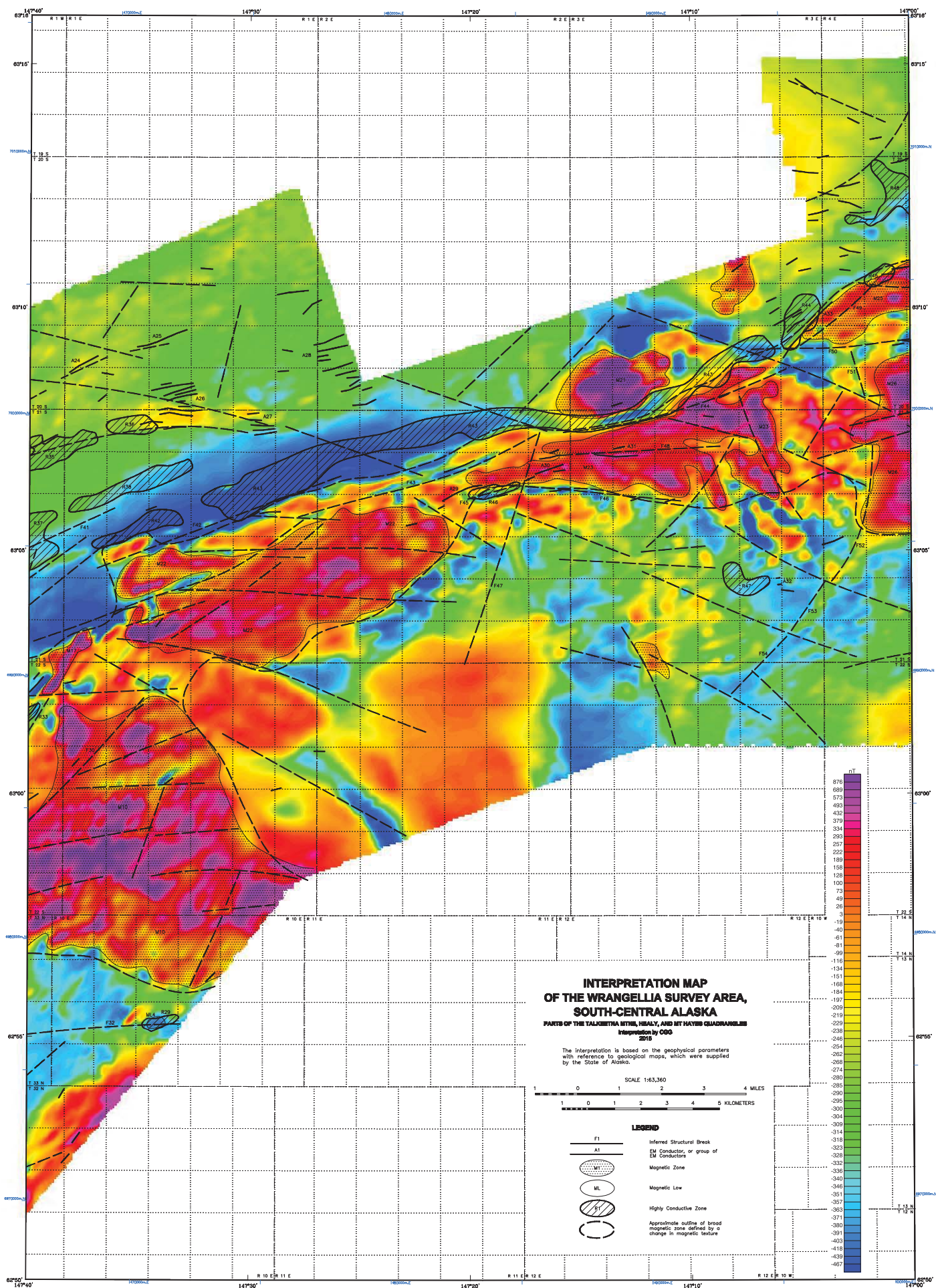




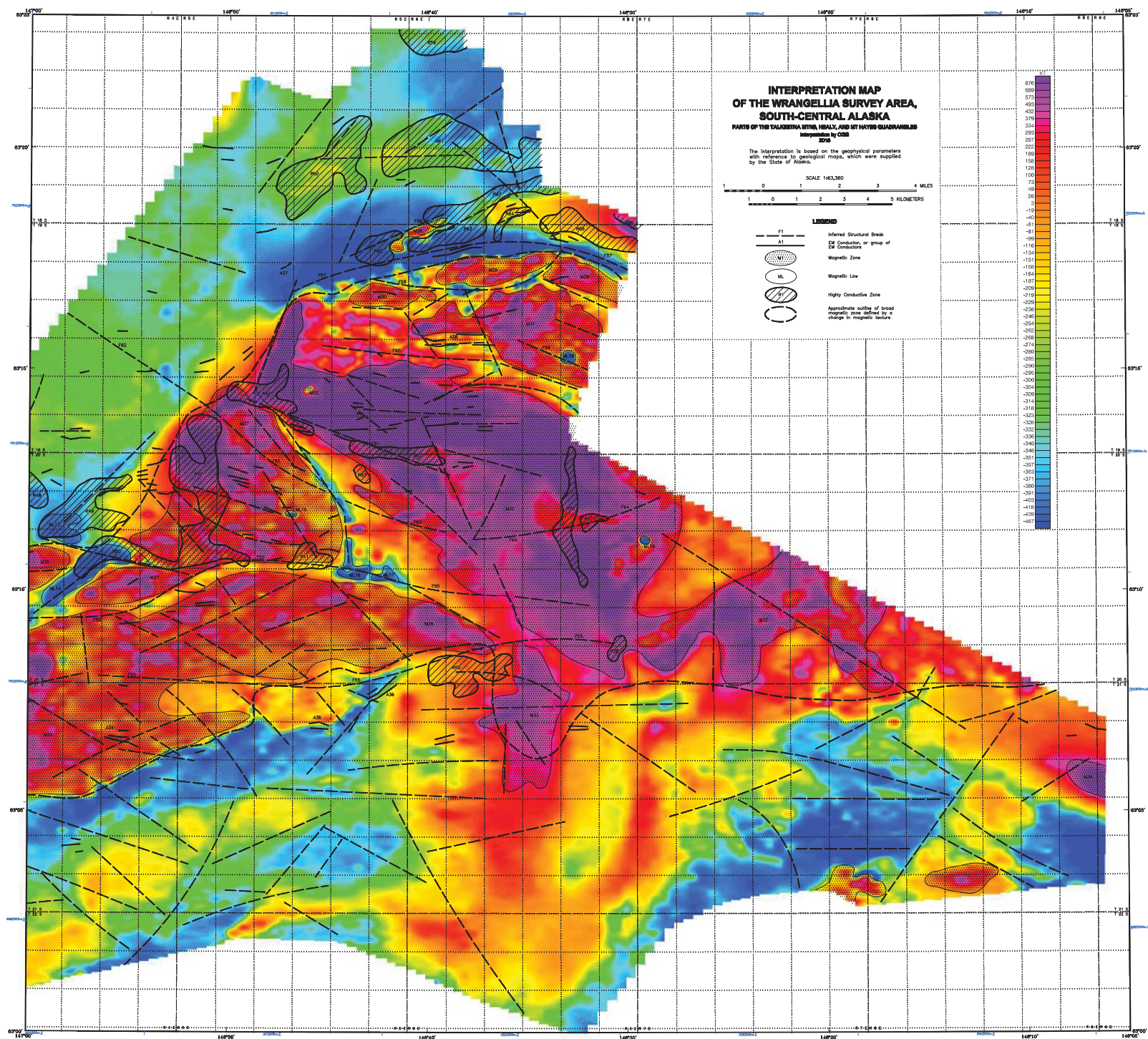










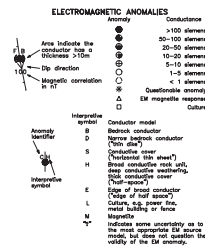






The geophysical data were acquired with a DIGHAM<sup>®</sup> Electromagnetic (EM) system and a Fugro D1000<sup>®</sup> caesium magnetometer with a Sincres CS3 caesium fluxgate compass mounted on a vessel towed at a constant speed and depth of 100 feet. In addition the ship was equipped with a Raytheon RACAL-6000<sup>®</sup> GPS receiver, a Raytheon RACAL-6000<sup>®</sup> GPS navigation system, 50/60 Hz monitors and video camera. Flights were made at a mean terrain clearance of 200 feet with a maximum altitude of 300 feet. The flight track was spaced at one eighth of a mile for about 97.9 sq miles. The lines were flown perpendicular to the flight direction.

A Novatel OEMS-G2L Global Positioning System<sup>®</sup> was used for navigation. The helicopter position was determined by differential positioning to a relative accuracy of better than 0.5 m. Flight path positions were determined by differential positioning to a relative accuracy of better than 0.5 m. The datum used was the North American datum, 1927 North American datum using a reference station located near the mouth of the Columbia River. The datum is based on a mean sea level of 0 and an east constant of 500,000m. Positional accuracy of the presented data is better than 0.5 m.



by  
Laurel E. Burns, CGG, and Fugro GeoServices, Inc.  
2016

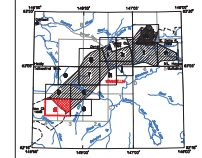
## ELECTROMAGNETICS

To determine the location of EM anomalies or their boundaries, the DICHIEM EM system measured base quadrature components at five frequencies. Two vertical coil-pairs operated at 1000 and 2500 Hz while three horizontal coil-pairs operated at 900, 7200, and 3600 Hz. The system also measured 100 Hz 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 selected amplitude. 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 personnel operating the flight track video were experienced in locating cultural sources.

## RESIDUAL MAGNETIC FIELD

The magnetic total field data were processed using digitally recorded data from a CGG D1344 magnetometer. The 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 2010, updated for date of flight and instrument variations), (3) leveled to the fine data, and (4) interpolated onto a regular 80 m grid using a modified Akima (1970) technique. All grids were then resampled from the 80 m cell size down to a 25 m cell size to produce the maps and final grids contained in this publication.

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.

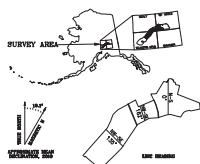


## SURVEY HISTORY

This map was compiled and drawn under contract between the State of Alaska, Department of Natural Resources, Division of Geologic & Geophysical Surveys, and the U.S. Geological Survey. The geologic and geographical data for the area were acquired and processed by GGS in 2013 and 2014. Previously published maps show the location map by dashed lines. This map shows the actual locations of the project. The project was funded by the Alaska State Legislature as part of the Alaska Strategic and Critical Minerals Program, which was established by the Alaska Airborne Geophysical and Geological Mineral Inventory Program. Milrock Exploration Corporation provided aerial photo data for portions of the area shown above as denser hatching.

All data and maps produced from data from this survey are available for download at no charge from the USGS, 335A College Road, Fairbanks, Alaska, 99708-3707, and are downloadable for free from the internet (<http://www.usgs.gov>). These data can also be viewed on paper through the DGGIS office, or they can be downloaded from the website in Adobe Acrobat PDF format.



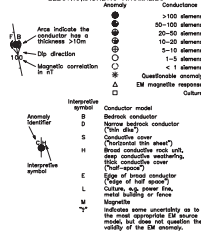


### DESCRIPTIVE NOTES

The geophysical data were acquired with a DIGHEM Electromagnetic (EM) system and a Fugro DT3440 real-time magnetic field recording system with a 100 mHz sensor. The EM and magnetic sensors were flown at a height of 100 feet. In addition the survey recorded data from radar and laser altimeters, GPS navigation system, 50/60 Hz monitors and video camera. Flights were performed with a 100 mHz sensor at a constant altitude of a mean terrain clearance of 200 feet with a spacing primarily of a quarter of a mile, and one eighth of a mile for about 97.9 sq miles. Tie lines were flown perpendicular to the flight

A Novatel OEMS-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 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.

## ELECTROMAGNETIC ANOMALIES



# RESIDUAL MAGNETIC FIELD AND DETAILED ELECTROMAGNETIC ANOMALIES WITH TOPOGRAPHY OF THE WRANGELLIA SURVEY AREA, SOUTH-CENTRAL ALASKA

PARTS OF TALKIEETNA MTS. C-3, C-4,  
D-3, and D-4 QUADRANGLES

by  
Laurel E. Burns, CGG, and Fugro GeoServices, Inc.  
2014

## ELECTROMAGNETICS

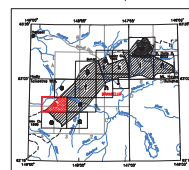
To determine the location of EM anomalies or their boundaries, the DDEEM EM system measured base and quadrature components at five frequencies. Two vertical coaxial-coil pairs operated at 1000 and 5500 Hz while three horizontal coplanar-coil pairs operated at 900, 7200, and 5500 Hz. The EM system responds to bedrock conductors, conductive overburden, and cultural sources. The type of conductor is indicated on the aeromagnetic map by the bedrock conductance number. The primary method of 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 position of the aircraft flight track video were examined to locate cultural sources.

### RESIDUAL MAGNETIC FIELD

The magnetic total field data were processed using a digitally recorded data from a GGG D1344 magnetometer with a Schindler CES cesium sensor. Data were corrected for diurnal variations and magnetic variations by subtraction of the digitally recorded base station magnetic data, (2) IGRF corrected (IGRF model 2010), updated for date of flight and estimated variations, (3) leveled to the tie line data, and (4) interpolated onto a regular 80 m grid using a modified Akima (1970) technique. All grids were then resampled from the 80 m cell size down to a 25 m cell size to produce the maps and final grids contained in this publication.

Aasma, 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.

## LOCATION INDEX FOR 1:31,680-SCALE MAPS

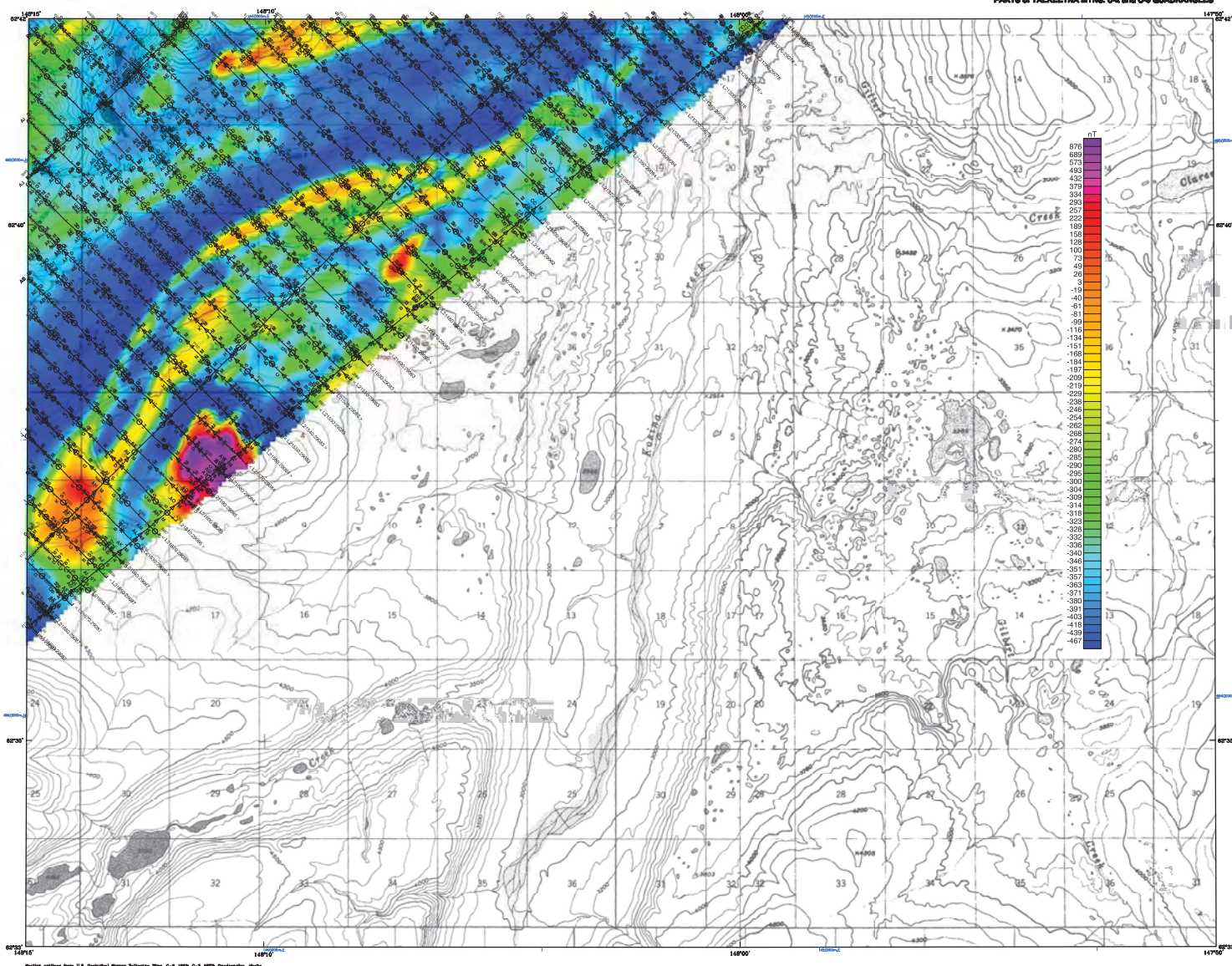


## SURVEY HISTORY

This map has been compiled and drawn under contract by the State of Alaska Department of Natural Resources, Division of Geological & Geophysical Surveys (DGGS), and Fugro GeoServices, Inc. Airborne geophysical data for the area were acquired and processed by Fugro GeoServices, Inc. and the DGGS. The flow DGGS surveys adjacent to the current survey are shown in the location map by dashed lines, survey name, and date of publication. The map was prepared for the Alaska Department of Natural Resources as part of the Alaska Strategic and Critical Minerals Assessment project, which is part of the Alaska Department of Natural Resources' Strategic and Critical Minerals Assessment project. The project is a part of the Alaska Department of Natural Resources' Strategic and Critical Minerals Assessment project. The project is a part of the Alaska Department of Natural Resources' Strategic and Critical Minerals Assessment project. The project is a part of the Alaska Department of Natural Resources' Strategic and Critical Minerals Assessment project.

All data and maps produced to date from this survey are available in digital format on DVD for a nominal fee through DGGs, 3354 College Road, Fairbanks, Alaska, 99709-3707, and are downloadable for free from the DGGs website ([www.dggs.alaska.gov/pubs](http://www.dggs.alaska.gov/pubs)). Maps are also available on paper through the DGGs office, and are viewable online at the website in Adobe Acrobat PDF file format.

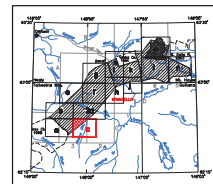




Aerial outline from U.S. Geological Survey Tectonic Map C-2, 1985. C-2, 1987. Geologic Map.

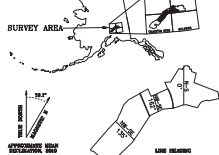
SCALE 1:31,680  
0 0.5 1 1.5 2 MILES  
0 0.5 1 1.5 2.5 KILOMETERS

LOCATION INDEX FOR 1:31,680-SCALE MAPS



## RESIDUAL MAGNETIC FIELD AND DETAILED ELECTROMAGNETIC ANOMALIES WITH TOPOGRAPHY OF THE WRANGELLIA SURVEY AREA, SOUTH-CENTRAL ALASKA PARTS OF TALKIETHNA MTS. C-2 and C-3 QUADRANGLES

by  
Laurel E. Burns, CSG, and Fugro GeoServices, Inc.  
2016

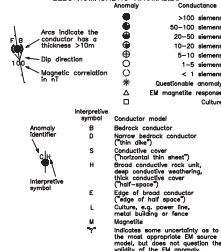


### DESCRIPTIVE NOTES

The geophysical data were acquired with a DIGEM® 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 radar and laser altimeters, GPS navigation system, 50/60 Hz monitors and video cameras. Flights were performed with an AS-350-B3 Spurline helicopter at a mean terrain clearance of 200 feet with a spacing primarily of a quarter of a mile, and one eighth of a mile for about 87.9 sq miles. The lines were flown perpendicular to the flight lines at intervals of approximately 3 miles.

A Novatel OEM5-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 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° 30' north longitude, 0 and an east constant of 500,000. Vertical accuracy of the presented data is better than 10 m with respect to the UTM grid.

### ELECTROMAGNETIC ANOMALIES



### ELECTROMAGNETICS

To determine the location of EM anomalies or their boundaries, the DIGEM® EM system measured in-phase and quadrature components at five frequencies. Two vertical coil-coil pairs operated at 1000 and 5000 Hz while three horizontal coil-coil pairs operated at 800, 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, the in-phase and quadrature responses, together with conductor and magnetic patterns and, appropriately, the power line monitor and the flight track view were examined to locate cultural sources.

### RESIDUAL MAGNETIC FIELD

The magnetic total field data were processed using digitally recorded data from a CGG D1344 magnetometer with a Scintrex CS3 cesium 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) GPR corrected (GPR model 2010, 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. All grids were then reprojected from the 80 m cell size down to a 25 m cell size to produce the maps and final grids contained in this publication.

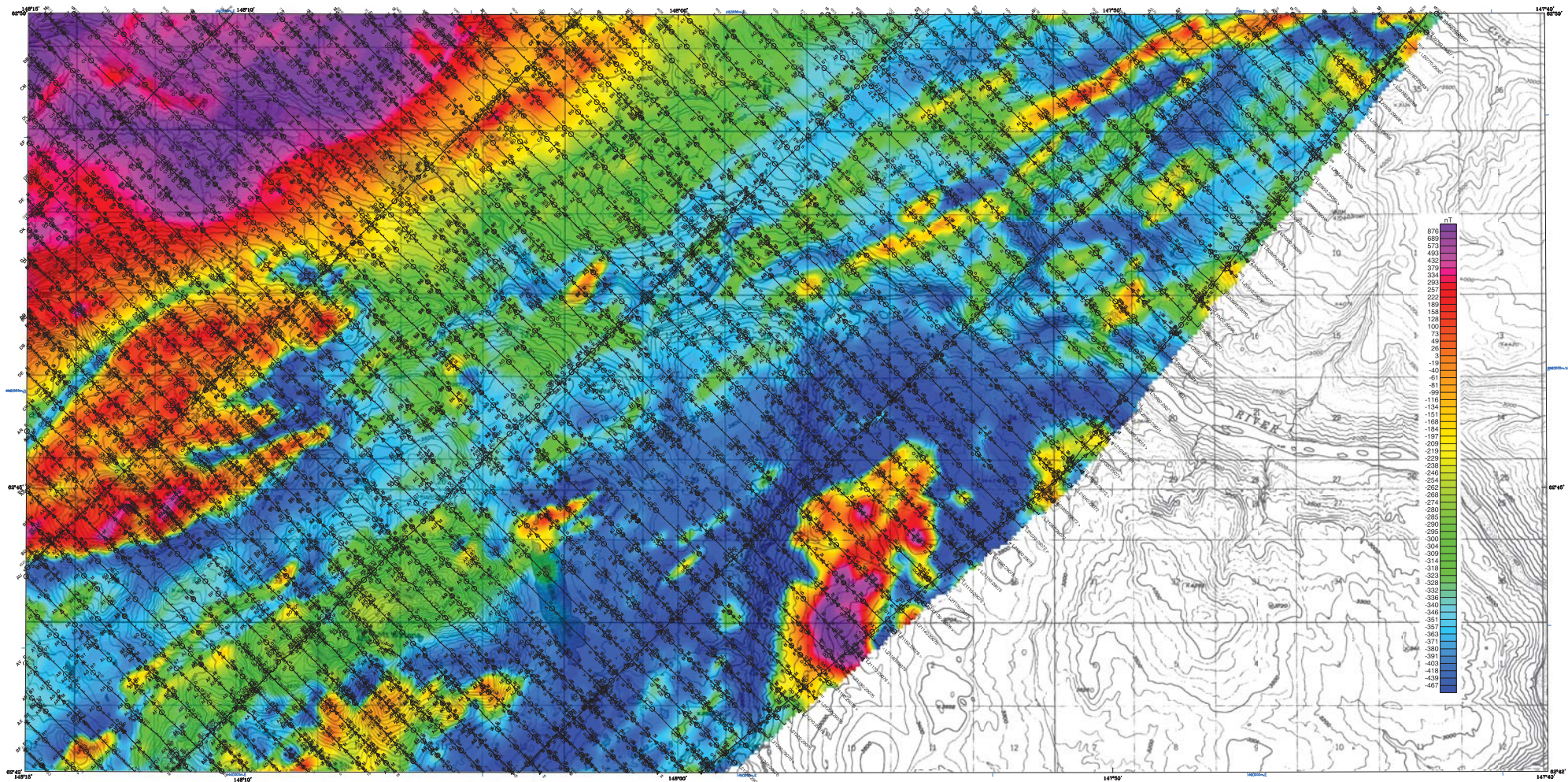
Alkema, H. 1970. A new method of interpolation and smooth curve fitting based on local properties. *Journal of the Association of Computing Machinery*, v. 17, no. 4, p. 589-602.

### SURVEY HISTORY

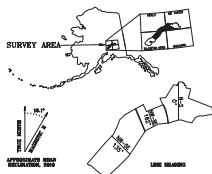
This map has been compiled and drawn under contract between the State of Alaska, Department of Natural Resources, Division of Geological & Geophysical Surveys (DGGGS), and Fugro GeoServices, Inc. Airborne geophysical data for the area were acquired and processed by CGG in 2013 and 2014. Previously flown CGG surveys adjacent to the current survey are shown in the location map by dashed lines, survey names, and date of publication. The project was funded by the Alaska State Legislature as part of the Alaska Strategic and Critical Minerals Assessment project, which is part of the Alaska Airborne Geophysical and Geological Mineral Inventory Program. Milrock Exploration Corporation contributed (infill) data for a portion of the area shown above as dashed halftone.

All data and maps produced to date from this survey are available in digital format as PDF for a nominal fee through DGGGS, 3354 College Road, Fairbanks, Alaska, 99709-3700 and are downloadable for free from the DGGGS website ([www.dgggs.alaska.gov/pdfs](http://www.dgggs.alaska.gov/pdfs)). Maps are available on paper through the DGGGS office, and are available online at the website in Adobe Acrobat PDF file format.





Drilling within 100 m of Selected Survey Station. C-2, C-3, D-2, and D-3.

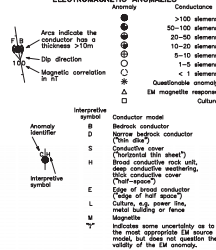


#### DESCRIPTIVE NOTES

The geophysical data were acquired with a DIGHEM Electromagnetic (EM) system and a Fugro D1344 cesium magnetometer with a Sinter CS3 cesium sensor. The EM and magnetic sensors were flown at a height of 100 feet. In addition the survey recorded data from radar and laser altimeters, GPS navigation system, 50,000 Hz resistivity and video camera. Flights were performed with an AS-350-B3 Spire helicopter at a mean forward distance of 200 feet with a spacing primarily of a quarter of a mile, and one eighth of a mile for about 97.9 miles. The lines were flown perpendicular to the flight lines at intervals of approximately 3 miles.

A Novatel OEM5-G2L Global Positioning System was used for navigation. The helicopter position was derived every 0.5 seconds using post-flight better than 6 m. Flight path positions were entered into the Cirrus 1566 north zone 4) spherical, 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.

#### ELECTROMAGNETIC ANOMALIES



## RESIDUAL MAGNETIC FIELD AND DETAILED ELECTROMAGNETIC ANOMALIES WITH TOPOGRAPHY OF THE WRANGELLIA SURVEY AREA, SOUTH-CENTRAL ALASKA PARTS OF TALKEETNA MTS. C-2, C-3, D-2, and D-3 QUADRANGLES

by  
Laurel E. Burns, CGG, and Fugro Geoservices, Inc.  
2016

#### ELECTROMAGNETICS

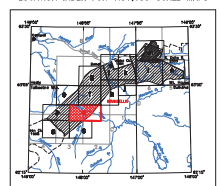
To determine the location of EM anomalies or their boundaries, the DIGHEM EM system measured in-phase and quadrature components of the frequency, two vertical coil-coil pairs operated at 1000 and 5000 Hz while three horizontal coil-coil pairs operated at 500, 2000, and 5000 Hz. EM data were acquired at 100 m intervals. The EM system responds to bedrock conductors, conductive overburden, and cultural sources. The type of conductor is indicated on the topographic map by the interpretive symbol attached to each EM anomaly. Determination of the type of conductor is based on EM anomaly shapes of the conductors and coil-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.

#### RESIDUAL MAGNETIC FIELD

The magnetic total field data were processed using digitally recorded data from a CGG D1344 magnetometer with a Sinter CS3 cesium 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 2015, updated for date of flight and off-center variations), (3) leveled to the tie line data, and (4) intersected onto a regular 80 m grid using a modified Alamo (1970) technique. All grids were then resampled from the 80 m cell size down to a 25 m cell size to produce the maps and final grids contained in this publication.

Alamo, 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. 2, p. 589-602.

#### LOCATION INDEX FOR 1:50,000-SCALE MAPS



#### SURVEY HISTORY

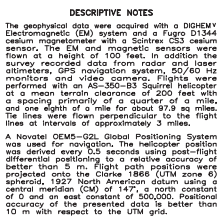
This map has been compiled and drawn under contract between the State of Alaska, Department of Natural Resources, Division of Geological & Geophysical Surveys (DGGGS), and Fugro Geoservices, Inc., Alaska. The project was funded by the Alaska State Legislature as part of the Alaska Strategic and Critical Minerals Assessment project, which is part of the Alaska Division of Geological & Geophysical Surveys (DGGGS) Inventory Program. Minors Exploration Corporation contributed initial data for a portion of the area shown above as dense halos.

All data and maps produced to date from this survey are available in digital format on DVD for a nominal fee through DGGGS, 1554 College Road, Fairbanks, Alaska, 99709-3707, and are downloadable for free from the DGGGS website ([www.dgggs.alaska.gov/dgggs](http://www.dgggs.alaska.gov/dgggs)). Maps are also available on paper through the DGGGS office, and are available online at the website in Adobe Acrobat PDF file format.





by  
Laurel E. Burns, CGG, and Fugro GeoServices, Inc.  
2015

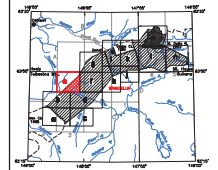


Interpretive symbol	Conductor model
B	Bedrock conductor
D	Narrow bedrock conductor (thin dikes)
S	Conductive cover
S	Horizontal thin sheet
H	Broad conductive rock
H	Deep conductive waste
H	Thick conductive cover (half-space)
E	Edge of broad conductor (edge of half space)
L	Culture, e.g., power line metal building or fence
M	Magnetite
na	Indicates some uncertainty in the most appropriate model, but does not indicate the validity of the EM or the data

To determine the location of EM anomalies or their boundaries, the DIGHEM<sup>®</sup> EM system measured inphase and quadrature components at five frequencies. Two vertical coaxial-coil pairs operated at 1000 and 5500 Hz while the horizontal coils operated at 100, 1000, 5500 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 EM response is interpreted using a color-coded legend. An 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 aircraft flight track video were examined to locate cultural sources.

The magnetic total field data were processed using digitally recorded data from a CGS D1344 magnetometer. 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 for 2010, updated for date of flight and instrument variations), (3) leveled to the tie line data, and (4) interpolated onto a regular 80 m grid using a modified Aina (1970) technique. All grids were then resampled from the 80 m cell size down to a 25 m cell size to produce the maps and final grids contained in this publication.

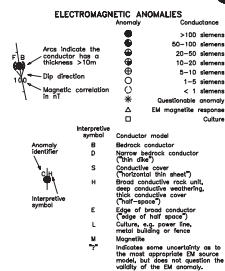
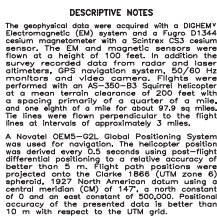
Akima, H., 1970, A new method of interpolation and smooth curve fitting based on local procedures *Journal of the Association of Computing Machinery*, v. 17, no. 4, p. 589-602.



This map has been compiled and drawn under contract from the State of Alaska, Department of Natural Resources, Division of Geology and Earth Sciences (DGES), and Fugro GeoServices, Inc. Airborne geophysical data for the area were acquired on a Fugro 3000 system in 1999. The map shows the flown DGES surveys adjacent to the current survey are shown in the location map by dashed lines. The project was funded by the Alaska State Legislature as part of the Alaska Strategic and Critical Minerals Assessment. The Alaska Division of Geology and Earth Sciences, and Fugro GeoServices, Inc. contributed staff data for a portion of the area shown above as denser hatchling.

All data and maps produced from this survey are available to the public. A DSD for a nominal 1000 ft by 1000 ft grid for the DGES, 3354 College Road, Fairbanks, Alaska 99709-3707, and are downloadable free from the Alaska Division of Geology and Earth Sciences. The data is also available on paper through the DGES office, and is available online at the website in Adobe Acrobat PDF file format.





## PARTS of TALKEETNA MTNS. D-2 and D-3 QUADRANGLES

by  
Laurel E. Burna, CGG, and Fugro GeoServices, Inc.  
2018

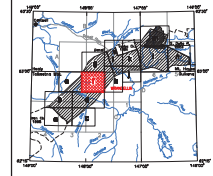
## ELECTROMAGNETICS

To determine the location of EM anomalies or their boundaries, the DMS-EM system recorded phase and quadrature components at five frequencies. Two vertical coaxial-coil pairs operated at 5000 and 5500 Hz while three horizontal coplanar-coil pairs operated at 900, 7200, and 11,000 Hz. The EM system responds to bedrock conductors, conductive overburden, and cultural sources. The type of conductor is indicated on the aeromagnetic map by the International Geomagnetic Reference Field (IGRF) 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 position of the aircraft flight track video were examined to locate cultural sources.

## RESIDUAL MAGNETIC FIELD

The magnetic total field data were processed using digitally recorded data from a CGG D1344 magnetic tape with Seismic Systems software. 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 updated for scale of flight in kilometers and variations), (3) leveled to the tie line data and (4) interpolated onto a regular 80 m grid using a modified Akima (1970) technique. All grids were then resampled from the 80 m cell size down to a 25 m cell size to produce the maps and final grids contained in this publication.

Alding, 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.



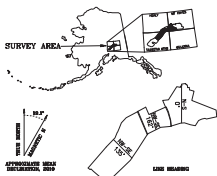
## SURVEY HISTORY

**SOURCE INFORMATION**

This map was compiled by the Alaska Department of Natural Resources, Division of Geological & Geophysical Surveys (DGGG), Fairbanks, Alaska, and was created under contract between the State of Alaska, Department of Natural Resources, Division of Geological & Geophysical Surveys (DGGG) and the U.S. Geological Survey (USGS). The geospatial data for the area were acquired and processed by DGGG in 2013 and 2014. Previously published maps of the same area are available from USGS. The survey are shown in the location map by dashed lines. The names, survey numbers, and date of publication of the maps used are listed in the accompanying table. The Legislature as part of the Alaska Strategic and Critical Minerals Act (AS 38.05.060) authorized the Department of Alaska Airborne Geophysics and Geographical Information Inventory Program. Milrock Exploration Corporation conducted the survey over a portion of the area shown above as denser habitat.

All data and maps produced to date from this survey are available online at the following URL:  
[http://www.dggg.alaska.gov/dggg/GDGIS/3356\\_Collector\\_Fairbanks\\_Alaska\\_9700S-570W/](http://www.dggg.alaska.gov/dggg/GDGIS/3356_Collector_Fairbanks_Alaska_9700S-570W/), and are downloadable for free from the USGS National Map Viewer (<http://viewer.nationalmap.gov>). The data can also be viewed on paper through the DGGG office, and can be downloaded from the website in Adobe Acrobat (.PDF) file format.

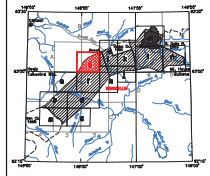




### PARTS of HEALY A-2 and A-3 QUADRANGLES

by  
Laurel E. Burns, CGG, and Fugro GeoServices, Inc.  
2015

## LOCATION INDEX FOR 1:31,680-SCALE MAPS



#### DESCRIPTIVE NOTES

The geophysical data were acquired with a DIGHEMY Electromagnetic (EM) system and a Fugro D134 sensor. The EM system was mounted on a Cessna 441Q aircraft. The EM and magnetic sensors were flown at a height of 100 feet. In addition the survey recorded data from radar and laser altimetry. GPS navigation system, 100/60 Hz monitors on an AS-350-83 Squirrel helicopter were performed with an NS-350-83 Squirrel helicopter at a mean terrain clearance of 200 feet with a spacing primarily of a quarter of a mile, and cross flight lines of 1/8 mile. The flight lines were flown perpendicular to the flight lines at intervals of approximately 3 miles.

A Novatel OEMS-G2L Global Positioning System was used for navigation. The helicopter position was derived every 10 s and the 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 1 on a scale of 1:50,000. Positional accuracy of the presented data is better than 10 m with respect to the UTM grid.

**Legend:**

**Interpretive symbols:**

- A** Arcs indicate the conductor has a thickness  $>10\text{m}$
- D** Dip direction
- M** Magnetic correlation in %
- B** Bedrock conductor
- H** Horizontal conductor ("thin sheet")
- S** Shear conductor ("fractured thin sheet")
- E** Edge of broad conductor (edge of half space)
- L** Lateral conductor (edge of half space)
- M** Magnetic

**Interpretive text:**

- A** Indicates some uncertainty as to the magnetic expression of EM source, but does not question the validity of the EM response
- B** Bedrock conductor
- H** Horizontal conductor ("thin sheet")
- S** Shear conductor ("fractured thin sheet")
- E** Edge of broad conductor (edge of half space)
- L** Lateral conductor (edge of half space)
- M** Magnetic

**Conductance:**

- $>100$  Siemens
- 50–100 Siemens
- 20–50 Siemens
- 10–20 Siemens
- 1–10 Siemens
- 1–5 Siemens
- $<1$  Siemens

**Qualitative conductance:**

- Q
- EM magnitude
- Other

To determine the location of EM anomalies or their boundaries, the GIGEM<sup>®</sup> EM system measured inphase and quadrature components at five frequencies. Two vertical coaxial-coil pairs operated at 1000 and 5500 Hz while the horizontal coils operated at 100, 1000 and 5500 Hz 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 response is indicated by a seismogram map by the Interpretive symbol attached to each EM location. The 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 position of the flight track video were examined to locate cultural sources.

The magnetic total field data were processed using digitally recorded data from a CCGG D1344 magnetic survey system. The 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 2010, updated for scale 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. All grids were then resampled from the 80 m cell size down to a 25 m cell size to produce the maps and final grids contained in this publication.

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.





The geophysical data were acquired with a DIGHEM Electromagnetic (EM) system and a Fugro D1600 helicopter-mounted sensor. The EM and magnetic sensors were flown at a height of 180 feet. In addition the aircraft was equipped with GPS navigation systems, altimeters, GPS navigation system, 50/80 inch diameter wheels, and a fuel tank capacity of 100 gallons performed on an AS-350-B3 Saurale helicopter at one nautical mile clearance of 200 feet over land and sea level. The flight track was planned along and one eighth of a mile for about 97.9 sq miles per hour. The flight track was planned along the Flight Lines at intervals of approximately 3 miling.

A Novatel OEMS-G2L global positioning system was used for navigation. The helicopter position was determined by differential positioning technique. Differential positioning to a relative accuracy of better than ± m. Flight path positions were determined by differential positioning technique. A spherical, 1927 North American datum using a semi-major axis of 6378 km and a flattening factor of 0 and an east constant of 500,000. Positional accuracy of the presented data is better than ± m.

PARTS of TALKEETNA MTNS. D-1, D-2, and  
HEALY A-1, A-2 QUADRANGLES

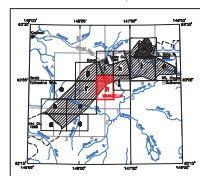
by  
Laurel E. Burns, CGG, and Fugro GeoServices, Inc.  
2018

● >100 elements  
● 50–100 elements

- [illegible]

To determine the location of EM anomalies or their boundaries, the EM system was used in three quadrature components at five frequencies. Two vertical coil-coil pairs operated at 1000 and 5500 Hz while three horizontal coil-coil pairs operated at 900, 7200, and 5500 Hz. The frequency interval between intervals. The EM system responds to bedrock conductors, conductive overburden, and cultural sources. The type of conductor is indicated on the electromagnetic map by the selected color-coded symbols. The primary determination of the type of conductor is based on EM anomaly shapes of the coil-coil- and coplanar-coil responses, together with conductor and magnetic patterns and topography. The position of the flight track used for the EM survey was examined to locate cultural sources.

The magnetic total data files were processed using a digitally recorded data from a CCG D13-44 magnetometer with a Schöner CS3 cellular 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 magnetic data, (2) corrected for magnetic declination in 2010, 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. At grids were then resampled to a regular 40 m grid. The final data were used to produce the maps and final grids contained in this publication.



This map has been compiled and drawn under contract from the Alaska Department of Natural Resources, Division of Geological & Geophysical Surveys (DGG&S), and Fugro. The DGG&S has the best available geophysical data for the area were acquired under contract to the DGG&S from 1995 to 1998. The DGG&S flown DGG&S surveys adjacent to the current survey are shown in the location map by dashed lines. The map is a north arrow pointing towards the top of the page.

The project was funded by the Alaska State Legislature as part of the Alaska Strategic and Critical Minerals Inventory Project. The project was also funded by the Alaska Airborne Geophysical and Geological Mineral Inventory Program. The project was also funded by the Alaska Airborne Geophysical and Geological Mineral Inventory Program. The project was also funded by the Alaska Airborne Geophysical and Geological Mineral Inventory Program.

All data and maps are produced to date from this survey. The data is available on paper through the DGG&S, Alaska 99709-3707, and are downloadable for free from the DGG&S website at <http://www.dgg&s.state.ak.us>. The data is also available on paper through the DGG&S office, and are viewable online at the website in Adobe Acrobat PDF file format.





The geophysical data were acquired with a DIGHEM<sup>®</sup> electromagnetic (EM) system and a Fugro D1344<sup>®</sup> cesium magnetometer. The cesium EM system consists of a sensor, the EM and magnetic sensors were flown at a height of 100 feet. In addition the system recorded data from radar and laser altimeters, GPS, and a video camera. Flights were performed with an AS-350-B3 Squirrel helicopter at a mean terrain clearance of 200 feet with a spacing primarily of 400 feet. A maximum of 1000 data points per mile for about 97.9 seconds. The lines were flown perpendicular to the flight lines at intervals of approximately 3 miles.

A Novatel OEM5-G2L Global Positioning System was used for navigation. The helicopter position was derived every 2 seconds using a 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 5000. Position accuracy of the projected data is better than 10 m, with respect to the UTM grid.

**PARTS of HEALY A-1, A-2,  
B-1, and B-2 QUADRANGLES**

by  
Laurel E. Burns, CCG, and Pugno GeoServices, Inc.  
2018

## ELECTROMAGNETIC ANOMALIES

- |  |   |
|--|---|
|  | <p><b>Conductor</b></p> <p>● &gt;100<br/>         ● 50-100<br/>         ● 20-50<br/>         ● 10-20<br/>         ● 5-10<br/>         ○ 1-5<br/>         ○ &lt;1</p> <p>○ Questionable<br/>         △ EM magnetite</p>  |
| <p><b>Interpretive symbol</b></p> <p>B D<br/>         S<br/>         H<br/>         E<br/>         L<br/>         M</p> <p> Anomaly Identifier</p> <p> Interpretive symbol</p> | <p><b>Conductor model</b></p> <p>Electronic conductor<br/>         Narrowly defined conductor ("thin disc")<br/>         Conductive cover<br/>         ("horizontal tin snuff")<br/>         Deep conductive rock and<br/>         deep conductive weathered<br/>         rock beneath the cover<br/>         ("half-space")<br/>         Edge of broad conductor<br/>         ("edge of half space")<br/>         Culture, etc. power line,<br/>         metal building or fence<br/>         M Magnetite</p> <p>△ indicates some uncertainty,<br/>         the most appropriate EM<br/>         model, but does not owe<br/>         sufficiency of the EM evidence</p> |

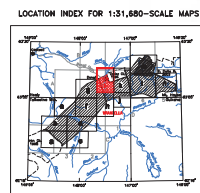
## ELECTROMAGNETICS

To determine the location of EM anomalies or their boundaries, the EM system was used in three 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 5500 Hz. The EM system was used at 1000 Hz 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 legend. The conductor type is determined by the combination 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 position of the EM system flight track used were examined to locate cultural sources.

### RESIDUAL MAGNETIC FIELD

The magnetic latid field data were processed using digitally recorded data from a CCG D1344 magnetometer with a Schriener CSJ cesium atomic clock. 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 magnetic data; (2) corrected for geomagnetic model 2010, 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. All grids were then resampled to a regular 80 m grid using a nearest neighbor method to produce the maps and final gride contours in this publication.

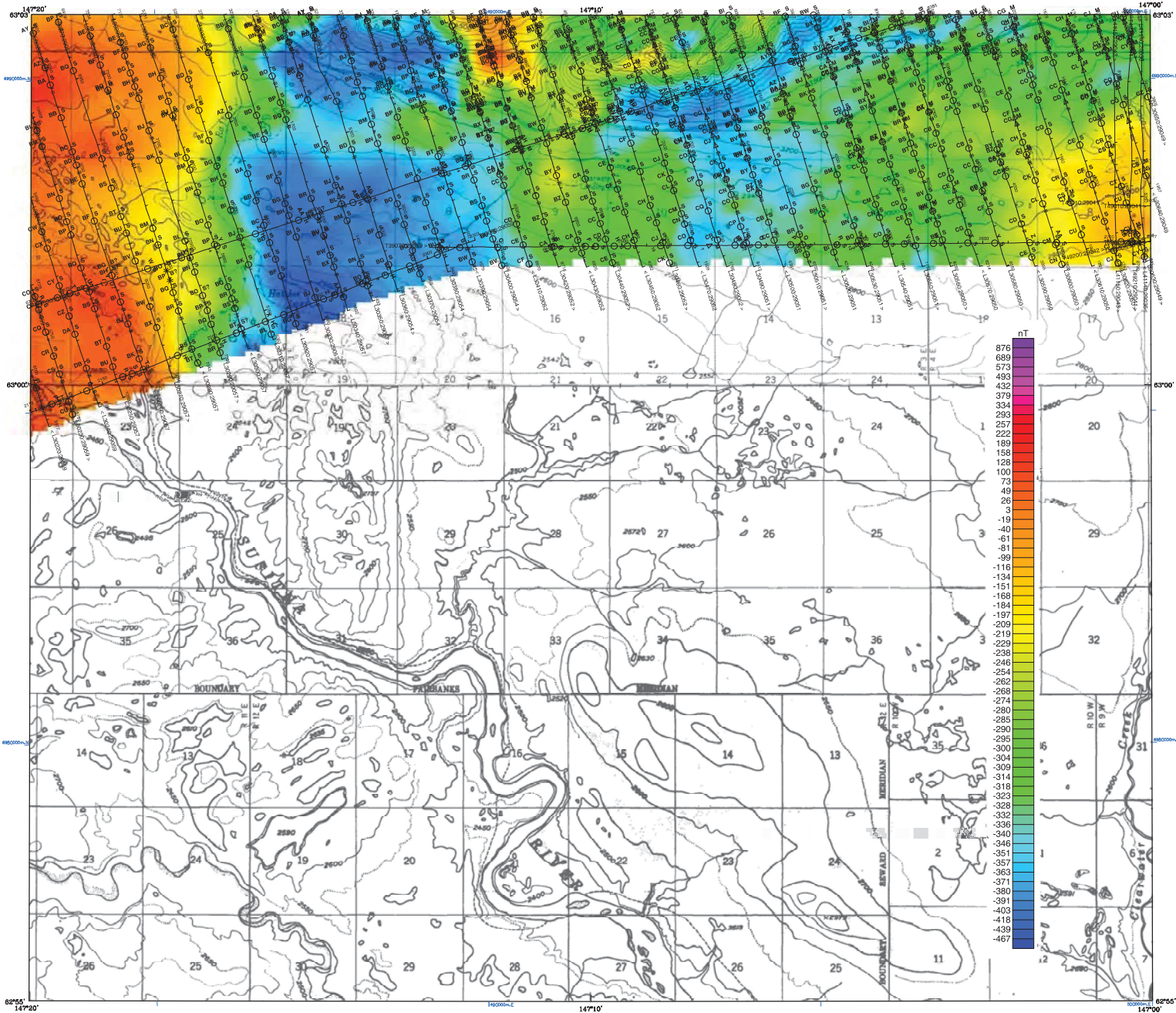
Akima, H., 1970. A new method of interpolation and smooth curve fitting based on local procedures. *Journal of the Association of Computing Machinery*, 17(6), 589-590.



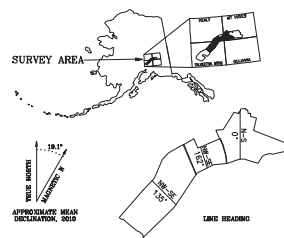
## SURVEY HISTORY

This map was compiled and drawn under contract between the Department of Natural Resources, Division of Geological & Geophysical Surveys and the Alaska Department of Natural Resources. The data were collected by the Division of Geological & Geophysical Surveys for the area. The map was compiled and processed by CGD in 2013 and 2014. Previously published maps of this area are available. The survey are shown in the location map by dashed line, survey name, and date of publication. The map is available for free from the Alaska Department of Natural Resources, Division of Geological & Geophysical Surveys, 1400 West Northern Avenue, Suite 100, Anchorage, Alaska 99503-2707, and are downloadable for free from the Alaska Department of Natural Resources website. The map is also available on paper through the DGGS office, and are available online at the website [Alaska.Aerialist.PDF](http://Alaska.Aerialist.PDF).





Section outlines from U.S. Geological Survey Talkkeetna Mtn. D-1, 1964; Healy A-1, 1978; Quadrangles, Alaska.

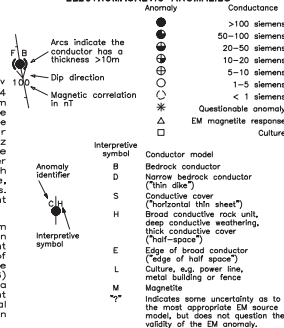


#### DESCRIPTIVE NOTES

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 radar and laser altimeters, GPS navigation system, 50/60 Hz monitors and video camera. Flights were performed with an AS-350-B3 Squirrel helicopter at a mean terrain clearance of 200 feet with a spacing primarily of a quarter of a mile, and one eighth of a mile for about 97.9 sq miles. The lines were flown perpendicular to the flight lines at intervals of approximately 3 miles.

A Novatel OEMS-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 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.

#### ELECTROMAGNETIC ANOMALIES



## RESIDUAL MAGNETIC FIELD AND DETAILED ELECTROMAGNETIC ANOMALIES WITH TOPOGRAPHY OF THE WRANGELLIA SURVEY AREA, SOUTH-CENTRAL ALASKA

PARTS OF TALKKEETNA MTNS. D-1 and HEALY A-1 QUADRANGLES

by  
Laurel E. Burns, CGG, and Fugro GeoServices, Inc.  
2015

#### ELECTROMAGNETICS

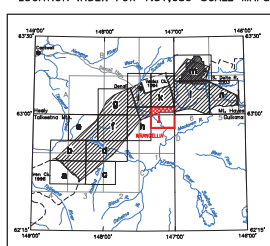
To determine the location of EM anomalies or their boundaries, the DIGHEM EM system measured inphase and quadrature components at five frequencies. Two vertical coaxial-coil pairs operated at 1000 and 5500 Hz while three horizontal coplanar-coil pairs operated at 900, 7200, and 56,000 Hz. EM data were 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 coiled 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.

#### RESIDUAL MAGNETIC FIELD

The magnetic total field data were processed using digitally recorded data from a CGG D1344 magnetometer with a Scintrex CS3 cesium 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 2010, 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. All grids were then resampled from the 80 m cell size down to a 25 m cell size to produce the maps and final grids contained in this publication.

Alkema, 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. 588-602.

#### LOCATION INDEX FOR 1:31,680-SCALE MAPS



#### 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 Fugro GeoServices, Inc. Airborne geophysical data for the area were acquired and processed by CGG in 2013 and 2014. Previously flown DGGGS surveys adjacent to the current survey are shown in the location map by dashed lines, survey name, and date of publication. The project was funded by the Alaska State Legislature as part of the Alaska Strategic and Critical Minerals Assessment project, which is part of the Alaska Airborne Geophysical and Geological Mineral Inventory Program. Milrock Exploration Corporation contributed inflight data for a portion of the area shown above as denser hatching.

All data and maps produced to date from this survey are available in digital format on DVD for a nominal fee through DGGGS, 3354 College Road, Fairbanks, Alaska, 99709-3707, and are downloadable for free from the DGGGS website ([www.dggs.alaska.gov/pubs](http://www.dggs.alaska.gov/pubs)). Maps are also available on paper through the DGGGS office, and are viewable online at the website in Adobe Acrobat .PDF file format.



### PARTS of HEALY A-1 and B-1 QUADRANGLES

**USCRIPTIVE NOTES**

The geophysical system was acquired with a DIGIMAX cesium magnetometer mounted on a Sincroflex CS3 cesium magnetometer cart. The cart was towed by a motor launch at a height of 100 feet. In addition the system included a GPS receiver, a digital compass, two altimeters, GPS navigation system, 50/60 Hz monitors and video camera. Flights were made over the study area at an altitude of approximately 100 m at a mean terrain clearance of 200 feet with a maximum cross track error of 100 meters. The flight lines are roughly parallel to each other with a distance between them of about 97.9 sq miles. The lines were flown perpendicular to the flight direction.

A Novatel OEMS-2 Global Positioning System was used for navigation. The helicopter position was determined by differential positioning to a relative accuracy of better than 5 m. Flight path positions were determined by integrating the heading information from a gyrospherid, 1927 North American datum using a magnetic declination of 18 degrees East, latitude of 40° N and an east constant of 500,000. Positional errors were estimated as being less than 1 meter north-south and 10 m with respect to the UTM grid.

**ELECTROMAGNETIC ANOMALIES**

**Antennary**

**Conduction**

● >100 slm  
 ● 50-100 slm  
 ● 20-50 slm  
 ● 10-20 slm  
 ● 5-10 slm  
 ○ 1-5 slm  
 ○ < 1 slm

⊗ Questionable anomaly  
 Δ EM magnetic response

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

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

**ELECTROMAGNETICS**

To determine the location of EM anomalies or their boundaries, the DIGHEM<sup>®</sup> EM system measured inphase and quadrature coil-coupled responses at 1000 Hz and 5000 Hz. The coil-coupled coils operated at 1000 and 5500 Hz while three horizontal coil-coupled coils operated at 900, 7200, and 5500 Hz. The 1000 Hz and 5500 Hz responses were sampled at 100 m 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 legend. The number of conductors is indicated by the vertical dimension of the type of conductor is based on EM anomaly shapes of the coil-coupled and coil-coupled responses, together with conductor and magnetic patterns and topography. The position of the flight track video were examined to locate cultural sources.

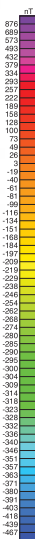
The magnetic total field data were processed using digitally recorded data from a CGO D13-44 magnetometer with a built-in CSS current source. Data were collected at a sampling interval of 0.1 seconds. The magnetic data were (1) corrected for diurnal variations by subtraction of the digitally recorded base magnetic data, (2) KRM corrected (KRM model 2010, 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 two-beam technique. The resulting maps were from the 80 m cell size down to a 25 m cell size to produce the maps and final grids contained in this publication.

**SURVEY HISTORY**

This map has been compiled and drawn under contract between the State of Alaska and Department of Natural Resources, Division of Geological & Geophysical Survey Operations. The map is based on data collected by the Division of Geological & Geophysical Survey Operations for the areas covered and processed by GCS in 2013 and 2014. Previously published maps of the same area are shown in the map area by dashed lines, survey name, and date of publication. The map is published by the Division of Geological & Geophysical Survey Operations, the Legislature as part of the Alaska Strategic and Critical Minerals Inventory Program, and the Department of Natural Resources, Division of Geological & Geophysical Survey Operations. Alaska Airborne Geological and Geophysical Mineral Inventory Program, Milrock Exploration Corporation. The map is published as a portion of the map area shown above as denser habitat.

All data and maps produced to date from this survey are available to the public. The map is available online through DGGG, 3354 College Road, Fairbanks, Alaska 99701-3707, and are downloadable free from the [www.dggg.alaska.gov](http://www.dggg.alaska.gov) website. The map is also available on paper through the DGGG office, and is available online at the website in Adobe Acrobat PDF file format.





Portion collated from U.S. Geological Survey BL. Sheets A-4, 1000. Geographic. Map.



The geophysical data were acquired with a DGHM-2000 magnetometer (Figure 1) mounted on a cesium magnetometer with a Scintrex CS3 cesium fluxgate magnetometer. The magnetometer was flown at a height of 100 feet. In addition the survey recorded data from radar and laser altimetry, a GPS, a digital video camera, and a still camera and video camera. Flights were made at a mean terrain clearance of 200 feet with a spacing primarily of a quarter of a mile. The lines were flown perpendicular to the flight lines.

A Novatel OEM-22 Global Positioning System was used for navigation. The helicopter position was determined by a GPS receiver with a differential positioning to a relative accuracy of better than 5 m. Flight path positions were determined by a GPS receiver with a differential positioning to a relative accuracy of better than 5 m. Flight path positions were determined by a GPS receiver with a differential positioning to a relative accuracy of better than 5 m. Flight path positions were determined by a GPS receiver with a differential positioning to a relative accuracy of better than 5 m.

ELECTROMAGNETIC ANOMALIES	
	Anomaly
	<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>● &gt;100 elements</p> <p>○ 50-100 elements</p> <p>⊙ 20-50 elements</p> <p>⊕ 10-20 elements</p> <p>⊗ 1-5 elements</p> <p>⊖ &lt; 1 elements</p> <p>⊛ Questionable anomaly</p> <p>⊙ EM magnetite anomaly</p> <p>△ Culture</p> </div> <div style="width: 45%;"> <p>Conductance</p> </div> </div>
<p>arc indicates the conductor log is &gt;10 m</p> <p>↑ E direction</p> <p>⊙ magnetic correlation</p> <p>⊙ n 1</p>	<p>●</p> <p>○</p> <p>⊙</p> <p>⊕</p> <p>⊗</p> <p>⊖</p> <p>⊛</p> <p>⊙</p> <p>△</p>
Interpretive key	Conductor model
●	Broadest conductor
○	Narrow, high-pitch conductor
⊙	Conductive core
⊕	Vertical slot (wall)
⊗	Broad conductive rock unit, conductive overlying
⊖	Narrow conductive core, conductive overlying
⊛	Edge of broad conductor
⊙	Edge of not a conductor
L	Culture, esp. power line
⊙	mine, building or fence
M	Magnetite
⊙	Indicates more uncertainty as to the most appropriate model to assume model, but does not question the validity of the EM anomaly

**RESIDUAL MAGNETIC FIELD AND  
DETAILED ELECTROMAGNETIC ANOMALIES  
WITH TOPOGRAPHY  
OF THE WRANGELLIA SURVEY AREA,  
SOUTH-CENTRAL ALASKA**

**PART OF MT. HAYES A-6  
QUADRANGLE**

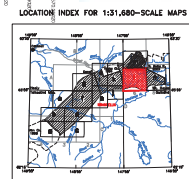
by  
Laurel E. Bura, CGG, and Fugro Geoservices, Inc.  
2018

### ELECTROMAGNETICS

To determine the location of EM anomalies or their boundaries, the DIGHEM<sup>®</sup> EM system measured inphase and quadrature components at five frequencies. Two vertical coil-coll pairs operated at 1000 and 5500 Hz while the other two coil-coll pairs operated at 7200, 7300, 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 identified by the specific map, or the interpretive symbol attached to each EM anomaly. Determination of the type of conductor is based on EM anomaly shapes of the coil-coll and coil-coll pairs, together with conductor and magnetic patterns and topography. The power line monitor and the flight track video were examined to locate cultural sources.

RESIDUAL MAGNETIC FIELD

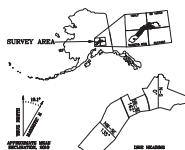
The magnetic total field data were processed using digitally recorded data from a GGG D1344 magnetic tape recorder. The data were sampled and collected at a sampling interval of 0.1 seconds. The magnetic data were (1) corrected for diurnal variations by subtraction of the digitally recorded base station magnetic data, (2) GRSF corrected (GRSF model 2010, updated for date of flight and atmospheric variations), (3) leveled to the first data, and (4) interpolated onto a regular 80 m grid using a modified Akima (1970) technique. All grids were then resampled from the 80 m cell size down to a 25 m cell size by averaging the maps and final grids contained in this publication.



## 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 (DGGGS), and the U.S. Geological Survey (USGS). The geophysical data for the area were acquired and processed by GGS in 2013 and 2014. Previously, the geophysical data for the area were acquired and processed by the USGS. The location map by dashed lines shows the national boundary and the location of the project. The project was funded by the Alaska State Legislature as part of the Alaska Strategic and Critical Minerals Program. The project was also funded by the Alaska Airborne Geophysical and Geological Mineral Inventory Program. Milrock Exploration Corporation (Milrock) is the owner of the portion of the map that shows areas as denser hatching.





The geophysical data were acquired with a DHM-Electromagnetic (EM) system and a Fugro D1344 cesium magnetometer with a Schlumberger CS3 cesium fluxgate gradiometer. The EM system was towed in a beam pull configuration at a depth of 10 m and flown at a height of 100 feet, in addition the aircraft was equipped with a Fugro D1344 GPS altimeters, GPS navigation system, 50/60 Hz monitors and video camera. Flights were made over the study area in a series of parallel tracks at a mean terrain clearance of 200 feet with a maximum cross track error of 100 ft. The flight lines had a ground speed of approximately 180 knots and one eighth of a mile for about 97.9 sq miles. The lines were flown perpendicular to the flight direction.

A Novatel OEMS-02L Global Positioning System was used for navigation. The hepacopter position was determined by differential GPS using real time differential positioning to a relative accuracy of better than 2 m. Flight path positions were determined by integrating the heading information from a spherical, 1927 North American datum using a Kalman filter algorithm. The horizontal accuracy of 0 and an east constant of 500,000. Positional accuracy of the presented data is better than 2 meters.

[illegible]

**PARTS of MT. HAYES A-5, A-6,  
B-5, and B-6 QUADRANGLES**  
by  
Laurel E. Burns, CGO, and Fugro GeoServices, Inc.  
2018

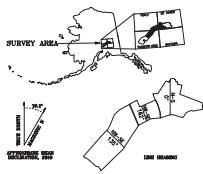
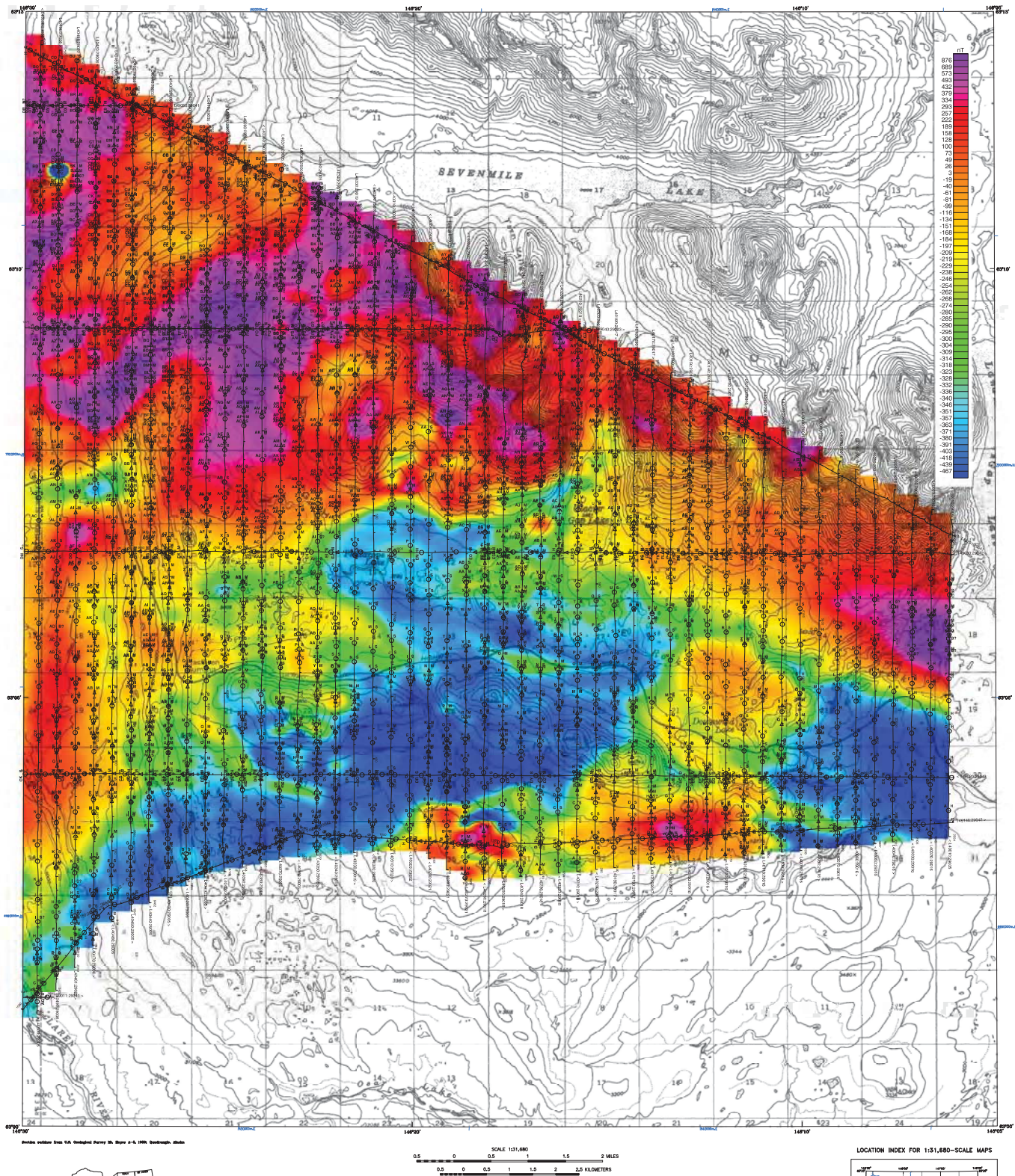
To determine the location of EM anomalies or their boundaries, the DQ-1000 system operates in the quadrature mode with two orthogonal coils. The quadrature components at five frequencies. Two vertical coaxial-coil pairs operated at 1000 and 5500 Hz with three horizontal coplanar-coil pairs operated at 900, 7200 and 5500 Hz. The system has a 1000 Hz sampling interval. The EM system responds to bedrock conditions, conductive overburden, and cultural sources. The type of conductor is indicated on the aeromagnetic map by the bedrock symbols. The system is capable of determining 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 geological maps and flight track views were examined to locate cultural sources.

The magnetic total field data were processed using digitally recorded data from a CGG D1.344 magnetometer with a Schlumber CS3 cesium sensor. Data were digitized and recorded on a 16-bit digital recorder. The magnetic data were (1) corrected for diurnal variations by subtraction of the digitally recorded base station magnetic data, (2) GPR corrected, (3) model corrected, (4) corrected for magnetic declination and inclination variations, (5) leveled to the tie line data, and (6) interpolated onto a regular 80 m grid using a modified Alamo (1970) technique. All grids were then resampled to a 20 m cell size down from 25 m cells to produce the maps and final grids contained in this publication.

The map has been compiled and drawn under contract between the State of Alaska, Department of Natural Resources, Division of Geological & Geophysical Surveys (DGGGS) and the U.S. Geological Survey. The geophysical data for the area were acquired and processed by CGO in 2013 and 2014. Previously published maps of the area are available from the DGGGS or are shown in the location map by dashed lines. The map was prepared by the Alaska State Legislature as part of the Alaska Strategic and Critical Minerals Inventory Act. The project was funded by the Alaska State Legislature and the U.S. Geological Survey, Alaska Airborne Geophysical and Geological Mineral Inventory Program. Milrock Exploration Corporation contributed aerial photography of a portion of the area shown above and deeper hatchings.

All data and maps produced to date from this survey are available from the DGGGS, 3354 College Road, Fairbanks, Alaska, 99709-3705, and are downloadable for free from the DGGGS website at <http://www.dgggs.alaska.gov>. The maps are also available on paper through the DGGGS office, and are available online at the website in Adobe Acrobat PDF format.

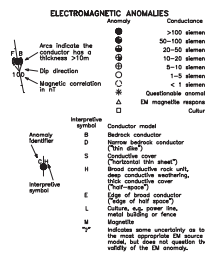




## DESCRIPTIVE NOTES

The geophysical data were acquired with a Geoscan EM31-MP (EM) system and a Fugro D1344 cesium magnetometer with a Sinterex C63 cesium sensor. The EM and magnetic sensors were flown at a height of 100 feet; in addition the survey recorded data from radar and laser altimetry, GPS navigation system, 50/60 Hz magnetic and video cameras. Flights were performed in an east-west line, with a track spacing of 0.25 miles, and a mean terrain clearance of 200 feet with a spacing priority of a quarter of a mile, and one eighth of a mile for about 9.9 sq miles. The lines were flown perpendicular to the flight lines at intervals of approximately 3 miles.

A Novatel OEM-300 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 and 1927 datum datum using a central meridian (CM) direction datum using a 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.



# RESIDUAL MAGNETIC FIELD AND DETAILED ELECTROMAGNETIC ANOMALIES WITH TOPOGRAPHY OF THE WRANGELLIA SURVEY AREA, SOUTH-CENTRAL ALASKA

PART OF MT. HAYES A-8  
QUADRANGLE

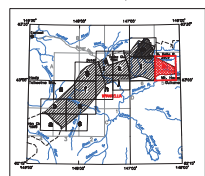
by  
Laurie E. Burns, CGO, and Fugro Geoservices, Inc.  
2015

## RESIDUAL MAGNETIC FIELD

The magnetic total field data were processed using digitally recorded data from a CGO D1344 magnetometer with a Sinterex C63 cesium 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) GRS corrected (GRS model 2011), (3) leveled to the tie line data, and (4) referenced to a regular 80 m grid using a modified Alaska (1970) technique. All grids were then resampled from the 80 m cell size down to a 25 m cell size to produce the maps and final grids contained in this publication.

Alaska, 1970. A new method of interpretation and smooth maps of magnetic data. In: *Proceedings of the Association of Geophysical Geologists*, v. 17, no. 4, p. 388-395.

## LOCATION INDEX FOR 1:51,680-SCALE MAPS



## 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 Fugro Geoservices, Inc. All geophysical data for the area were acquired and processed by DGGS surveys adjacent to the current survey area shown on the map. The location map is based on DGGS survey data, and dates of publication. The project was funded by the Alaska State Legislature as part of the Alaska Strategic and Critical Minerals Assessment project, which is part of the Alaska Strategic and Critical Minerals Assessment project. The project was funded by the Alaska State Legislature as part of the Alaska Strategic and Critical Minerals Assessment project, which is part of the Alaska Strategic and Critical Minerals Assessment project. The project was funded by the Alaska State Legislature as part of the Alaska Strategic and Critical Minerals Assessment project, which is part of the Alaska Strategic and Critical Minerals Assessment project.