WRANGELLIA ELECTROMAGNETIC AND MAGNETIC AIRBORNE GEOPHYSICAL SURVEY DATA COMPILATION

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

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DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS

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http://doi.org/10.14509/29848

WRANGELLIA ELECTROMAGNETIC AND MAGNETIC AIRBORNE GEOPHYSICAL SURVEY DATA COMPILATION

Burns, L.E.,[1] Barefoot, J.D.,[1] Naibert, T.J.,[1] 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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AVAILABLE DATA

Data Type	Provider	Description
ascii_data	contractor	ASCII format line data, other ASCII data
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

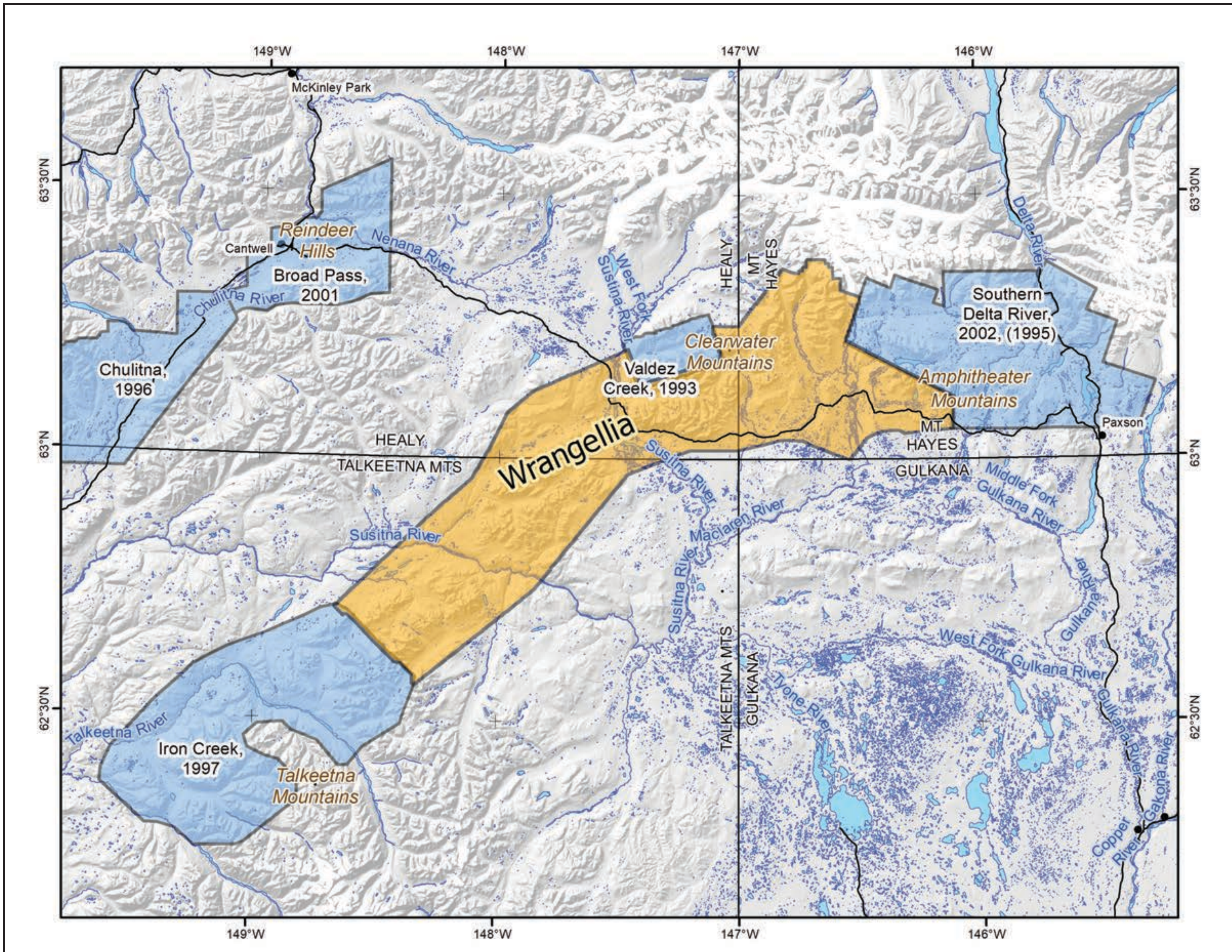

Figure 1. Wrangellia electromagnetic and magnetic airborne geophysical survey location shown in interior Alaska (inset). Wrangellia survey area shown with adjacent DGGS geophysical surveys, landmarks, relevant 1:250,000-scale quadrangle boundaries, mountain ranges, rivers, glaciers, and elevation hillshade.

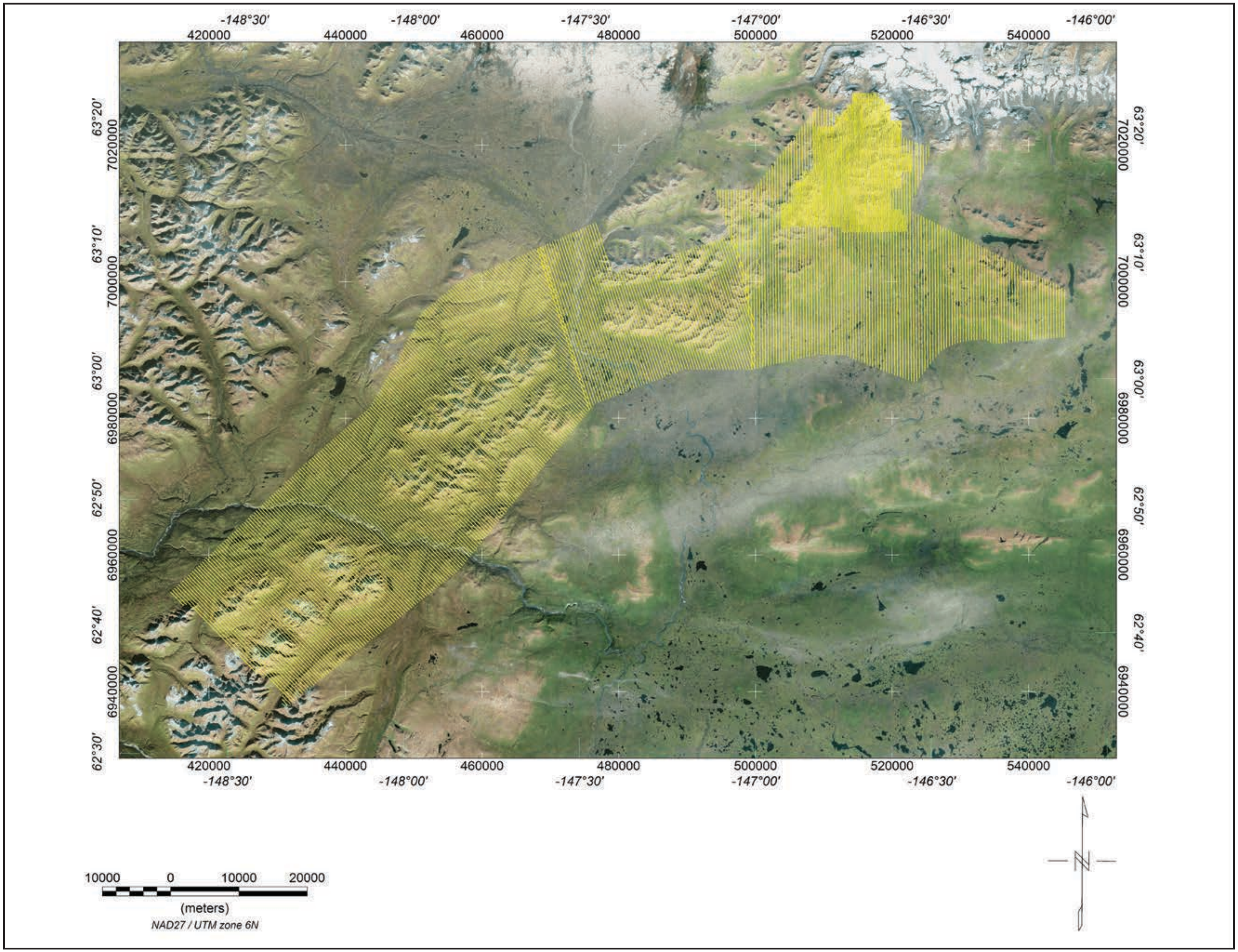

Figure 2. Flight path with orthometric image.

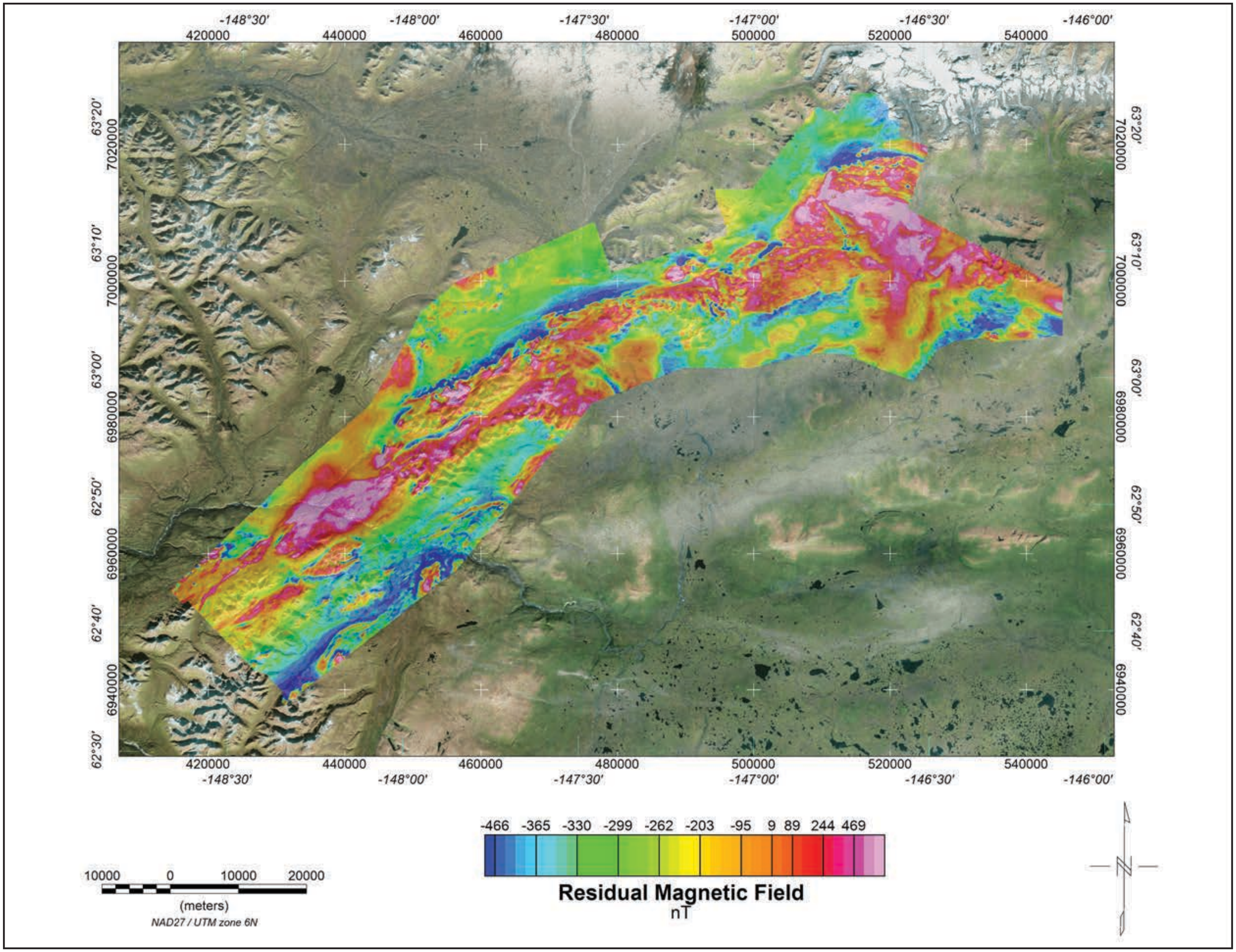

Figure 3. The residual magnetic intensity data were created using digitally recorded magnetic total field data from a Fugro D1344 magnetometer with a Scintrex CS3 cesium sensor. Data were collected at a sampling interval of 0.1 seconds. The magnetic data were (1) corrected for diurnal variations by subtracting 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.

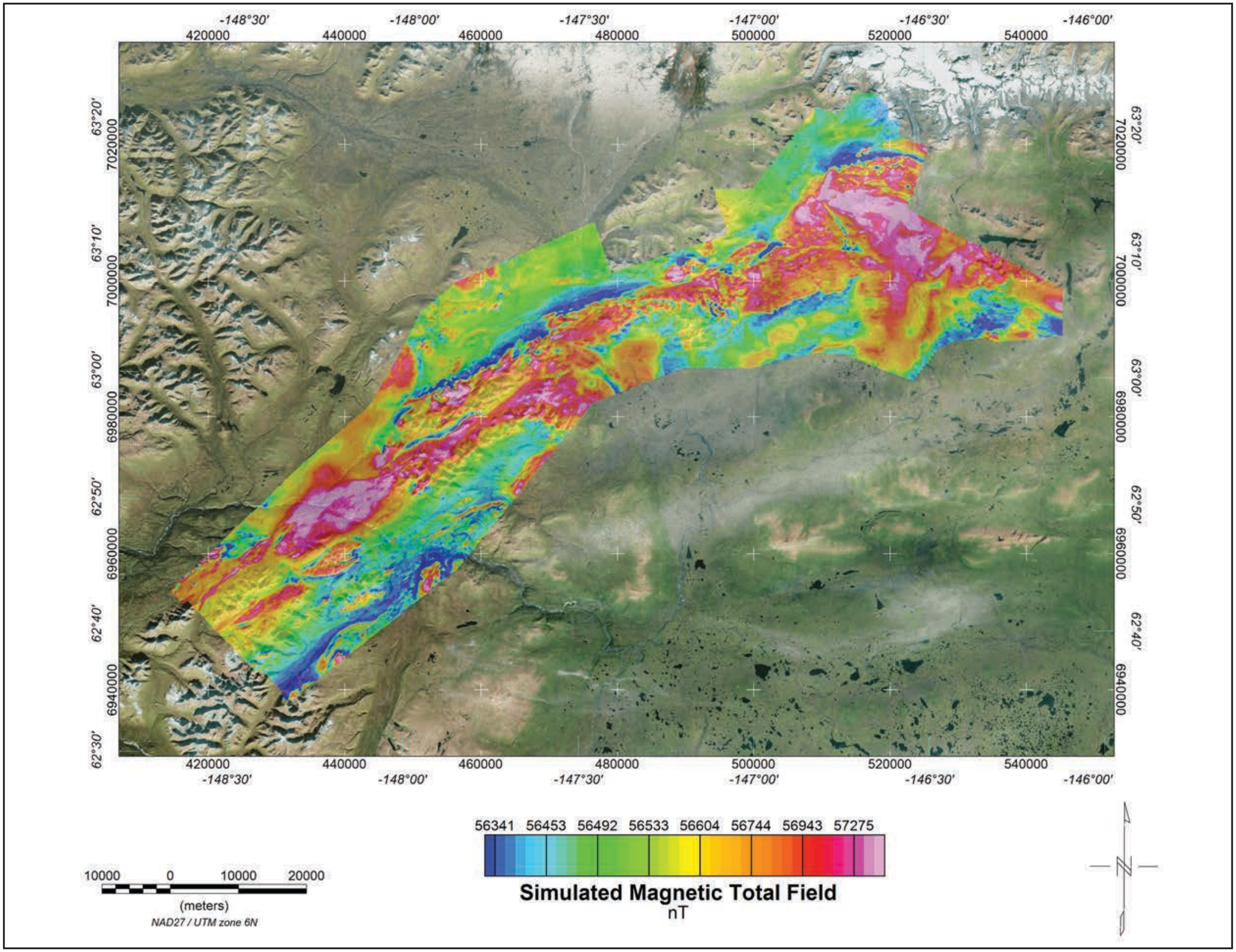

Figure 4. The simulated magnetic total field data were created using digitally recorded data from a Fugro D1344 magnetometer with a Scintrex CS3 cesium sensor. Data were collected at a sampling interval of 0.1 seconds. The magnetic data were (1) corrected for diurnal variations by subtracting the digitally 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.

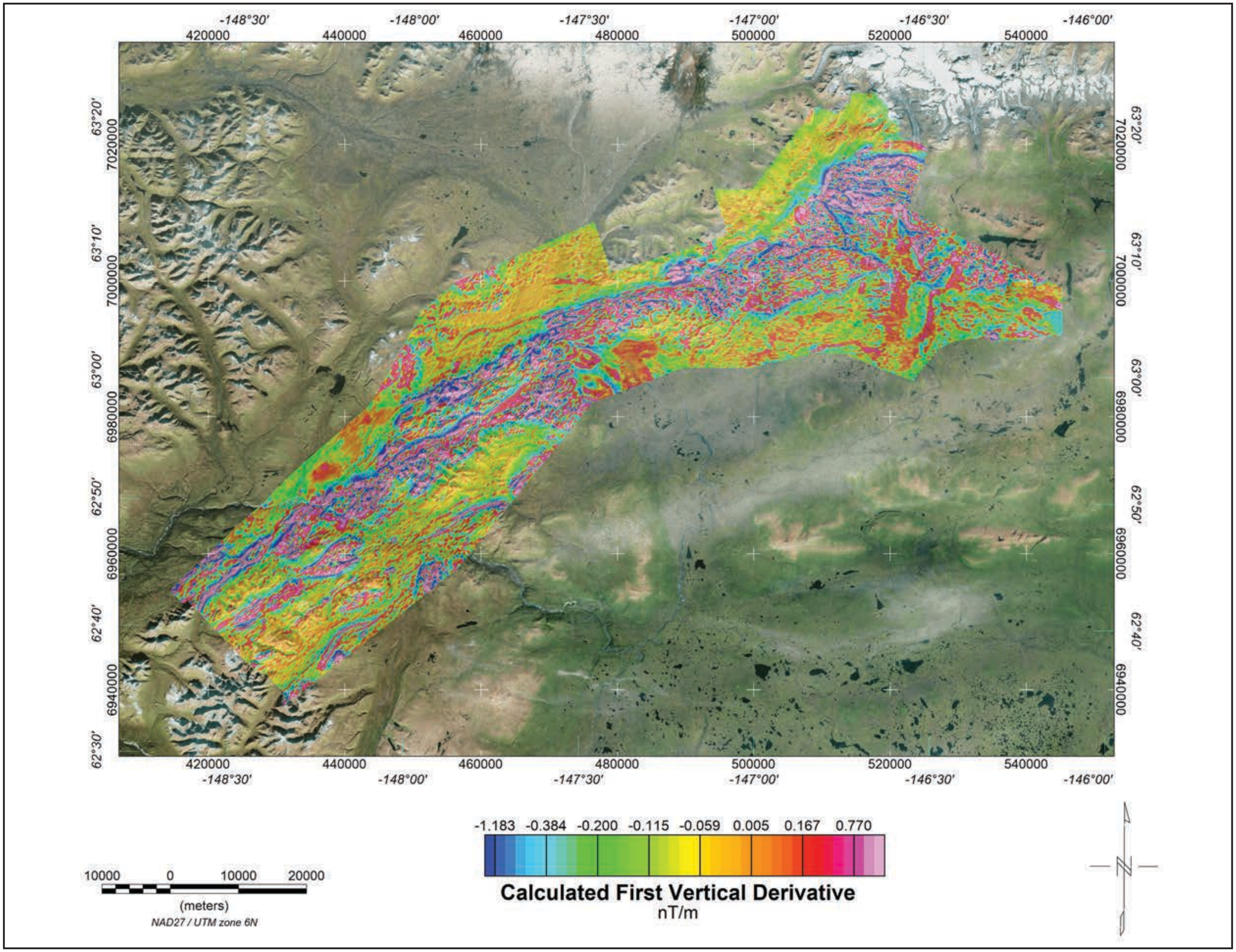

Figure 5. The first vertical derivative grid was calculated from the leveled residual magnetic field grid using an FFT base frequency domain filtering algorithm. The resulting first vertical derivative grid provides better definition and resolution of near-surface magnetic units and helps to identify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

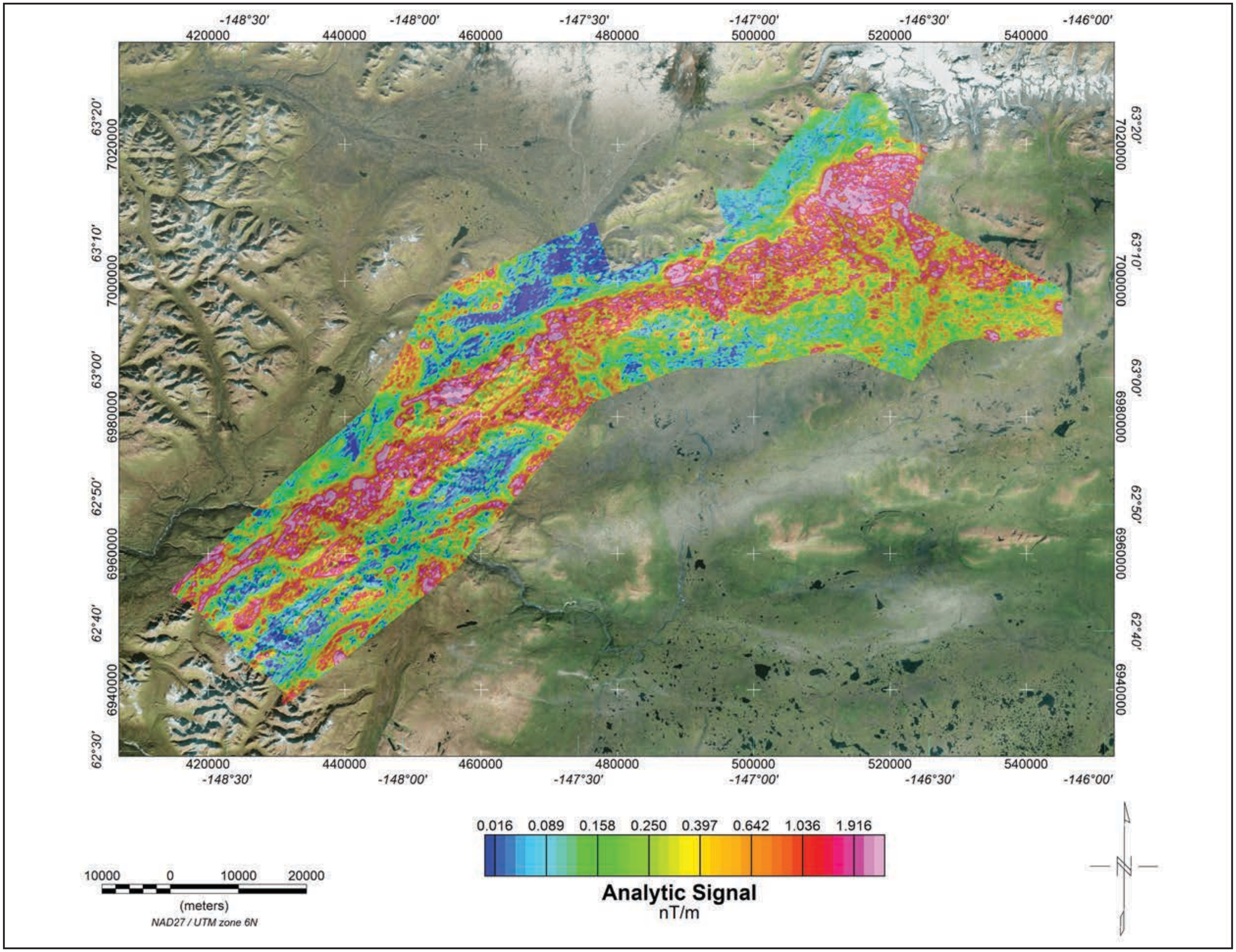

Figure 6. Analytic signal is the total amplitude of all directions of magnetic gradient calculated from the sum of the squares of the three orthogonal gradients. Mapped highs in the calculated analytic signal of magnetic parameter locate the anomalous source body edges and corners (such as contacts,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

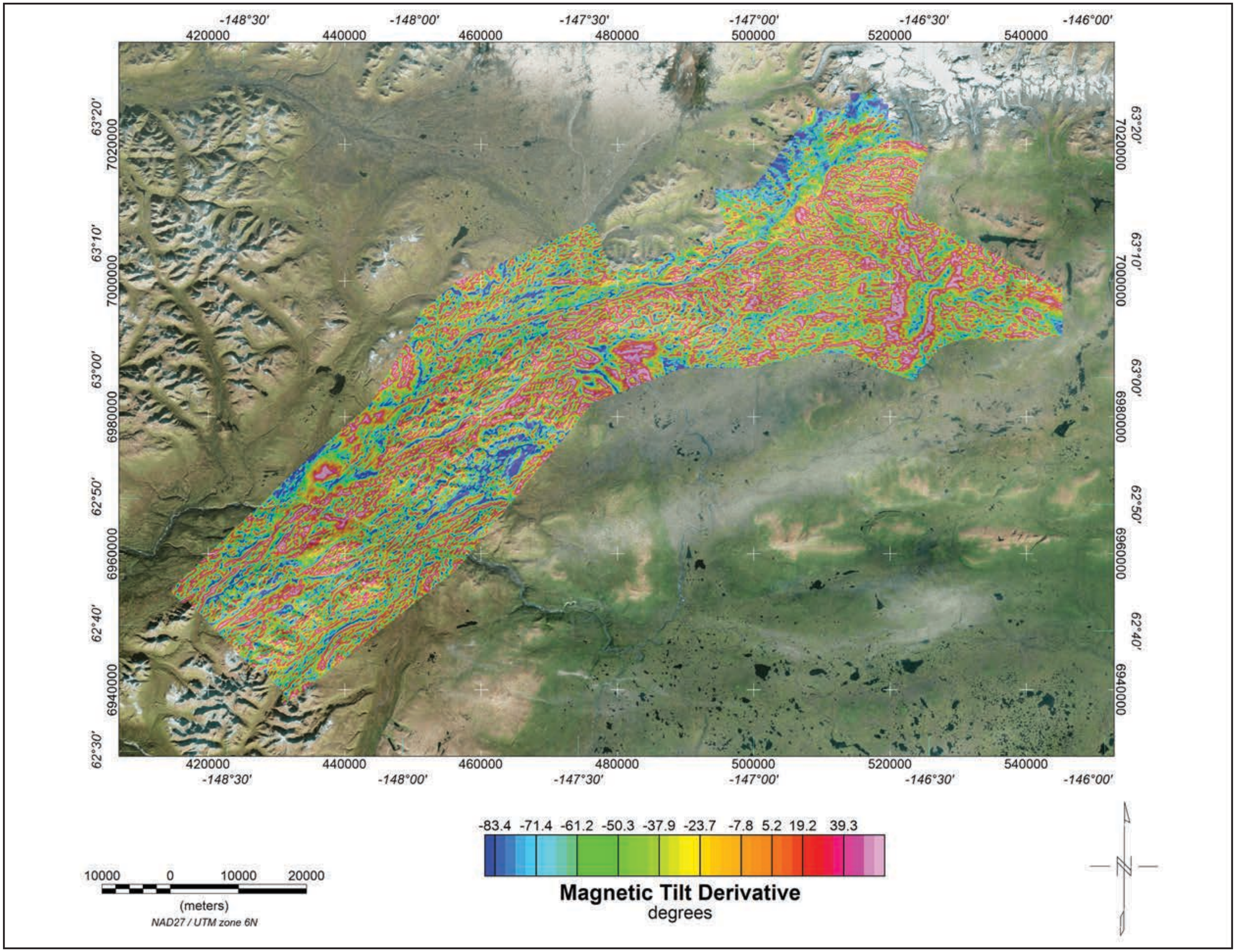

Figure 7. The tilt derivative is the angle between the horizontal gradient and the total gradient, which can be used to identify the depth and type of source. The tilt angle is positive over the source, crosses through zero at, or near, the edge of a vertical-sided source, and is negative outside the 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.

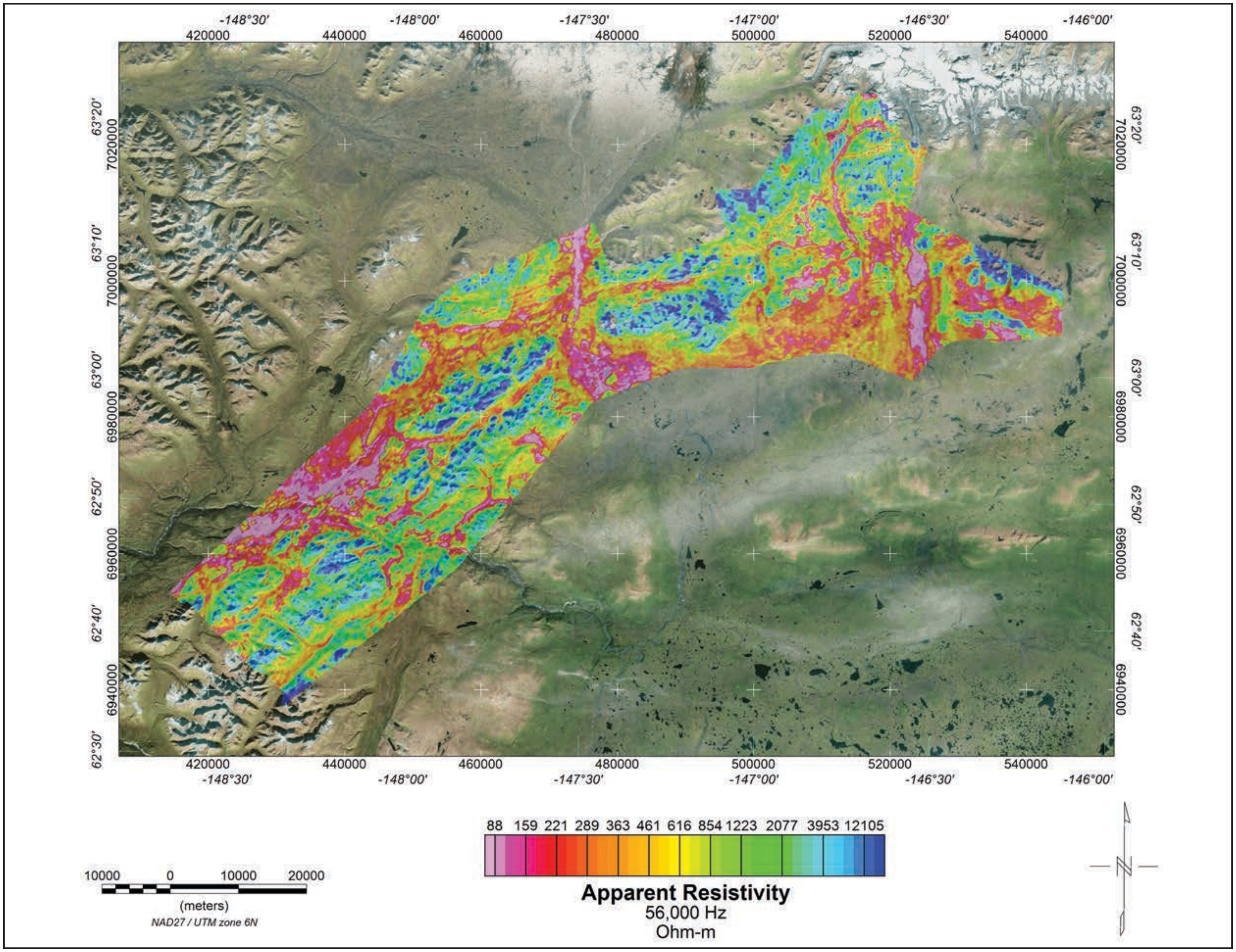

Figure 8. The DIGHEM[V] EM system measured inphase and quadrature components at five frequencies. Two vertical coaxial coil-pairs operated at 1000 and 5500 Hz while three horizontal coplanar coil-pairs operated at 900, 7,200 and 56,000 Hz. EM data were sampled at 0.1-second intervals. The EM system responds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

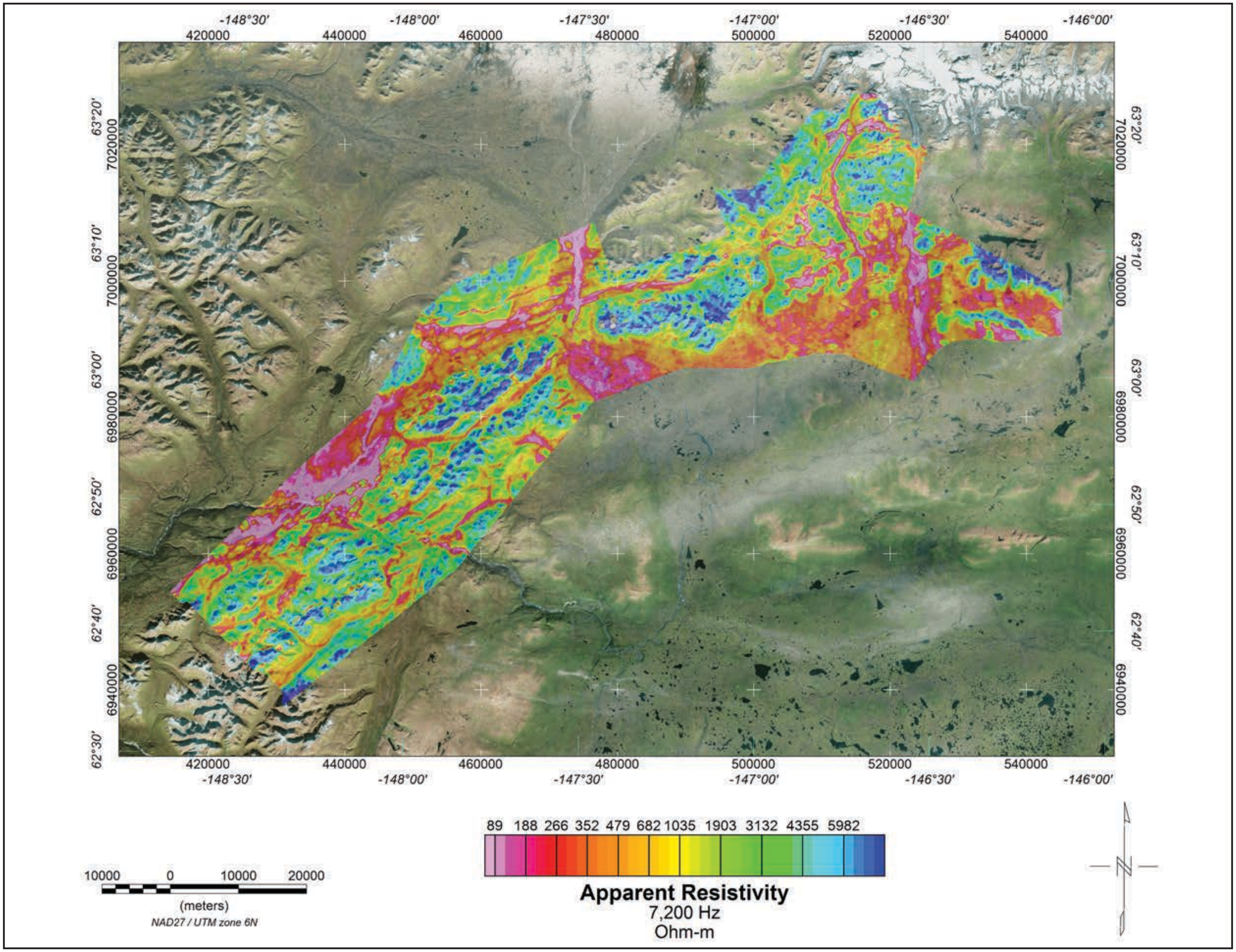

Figure 9. The DIGHEM[V] EM system measured inphase and quadrature components at five frequencies. Two vertical coaxial coil-pairs operated at 1000 and 5500 Hz while three horizontal coplanar coil-pairs operated at 900, 7,200 and 56,000 Hz. EM data were sampled at 0.1-second intervals. The EM system responds to bedrock conductors, conductive overburden, and cultural sources. Apparent resistivity is generated from the inphase and quadrature component of the coplanar 7,200 Hz using the pseudo-layer half-space model. The data were interpolated onto a regular 80 m grid using a modified Akima (1970) technique. 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.

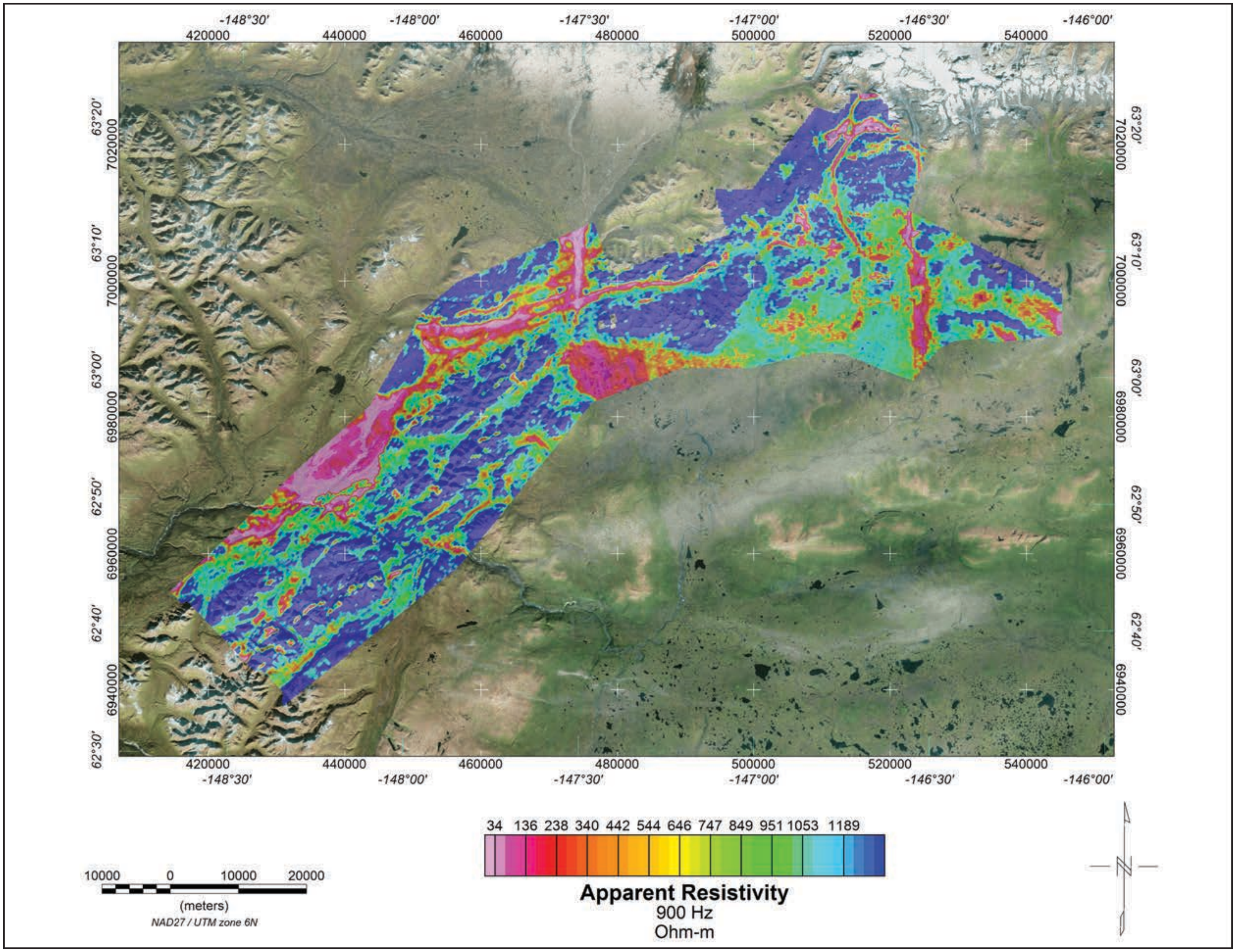

Figure 10. The DIGHEM[V] EM system measured inphase and quadrature components at five frequencies. Two vertical coaxial coil-pairs operated at 1000 and 5500 Hz while three horizontal coplanar coil-pairs operated at 900, 7,200 and 56,000 Hz. EM data were sampled at 0.1-second intervals. The EM system responds to bedrock conductors, conductive overburden, and cultural sources. Apparent resistivity is generated from the inphase and quadrature component of the coplanar 900 Hz using the pseudo-layer half-space model. The data were interpolated onto a regular 80 m grid using a modified Akima (1970) technique. 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
wrangellia_analyticsignal_topo_map_b.pdf	analytic signal grid with topographic base map
wrangellia_analyticsignal_topo_map_c.pdf	analytic signal grid with topographic base map
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
wrangellia_tiltderivative_contours_topo_map_a.pdf	magnetic tilt derivative grid with contours and topographic base map
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
wrangellia_res7200hz_topo_map_b.pdf	7,200 Hz coplanar apparent resistivity grid with topographic base map
wrangellia_res7200hz_topo_map_c.pdf	7,200 Hz coplanar apparent resistivity grid with topographic base map
wrangellia_res7200hz_topo_map_d.pdf	7,200 Hz coplanar apparent resistivity grid 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_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
wrangellia_res7200hz_contours_plss_map_d.pdf	7,200 Hz coplanar apparent resistivity grid with contours and public land survey system base layer
wrangellia_res900hz_topo_map_a.pdf	900 Hz coplanar apparent resistivity grid with topographic base map
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
wrangellia_flightlines_topo_map_b.pdf	flight lines with topographic base map
wrangellia_flightlines_topo_map_c.pdf	flight lines with topographic base map
wrangellia_flightlines_topo_map_d.pdf	flight lines with topographic base map
wrangellia_residualmag_and_emanomalies_detailed_topo_map_a.pdf	residual magnetic field grid and detailed electromagnetic anomalies with topographic base map
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
wrangellia_residualmag_and_emanomalies_detailed_topo_map_h.pdf	residual magnetic field grid and detailed electromagnetic anomalies with topographic base map
wrangellia_residualmag_and_emanomalies_detailed_topo_map_i.pdf	residual magnetic field grid and detailed electromagnetic anomalies with topographic base map
wrangellia_residualmag_and_emanomalies_detailed_topo_map_j.pdf	residual magnetic field grid and detailed electromagnetic anomalies with topographic base map
wrangellia_residualmag_and_emanomalies_detailed_topo_map_k.pdf	residual magnetic field grid and detailed electromagnetic anomalies with topographic base map
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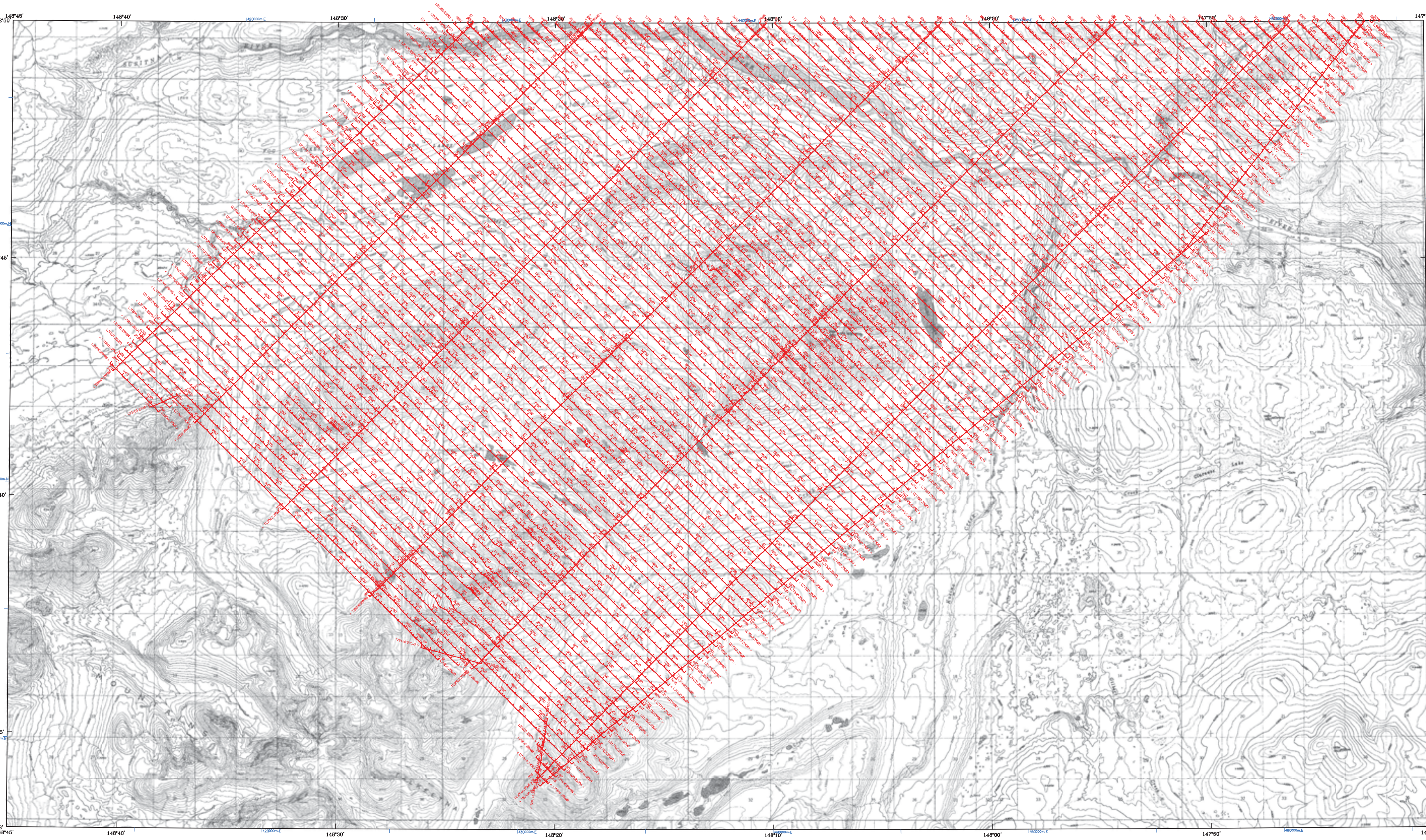
wrangellia_residualmag_and_emanomalies_detailed_topo_map_n.pdf	residual magnetic field grid and detailed electromagnetic anomalies with topographic base map
wrangellia_interpretation_plss_map_a.pdf	interpretation based on geophysical data with public land survey system base layer
wrangellia_interpretation_plss_map_b.pdf	interpretation based on geophysical data with public land survey system base layer
wrangellia_interpretation_plss_map_c.pdf	interpretation based on geophysical data with public land survey system base layer
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
wrangellia_interpretation_residualmag_plss_map_b.pdf	interpretation based on geophysical data with residual magnetic grid and public land survey system base layer
wrangellia_interpretation_residualmag_plss_map_c.pdf	interpretation based on geophysical data with residual magnetic grid and public land survey system base layer
wrangellia_interpretation_residualmag_plss_map_d.pdf	interpretation based on geophysical data with residual magnetic grid and public land survey system base layer



Base from U.S. Geological Survey Talkeetna Mtns C–2, 1963; C–3, 1977; C–4, 1965; D–2, 1963; D–3, 1965; D–4, 1965; Quadrangles, Alaska

SCALE 1:63,360

1 0 1 2 3 4 MILES

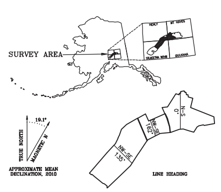
1 0 1 2 3 4 5 KILOMETERS

CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL

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

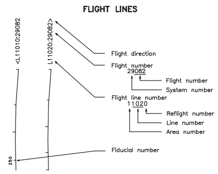


DESCRIPTIVE NOTES

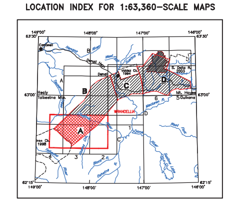
The geophysical data were acquired with a DIGHEM V Electromagnetic (EM) system and a Fugro D1344 cesium magnetometer with a Scintrex CS3 cesium sensor. The EM and magnetic sensors were flown at a height of 100 feet. In addition the survey recorded data from radar and laser altimeters, GPS navigation 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. Tie 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.

FLIGHT LINES



LOCATION INDEX FOR 1:63,360-SCALE MAPS



SURVEY HISTORY

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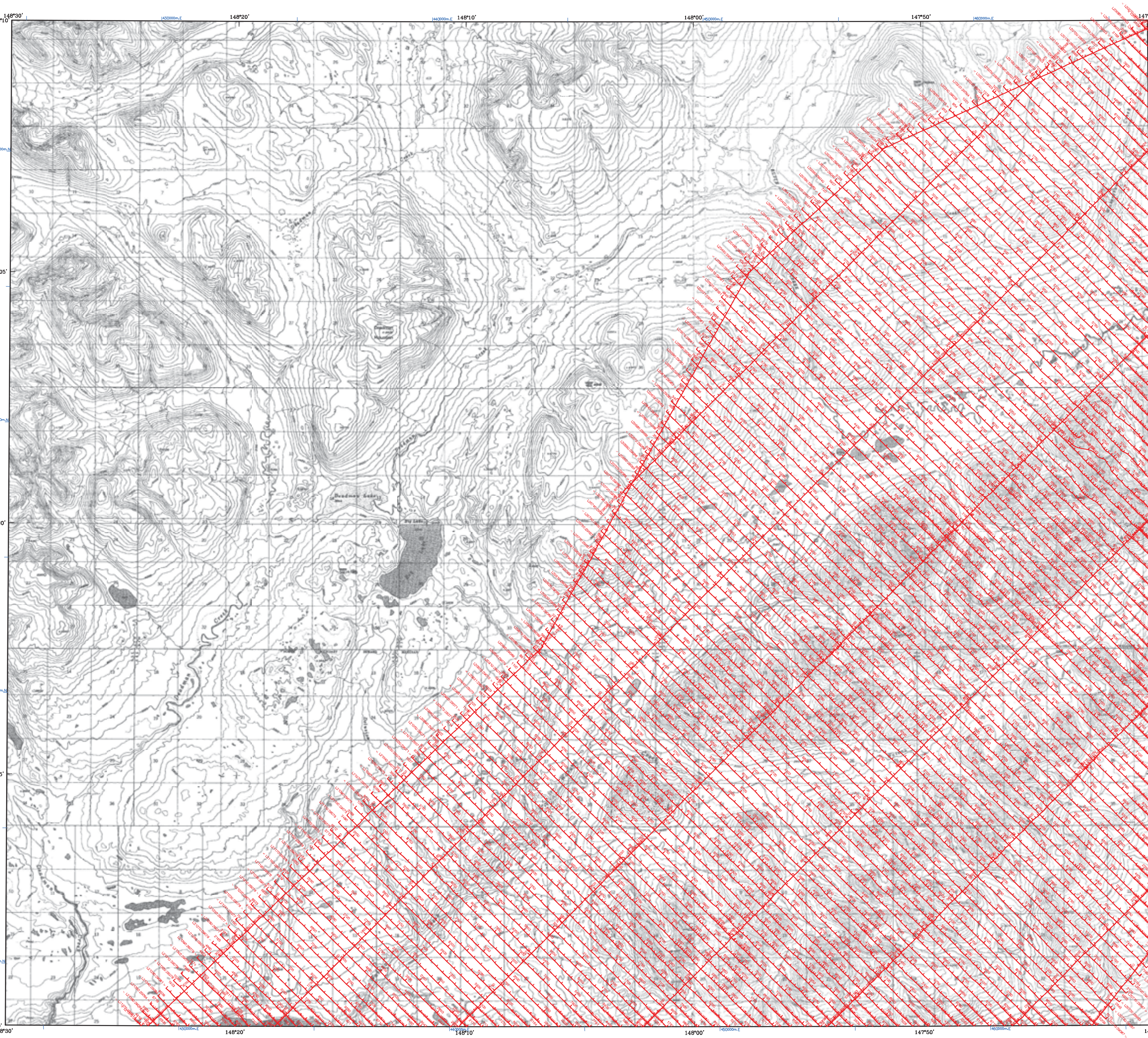
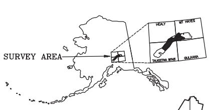
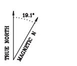


Base from U.S. Geological Survey Healy A-2, 1975; A-3, 1963; Talkeetna Mtns D-2, 1963; D-3, 1965; Quadrangles, Alaska





APPROXIMATE MEAN DECLINATION, 2010

LINE HEADING

SCALE 1:63,360

1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS

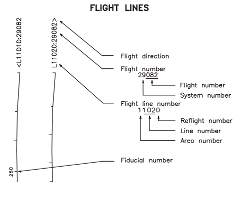
CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL

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

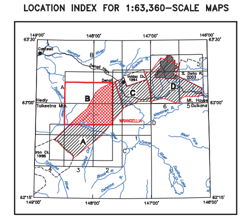
PARTS OF THE TALKEETNA MTNS, HEALY, AND MT HAYES QUADRANGLES

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

FLIGHT LINES



LOCATION INDEX FOR 1:63,360-SCALE MAPS



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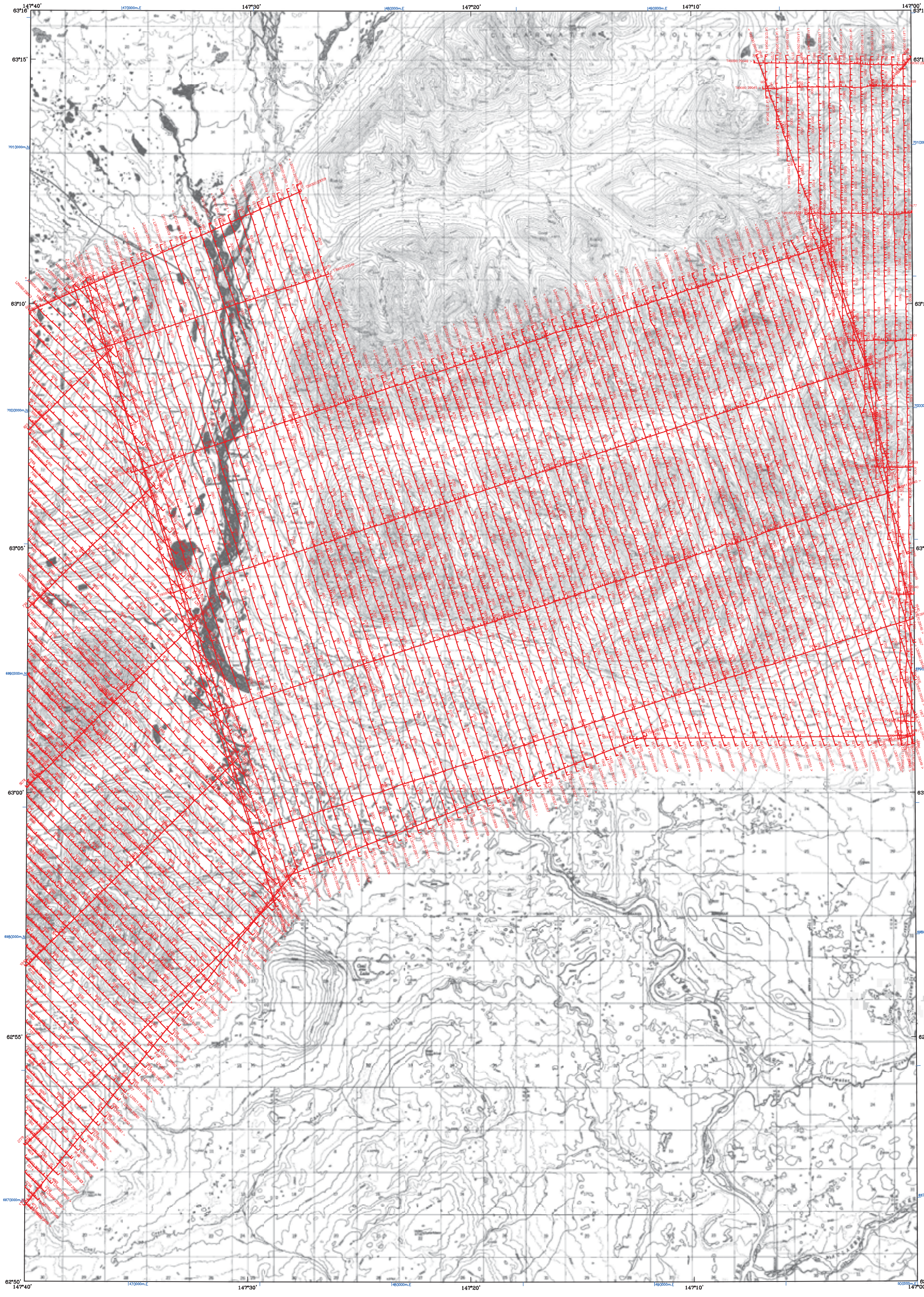

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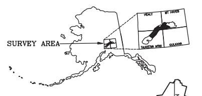

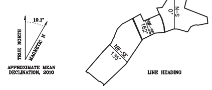

SCALE 1:63,360

1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS

CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL

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by
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2014

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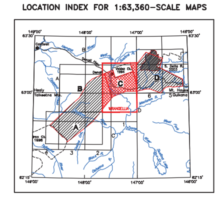

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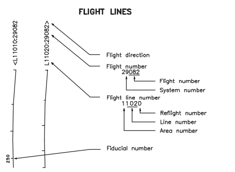
FLIGHT LINES



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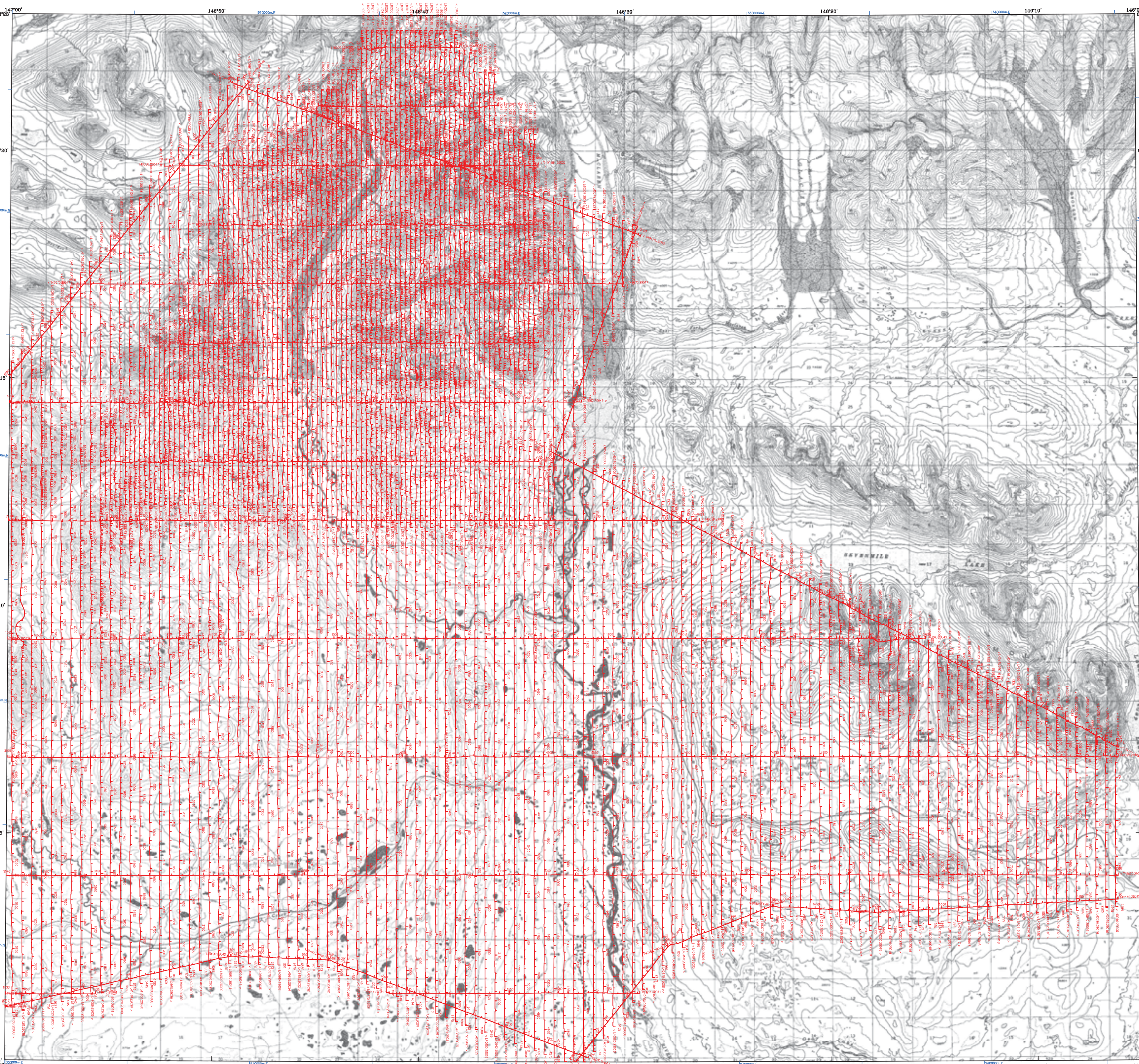


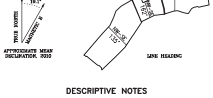
Base from U.S. Geological Survey Mt Hayes A-5, 1949; A-6, 1950; B-5, 1956; B-6, 1956; Quadrangles, Alaska

SCALE 1:63,360

1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS

CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL



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2014

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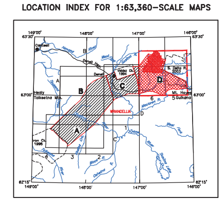

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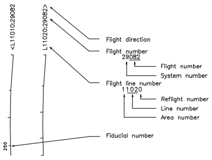
FLIGHT LINES



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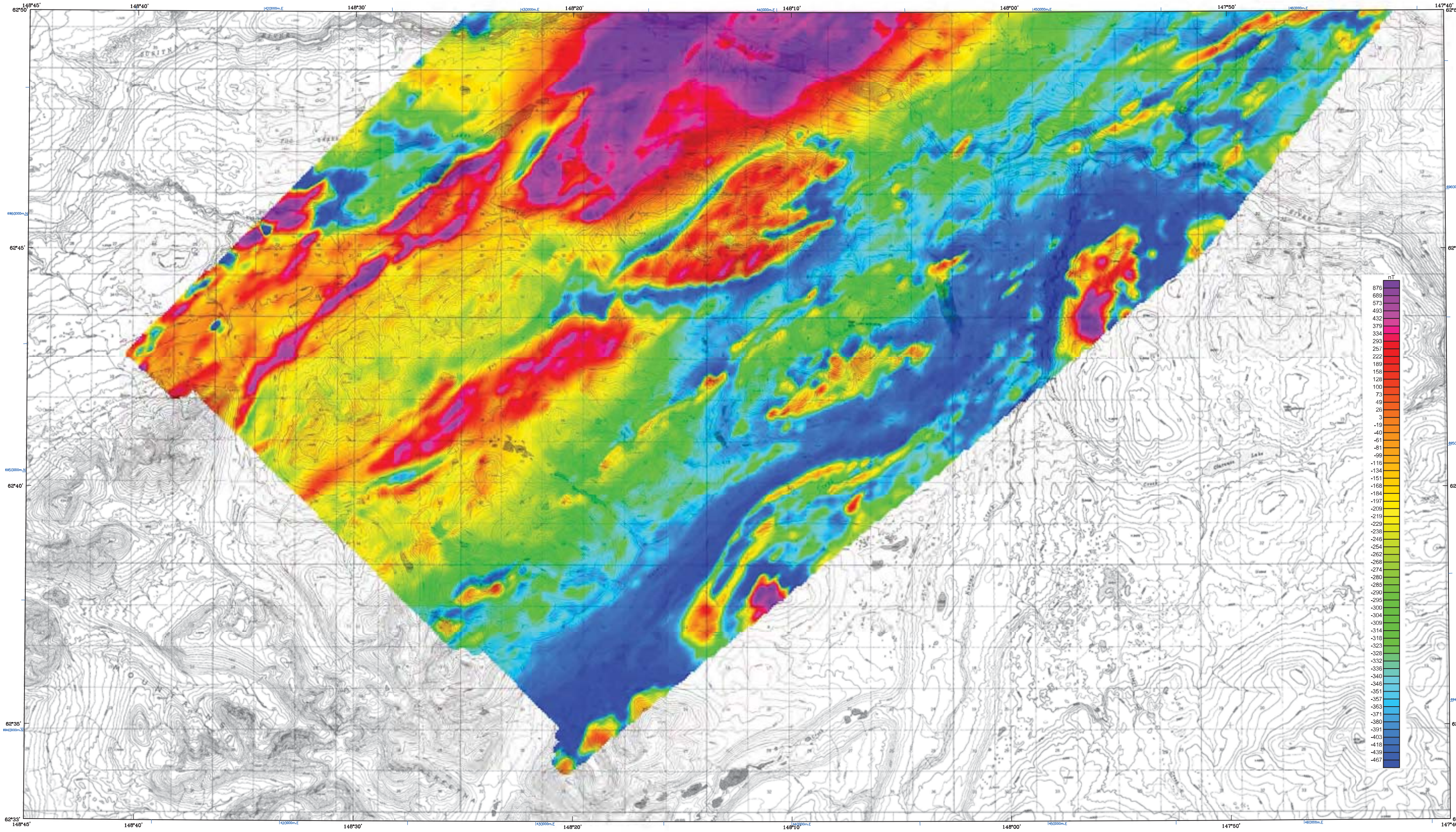
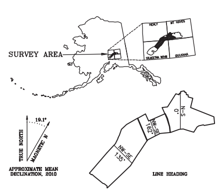


Base from U.S. Geological Survey Talkeetna Mtns C-2, 1963; C-3, 1977; C-4, 1965; D-2, 1963; D-3, 1965; D-4, 1965; Quadrangles, Alaska

SCALE 1:63,360

CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL



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

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

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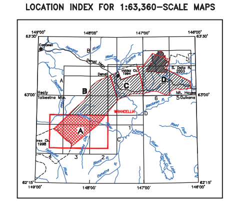

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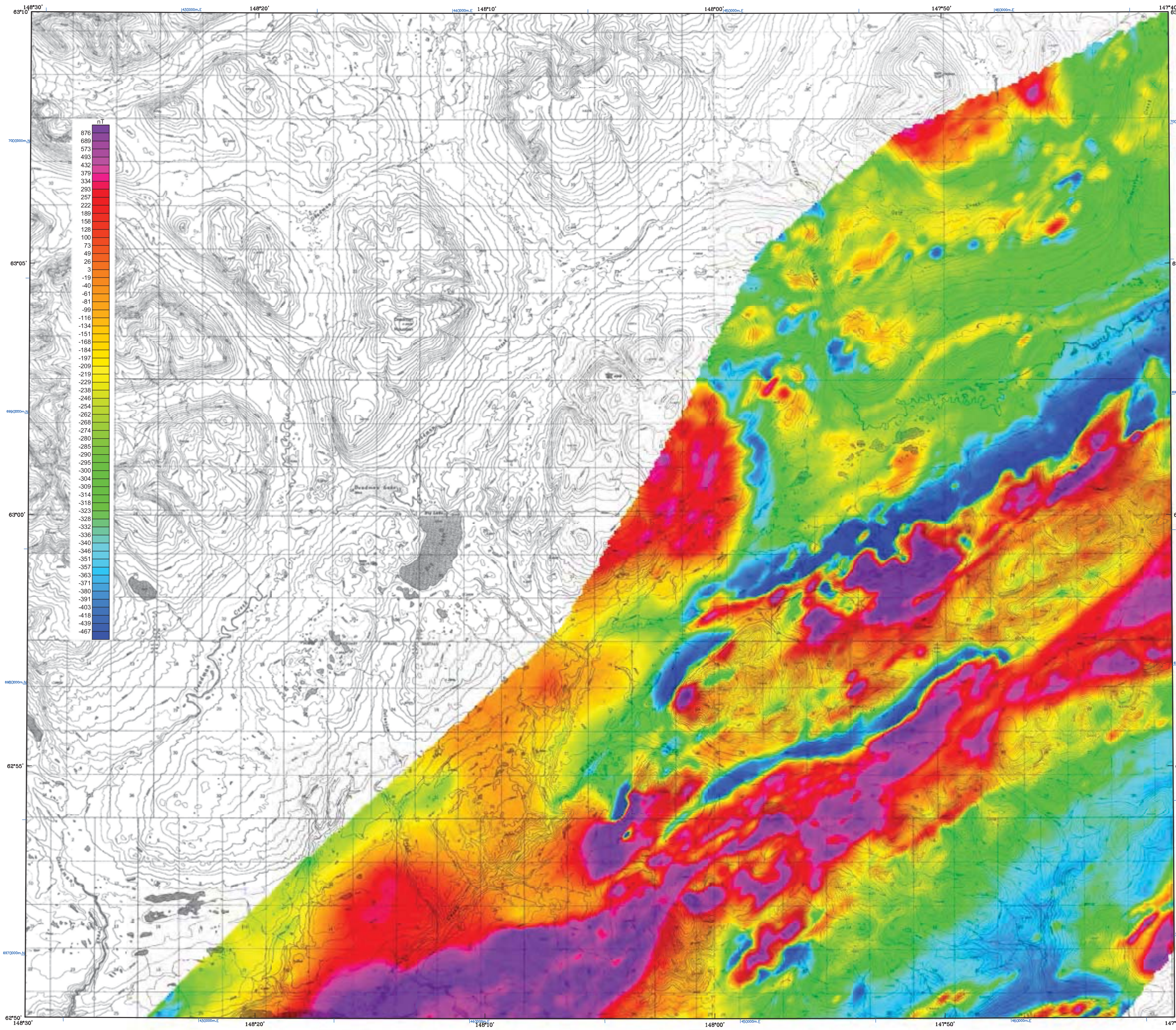
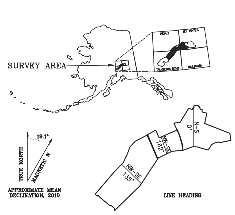


Base from U.S. Geological Survey Healy A-2, 1975; A-3, 1963; Talkeetna Mtns D-2, 1963; D-3, 1965; Quadrangles, Alaska



SCALE 1:63,360

1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS

CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL

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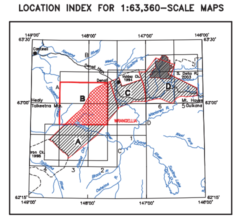

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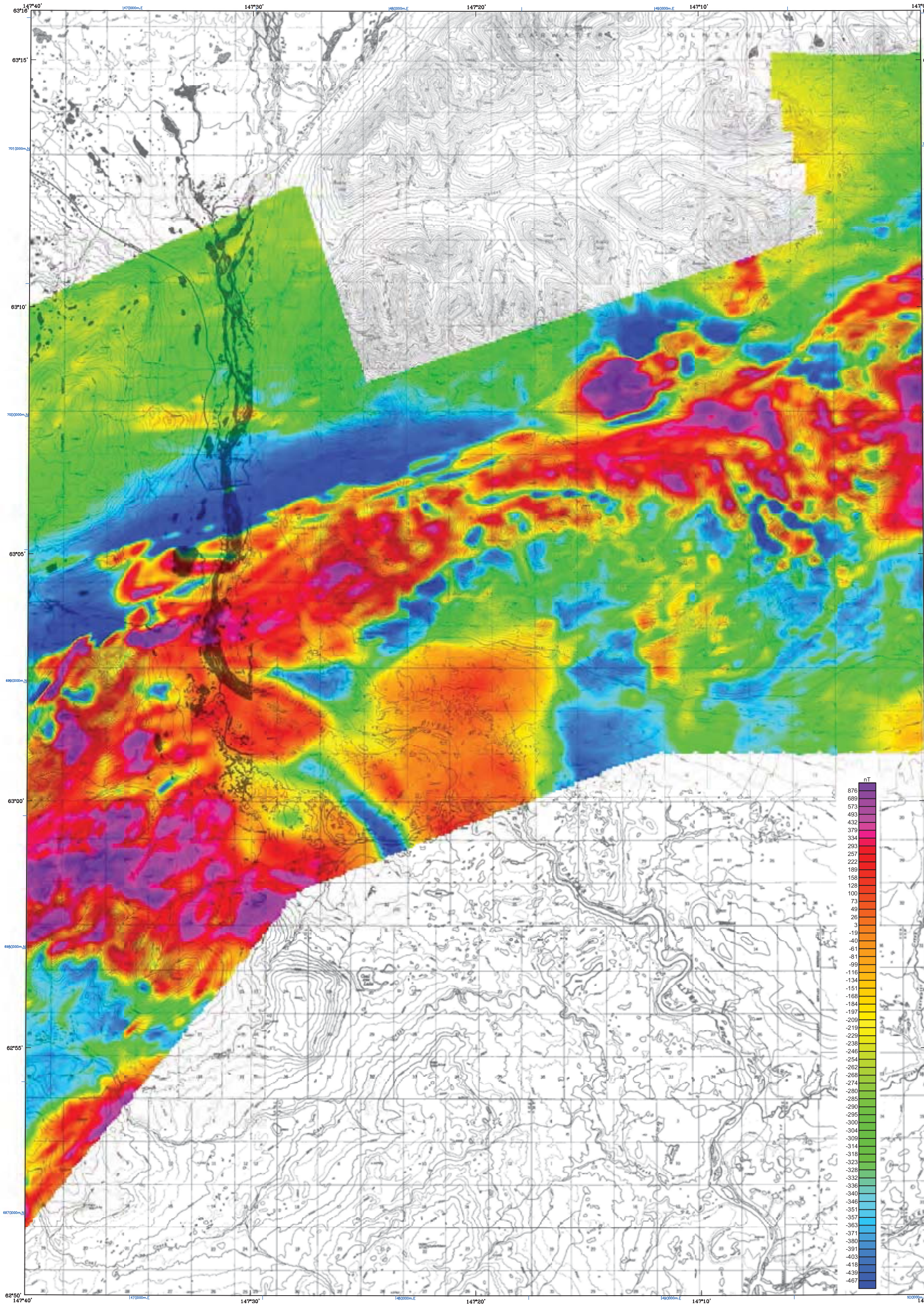

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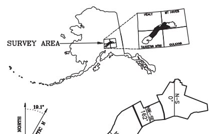

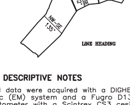

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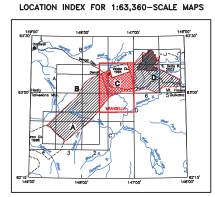

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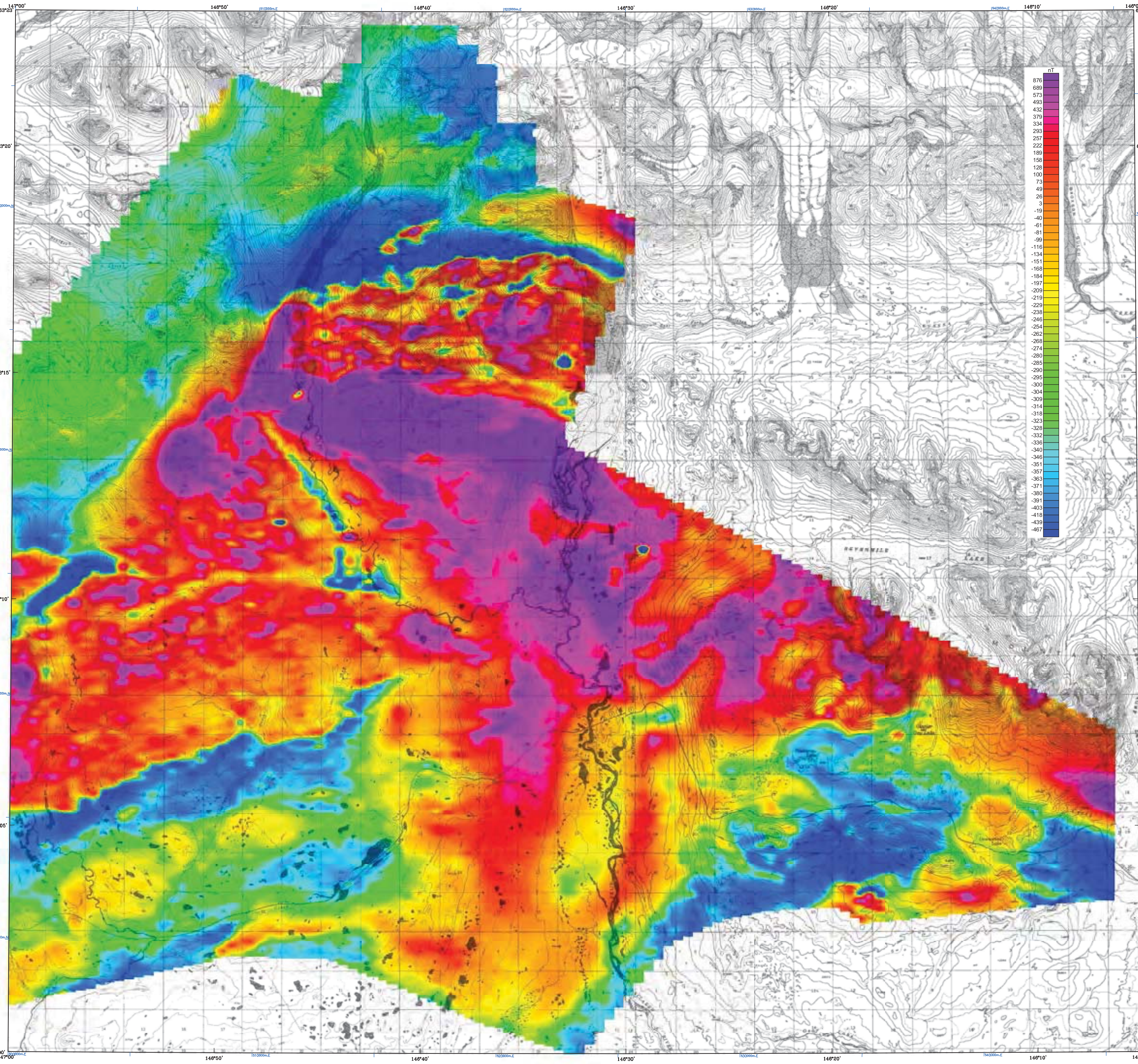
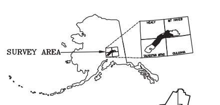
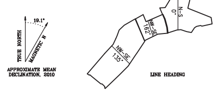


Base from U.S. Geological Survey Mt Hayes A-5, 1949; A-6, 1950; B-5, 1956; B-6, 1956; Quadrangles, Alaska





SCALE 1:63,360

1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS

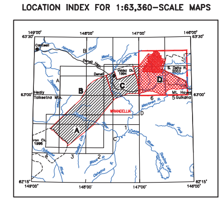
CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL

RESIDUAL 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

LOCATION INDEX FOR 1:63,360-SCALE MAPS



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. Tie lines were flown perpendicular to the flight lines at intervals of approximately 3 miles.

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RESIDUAL MAGNETIC FIELD

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SURVEY HISTORY

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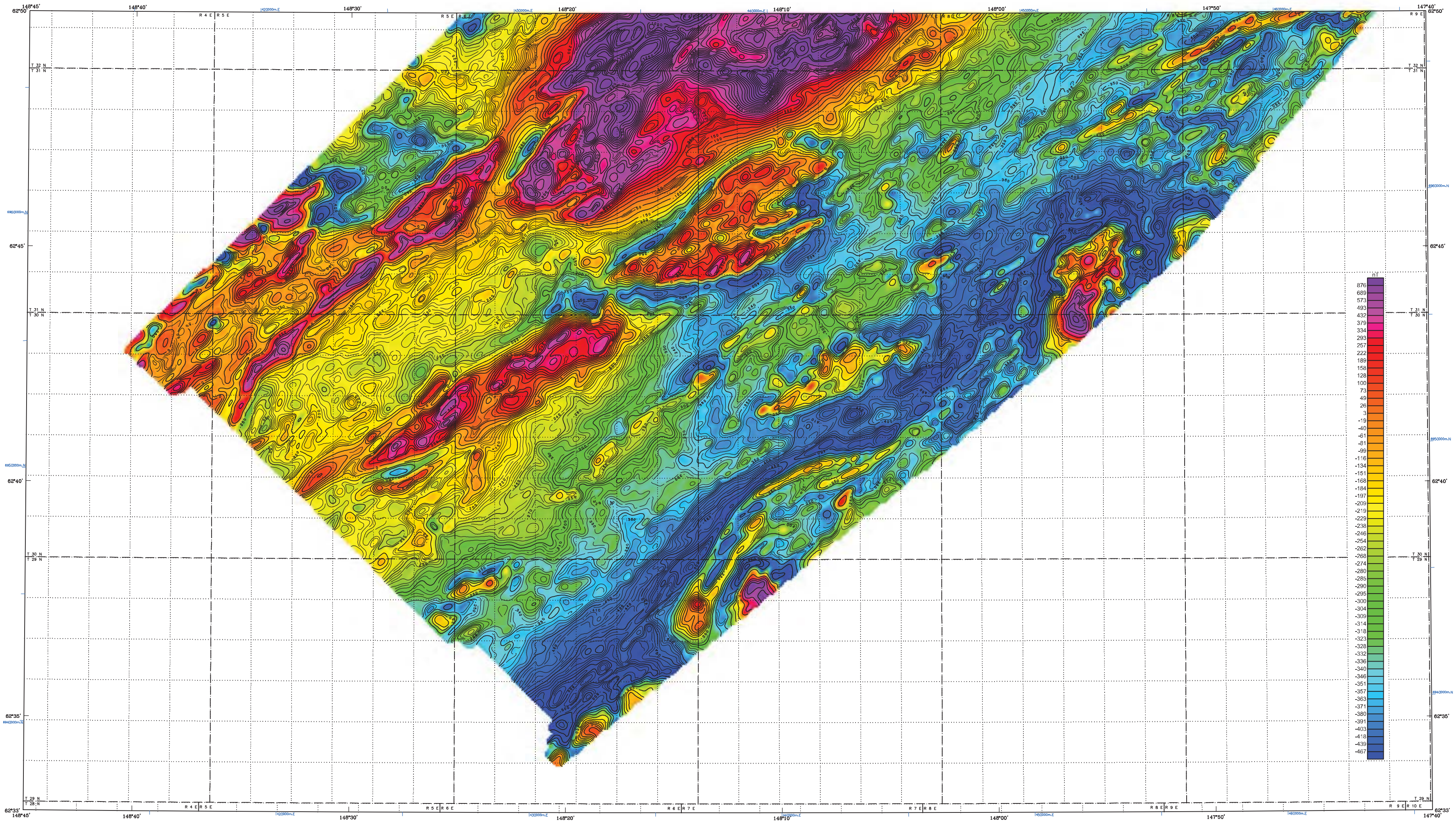
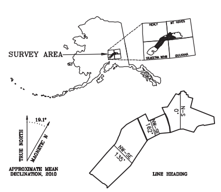


Section outlines from U.S. Geological Survey Talkeetna Mtns C-2, 1963; C-3, 1977; C-4, 1965; D-2, 1963; D-3, 1965; D-4, 1965; Quadrangles, Alaska



SCALE 1:63,360

1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS

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

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by
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2014

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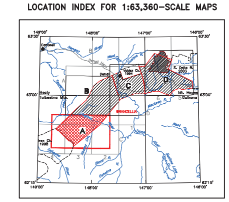

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MAGNETIC CONTOURS

. . . . 250 nT

. . . . 50 nT

. . . . 10 nT

. . . . 5 nT

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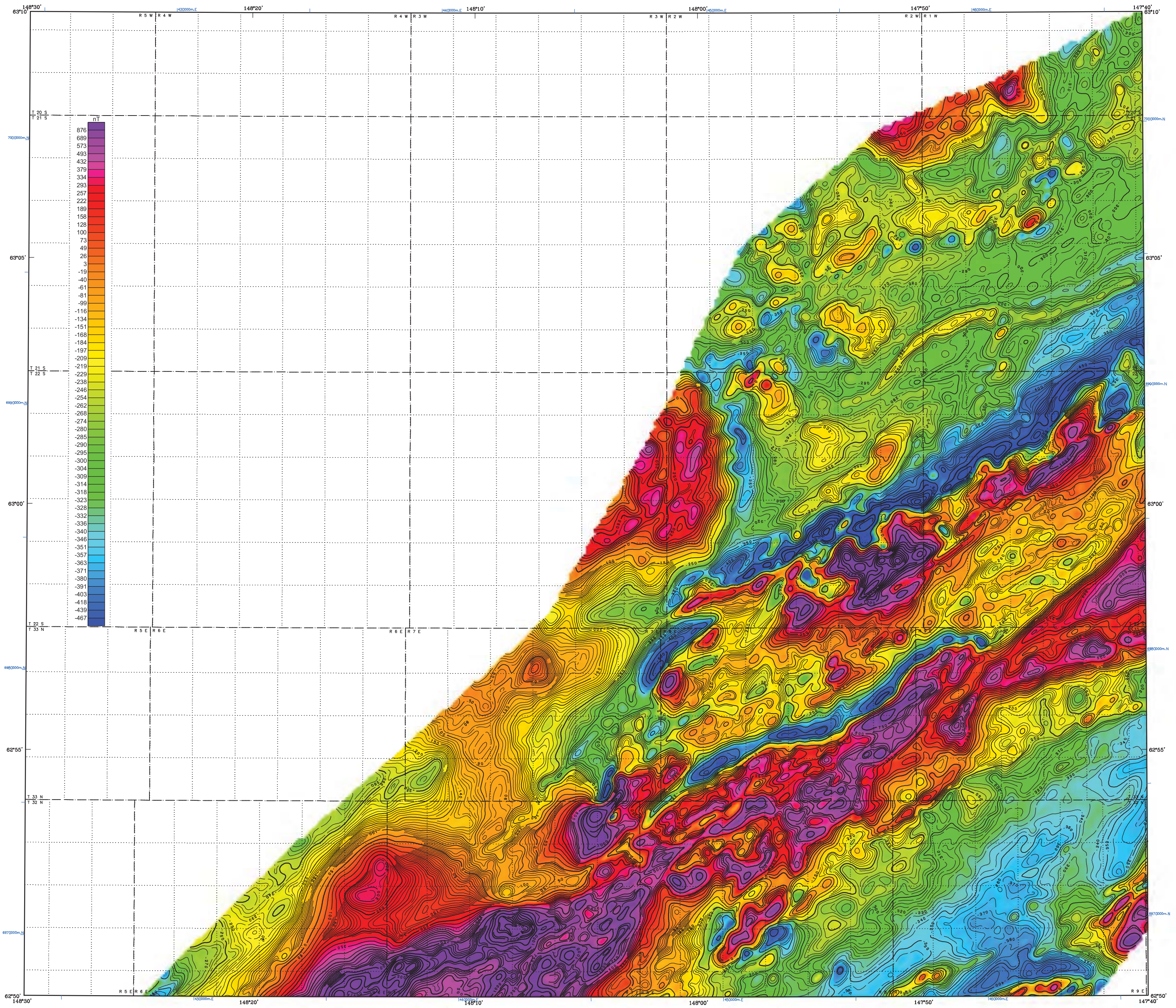
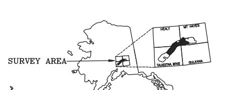


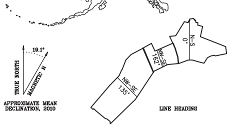
Section outlines from U.S. Geological Survey Healy A-2, 1975; A-3, 1963; Talkeetna Mtns D-2, 1963; D-3, 1965; Quadrangles, Alaska

SCALE 1:63,360

1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS





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

by
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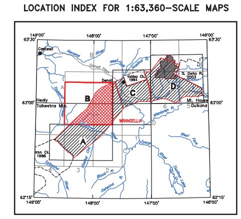

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MAGNETIC CONTOURS

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

SURVEY HISTORY

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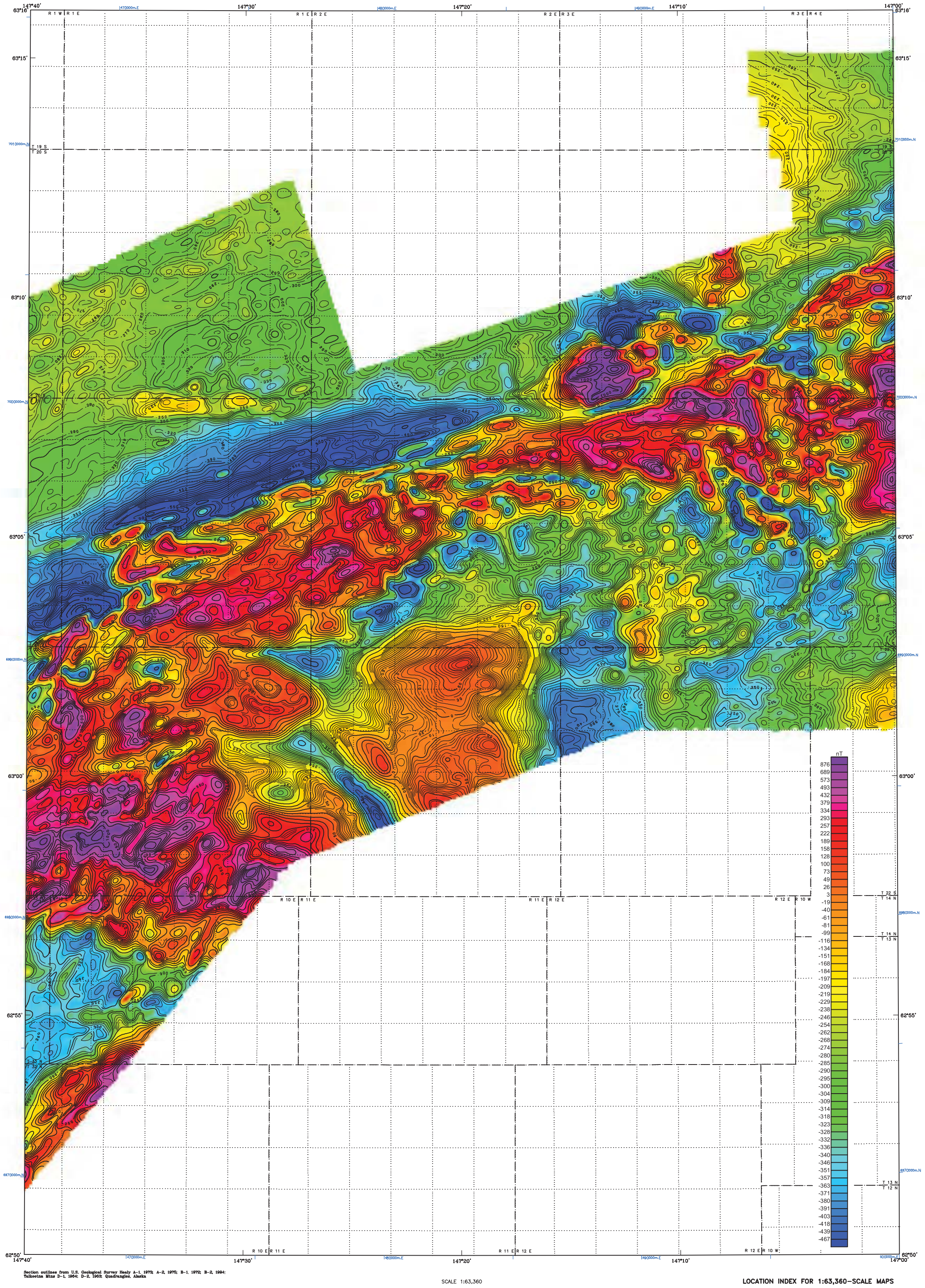
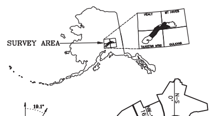


Section outlines from U.S. Geological Survey Healy A-1, 1973; A-2, 1975; B-1, 1972; B-2, 1994; Talkeetna Mtns D-1, 1964; D-2, 1963; Quadrangles, Alaska

SCALE 1:63,360

1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS



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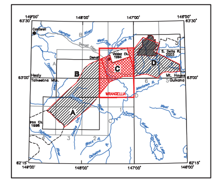

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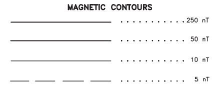

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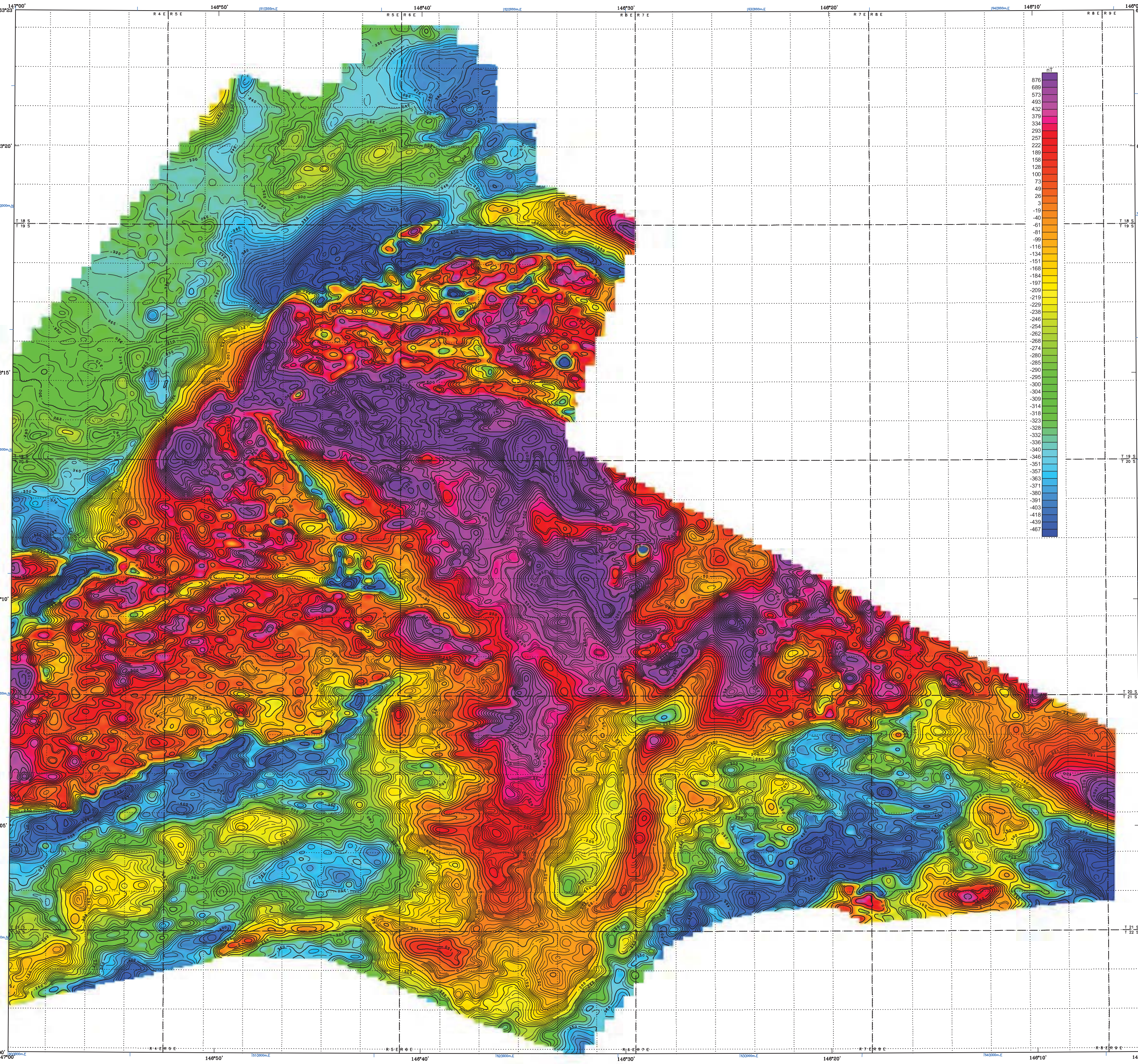

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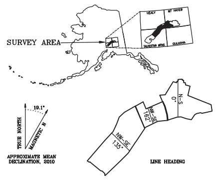
SCALE 1:63,360

1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS



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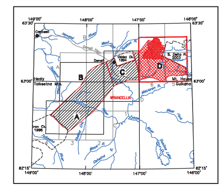

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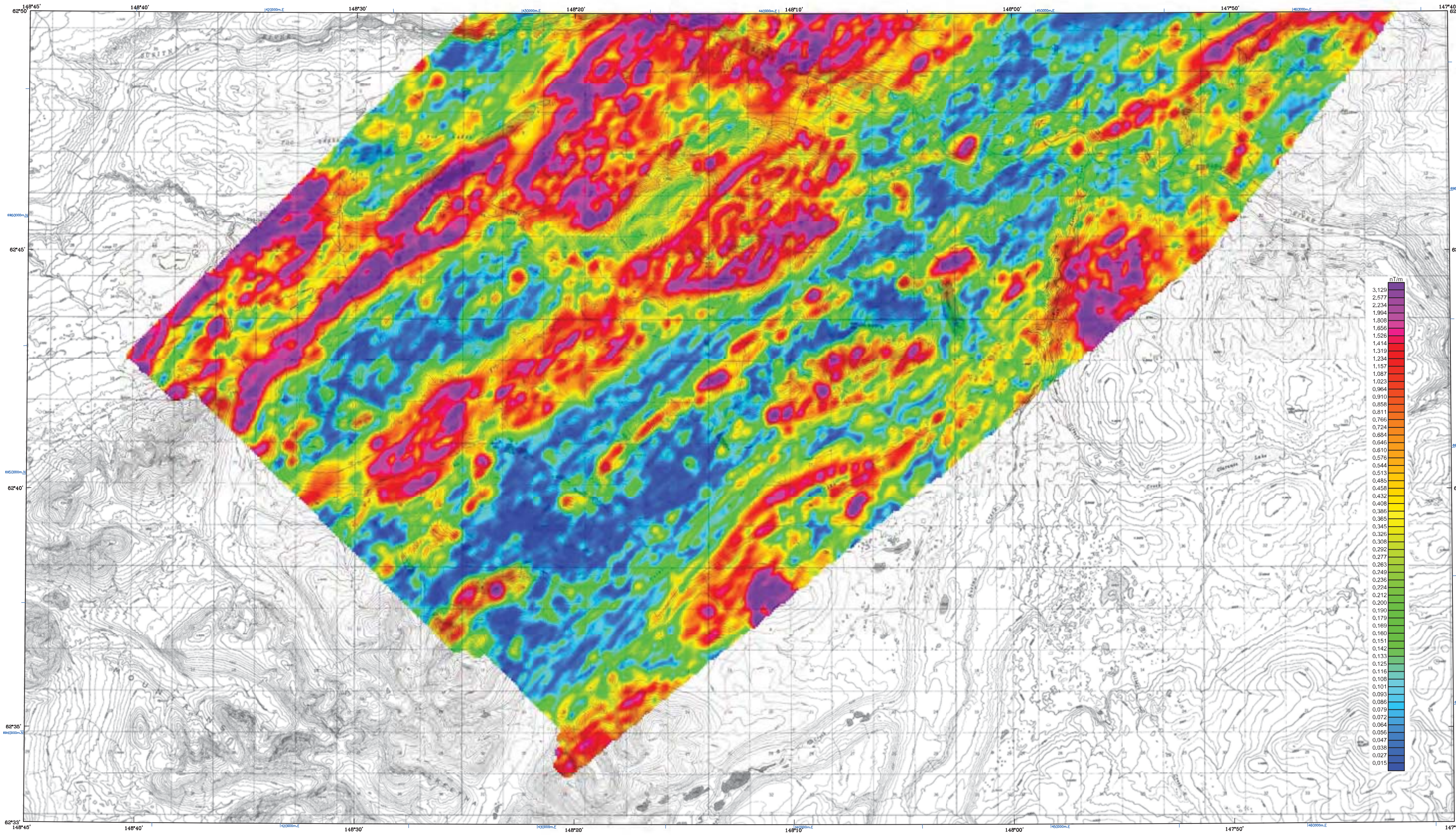
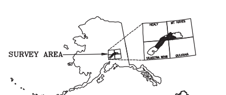
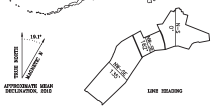


Base from U.S. Geological Survey Talkeetna Mtns C-2, 1963; C-3, 1977; C-4, 1965; D-2, 1963; D-3, 1965; D-4, 1965; Quadrangles, Alaska





SCALE 1:63,360

1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS

CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL

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

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by
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2014

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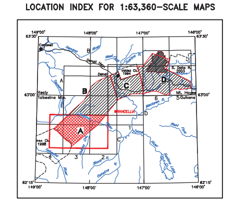

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ANALYTIC SIGNAL

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.

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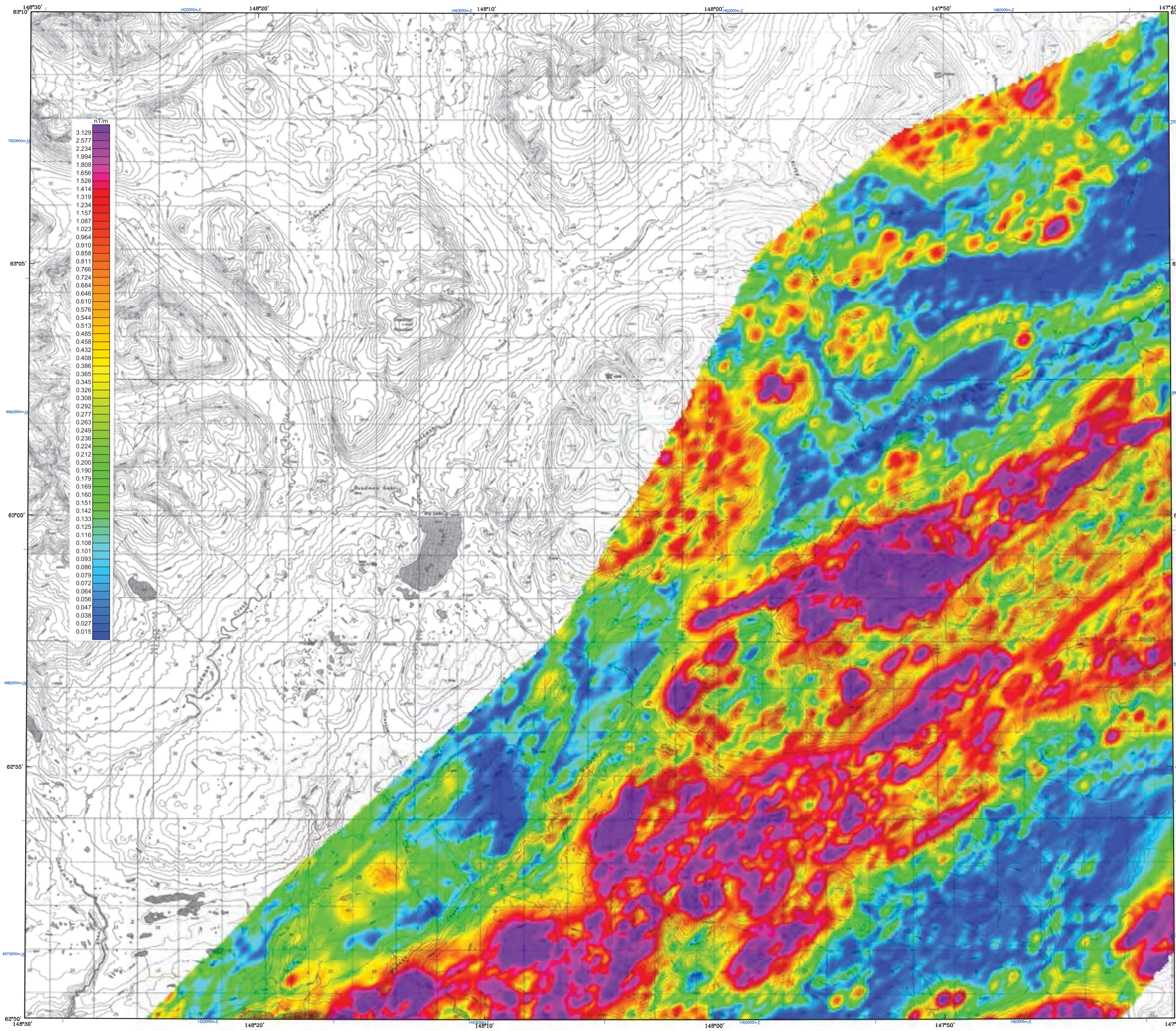
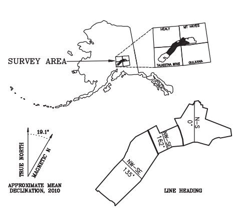


Base from U.S. Geological Survey Healy A-2, 1975; A-3, 1963; Talkeetna Mtns D-2, 1963; D-3, 1965; Quadrangles, Alaska



SCALE 1:63,360

1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS

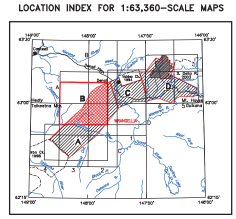
CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL

ANALYTIC SIGNAL 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

LOCATION INDEX FOR 1:63,360-SCALE MAPS



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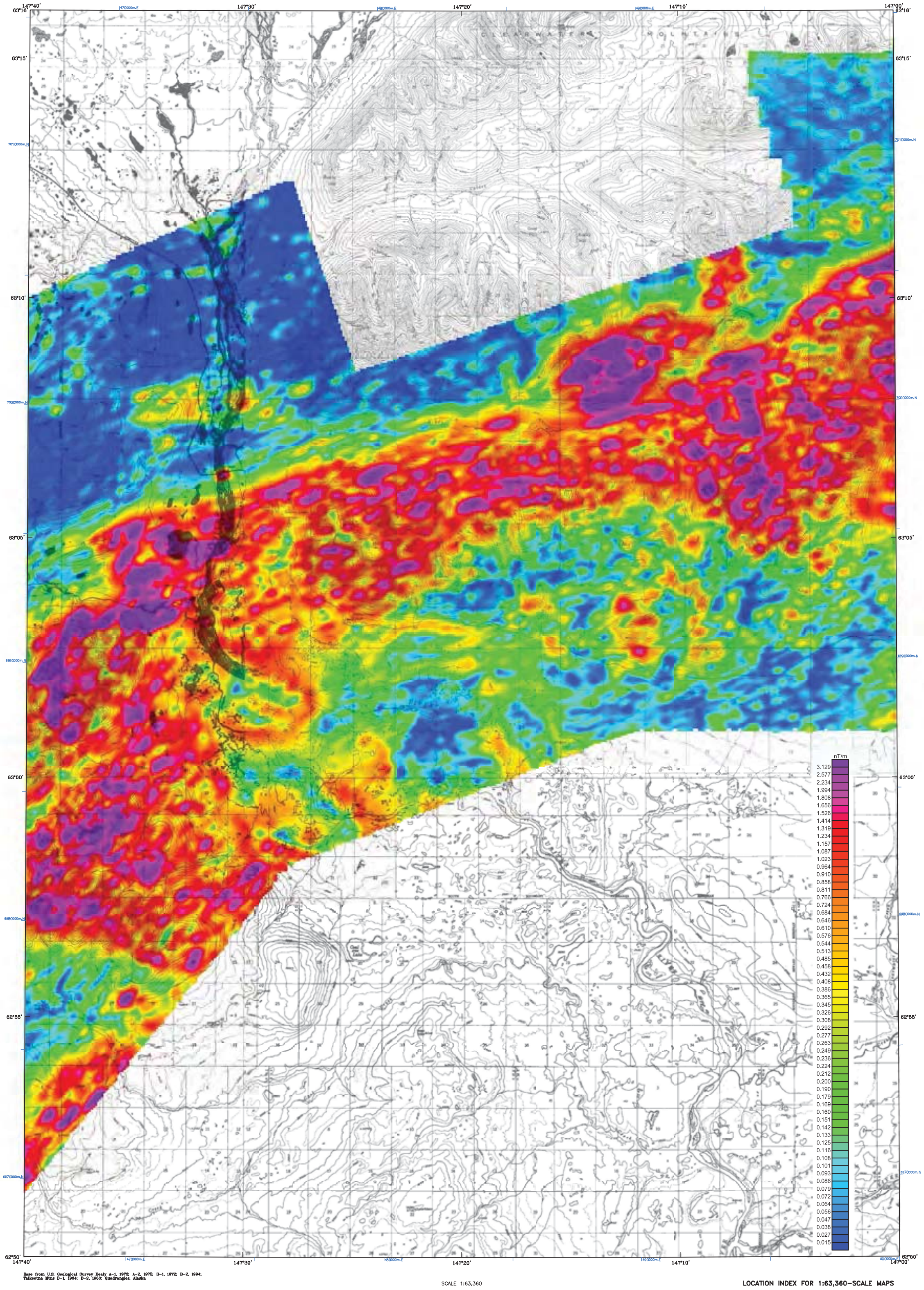

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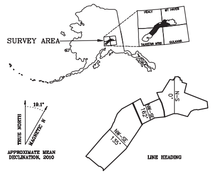

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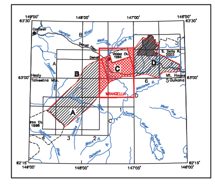

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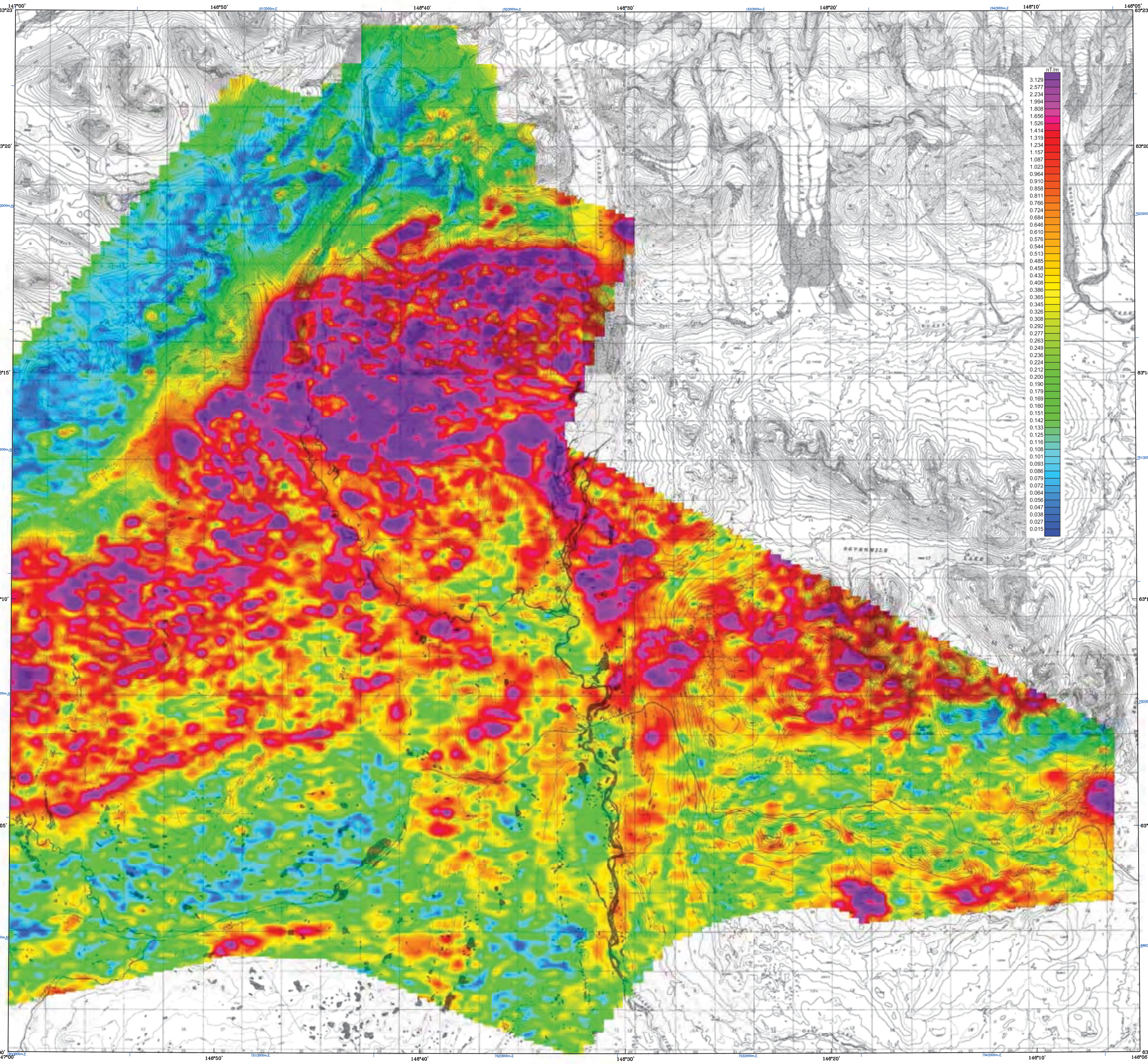
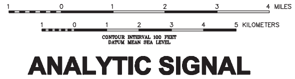
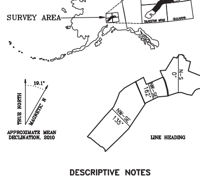


Base from U.S. Geological Survey Mt Hayes A-5, 1949; A-6, 1950; B-5, 1956; B-6, 1956; Quadrangles, Alaska





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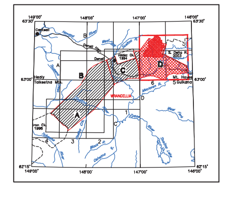

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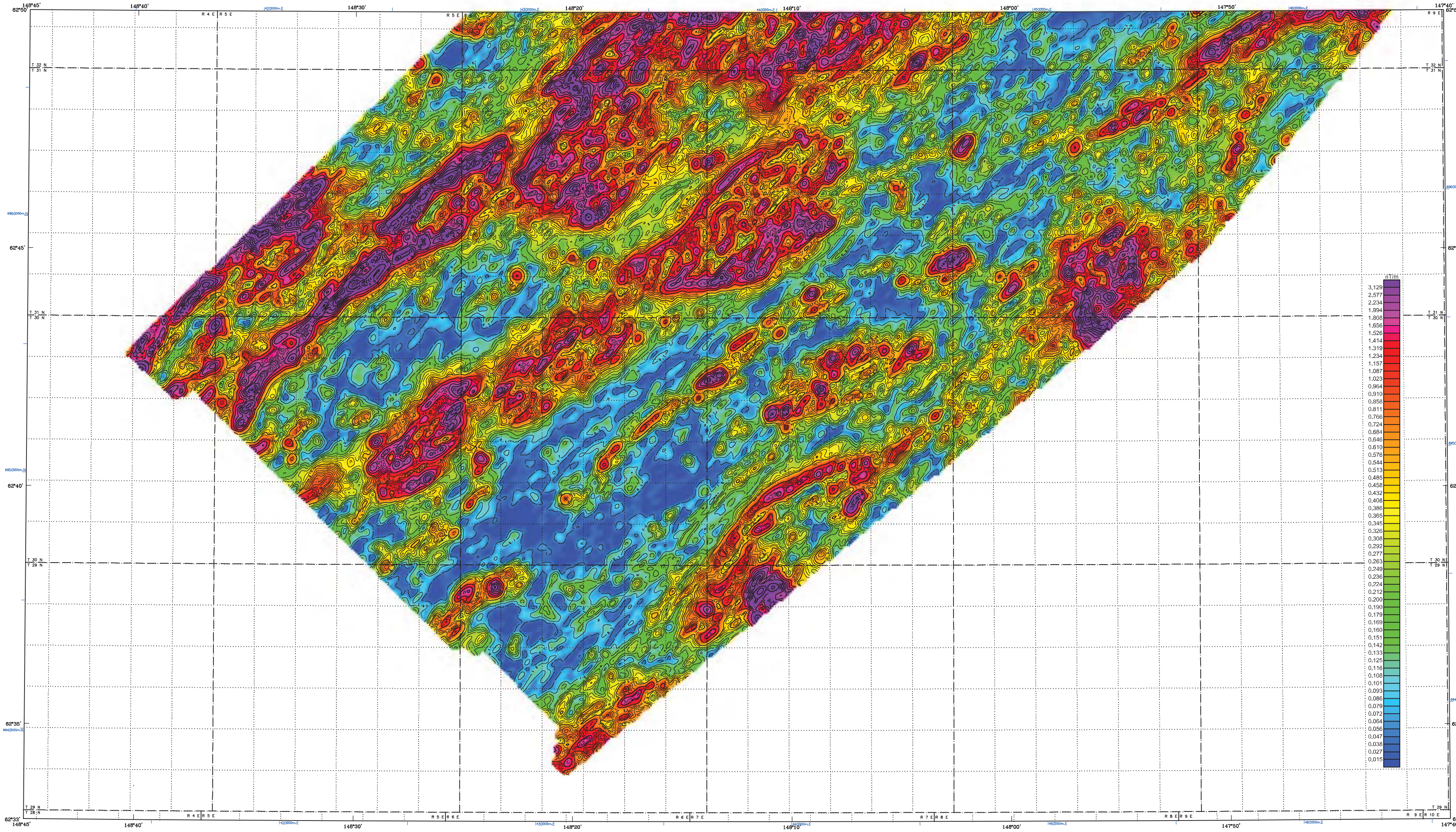
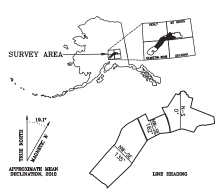


Section outlines from U.S. Geological Survey Talkeetna Mtns C-2, 1983; C-3, 1977; C-4, 1985; D-2, 1983; D-3, 1985; D-4, 1985, Quadrangles, Alaska

SCALE 1:63,360

1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS



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

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

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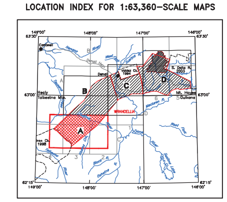

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2.50 nT/metre
0.50 nT/metre
0.10 nT/metre
0.05 nT/metre

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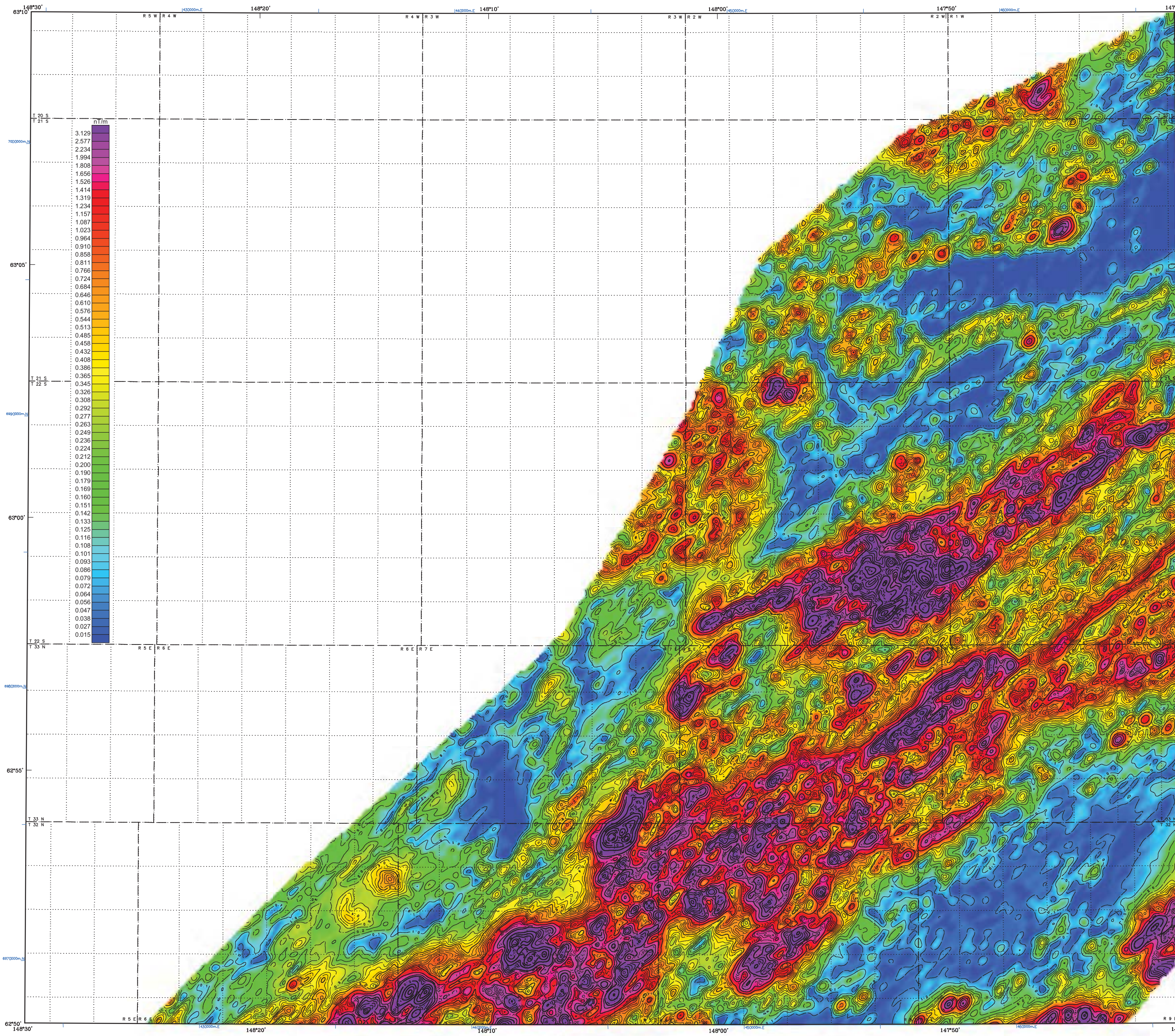

Section outlines from U.S. Geological Survey Healy A-2, 1975; A-3, 1963; Talkeetna Mtns D-2, 1963; D-3, 1965; Quadrangles, Alaska

SCALE 1:63,360

1 0 1 2 3 4 MILES

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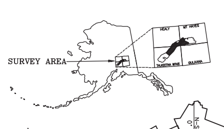
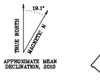
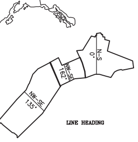
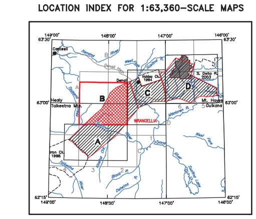
LOCATION INDEX FOR 1:63,360-SCALE MAPS









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by
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2014

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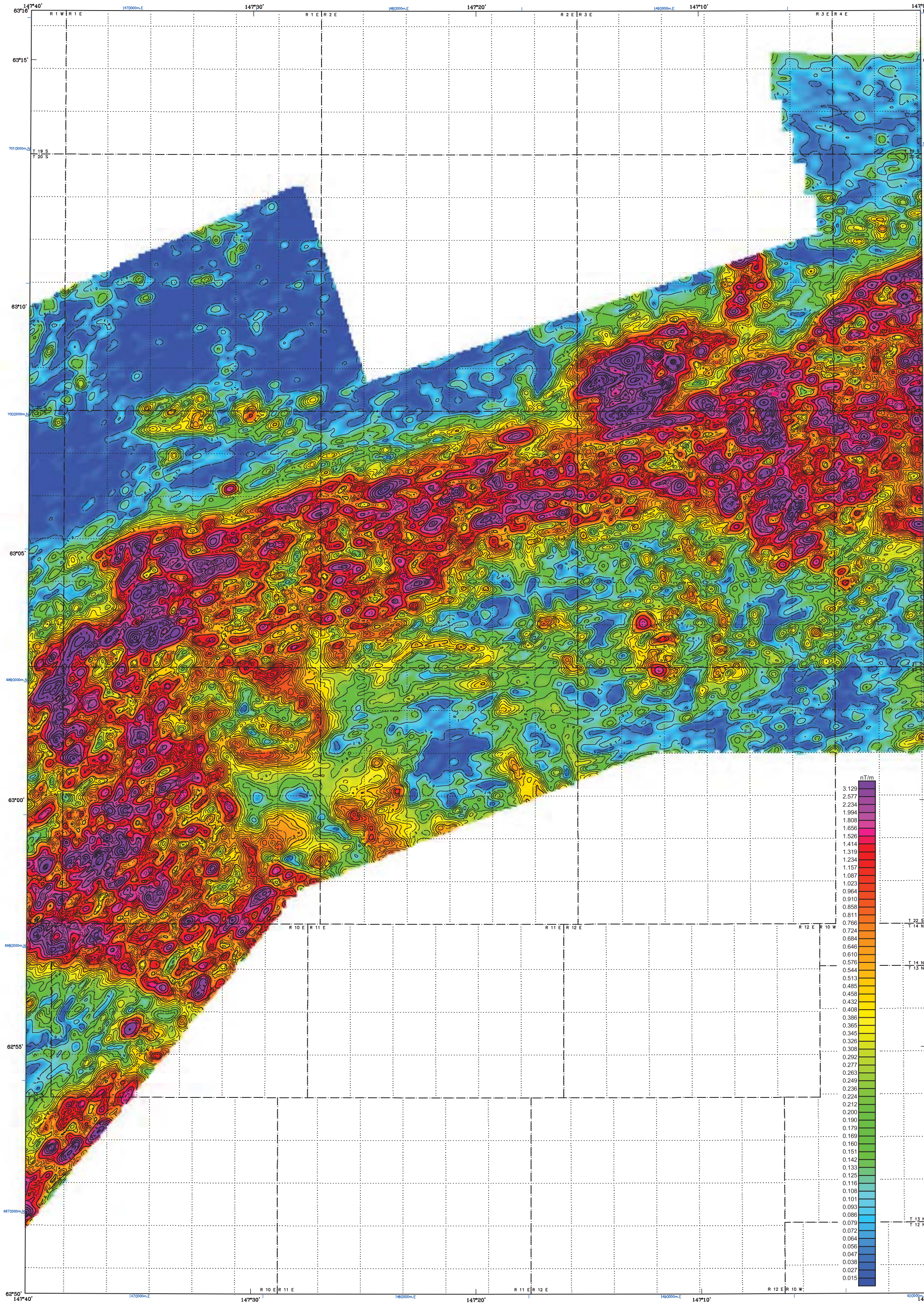

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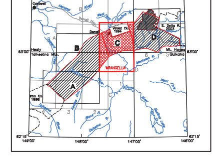

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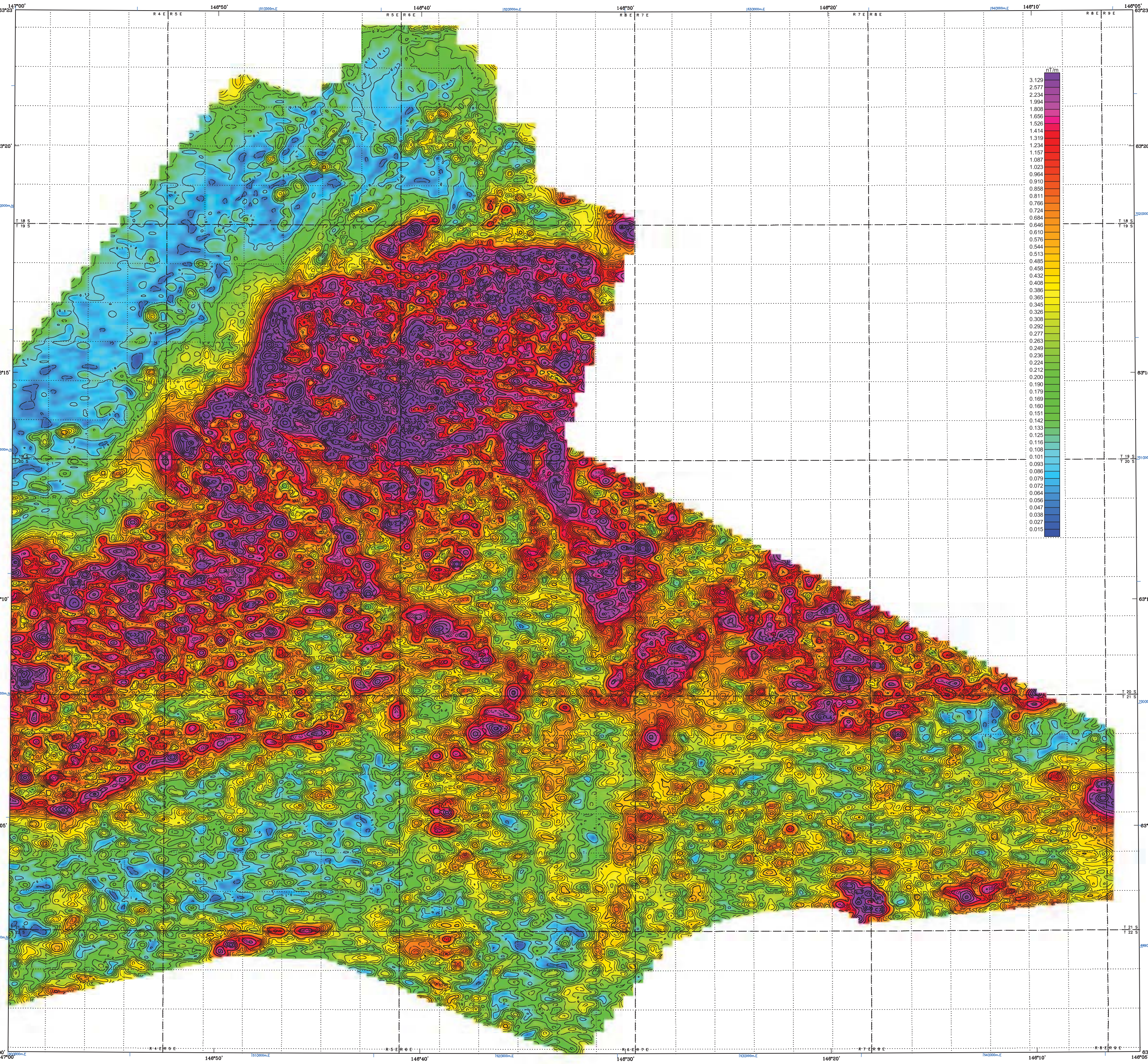
ALASKA DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS **GEOPHYSICAL REPORT 2014-1-5D**



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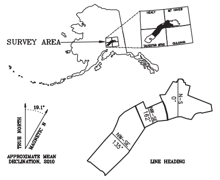

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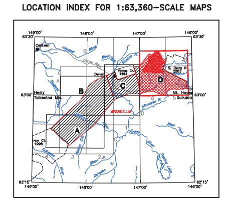

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ANALYTIC SIGNAL

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.

ANALYTIC SIGNAL CONTOURS

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

SURVEY HISTORY

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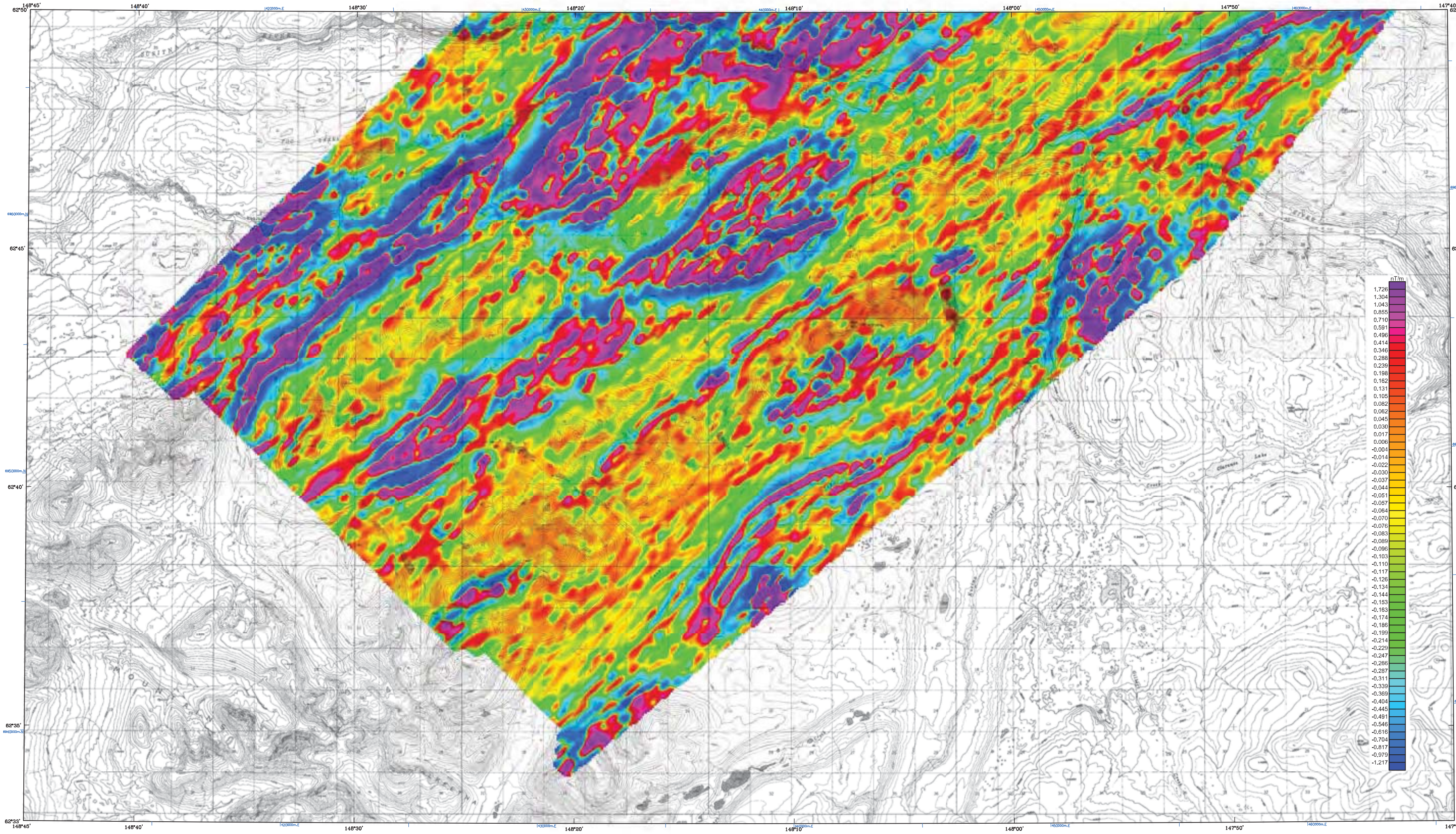
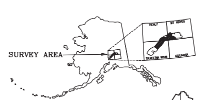
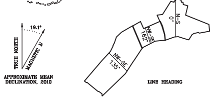


Base from U.S. Geological Survey Talkeetna Mtns C-2, 1963; C-3, 1977; C-4, 1965; D-2, 1963; D-3, 1965; D-4, 1965; Quadrangles, Alaska

SCALE 1:63,360

CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL



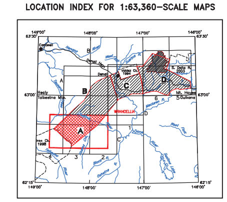


FIRST VERTICAL DERIVATIVE OF THE MAGNETIC FIELD WITH TOPOGRAPHY, WRANGELLIA SURVEY AREA, SOUTH-CENTRAL ALASKA

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

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

LOCATION INDEX FOR 1:63,360-SCALE MAPS



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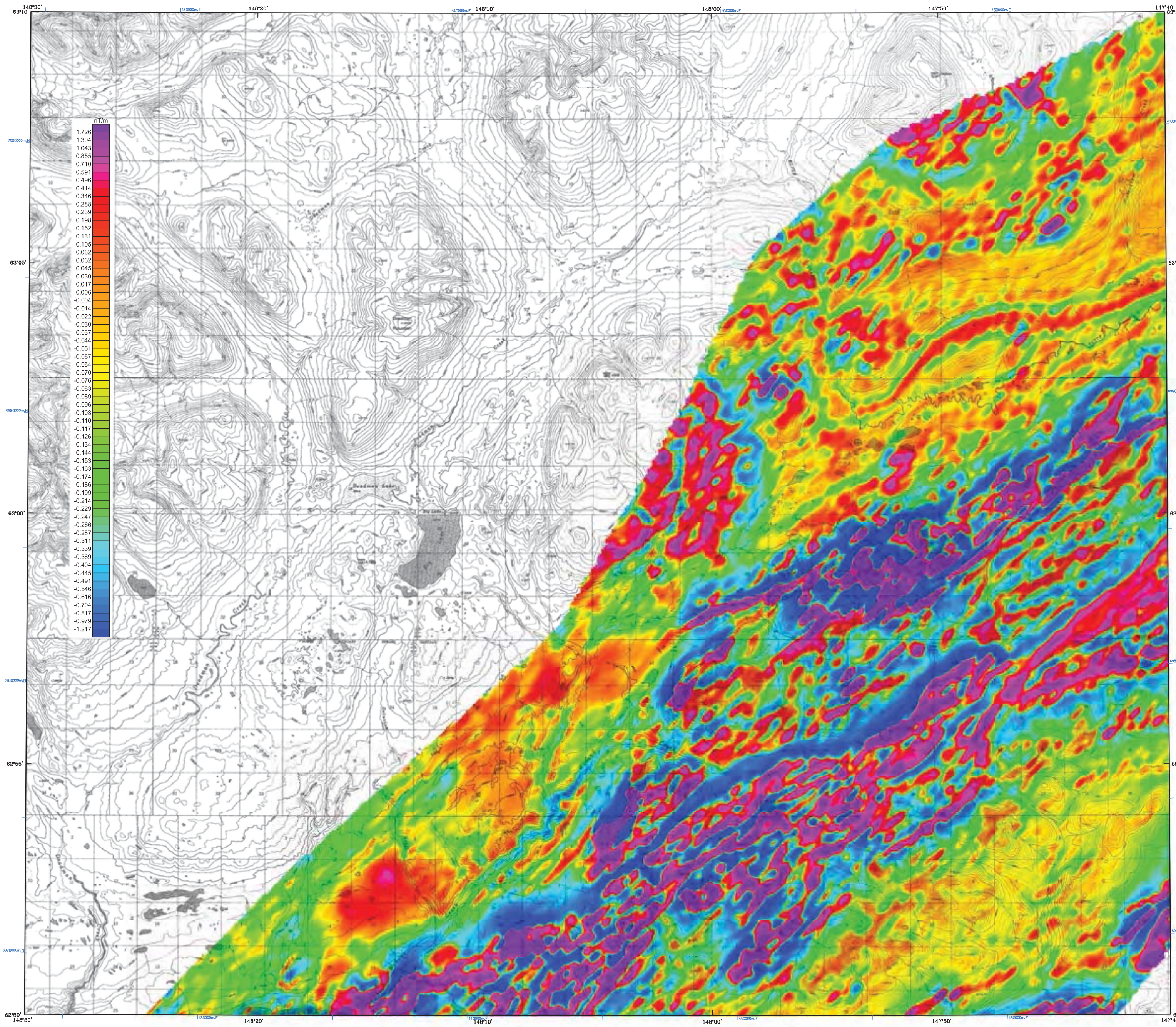


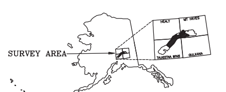
Base from U.S. Geological Survey Healy A-2, 1975; A-3, 1963; Talkeetna Mtns D-2, 1963; D-3, 1965; Quadrangles, Alaska

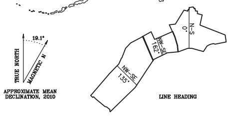
SCALE 1:63,360

1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS

CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL





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

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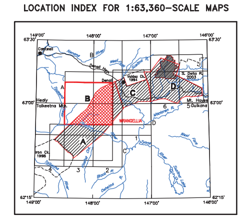

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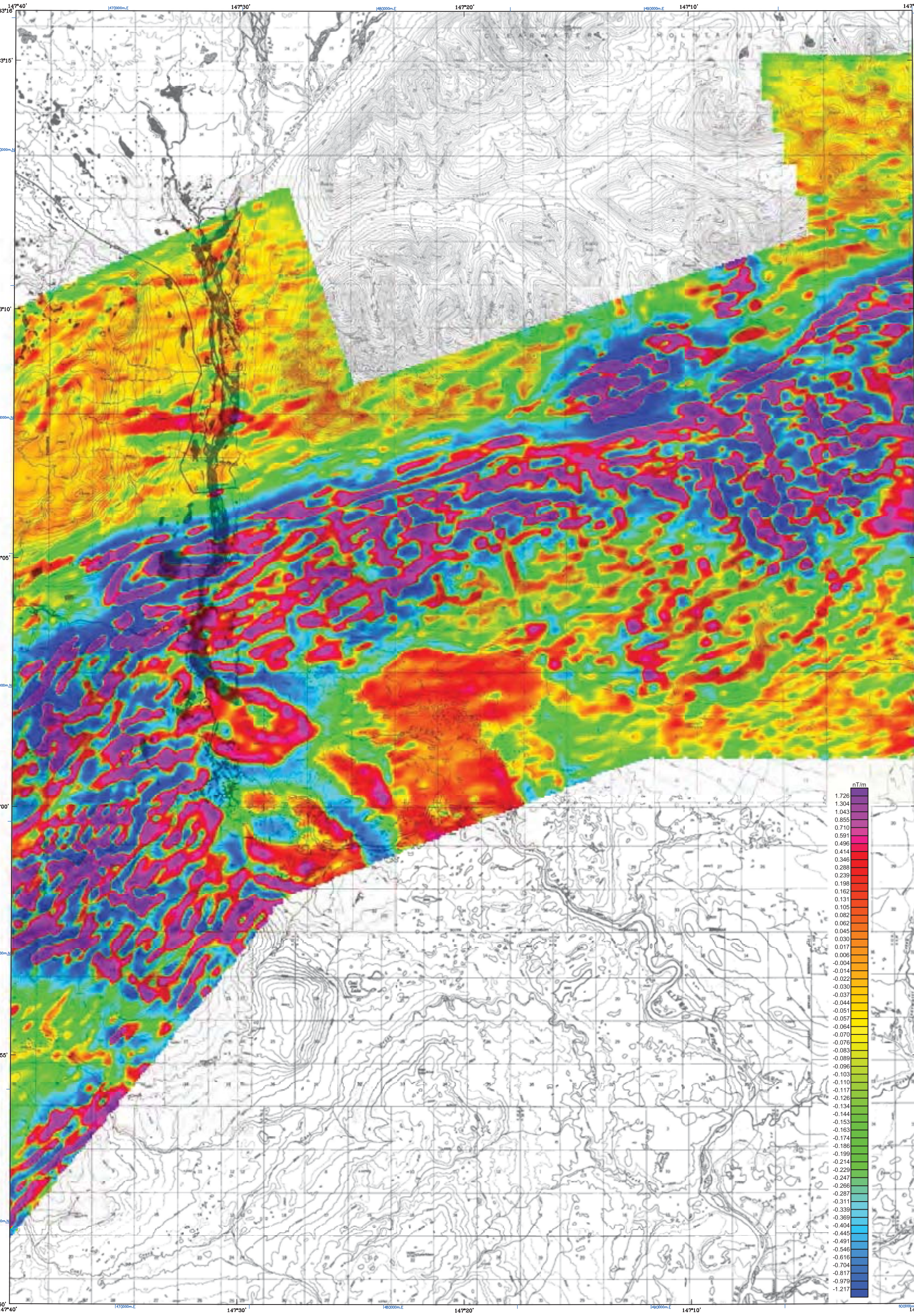


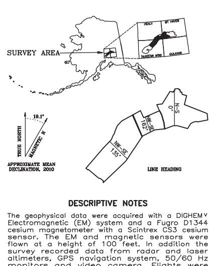
Base from U.S. Geological Survey Healy A-1, 1973; A-2, 1975; B-1, 1972; B-2, 1994; Talkeetna Mtns D-1, 1964; D-2, 1963; Quadrangles, Alaska

SCALE 1:63,360

1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS

CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL



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

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

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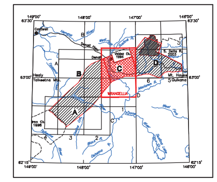

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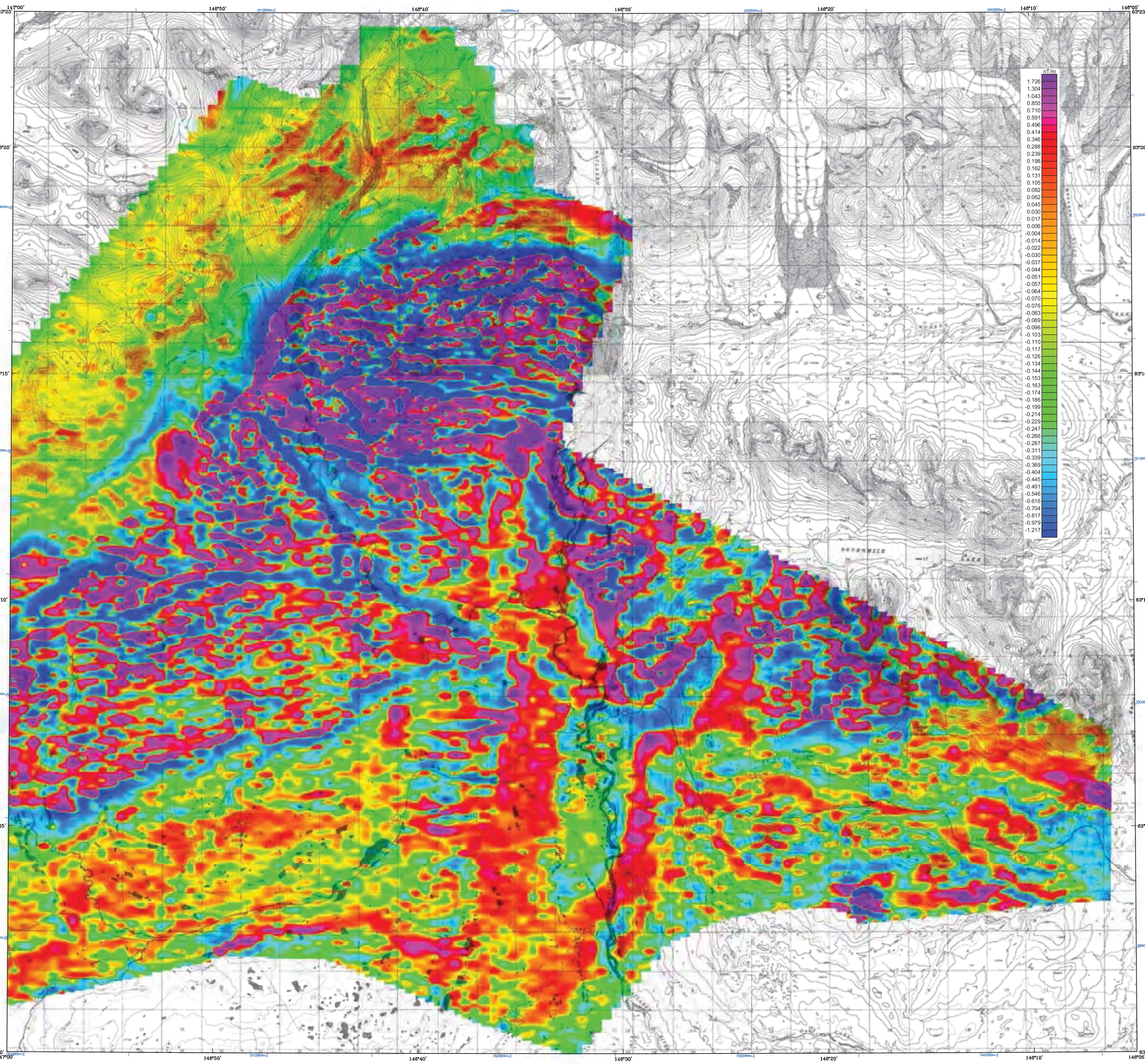


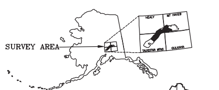
Base from U.S. Geological Survey Mt Hayes A–5, 1949; A–6, 1950; B–5, 1956; B–6, 1956; Quadrangles, Alaska

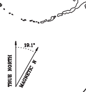
SCALE 1:63,360

1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS

CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL





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

by
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2014

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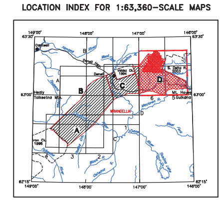

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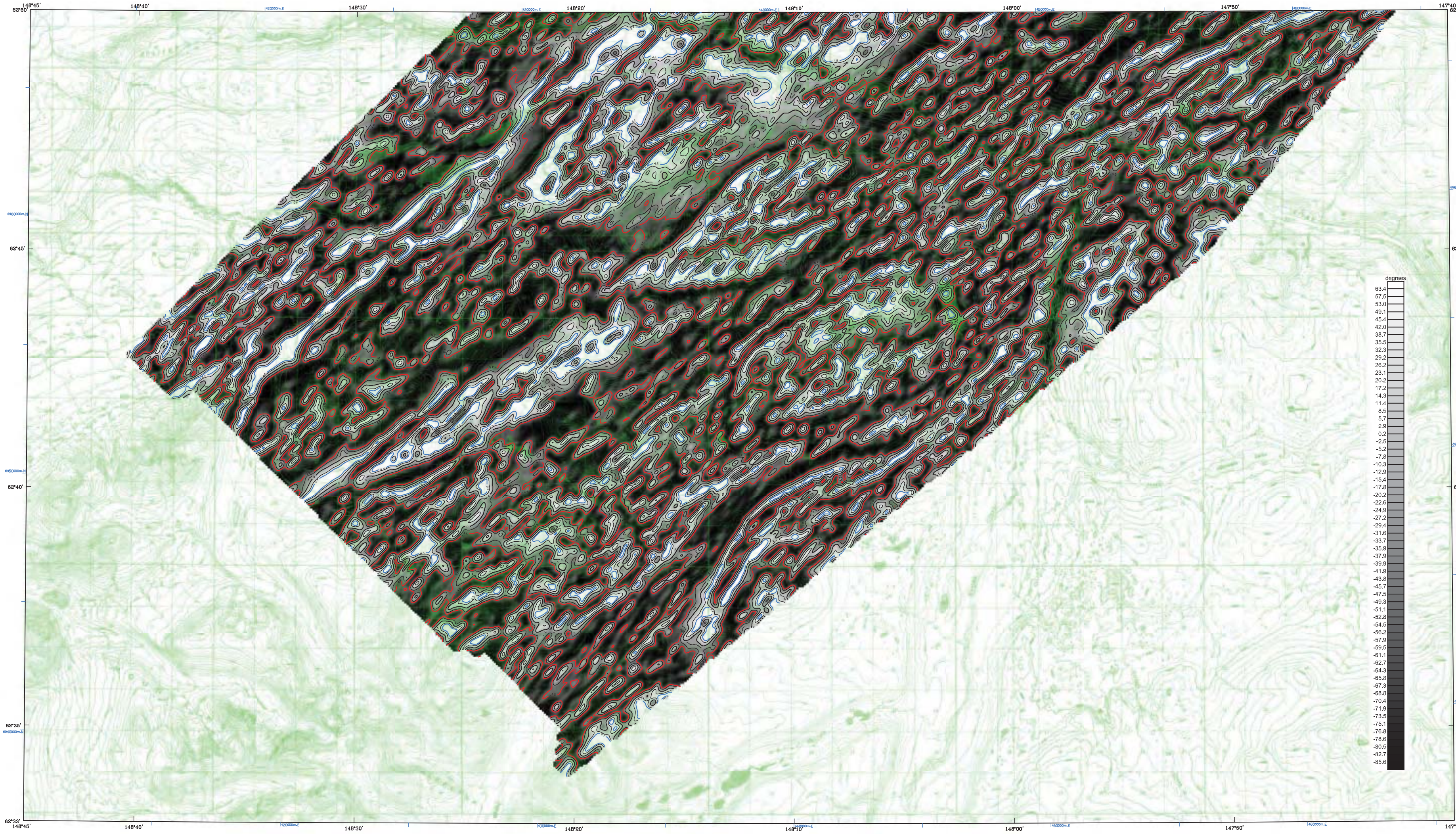

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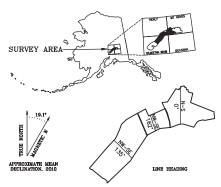

SCALE 1:63,360

1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS

CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL

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

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2014

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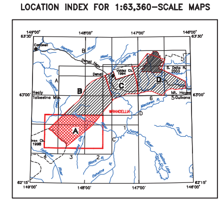

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MAGNETIC TILT DERIVATIVE

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

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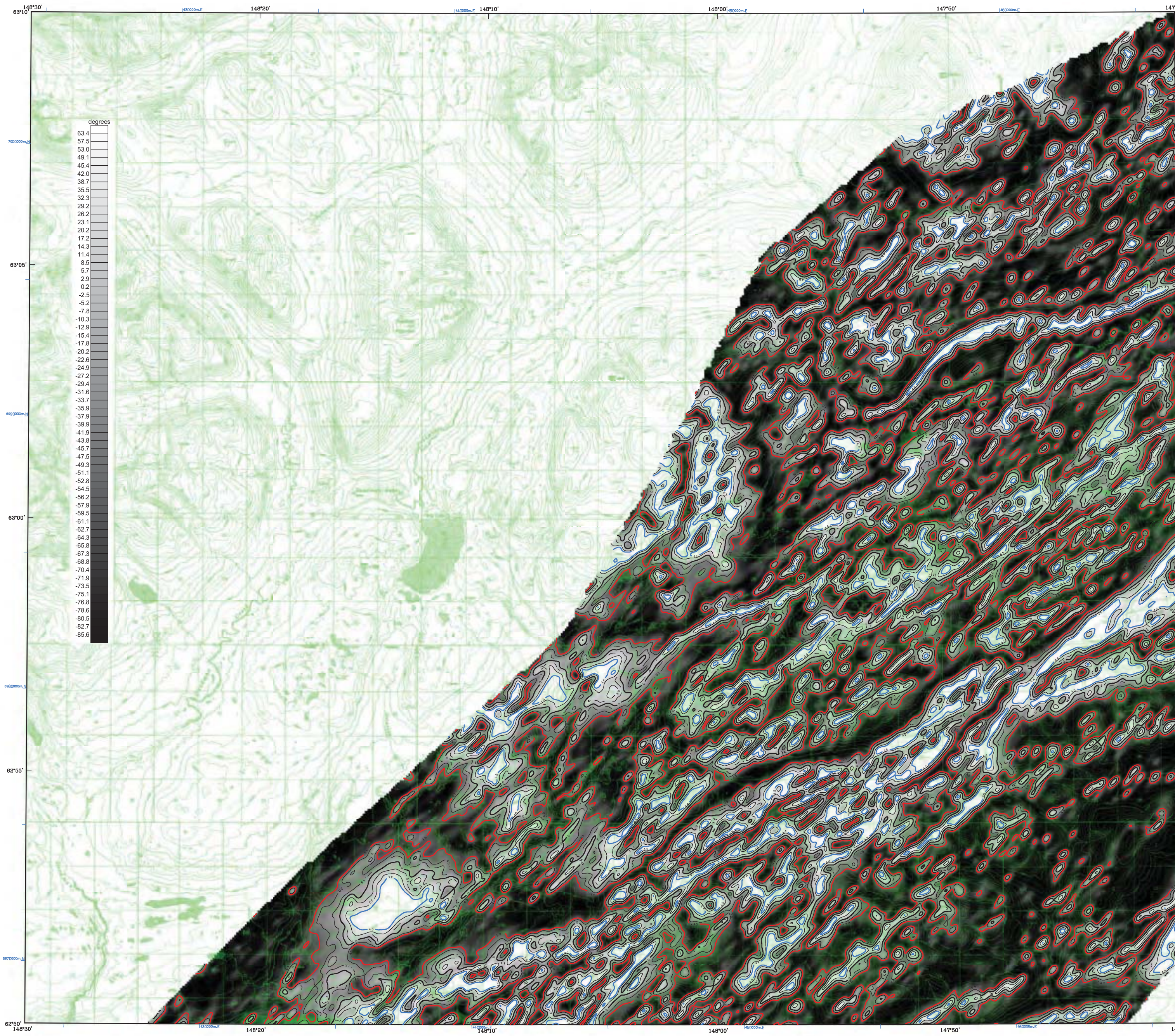
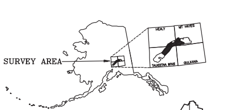
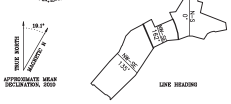


Base from U.S. Geological Survey Healy A-2, 1975; A-3, 1963; Talkeetna Mtns D-2, 1963; D-3, 1965; Quadrangles, Alaska





SCALE 1:63,360

1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS

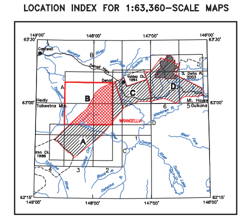
CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL

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, CGG, and Fugro GeoServices, Inc.
2014

LOCATION INDEX FOR 1:63,360-SCALE MAPS



DESCRIPTIVE NOTES

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MAGNETIC TILT DERIVATIVE

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MAGNETIC TILT DERIVATIVE CONTOURS

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

SURVEY HISTORY

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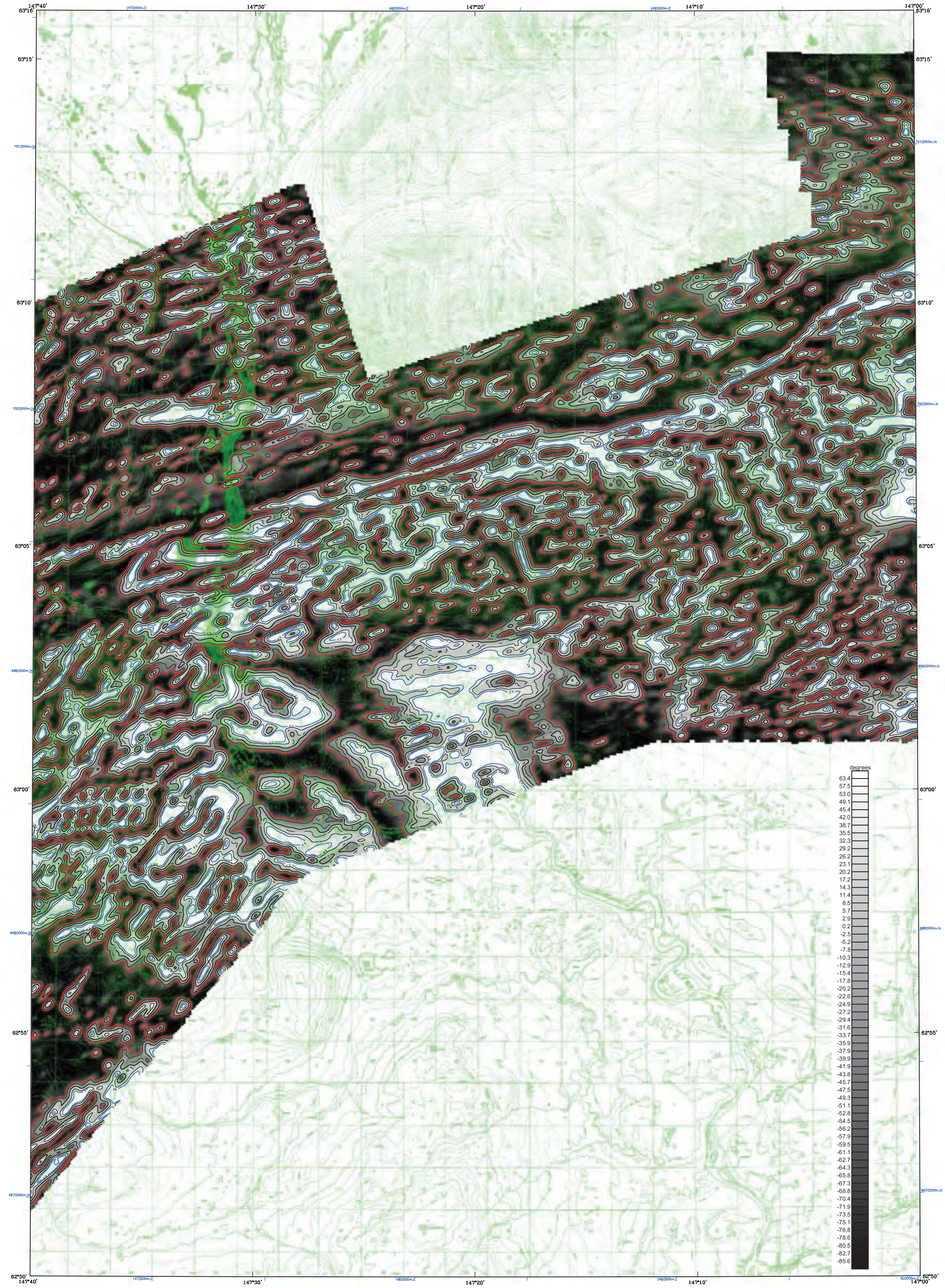


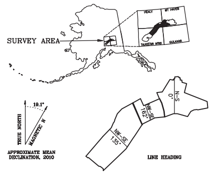
Base from U.S. Geological Survey Healy A-1, 1973; A-2, 1975; B-1, 1972; B-2, 1994; Talkeetna Mtns D-1, 1964; D-2, 1963; Quadrangles, Alaska

SCALE 1:63,360

1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS

CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL



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

by
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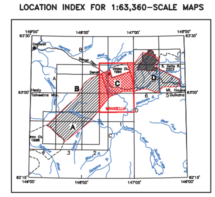
2014

LOCATION INDEX FOR 1:63,360-SCALE MAPS



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.........+30 degrees
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.... 0 degrees
.........−15 degrees
.........−30 degrees
.........−45 degrees

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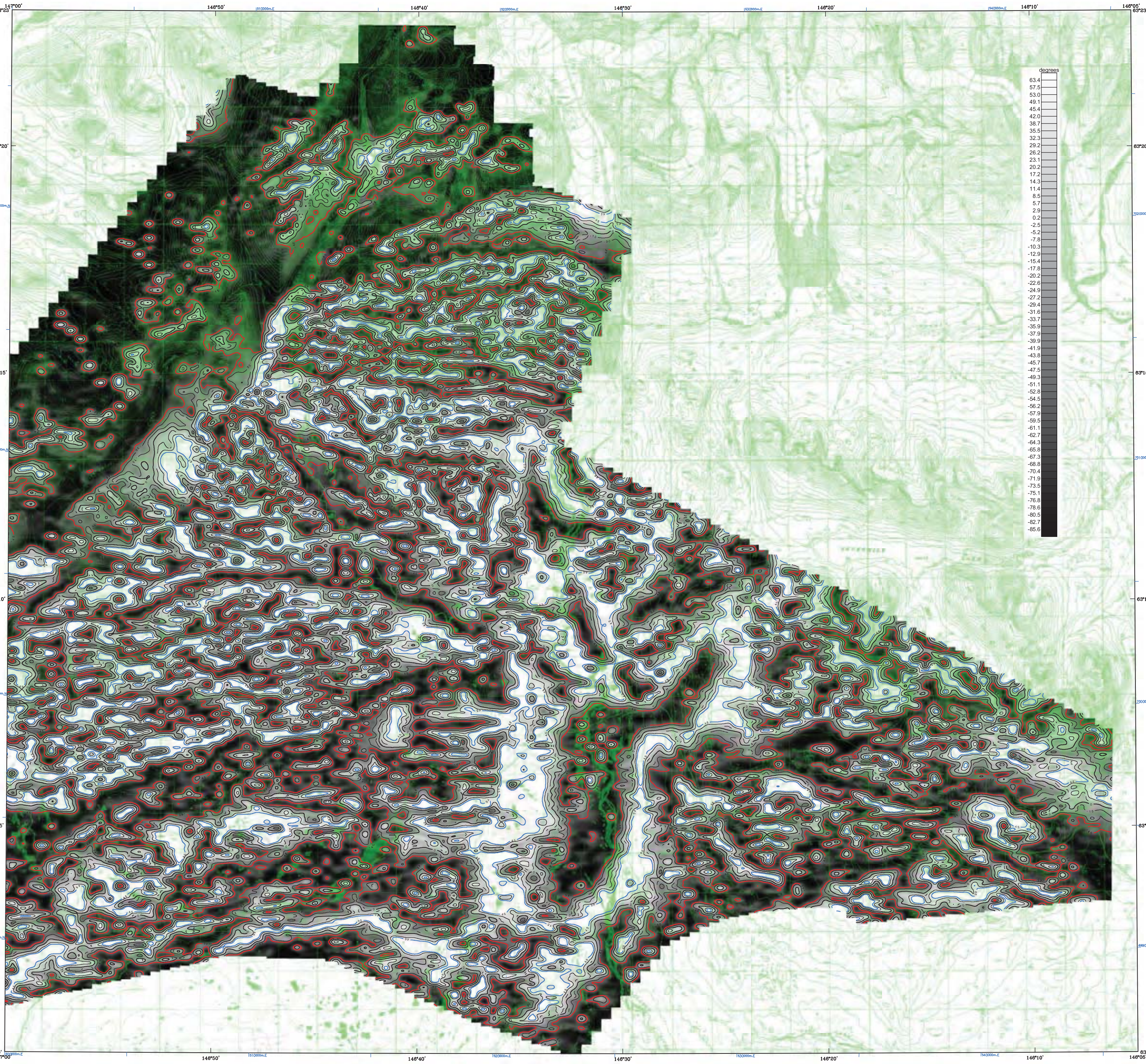


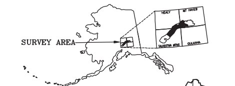
Base from U.S. Geological Survey Mt Hayes A-5, 1949; A-6, 1950; B-5, 1956; B-6, 1956; Quadrangles, Alaska

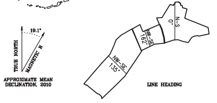
SCALE 1:63,360

1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS

CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL





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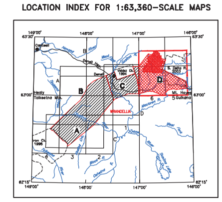
LOCATION INDEX FOR 1:63,360-SCALE MAPS



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. . . .+15 degrees
. . . . 0 degrees
. . . .−15 degrees
. . . .−30 degrees
. . . .−45 degrees

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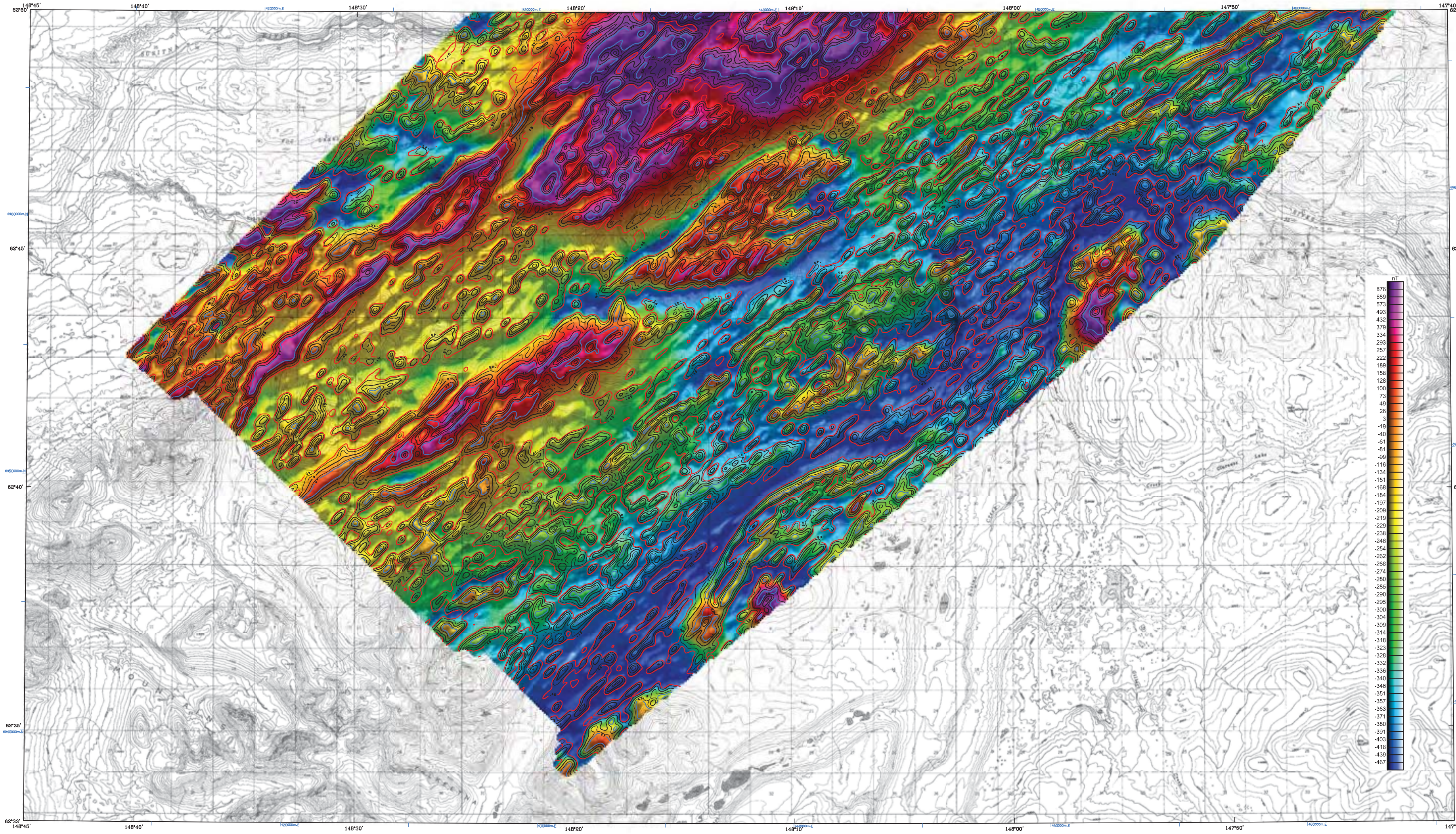


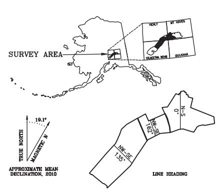
Base from U.S. Geological Survey Talkeetna Mtns C-2, 1963; C-3, 1977; C-4, 1965; D-2, 1963; D-3, 1965; D-4, 1965; Quadrangles, Alaska

SCALE 1:63,360

1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS

CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL



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

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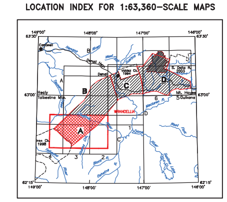
2014

Sun Azimuth: 0 degrees; Sun Inclination: 45 degrees

LOCATION INDEX FOR 1:63,360-SCALE MAPS



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RESIDUAL MAGNETIC FIELD

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

MAGNETIC TILT DERIVATIVE

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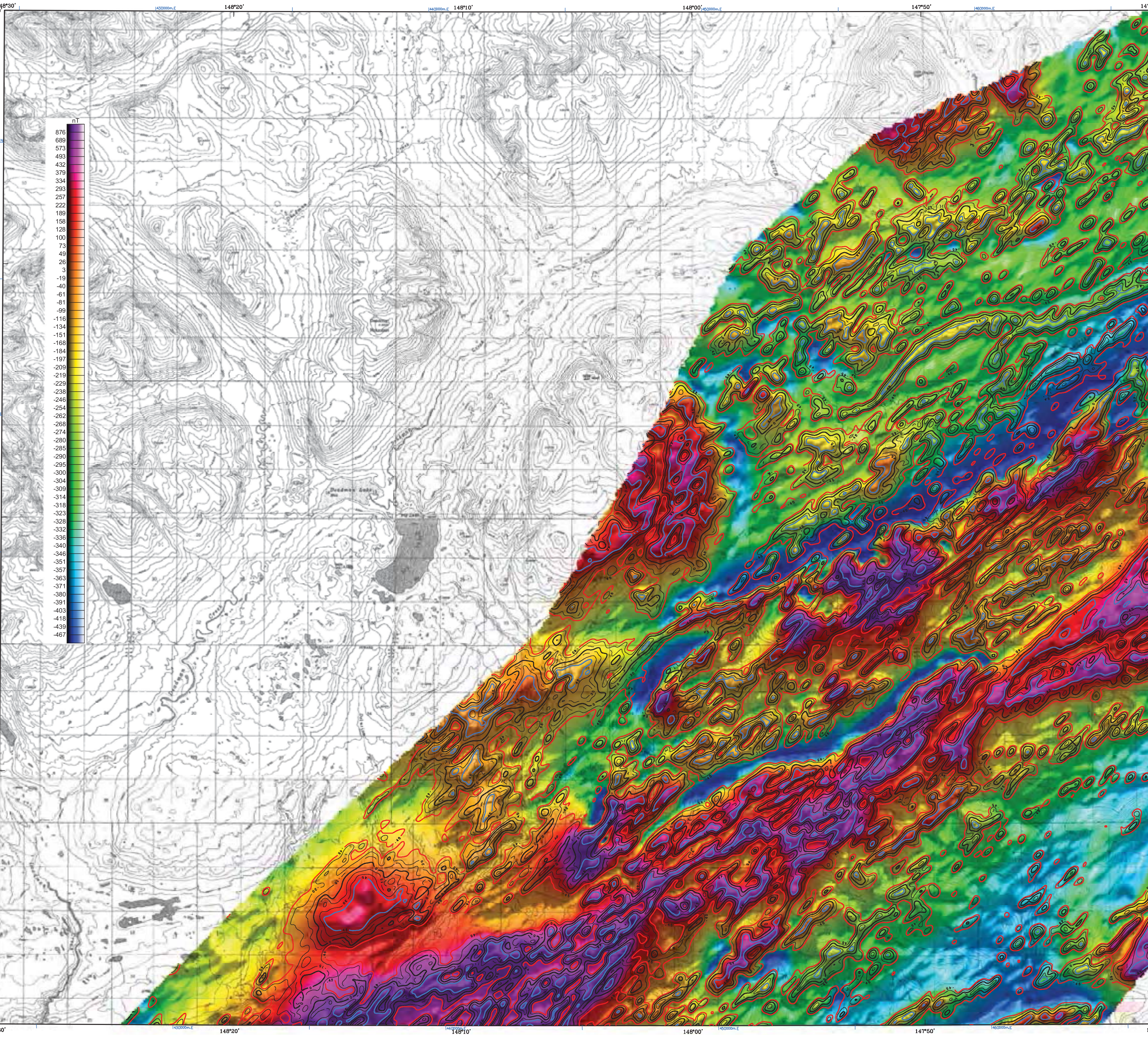


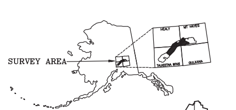
Base from U.S. Geological Survey Healy A-2, 1975; A-3, 1963; Talkeetna Mtns D-2, 1963; D-3, 1965; Quadrangles, Alaska

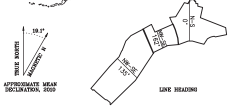
SCALE 1:63,360

1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS

CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL





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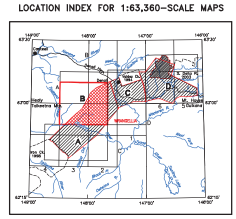
2014

Sun Azimuth: 0 degrees; Sun Inclination: 45 degrees

LOCATION INDEX FOR 1:63,360–SCALE MAPS



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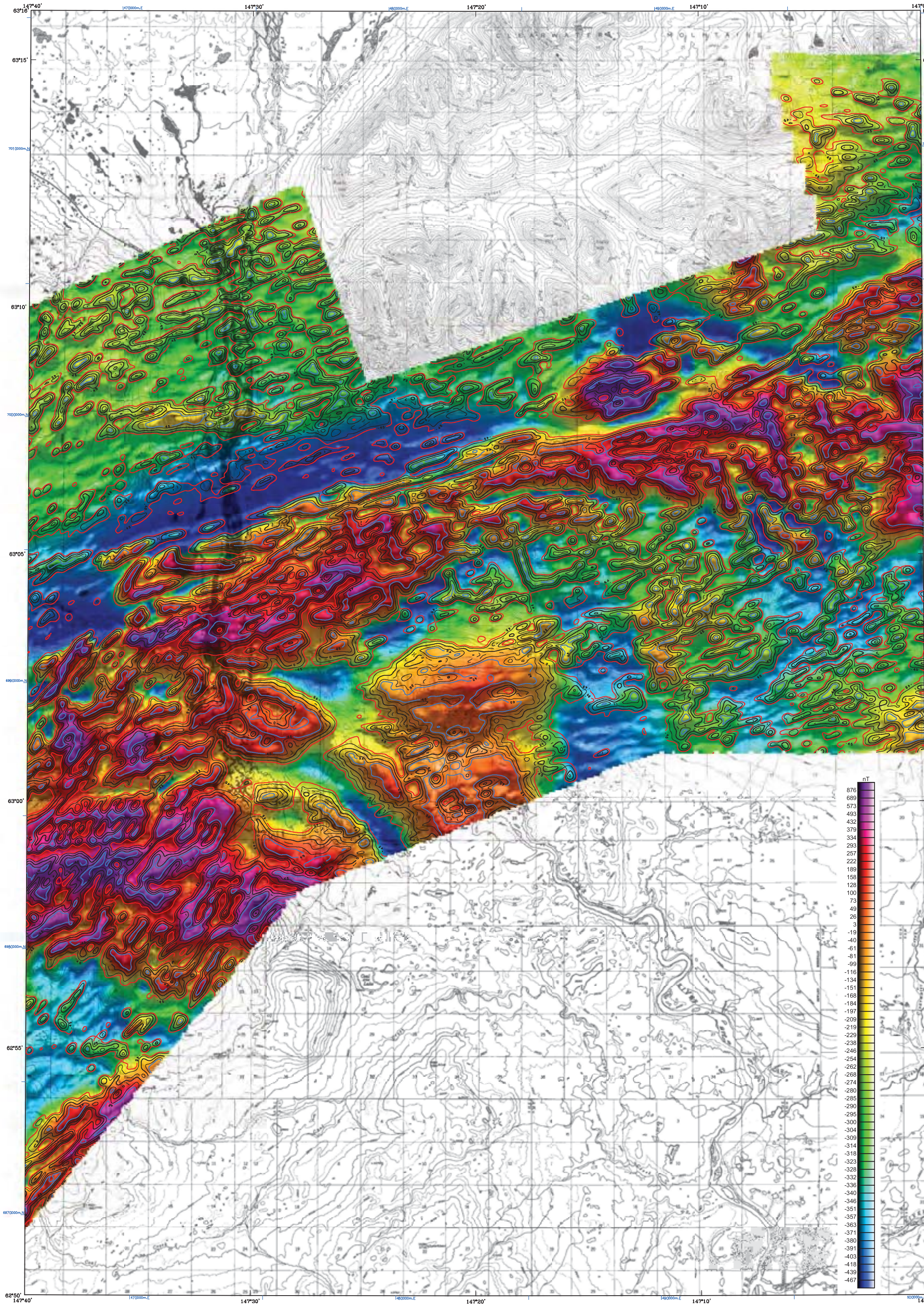


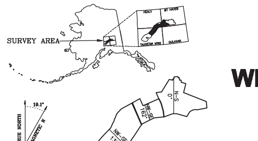
Base from U.S. Geological Survey Healy A-1, 1973; A-2, 1975; B-1, 1972; B-2, 1994; Talkeetna Mtns D-1, 1964; D-2, 1963; Quadrangles, Alaska

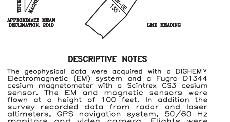
SCALE 1:63,360

1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS

CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL





APPROXIMATE MEAN DECLINATION, 2010

LINE HEADING

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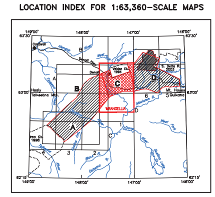

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The magnetic total field data were processed using digitally recorded data from a Fugro D1344 magnetometer with a Scintrex CS3 cesium sensor. Data were collected at a sampling interval of 0.1 seconds. The magnetic data were (1) corrected for diurnal variations by subtraction of the digitally recorded base station magnetic data, (2) IGRF corrected (IGRF model 2010, updated for date of flight and 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.

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

SURVEY HISTORY

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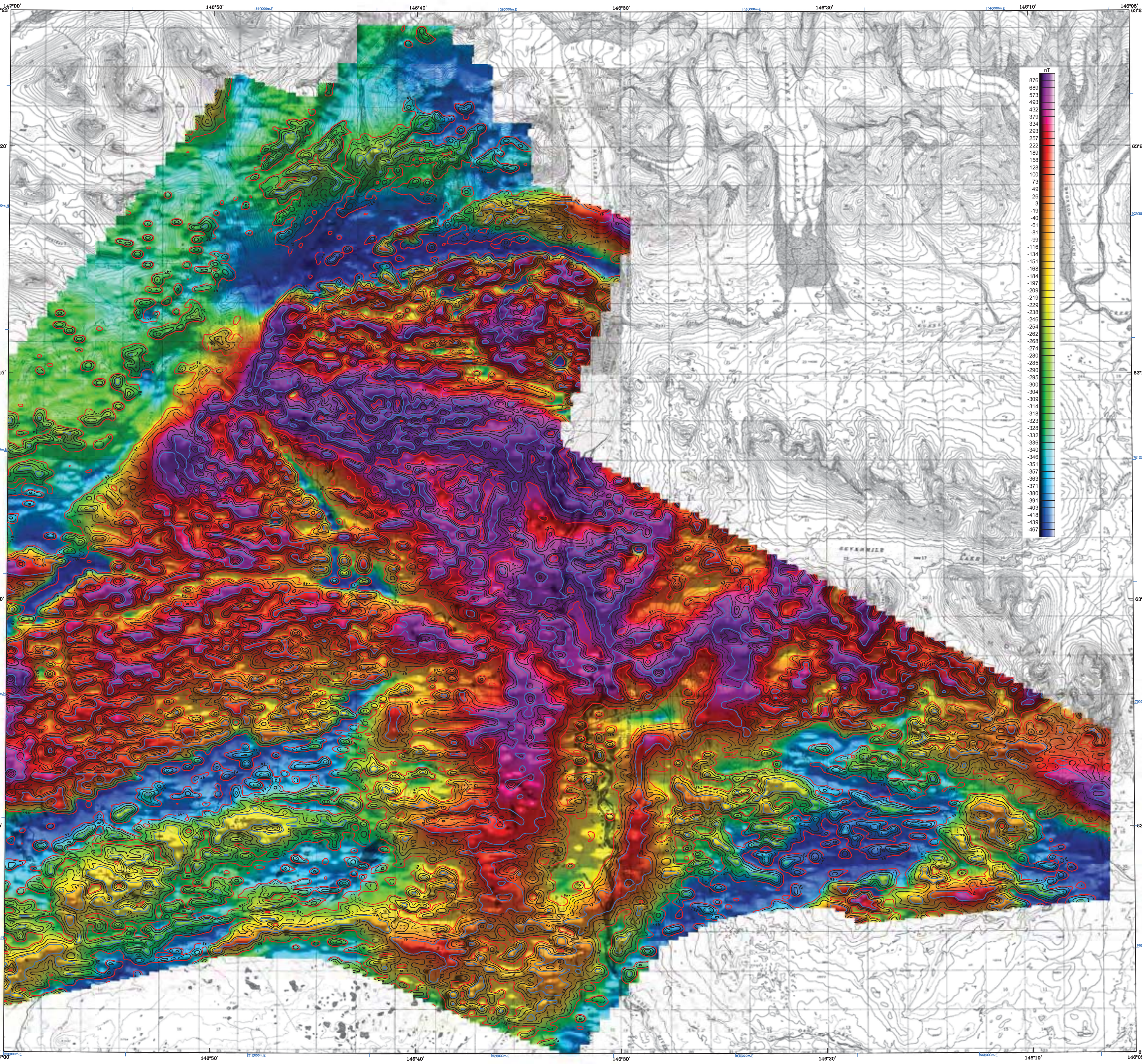


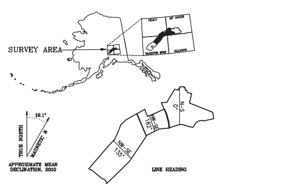
Base from U.S. Geological Survey Mt Hayes A-5, 1949; A-6, 1950; B-5, 1956; B-6, 1950; Quadrangles, Alaska

SCALE 1:63,360

1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS

CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL



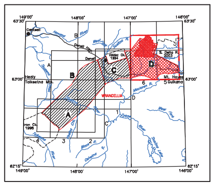
COLOR SHADOW RESIDUAL MAGNETIC FIELD WITH MAGNETIC TILT DERIVATIVE DATA CONTOURS, WRANGELLIA SURVEY AREA, SOUTH-CENTRAL ALASKA

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

LOCATION INDEX FOR 1:63,360-SCALE MAPS



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. . . .+30 degrees
. . . .+15 degrees
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. . . .−15 degrees
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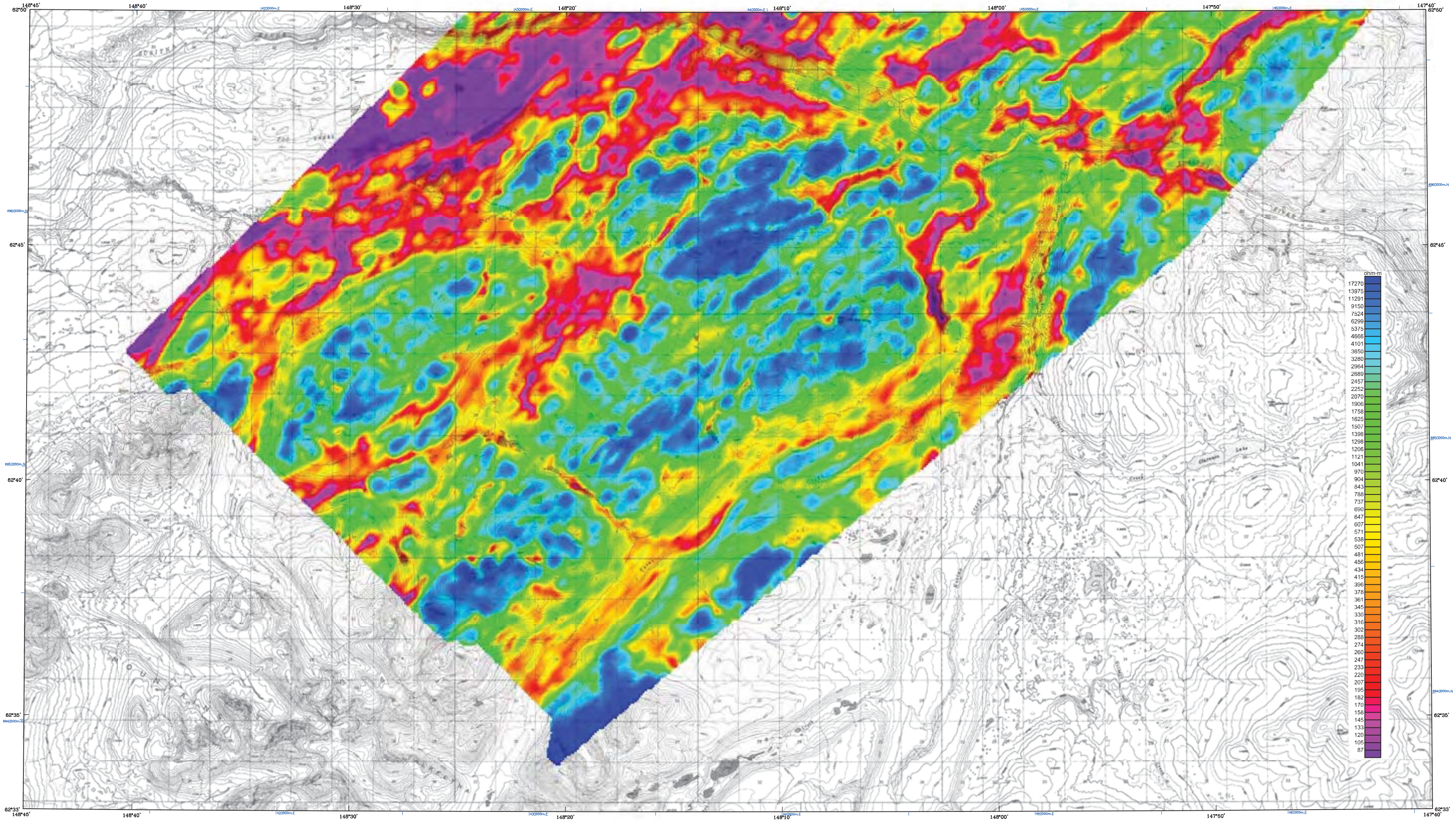


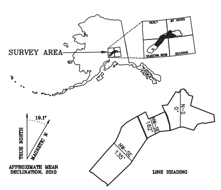
Base from U.S. Geological Survey Talkeetna Mtns C-2, 1963; C-3, 1977; C-4, 1965; D-2, 1963; D-3, 1965; D-4, 1965; Quadrangles, Alaska

SCALE 1:63,360

1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS

CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL

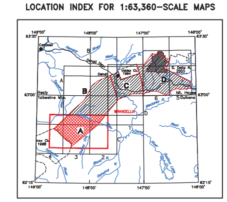


56,000 Hz COPLANAR APPARENT RESISTIVITY WITH TOPOGRAPHY, WRANGELLIA SURVEY AREA, SOUTH-CENTRAL ALASKA

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

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

LOCATION INDEX FOR 1:63,360-SCALE MAPS



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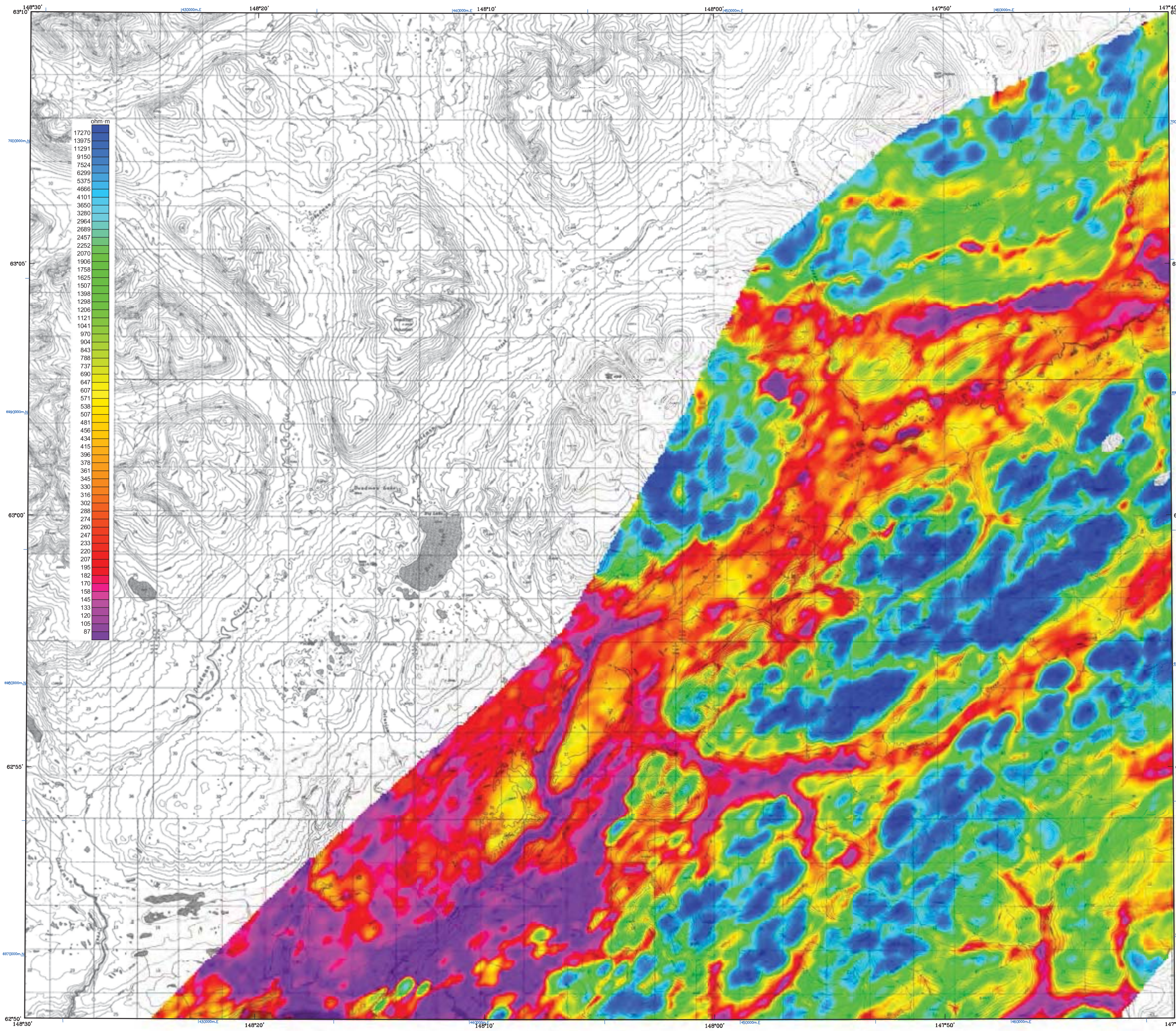


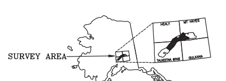
Base from U.S. Geological Survey Healy A-2, 1975; A-3, 1963; Talkeetna Mtns D-2, 1963; D-3, 1965; Quadrangles, Alaska

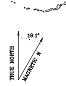
SCALE 1:63,360

1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS

CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL





APPROXIMATE MEAN DECLINATION, 2010

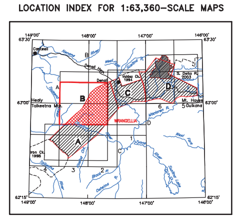
LINE HEADING

56,000 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, CGG, and Fugro GeoServices, Inc.
2014

LOCATION INDEX FOR 1:63,360-SCALE MAPS



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The DIGHEM^{V} EM system measured inphase and quadrature components at five frequencies. Two vertical coaxial coil-pairs operated at 1000 and 5500 Hz while three horizontal coplanar coil-pairs operated at 900, 7200 and 56,000 Hz. EM data were sampled at 0.1 second intervals. The EM system responds to bedrock conductors, conductive overburden, and cultural sources. Apparent resistivity is generated from the inphase and quadrature component of the coplanar 56,000 Hz using the pseudo-layer half space model. The data were interpolated onto a regular 80 m grid using a modified Akima (1970) technique. 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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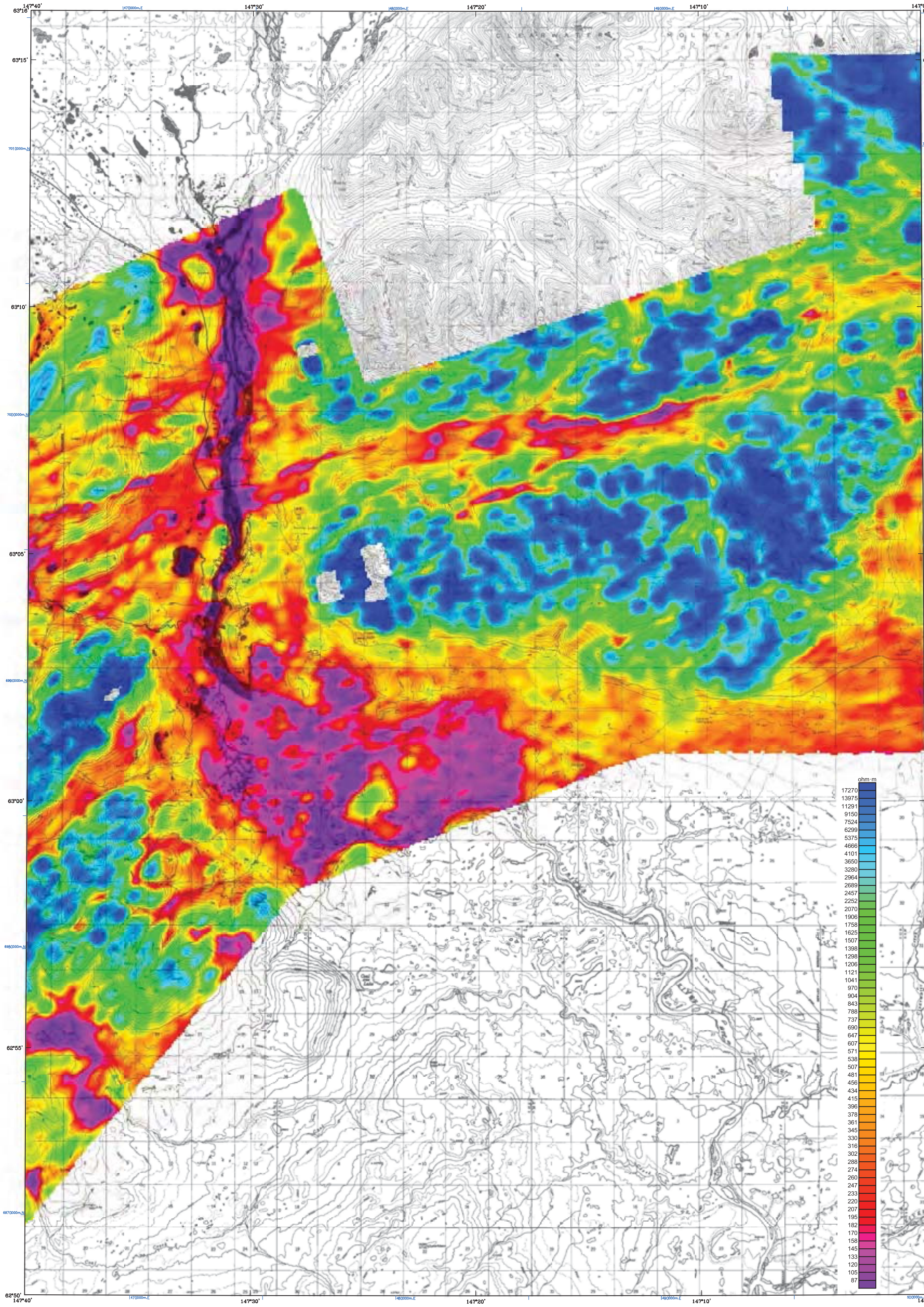


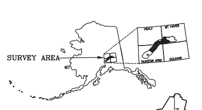
Base from U.S. Geological Survey Healy A-1, 1973; A-2, 1975; B-1, 1972; B-2, 1994; Talkeetna Mtns D-1, 1964; D-2, 1963; Quadrangles, Alaska

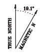
SCALE 1:63,360

1 0 1 2 3 4 MILES

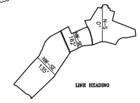
1 0 1 2 3 4 5 KILOMETERS

CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL





APPROXIMATE MEAN DECLINATION, 2010



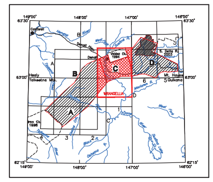
LINE HEADING

56,000 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, CGG, and Fugro GeoServices, Inc.
2014

LOCATION INDEX FOR 1:63,360-SCALE MAPS



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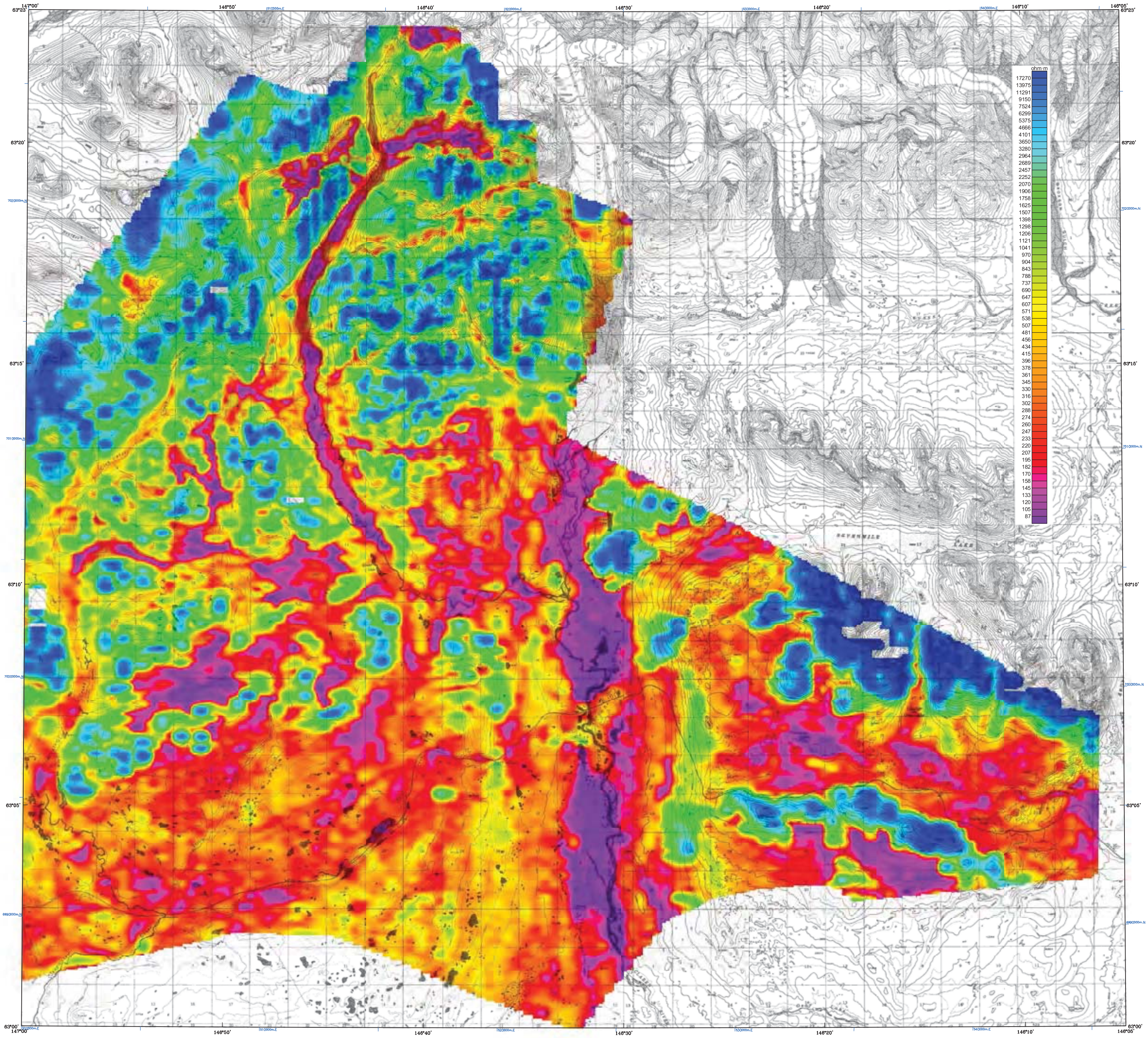

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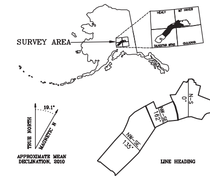
SCALE 1:63,360

1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS

CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL



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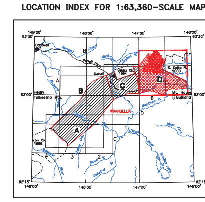

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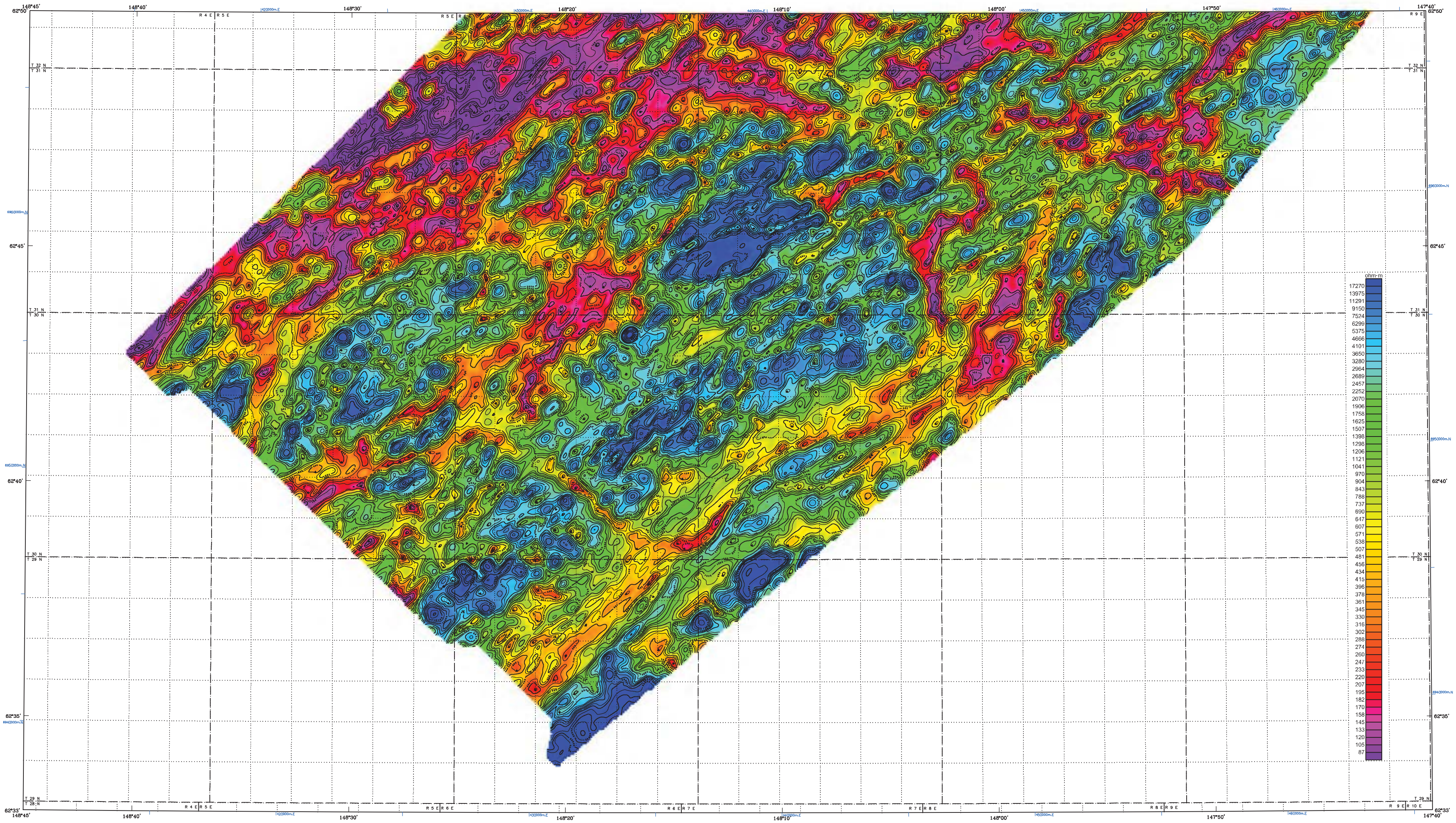
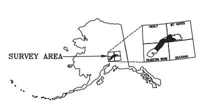


Section outlines from U.S. Geological Survey Talkeetna Mtns C-2, 1963; C-3, 1977; C-4, 1965; D-2, 1963; D-3, 1965; D-4, 1965; Quadrangles, Alaska

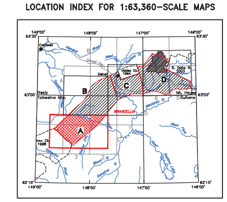
SCALE 1:63,360

1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS



LOCATION INDEX FOR 1:63,360-SCALE MAPS



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

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.

DESCRIPTIVE NOTES

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The DIGHEM^{V} EM system measured inphase and quadrature components at five frequencies. Two vertical coaxial coil-pairs operated at 1000 and 5500 Hz while three horizontal coplanar coil-pairs operated at 900, 7200 and 56,000 Hz. EM data were sampled at 0.1 second intervals. The EM system responds to bedrock conductors, conductive overburden, and cultural sources. Apparent resistivity is generated from the inphase and quadrature component of the coplanar 56,000 Hz using the pseudo-layer half space model. The data were interpolated onto a regular 80 m grid using a modified Akima (1970) technique. 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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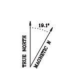

APPROXIMATE MEAN DECLINATION, 2010

LINE HEADING

RESISTIVITY CONTOURS

1000
800
600
500
400
300
250
200
150
125
100

Contours in ohm-m at 10 intervals per decade

. . . . resistivity low

SURVEY HISTORY

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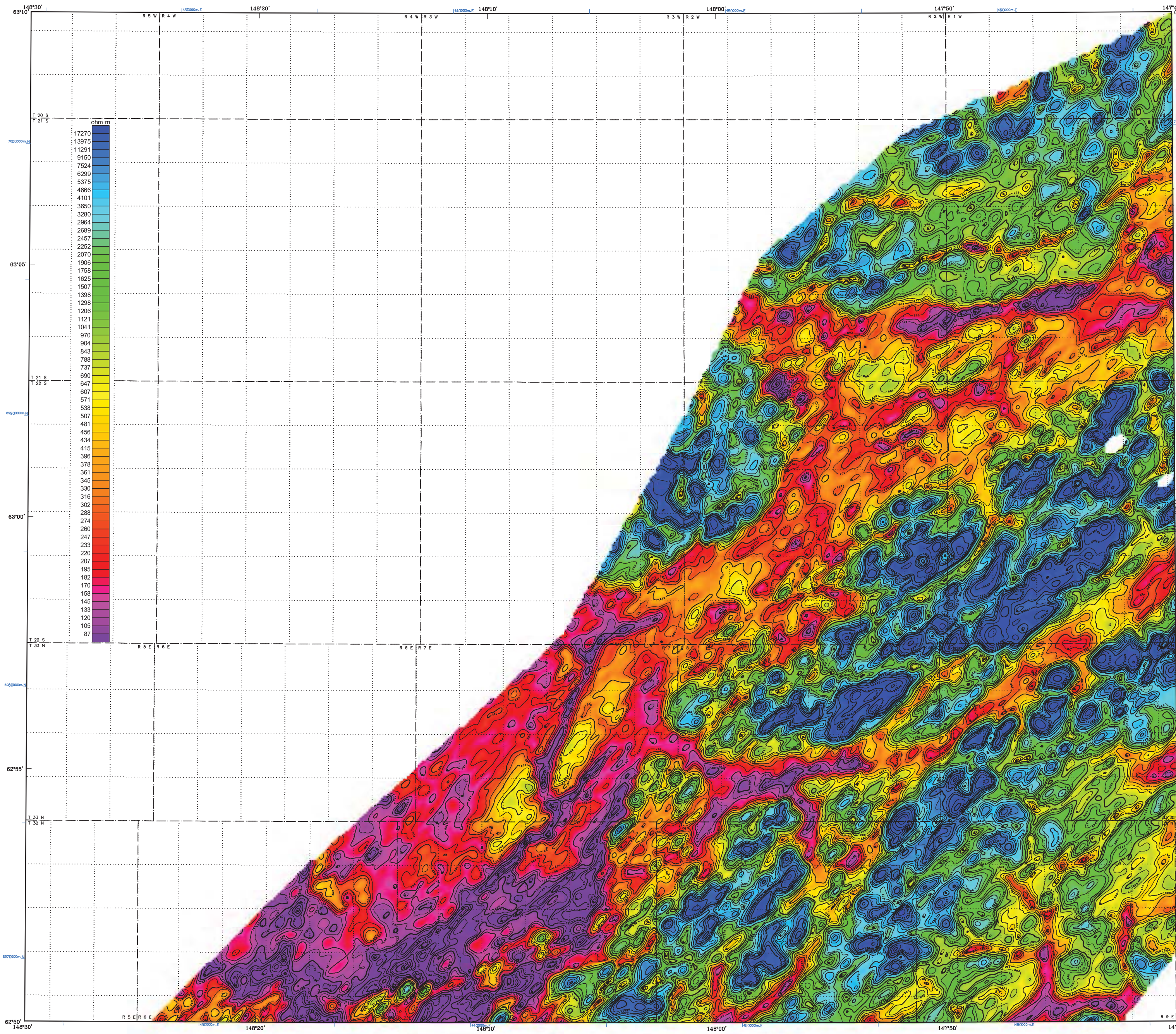
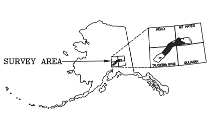


Section outlines from U.S. Geological Survey Healy A-2, 1975; A-3, 1963; Talkeetna Mtns D-2, 1963; D-3, 1965; Quadrangles, Alaska

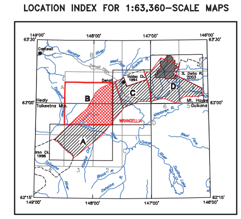
SCALE 1:63,360

1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS



LOCATION INDEX FOR 1:63,360-SCALE MAPS



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

by
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2014

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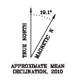
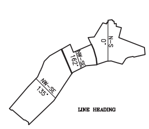


APPROXIMATE MEAN DECLINATION, 2010



LINE HEADING

RESISTIVITY CONTOURS

1000
800
600
500
400
300
250
200
150
125
100

Contours in ohm-m at 10 intervals per decade

. . . . resistivity low

SURVEY HISTORY

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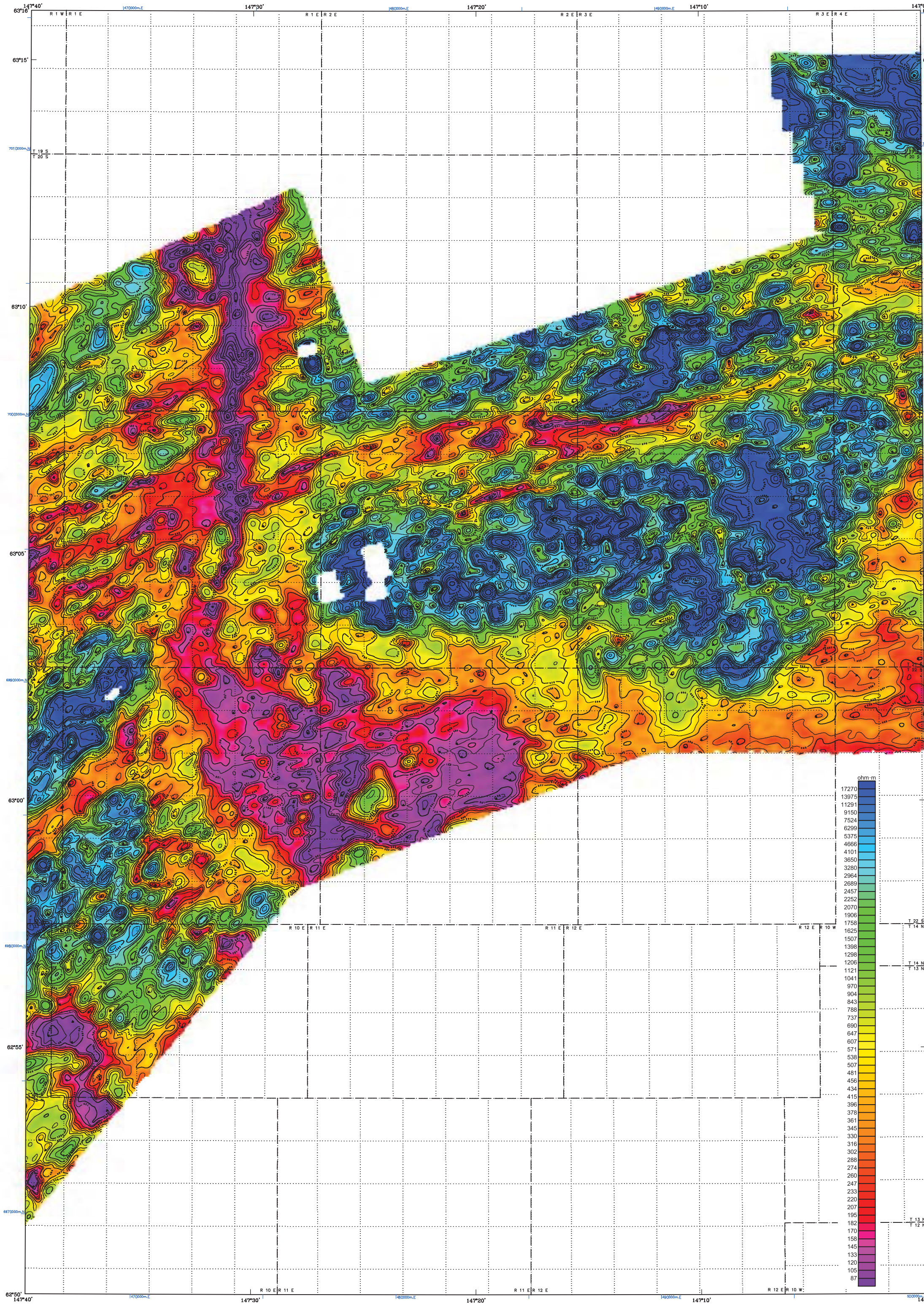
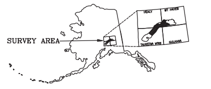


Section outlines from U.S. Geological Survey Healy A-1, 1973; A-2, 1975; B-1, 1972; B-2, 1994; Talkeetna Mtns D-1, 1964; D-2, 1963; Quadrangles, Alaska

SCALE 1:63,360

1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS

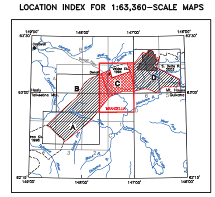


56,000 Hz COPLANAR APPARENT RESISTIVITY WITH DATA CONTOURS, WRANGELLIA SURVEY AREA, SOUTH-CENTRAL ALASKA

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

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

LOCATION INDEX FOR 1:63,360-SCALE MAPS



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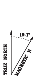

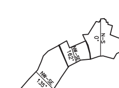

RESISTIVITY CONTOURS

1000
800
600
500
400
300
250
200
150
125
100

Contours in ohm-m at 10 intervals per decade

resistivity low

SURVEY HISTORY

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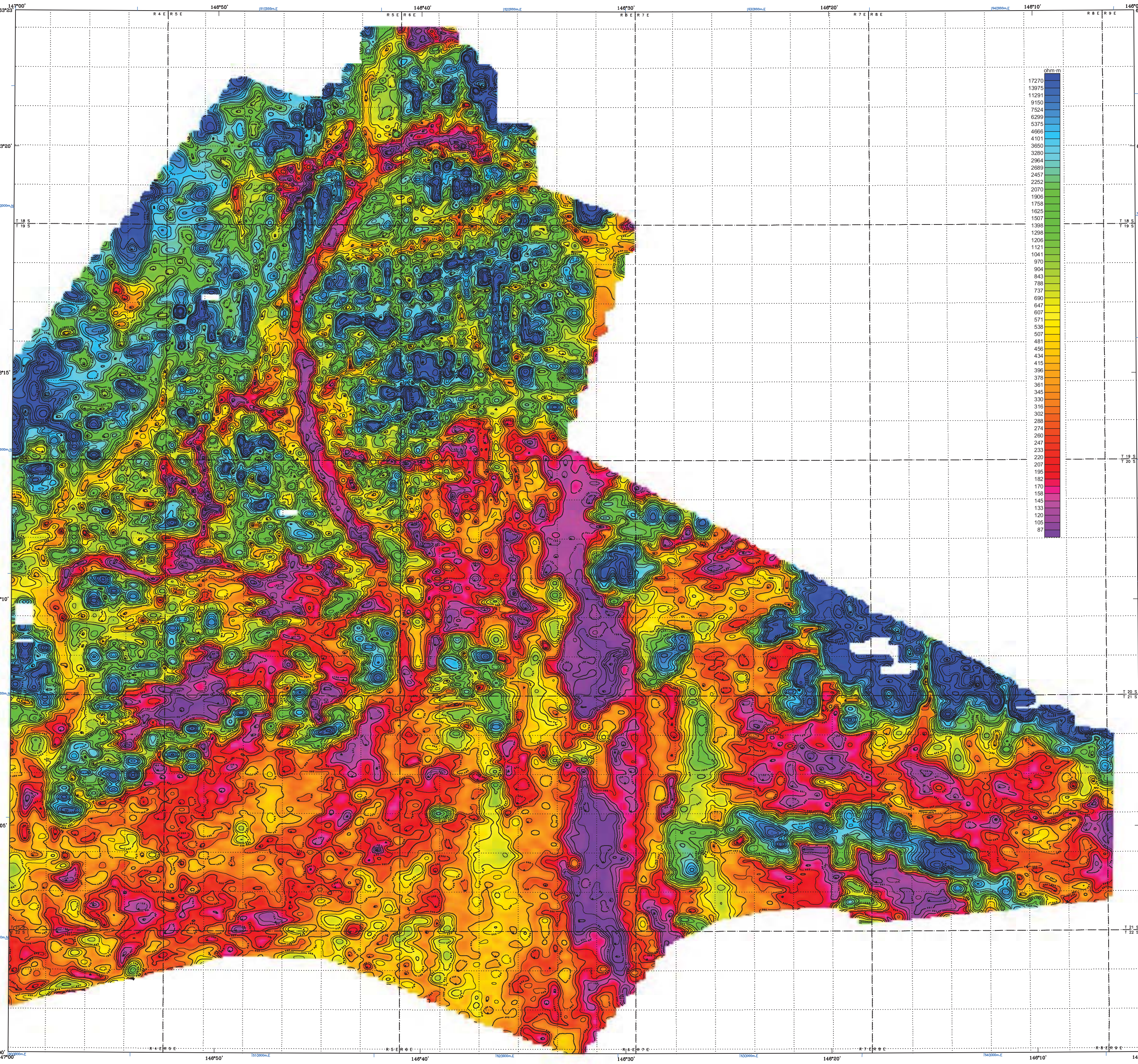
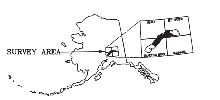


Section outlines from U.S. Geological Survey Mt Hayes A-5, 1949; A-6, 1950; B-5, 1956; B-6, 1956; Quadrangles, Alaska

SCALE 1:63,360

1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS



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

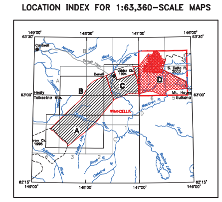
PARTS OF THE TALKEETNA MTNS, HEALY, AND MT HAYES QUADRANGLES

by

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

2014

LOCATION INDEX FOR 1:63,360-SCALE MAPS



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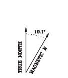
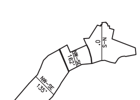


APPROXIMATE MEAN DECLINATION, 2010



LINE HEADING

RESISTIVITY CONTOURS

1000
800
600
500
400
300
250
200
150
125
100

Contours in ohm-m at 10 intervals per decade

. . . . resistivity low

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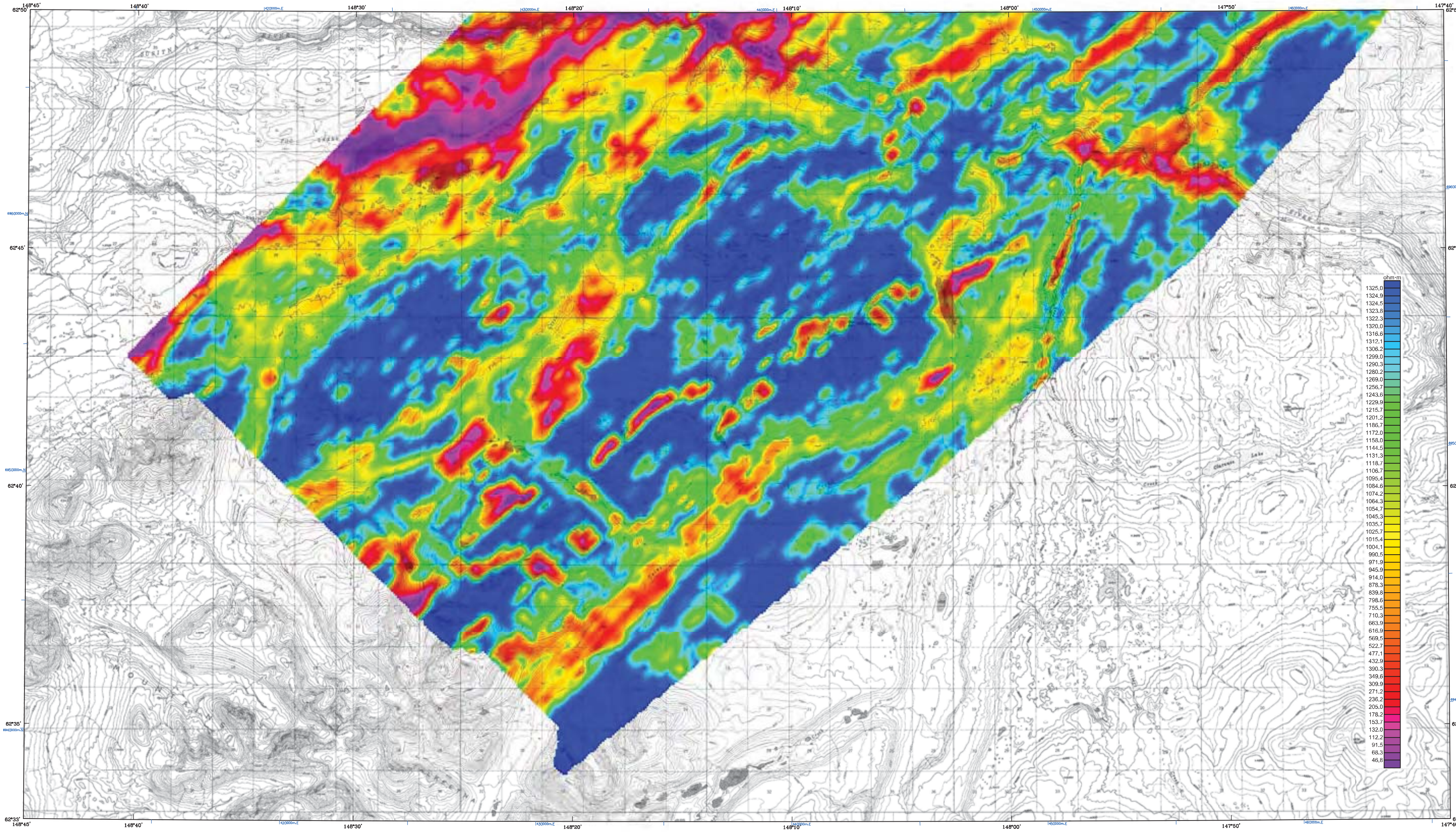


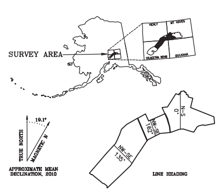
Base from U.S. Geological Survey Talkeetna Mtns C–2, 1963; C–3, 1977; C–4, 1965; D–2, 1963; D–3, 1965; D–4, 1965; Quadrangles, Alaska

SCALE 1:63,360

1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS

CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL



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

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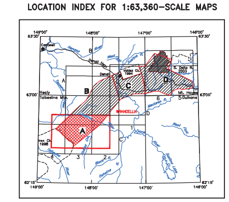

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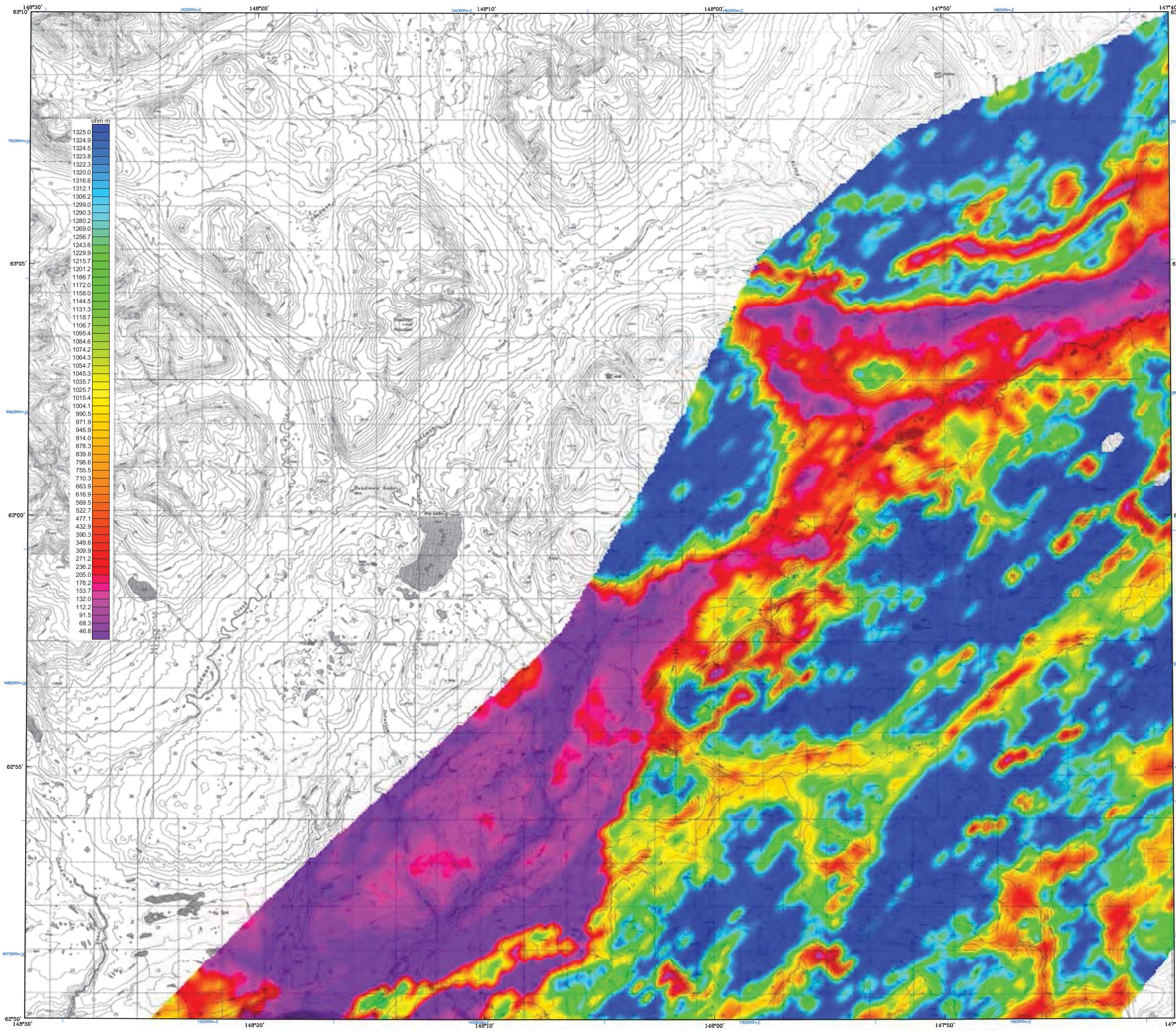


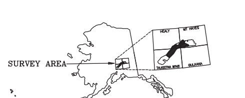
Base from U.S. Geological Survey Healy A-2, 1975; A-3, 1963; Talkeetna Mtns D-2, 1952; D-3, 1955; Quadrangles, Alaska

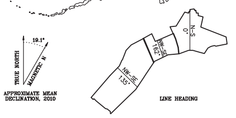
SCALE 1:63,360

1 0 1 2 3 4 MILES

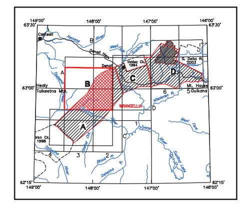
1 0 1 2 3 4 5 KILOMETERS

CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL





LOCATION INDEX FOR 1:63,360-SCALE MAPS



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, CGG, and Fugro GeoServices, Inc.
2014

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. Tie 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^V EM system measured inphase and quadrature components at five frequencies. Two vertical coaxial coil-pairs operated at 1000 and 5500 Hz while three horizontal coplanar coil-pairs operated at 900, 7200 and 56,000 Hz. EM data were sampled at 0.1 second intervals. The EM system responds to bedrock conductors, conductive overburden, and cultural sources. Apparent resistivity is generated from the inphase and quadrature component of the coplanar 56,000 Hz using the pseudo-layer half space model. The data were interpolated onto a regular 80 m grid using a modified Akima (1970) technique. 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.

RESISTIVITY ALTITUDE LIMITS

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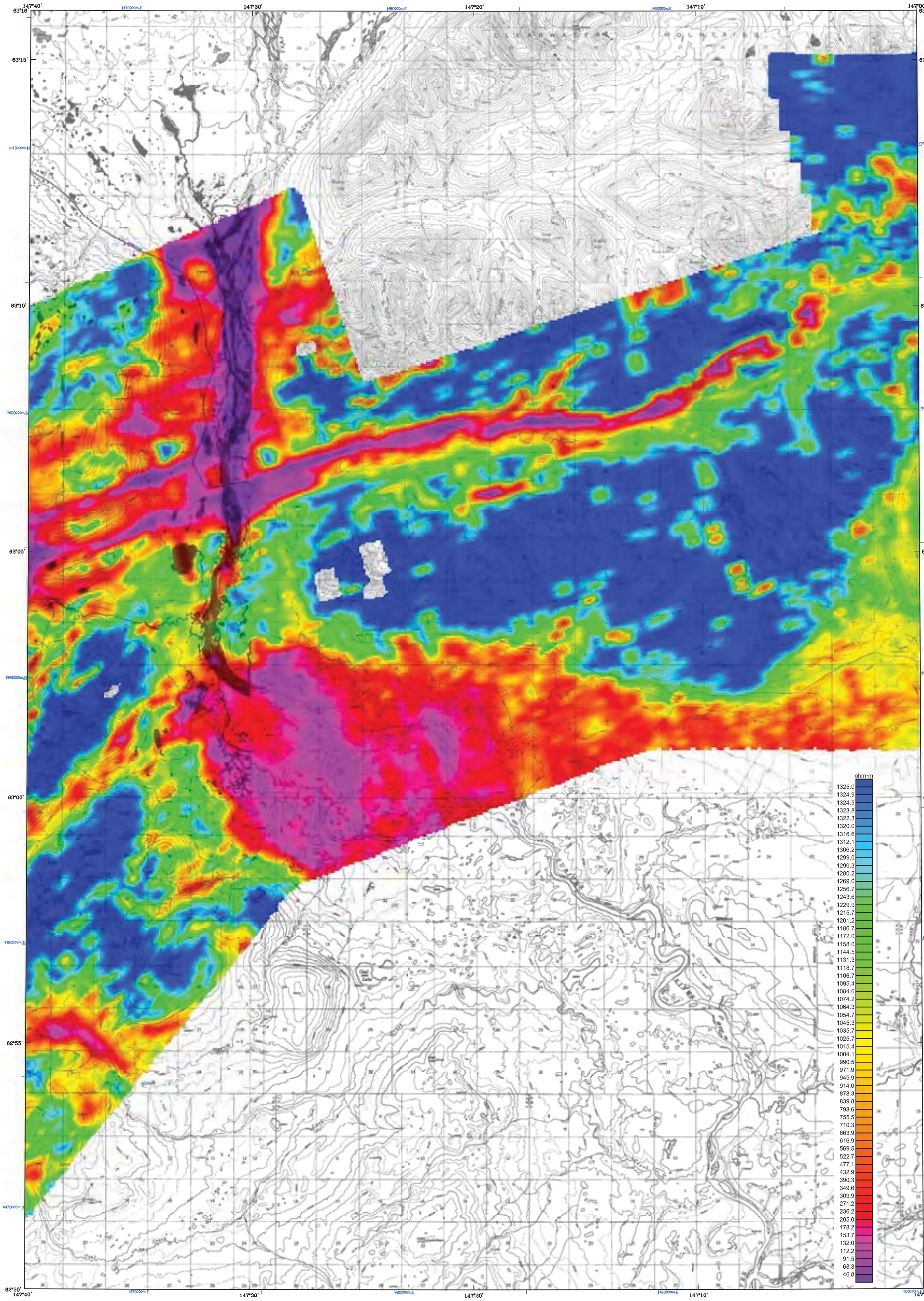
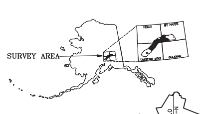
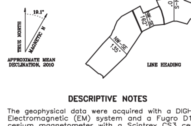


Base from U.S. Geological Survey Healy A-1, 1973; A-2, 1975; B-1, 1972; B-2, 1994; Talkeetna Mtns D-1, 1964; D-2, 1963; Quadrangles, Alaska

SCALE 1:63,360

CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL





APPROXIMATE MEAN DECLINATION, 2010

LINE HEADING

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

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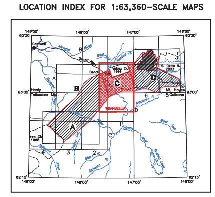
LOCATION INDEX FOR 1:63,360-SCALE MAPS



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RESISTIVITY

The DIGHEM^V EM system measured inphase and quadrature components at five frequencies. Two vertical coaxial coil–pairs operated at 1000 and 5500 Hz while three horizontal coplanar coil–pairs operated at 900, 7200 and 56,000 Hz. EM data were sampled at 0.1 second intervals. The EM system responds to bedrock conductors, conductive overburden, and cultural sources. Apparent resistivity is generated from the inphase and quadrature component of the coplanar 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.

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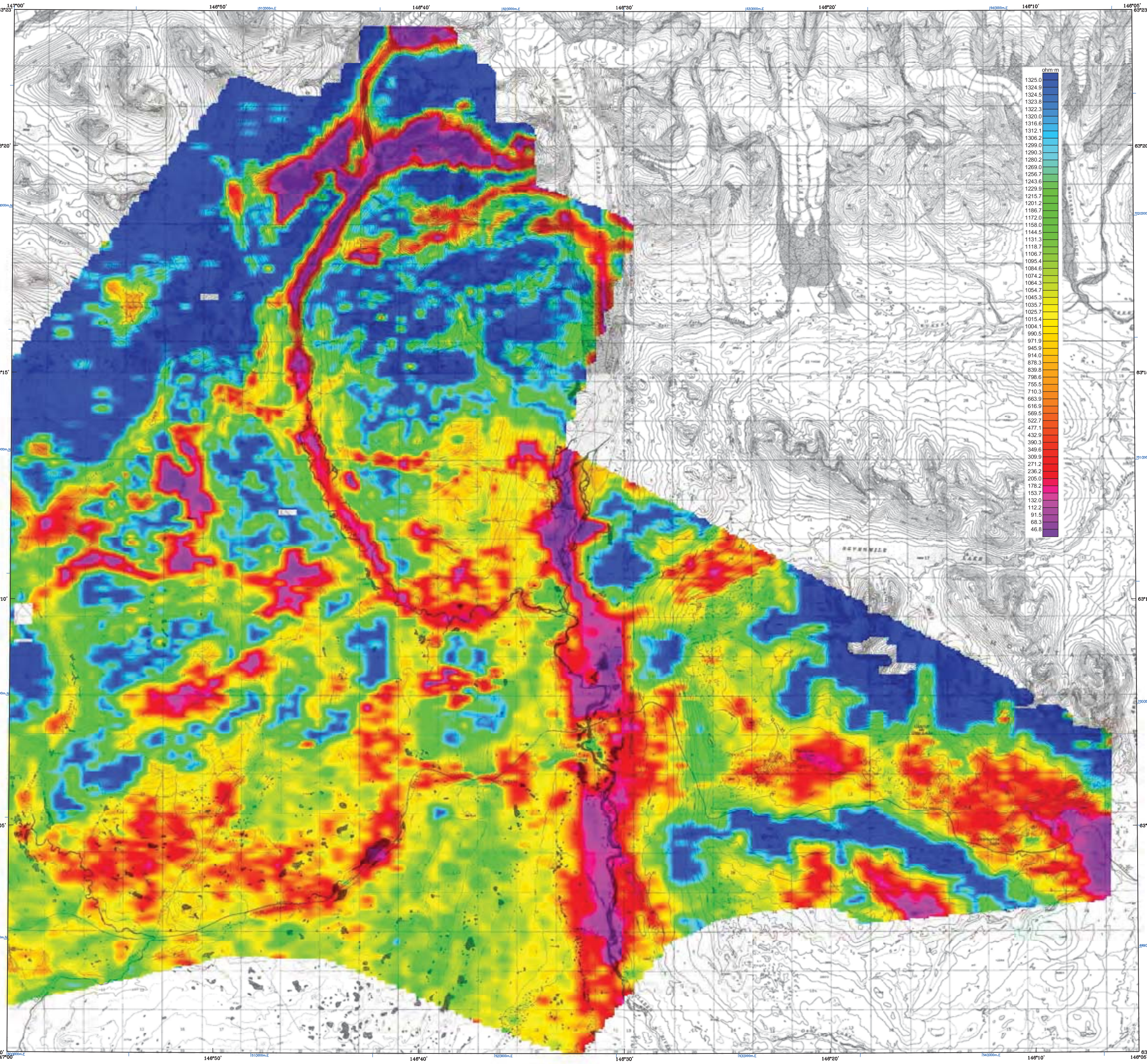


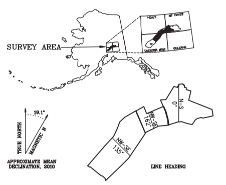
Base from U.S. Geological Survey Mt Hayes A-5, 1949; A-6, 1950; B-5, 1956; B-6, 1956; Quadrangles, Alaska

SCALE 1:63,360

1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS

CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL



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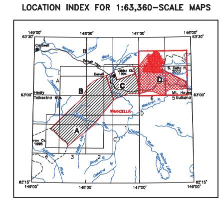

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RESISTIVITY

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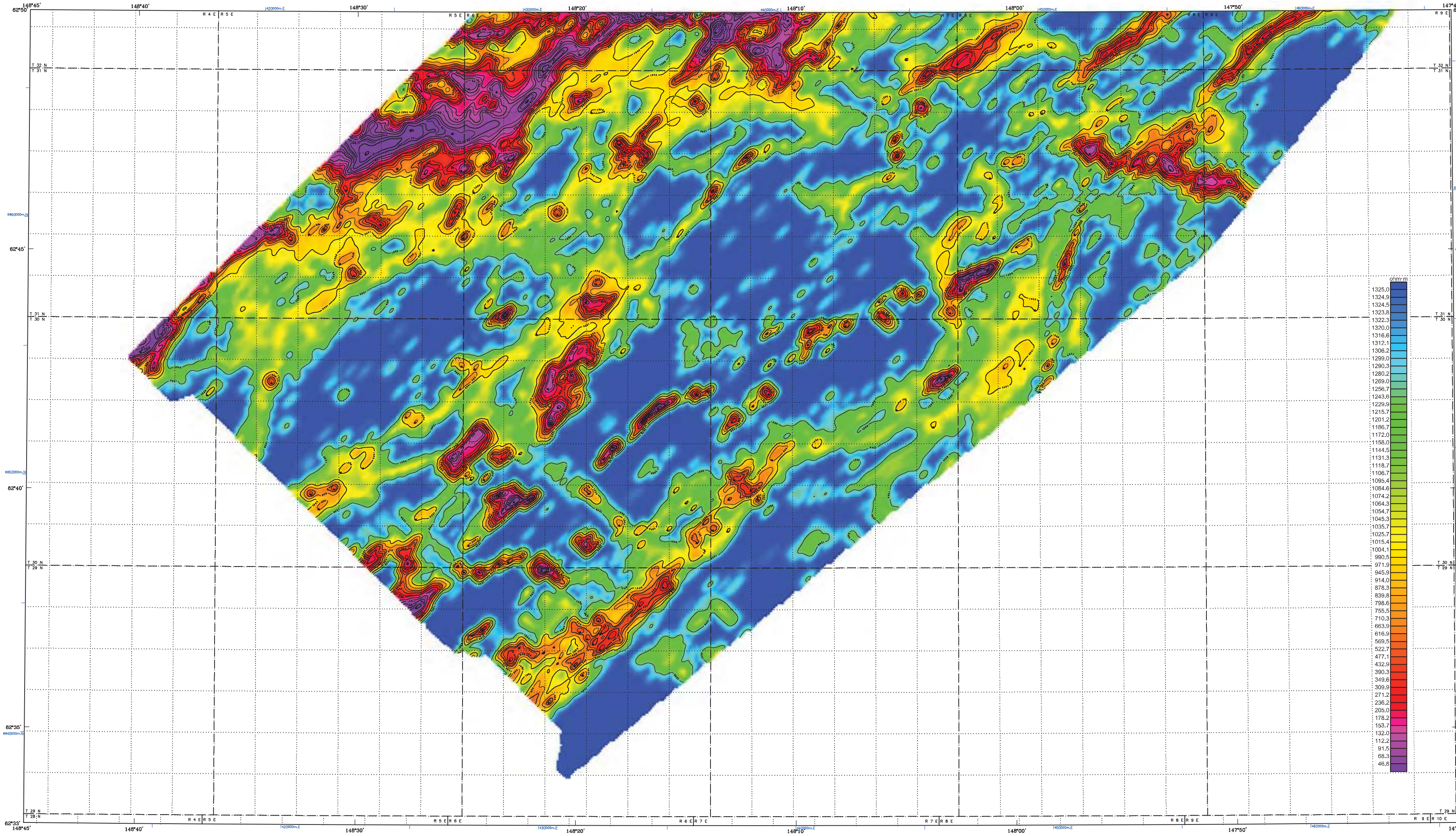
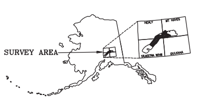


Section outlines from U.S. Geological Survey Talkeetna Mtns C–2, 1963; C–3, 1977; C–4, 1965; D–2, 1963; D–3, 1965; D–4, 1965; Quadrangles, Alaska



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

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by
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2014

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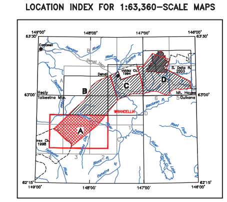

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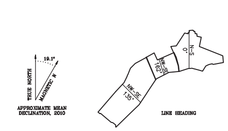

RESISTIVITY CONTOURS

1000
800
600
500
400
300
250
200
150
125
100

Contours in ohm–m at 10 intervals per decade

. . . . resistivity low

SURVEY HISTORY

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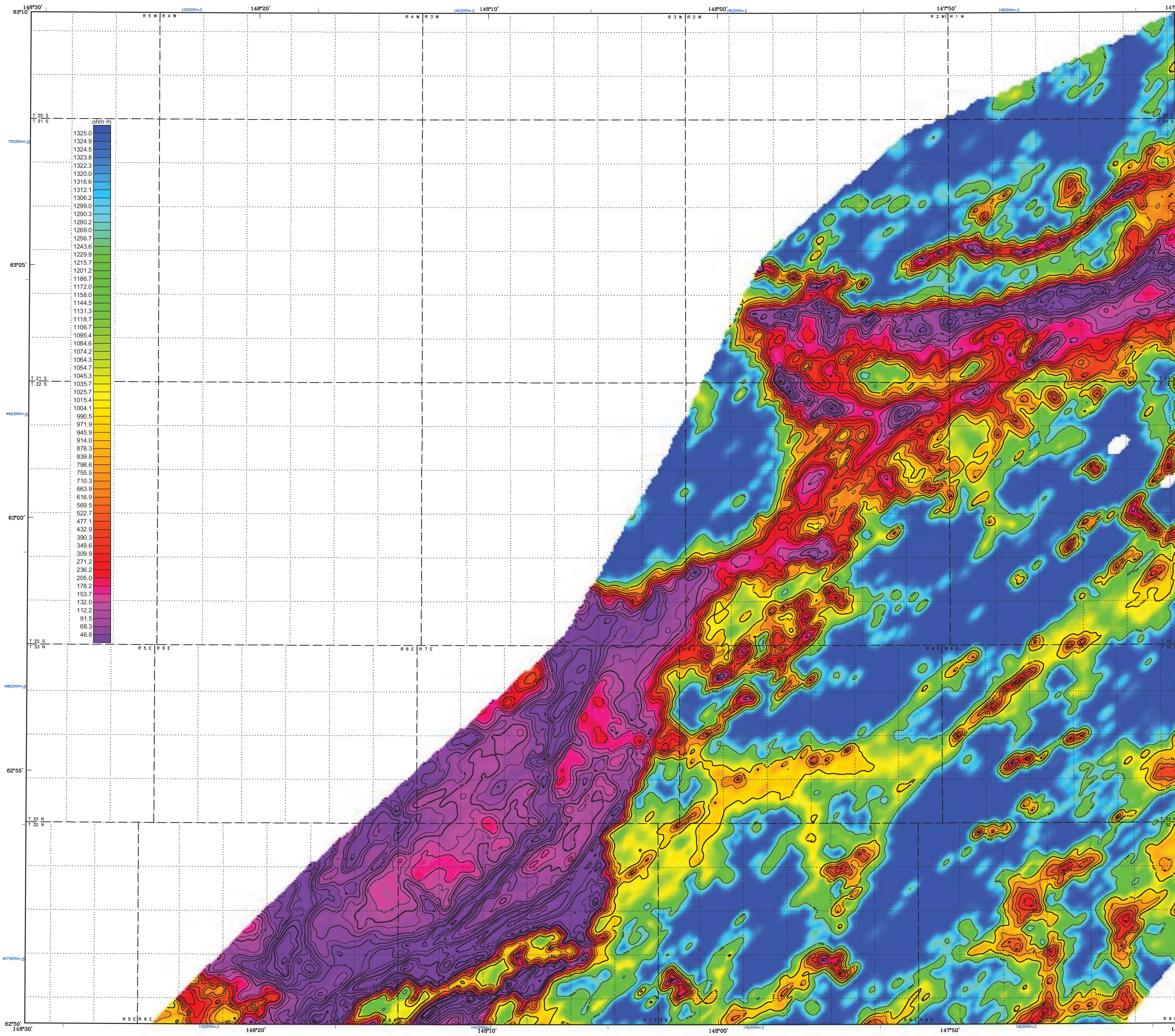

Section outlines from U.S. Geological Survey Healy A–2, 1975; A–3, 1963; Talkeetna Mtns D–2, 1963; D–3, 1965; Quadrangles, Alaska

SCALE 1:63,360

1 0 1 2 3 4 MILES

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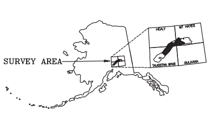

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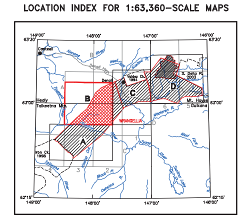
LOCATION INDEX FOR 1:63,360–SCALE MAPS



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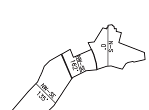

LINE HEADING

RESISTIVITY CONTOURS

- 1000
- 800
- 600
- 500
- 400
- 300
- 250
- 200
- 150
- 125
- 100

Contours in ohm–m at 10 intervals per decade

. . . . resistivity low

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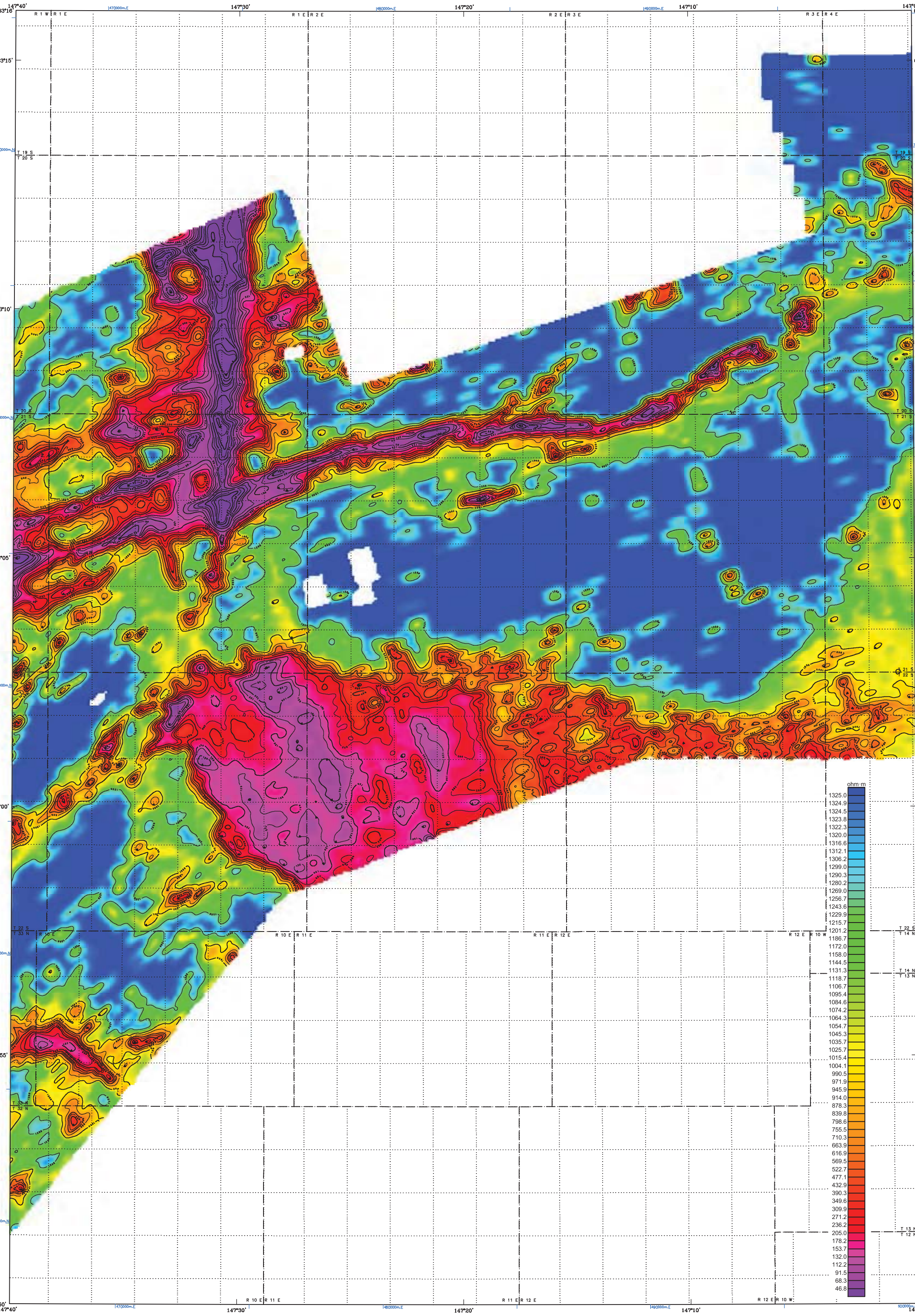

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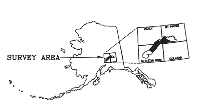
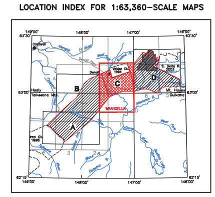
SCALE 1:63,360



LOCATION INDEX FOR 1:63,360-SCALE MAPS



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2014

RESISTIVITY ALTITUDE LIMITS

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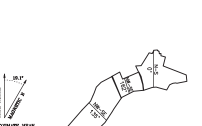
Akima, H., 1970, A new method of interpolation and smooth curve fitting based on local procedures: Journal of the Association of Computing Machinery, v. 17, no. 4, p. 589-602.



RESISTIVITY CONTOURS

1000
800
600
500
400
300
250
200
150
125
100

Contours in ohm-m at 10 intervals per decade

resistivity low

SURVEY HISTORY

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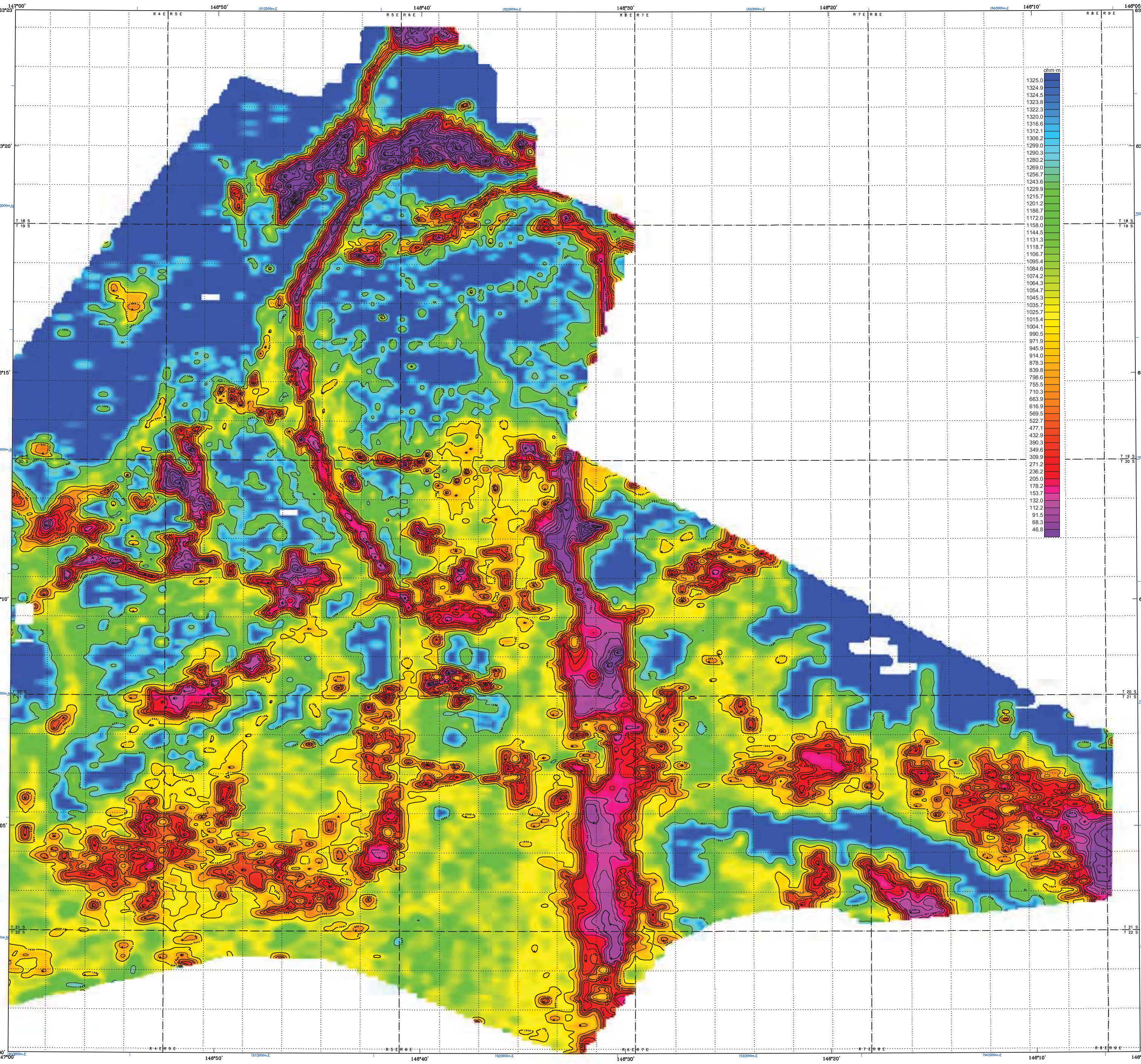
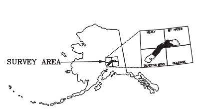


Section outlines from U.S. Geological Survey Mt Hayes A-5, 1949; A-6, 1950; B-5, 1956; B-6, 1956; Quadrangles, Alaska

SCALE 1:63,360

1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS

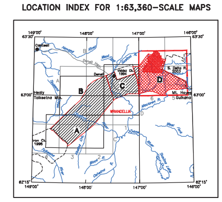


900 Hz COPLANAR APPARENT RESISTIVITY WITH DATA CONTOURS, WRANGELLIA SURVEY AREA, SOUTH-CENTRAL ALASKA

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

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

LOCATION INDEX FOR 1:63,360-SCALE MAPS



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.

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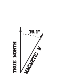
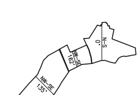


APPROXIMATE MEAN DECLINATION, 2010



LINE HEADING

RESISTIVITY CONTOURS

1000
800
600
500
400
300
250
200
150
125
100

Contours in ohm–m at 10 intervals per decade

. . . . resistivity low

SURVEY HISTORY

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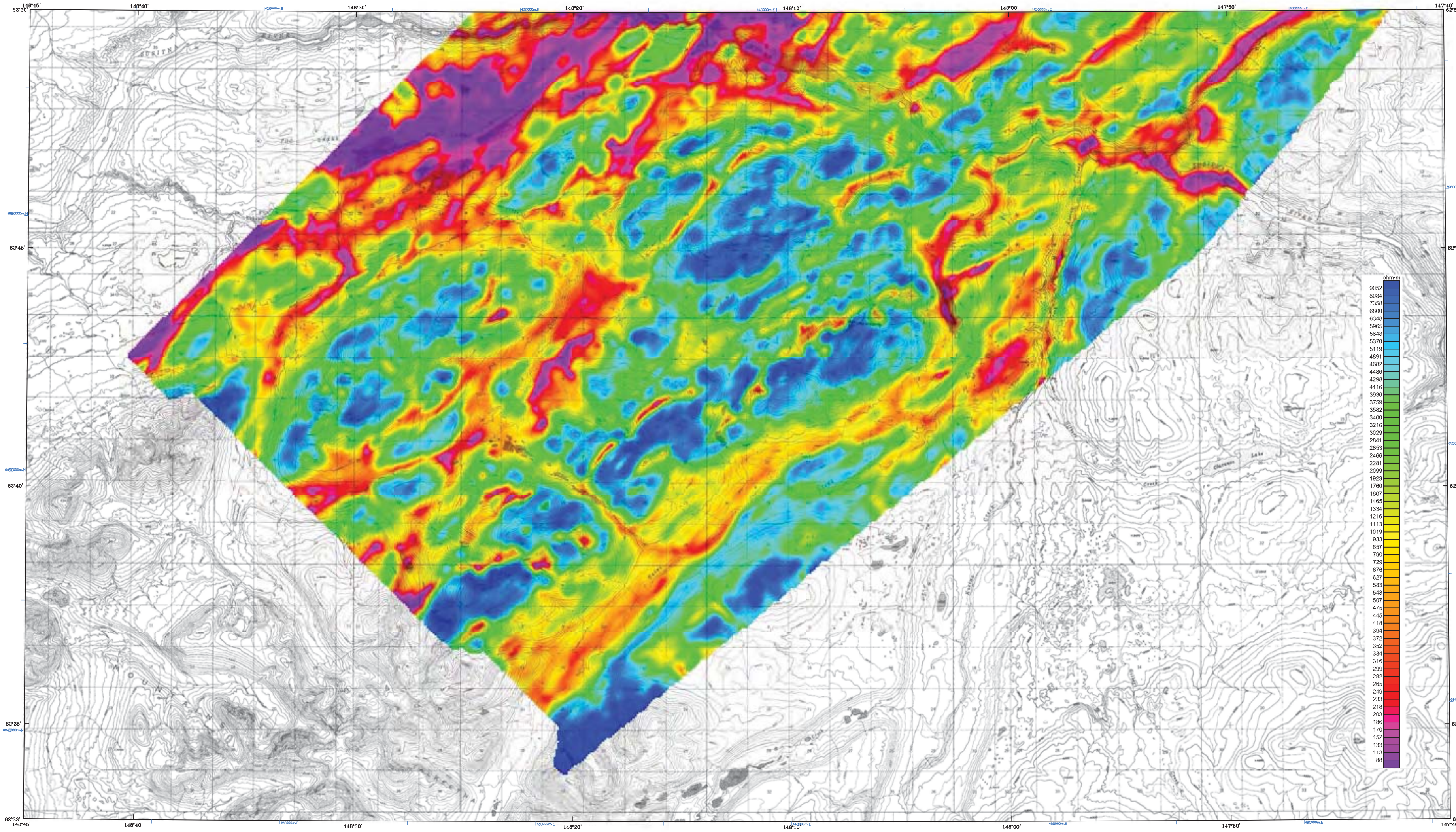


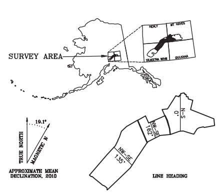
Base from U.S. Geological Survey Talkeetna Mtns C–2, 1963; C–3, 1977; C–4, 1965; D–2, 1963; D–3, 1965; D–4, 1965; Quadrangles, Alaska

SCALE 1:63,360

1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS

CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL

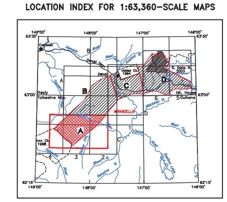


7200 Hz COPLANAR APPARENT RESISTIVITY WITH TOPOGRAPHY, WRANGELLIA SURVEY AREA, SOUTH-CENTRAL ALASKA

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

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

LOCATION INDEX FOR 1:63,360-SCALE MAPS



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. Tie lines were flown perpendicular to the flight lines at intervals of approximately 3 miles.

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RESISTIVITY

The DIGHEM V EM system measured inphase and quadrature components at five frequencies. Two vertical coaxial coil–pairs operated at 1000 and 5500 Hz while three horizontal coplanar coil–pairs operated at 900, 7200 and 56,000 Hz. EM data were sampled at 0.1 second intervals. The EM system responds to bedrock conductors, conductive overburden, and cultural sources. Apparent resistivity is generated from the inphase and quadrature component of the coplanar 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.

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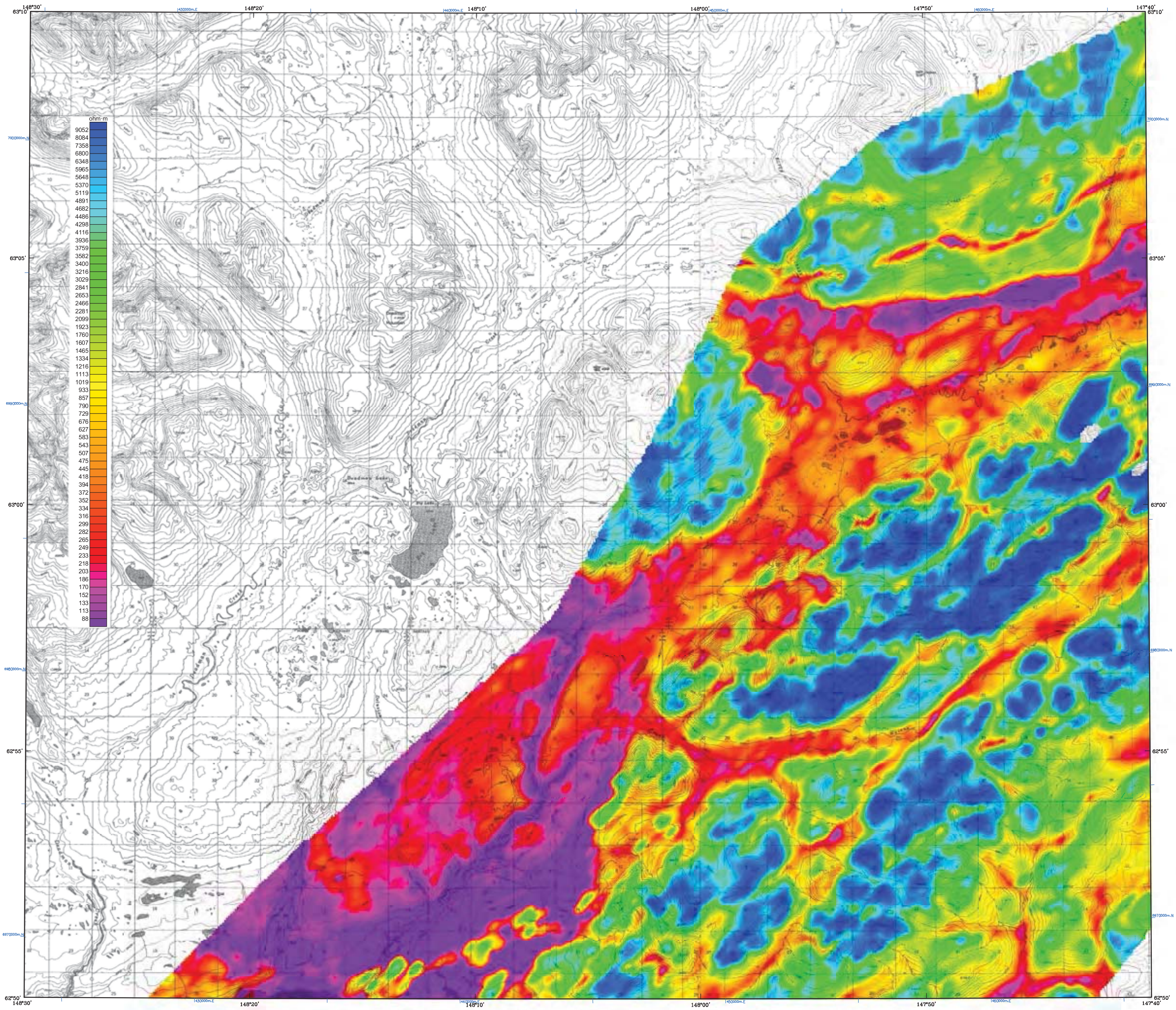


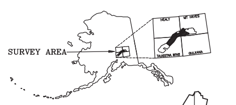
Base from U.S. Geological Survey Healy A-2, 1975; A-3, 1963; Talkeetna Mtns D-2, 1963; D-3, 1965; Quadrangles, Alaska

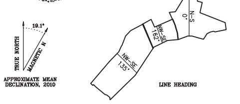
SCALE 1:63,360

1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS

CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL





7200 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, CGG, and Fugro GeoServices, Inc.
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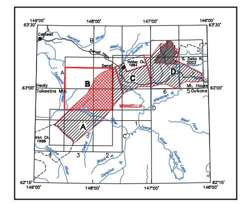

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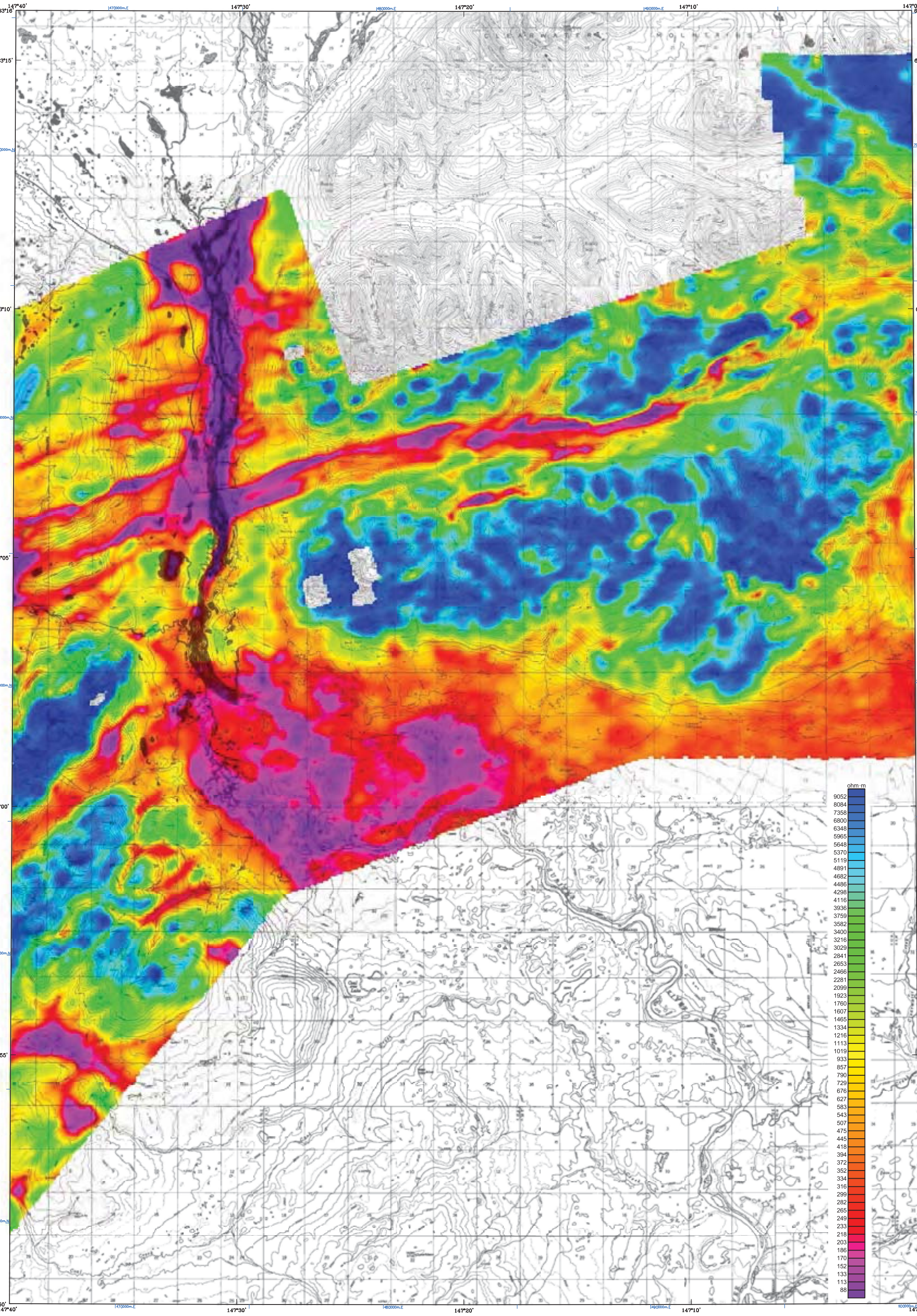


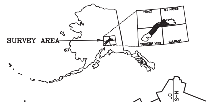
Base from U.S. Geological Survey Healy A-1, 1973; A-2, 1975; B-1, 1972; B-2, 1994; Talkeetna Mtns D-1, 1964; D-2, 1963; Quadrangles, Alaska

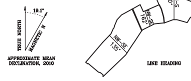
SCALE 1:63,360

1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS

CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL





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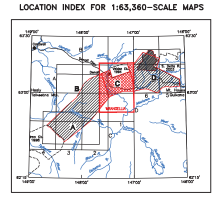
PARTS OF THE TALKEETNA MTNS, HEALY, AND MT HAYES QUADRANGLES

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

LOCATION INDEX FOR 1:63,360-SCALE MAPS



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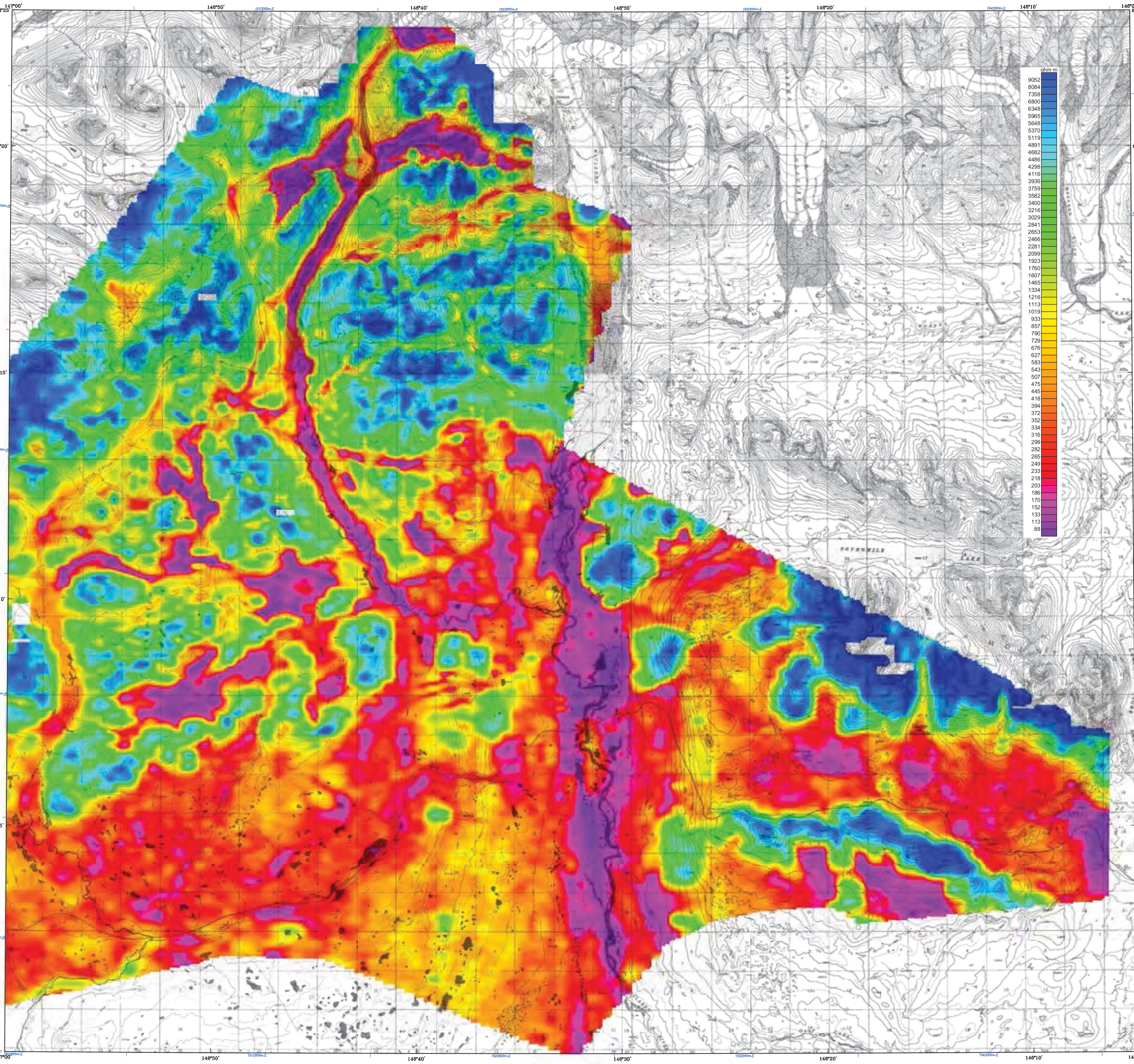

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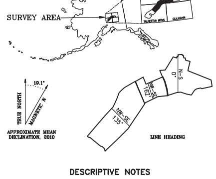
SCALE 1:63,360

1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS

CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL



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by
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2014

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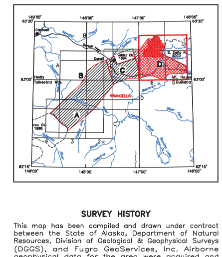

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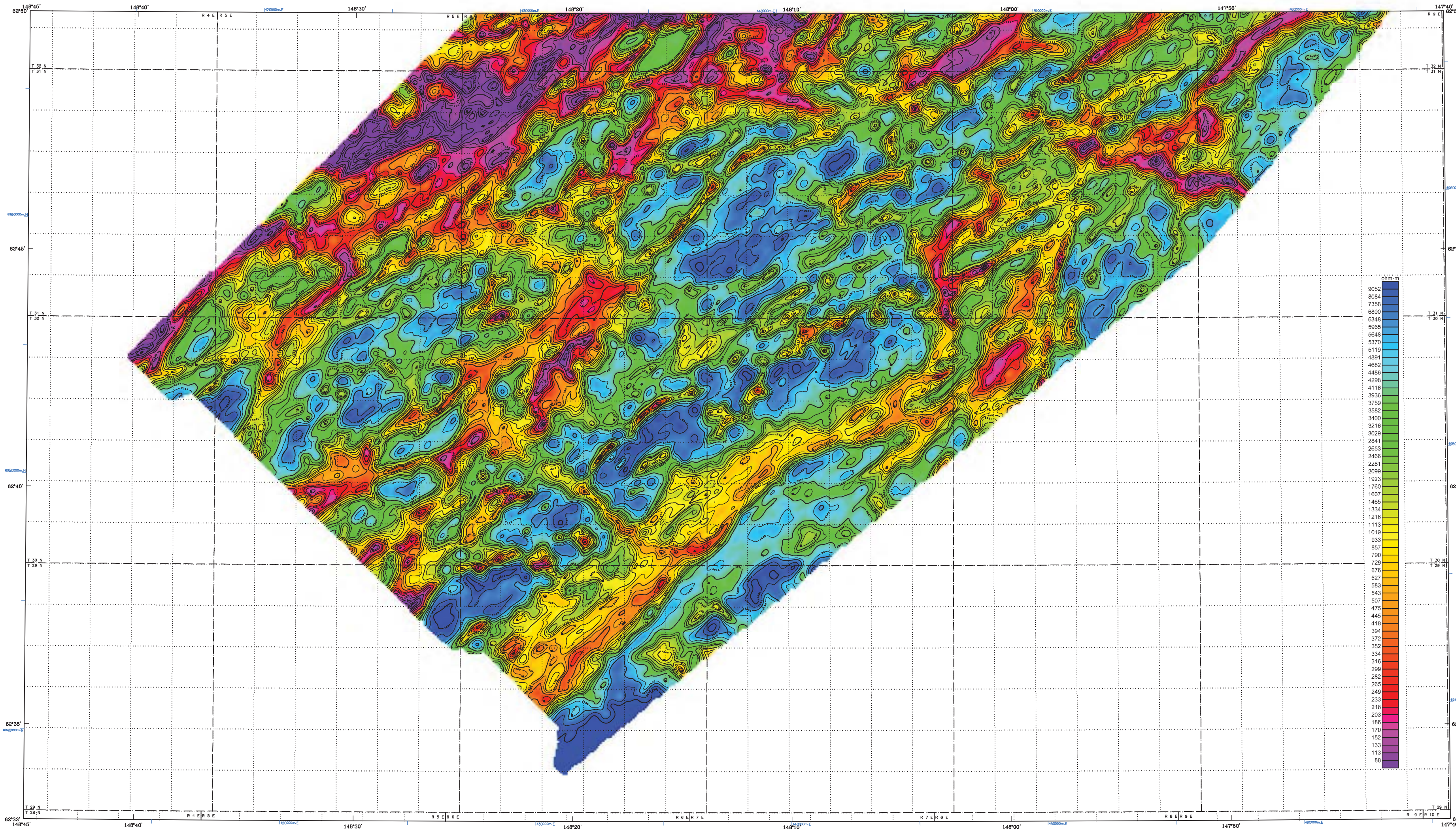
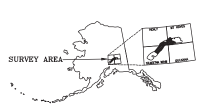


Section outlines from U.S. Geological Survey Talkeetna Mtns C-2, 1963; C-3, 1977; C-4, 1965; D-2, 1963; D-3, 1965; D-4, 1965; Quadrangles, Alaska

SCALE 1:63,360

1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS

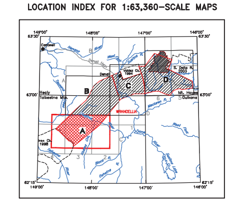


7200 Hz COPLANAR APPARENT RESISTIVITY WITH DATA CONTOURS, WRANGELLIA SURVEY AREA, SOUTH-CENTRAL ALASKA

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

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

LOCATION INDEX FOR 1:63,360-SCALE MAPS



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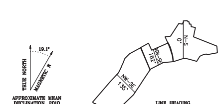

RESISTIVITY CONTOURS

1000
800
600
500
400
300
250
200
150
125
100

Contours in ohm–m at 10 intervals per decade

. . . . resistivity low

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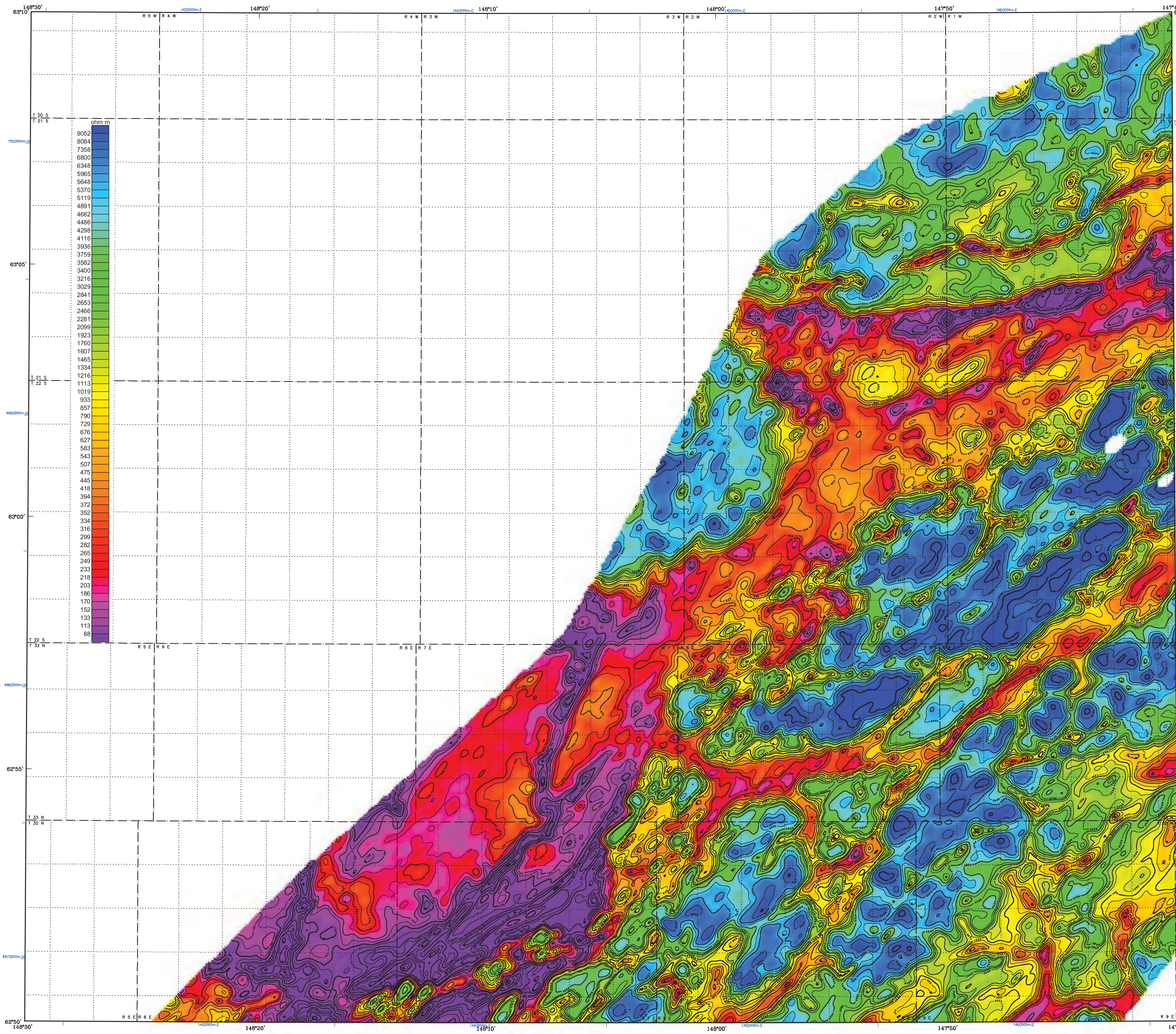
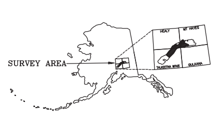


Section outlines from U.S. Geological Survey Healy A-2, 1975; A-3, 1963; Talkeetna Mtns D-2, 1963; D-3, 1965; Quadrangles, Alaska

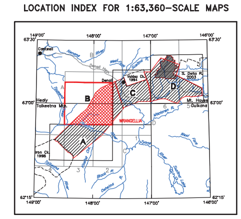
SCALE 1:63,360

1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS



LOCATION INDEX FOR 1:63,360-SCALE MAPS



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
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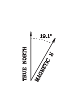
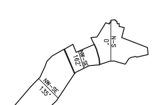


APPROXIMATE MEAN DECLINATION, 2010



LINE HEADING

RESISTIVITY CONTOURS

1000
800
600
500
400
300
250
200
150
125
100

Contours in ohm-m at 10 intervals per decade

. . . . resistivity low

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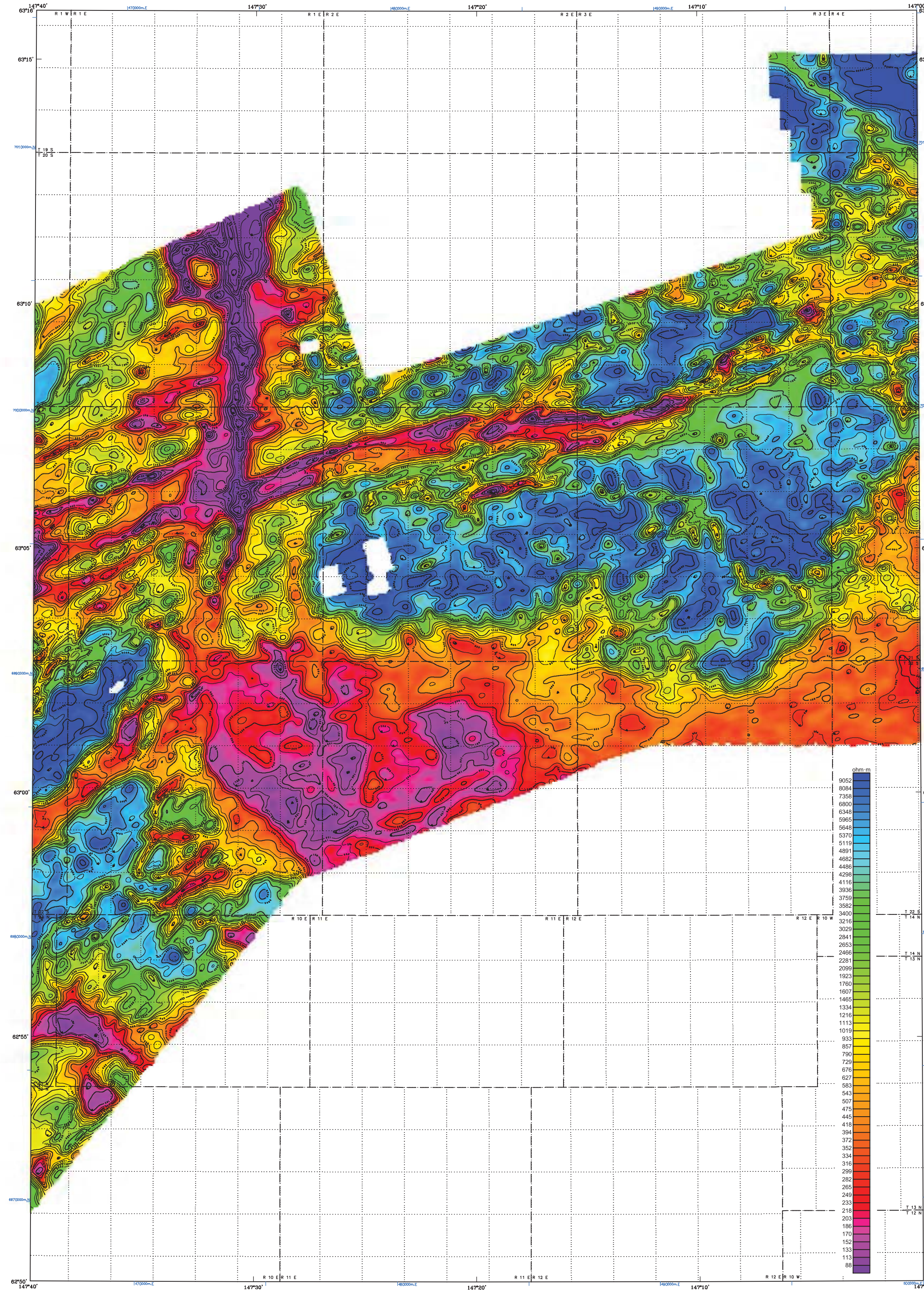

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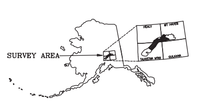
SCALE 1:63,360

1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS



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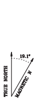

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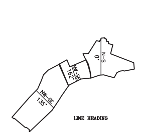


LINE HEADING

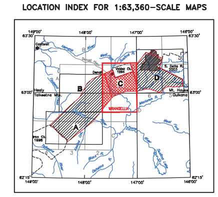
RESISTIVITY CONTOURS

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



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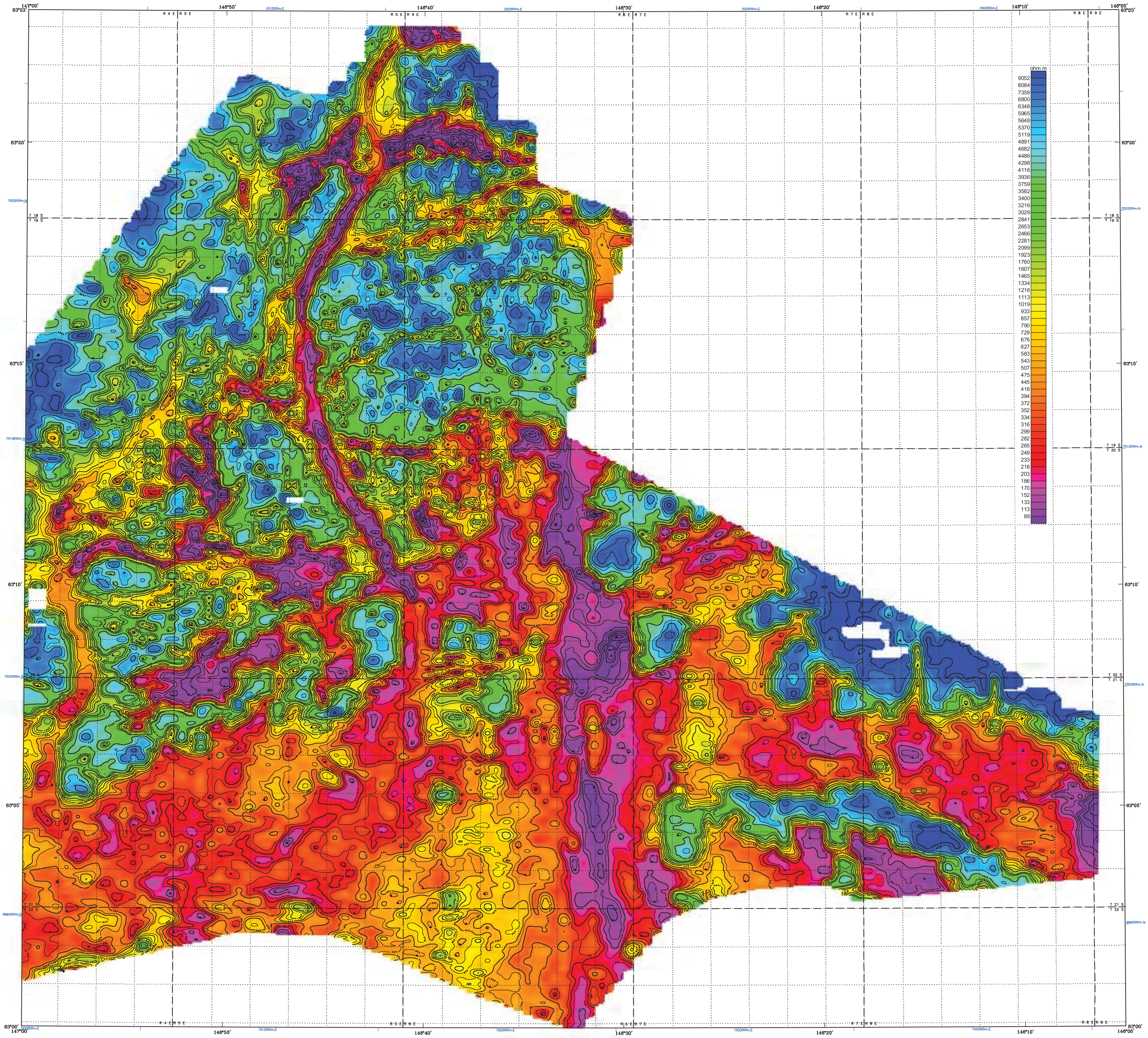
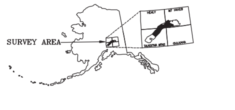


Section outlines from U.S. Geological Survey Mt Hayes A-5, 1949; A-6, 1950; B-5, 1956; B-6, 1956; Quadrangles, Alaska

SCALE 1:63,360

1 0 1 2 3 4 MILES

1 0 1 2 3 4 5 KILOMETERS



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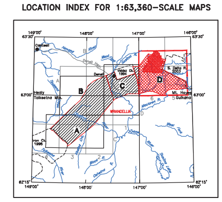

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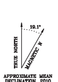

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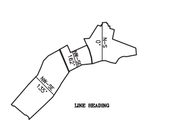

LINE HEADING

RESISTIVITY CONTOURS

1000
800
600
500
400
300
250
200
150
125
100

Contours in ohm-m at 10 intervals per decade

. . . . resistivity low

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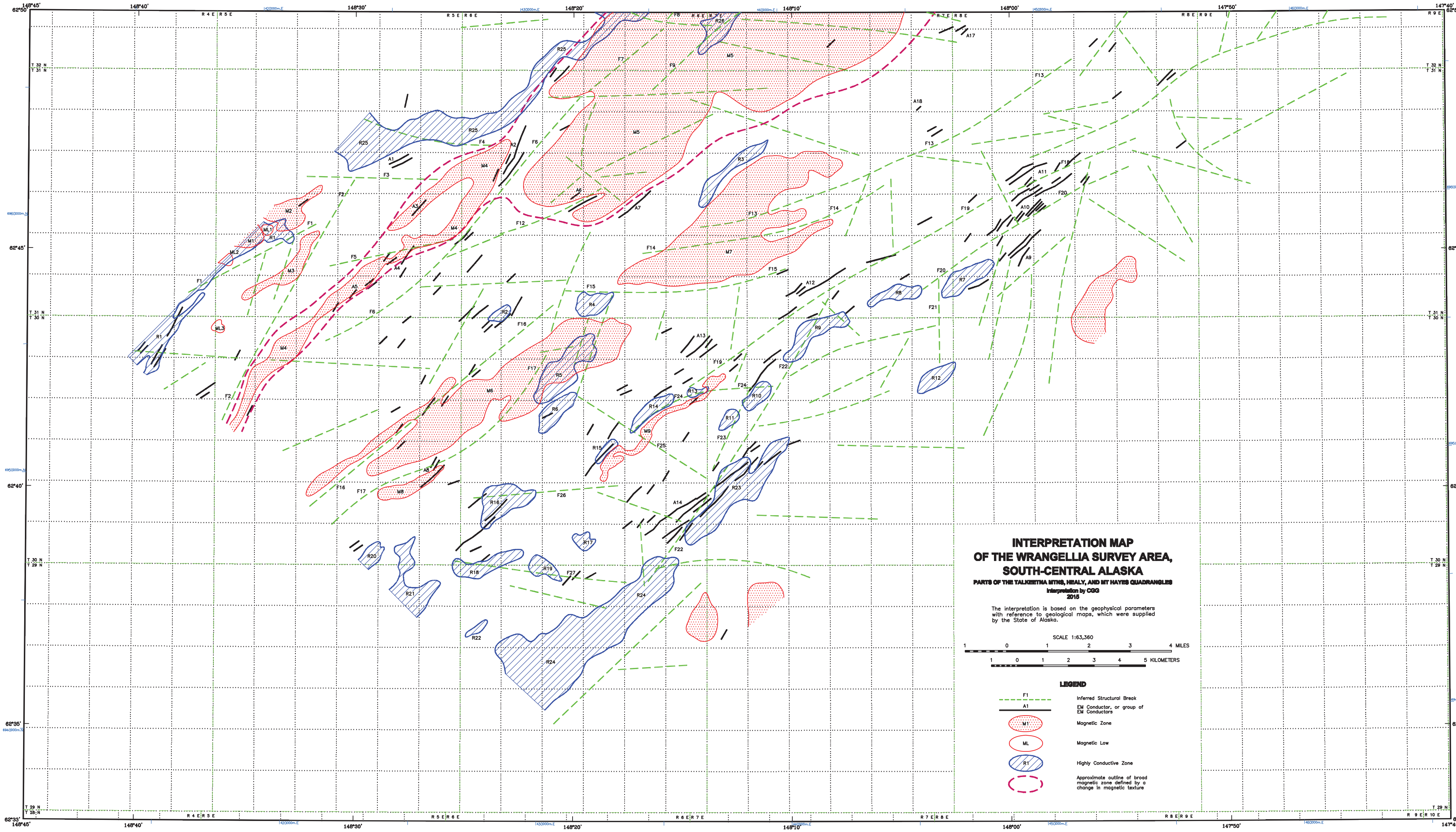
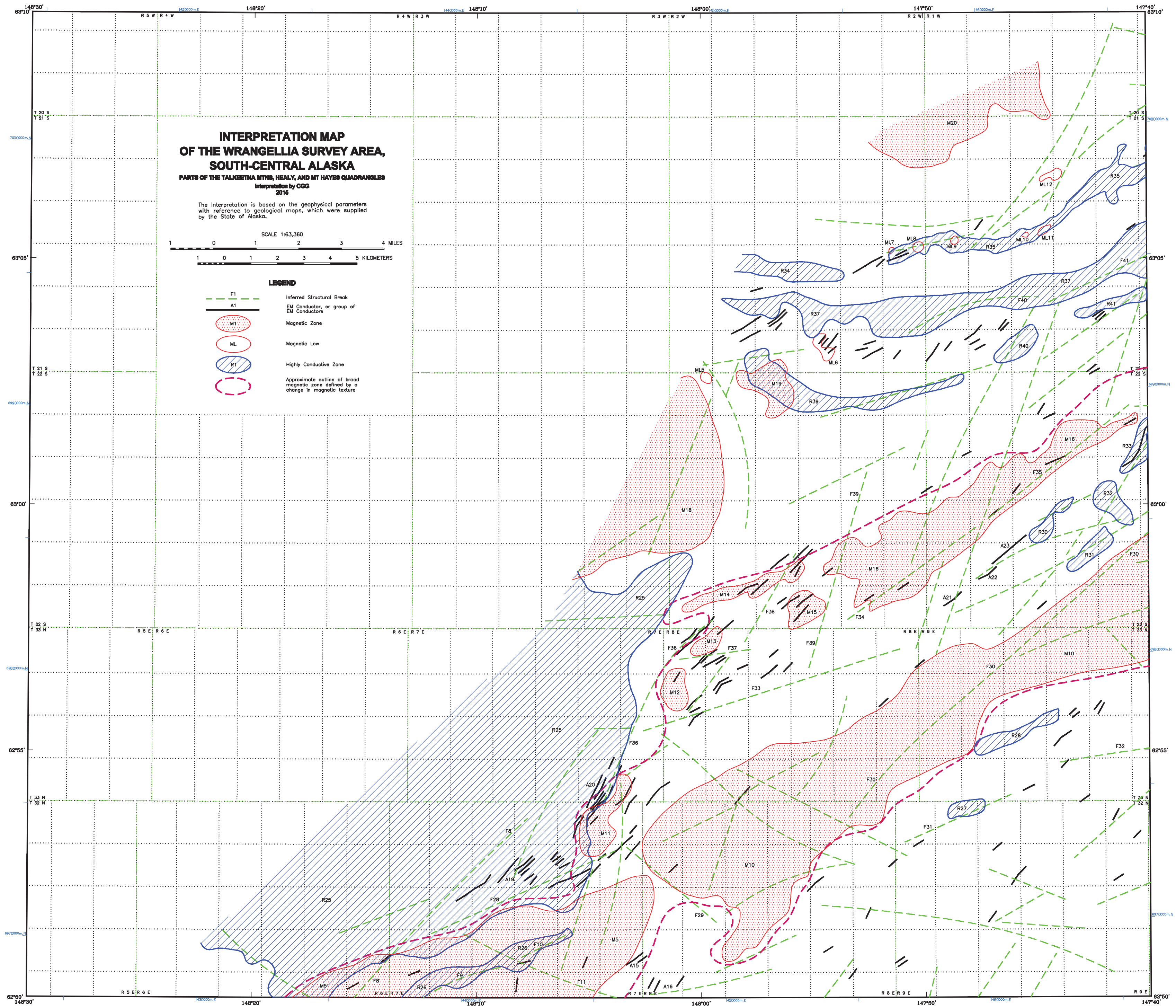

INTERPRETATION MAP
OF THE WRANGELLIA SURVEY AREA,
SOUTH-CENTRAL ALASKA
PARTS OF THE TALKEETNA MTNS, HEALY, AND MT HAYES QUADRANGLES
interpretation by CGG
2015
The interpretation is based on the geophysical parameters with reference to geological maps, which were supplied by the State of Alaska.
SCALE 1:63,360
1 0 1 2 3 4 MILES
1 0 1 2 3 4 5 KILOMETERS
LEGEND
F1
Inferred Structural Break
A1
EM Conductor, or group of EM Conductors
M1
Magnetic Zone
ML
Magnetic Low
R1
Highly Conductive Zone
Approximate outline of broad magnetic zone defined by a change in magnetic texture
148°45'
148°40'
148°30'
148°20'
148°10'
148°00'
147°50'
147°40'
62°50'
62°45'
62°40'
62°35'
62°33'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LEGEND
F1 Inferred Structural Break
A1 EM Conductor, or group of EM Conductors
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ML Magnetic Low
R1 Highly Conductive Zone
Approximate outline of broad magnetic zone defined by a change in magnetic texture
148°30'
148°20'
148°10'
148°00'
147°50'
147°40'
63°10'
63°05'
63°00'
62°55'
62°50'
M20
R35
R34
R37
R41
R40
R39
R25
M18
M16
M14
M15
M13
M12
M10
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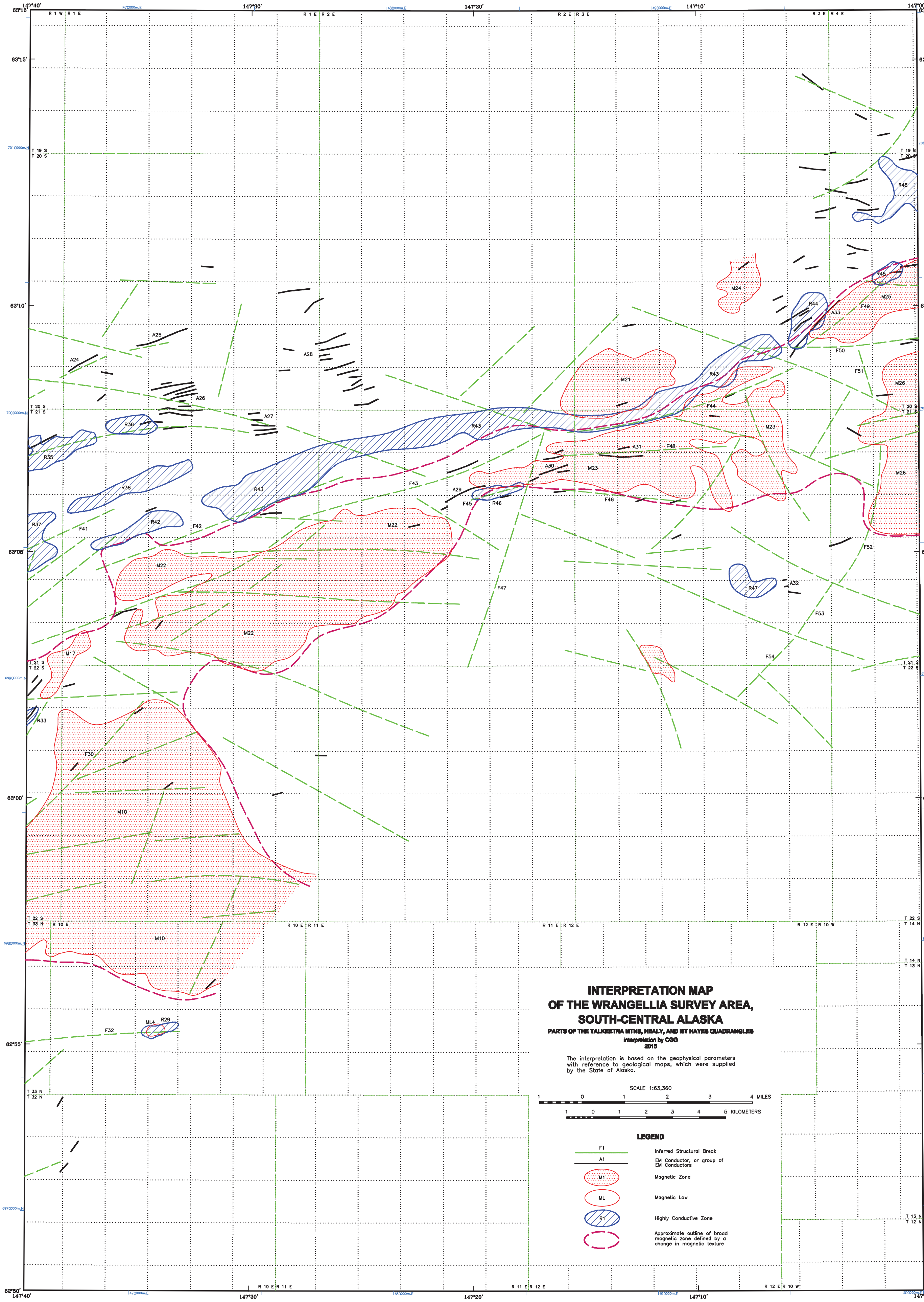
R30
R31
R32
R33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M1
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Approximate outline of broad magnetic zone defined by a change in magnetic texture
147°40'
147°30'
147°20'
147°10'
147°00'
63°18'
63°15'
63°10'
63°05'
63°00'
62°55'
62°50'
R 1 W R 1 E
R 1 E R 2 E
R 2 E R 3 E
R 3 E R 4 E
R 10 E R 11 E
R 11 E R 12 E
R 12 E R 10 W
T 19 S
T 20 S
T 21 S
T 22 S
T 33 N
T 32 N
T 14 N
T 13 N
T 12 N
1470000m.E
1480000m.E
1490000m.E
500000m.E
7010000m.N
7000000m.N
6990000m.N
6980000m.N
6970000m.N
M10
M17
M21
M22
M23
M24
M25
M26
ML4
R29
R33
R35
R36
R37
R38
R42
R43
R44
R45
R46
R47
R48
A24
A25
A26
A27
A28
A29
A30
A31
A32
A33
F30
F32
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F50
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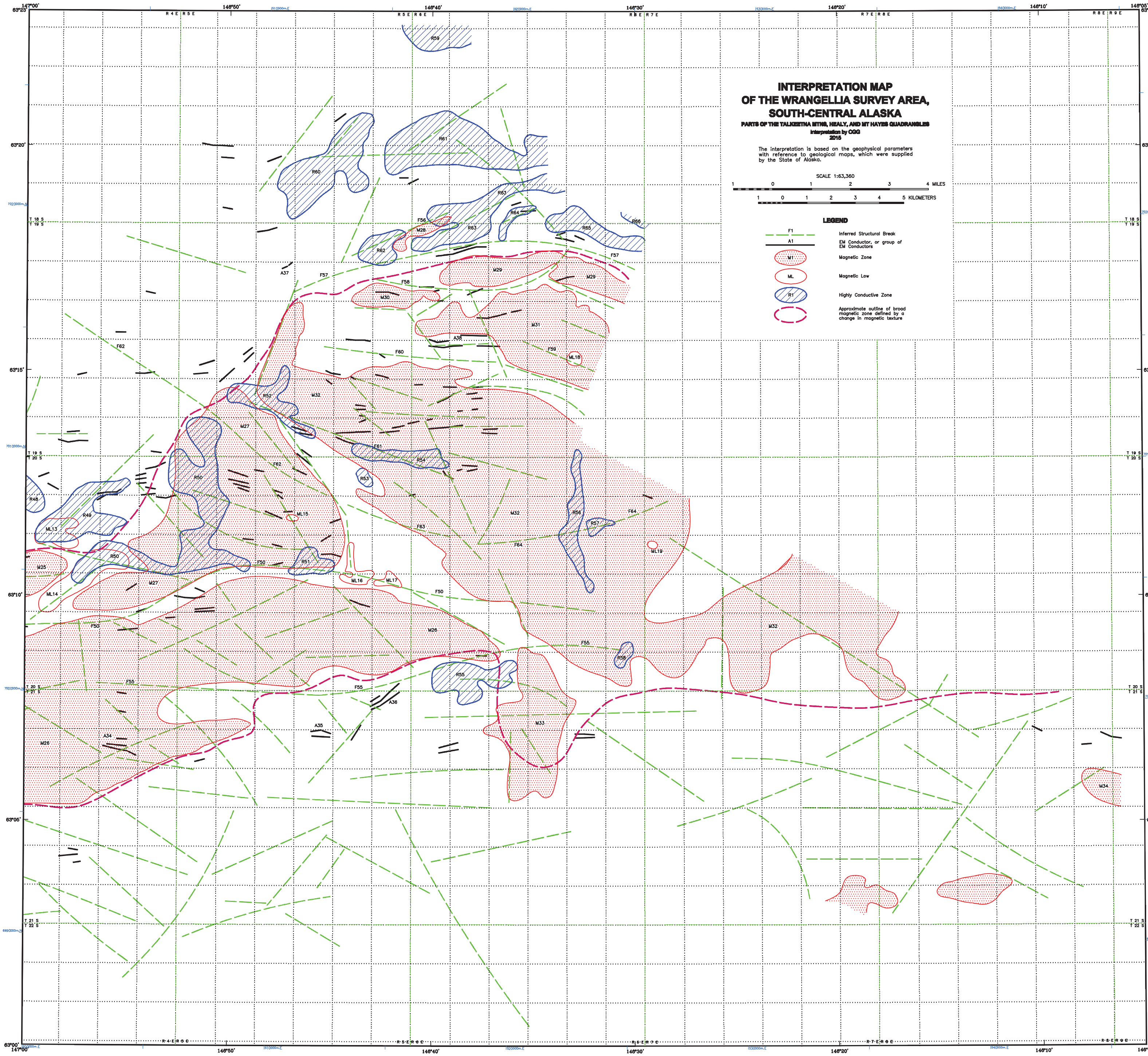
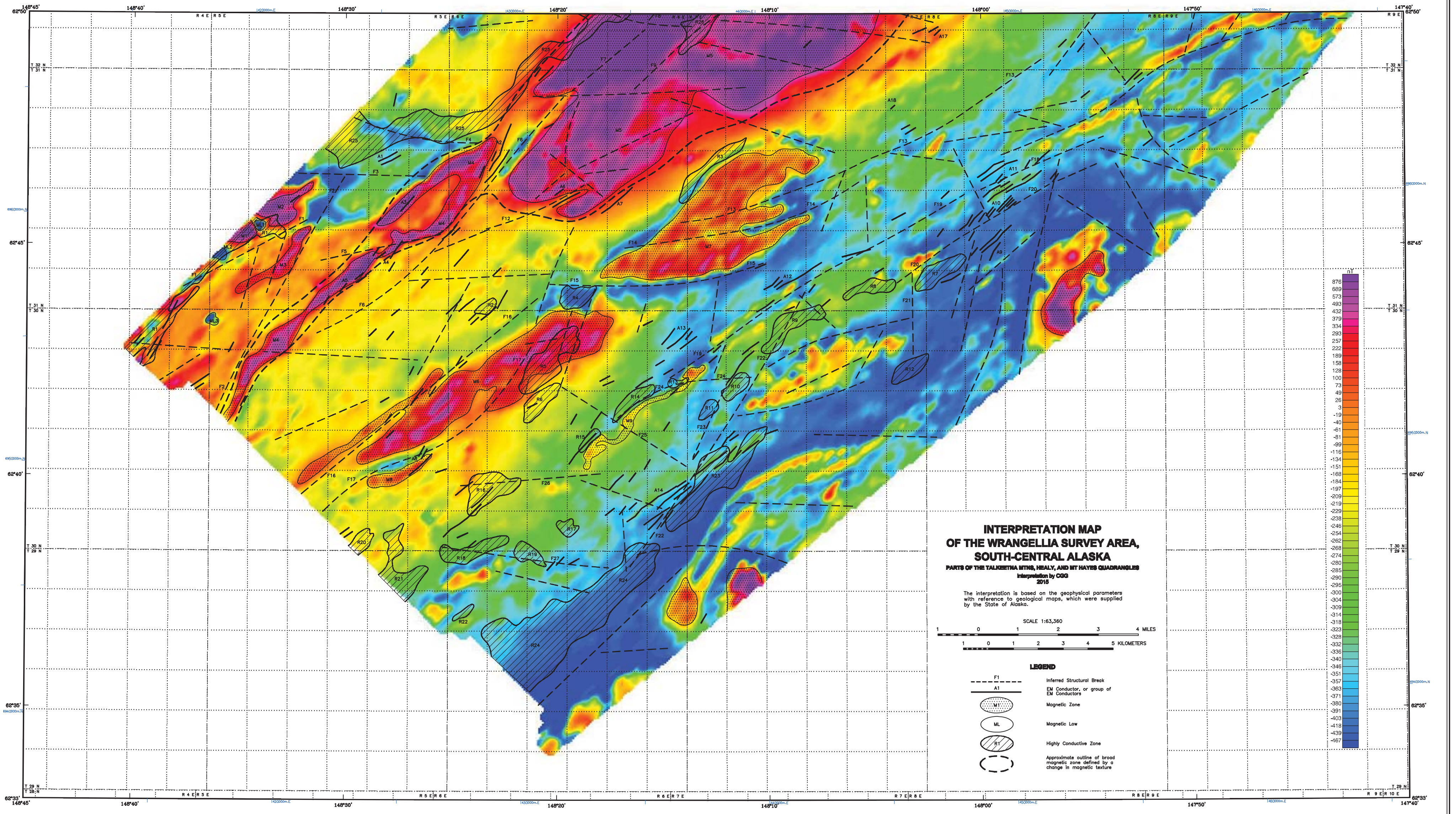
F52
F53
F54


INTERPRETATION MAP
OF THE WRANGELLIA SURVEY AREA,
SOUTH-CENTRAL ALASKA
PARTS OF THE TALKEETNA MTNS, HEALY, AND MT HAYES QUADRANGLES
interpretation by CGG
2015
The interpretation is based on the geophysical parameters with reference to geological maps, which were supplied by the State of Alaska.
SCALE 1:63,360
MILES
KILOMETERS
LEGEND
F1 Inferred Structural Break
A1 EM Conductor, or group of EM Conductors
M1 Magnetic Zone
ML Magnetic Low
R1 Highly Conductive Zone
Approximate outline of broad magnetic zone defined by a change in magnetic texture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KILOMETERS
LEGEND
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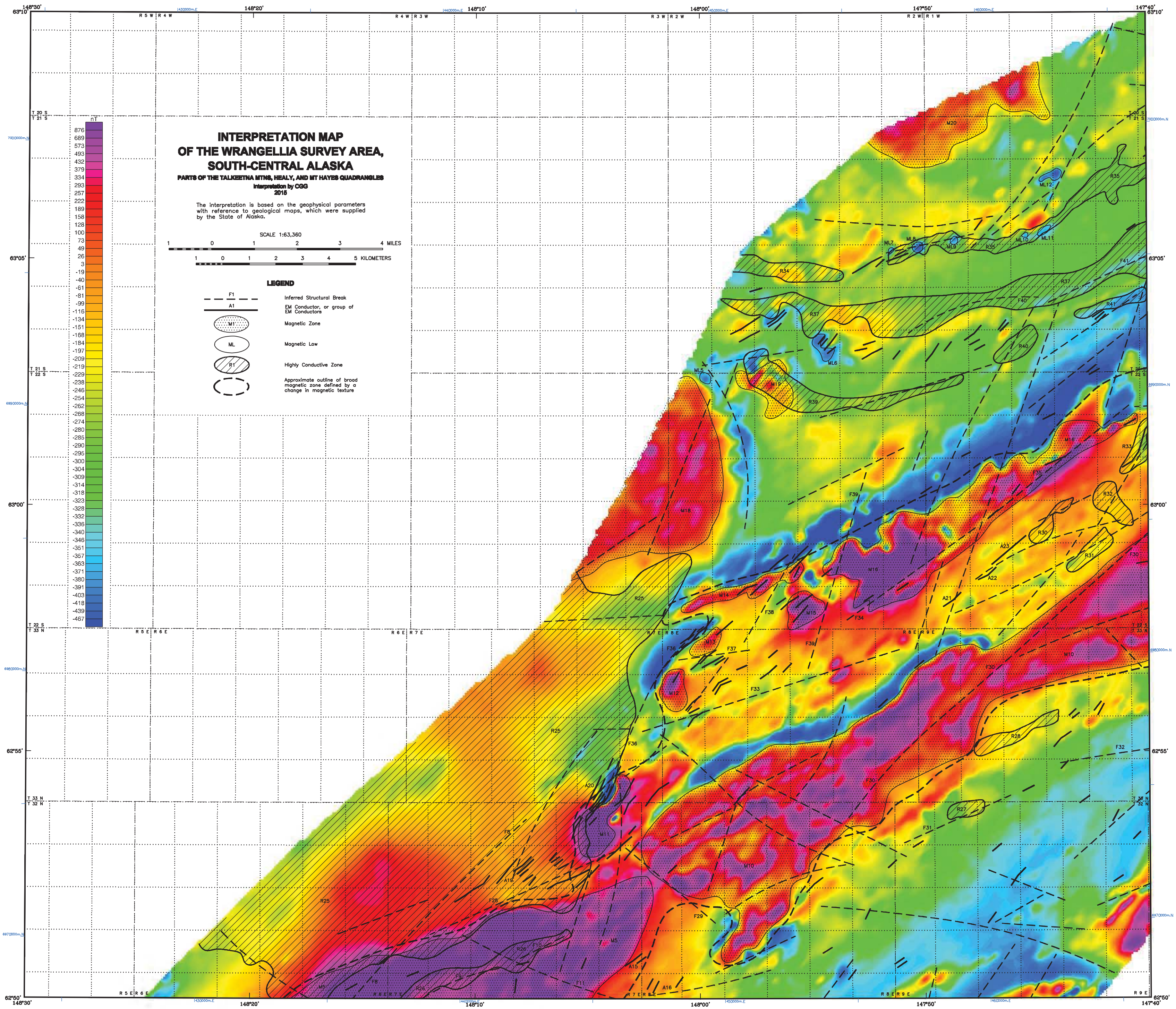
EM Conductor, or group of EM Conductors
Magnetic Zone
Magnetic Low
Highly Conductive Zone
Approximate outline of broad magnetic zone defined by a change in magnetic texture
148°45'
148°40'
148°30'
148°20'
148°10'
148°00'
147°50'
147°40'
62°50'
62°45'
62°40'
62°35'
62°33'
T 32 N
T 31 N
T 30 N
T 29 N
T 28 N
R 4 E
R 5 E
R 6 E
R 7 E
R 8 E
R 9 E
R 10 E
nT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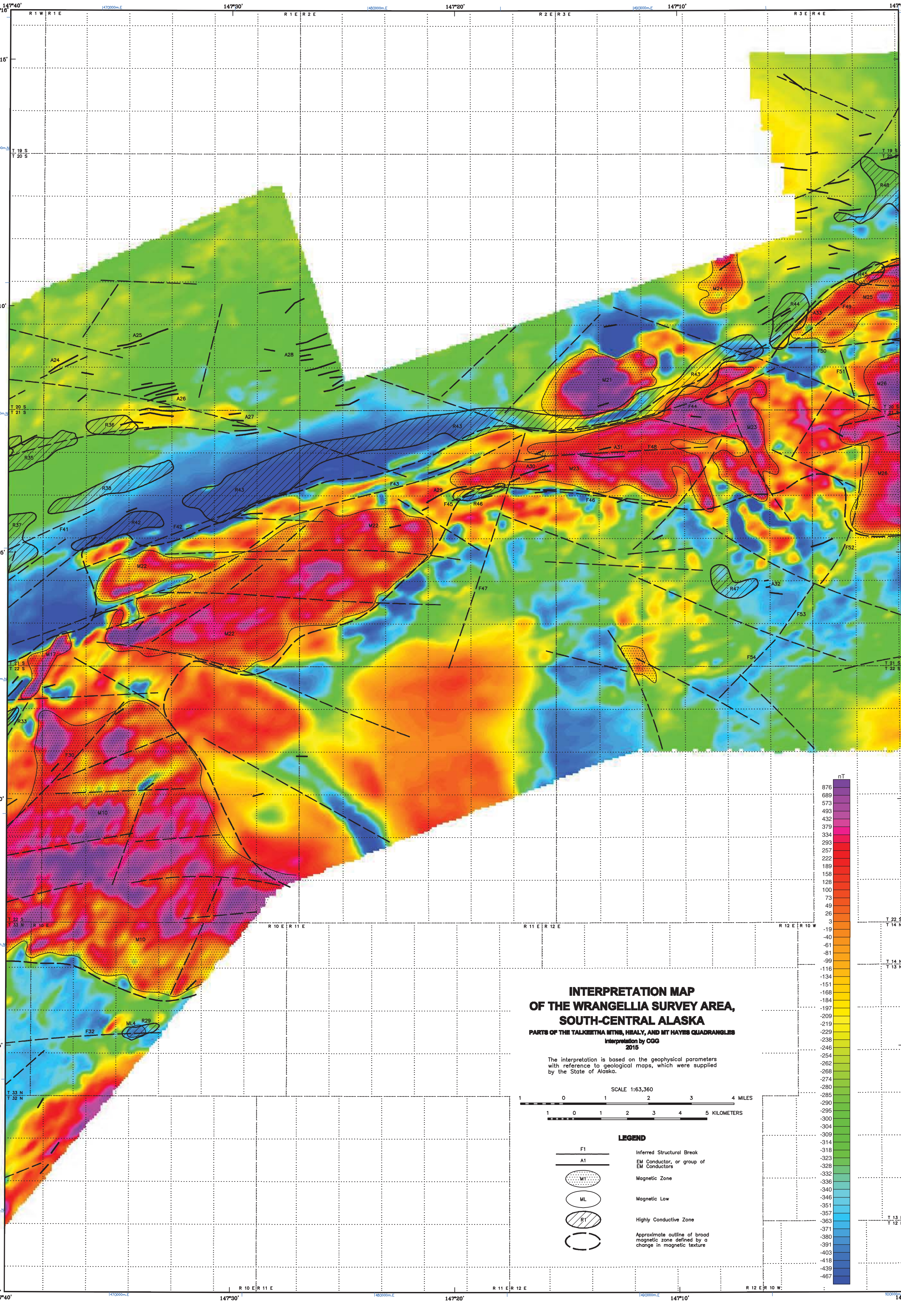
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SCALE 1:63,360
1 0 1 2 3 4 MILES
1 0 1 2 3 4 5 KILOMETERS
LEGEND
F1 Inferred Structural Break
A1 EM Conductor, or group of EM Conductors
M1 Magnetic Zone
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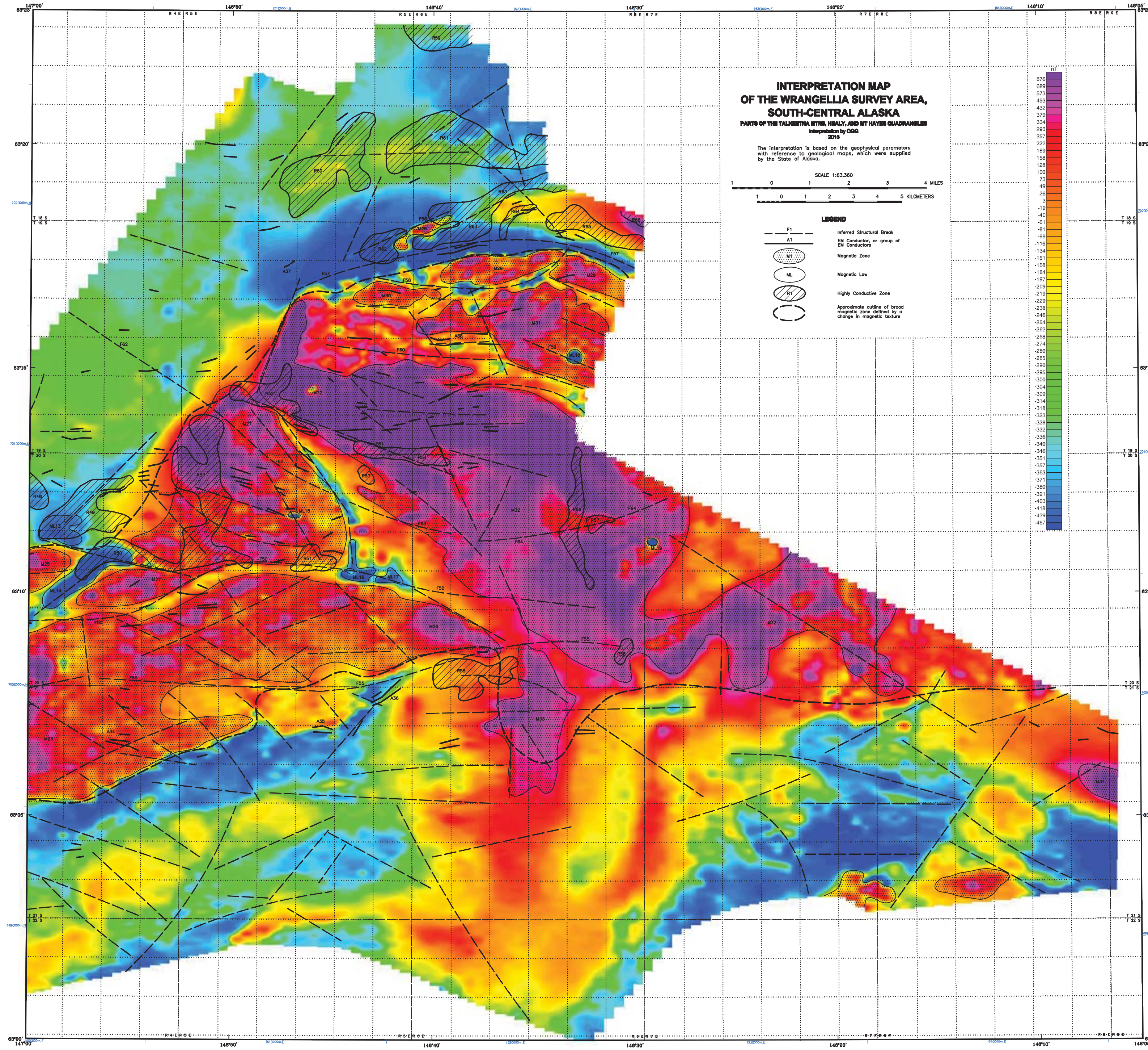
R1 Highly Conductive Zone
Approximate outline of broad magnetic zone defined by a change in magnetic texture
nT
876
689
573
493
432
379
334
293
257
222
189
158
128
100
73
49
26
3
-19
-40
-61
-81
-99
-116
-134
-151
-168
-184
-197
-209
-219
-229
-238
-246
-254
-262
-268
-274
-280
-285
-290
-295
-300
-304
-309
-314
-318
-323
-328
-332
-336
-340
-346
-351
-357
-363
-371
-380
-391
-403
-418
-439
-467
147°40'
147°30'
147°20'
147°10'
147°00'
63°18'
63°15'
63°10'
63°05'
63°00'
62°55'
62°50'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-314
-318
-323
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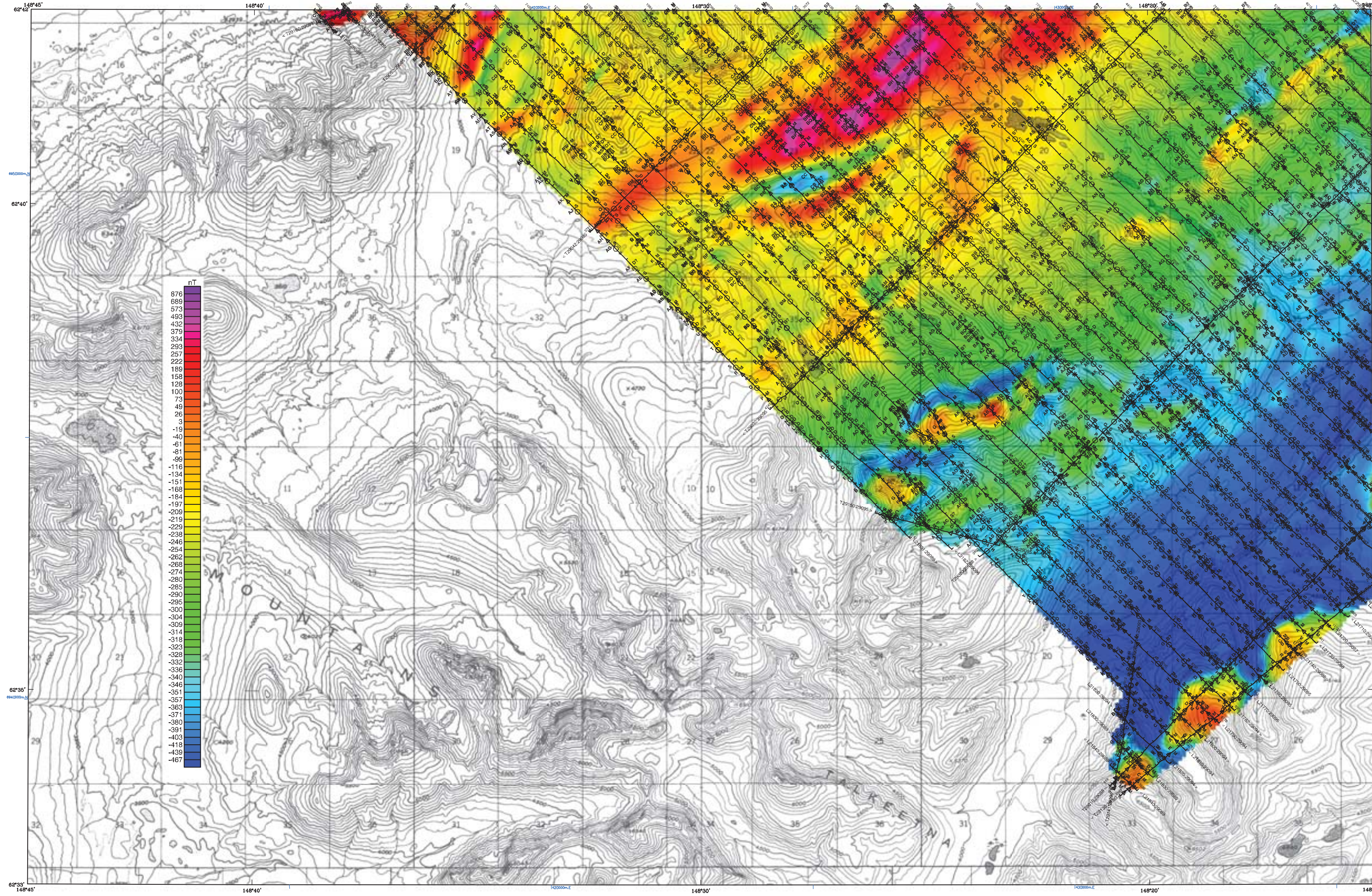
-403
-418
-439
-467



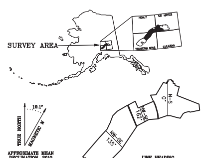
Section outlines from U.S. Geological Survey Talkeetna Mtns. C-3, 1977; C-4, 1965; Quadrangles, Alaska

SCALE 1:31,680

0.5 0 0.5 1 1.5 2 MILES

0.5 0 0.5 1 1.5 2 2.5 KILOMETERS

CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL



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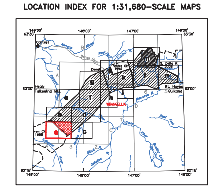
PARTS of TALKEETNA MTNS. C-3 and C-4 QUADRANGLES

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



ELECTROMAGNETIC ANOMALIES

Arcs indicate the conductor has a thickness >10m

Dip direction

Magnetic correlation in nT

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

Anomaly identifier

Interpretive symbol

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

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The geophysical data were acquired with a DIGHEM^{V} Electromagnetic (EM) system and a Fugro D1344 cesium magnetometer with a Scintrex CS3 cesium sensor. The EM and magnetic sensors were flown at a height of 100 feet. In addition the survey recorded data from 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. Tie lines were flown perpendicular to the flight lines at intervals of approximately 3 miles.

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ELECTROMAGNETICS

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

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

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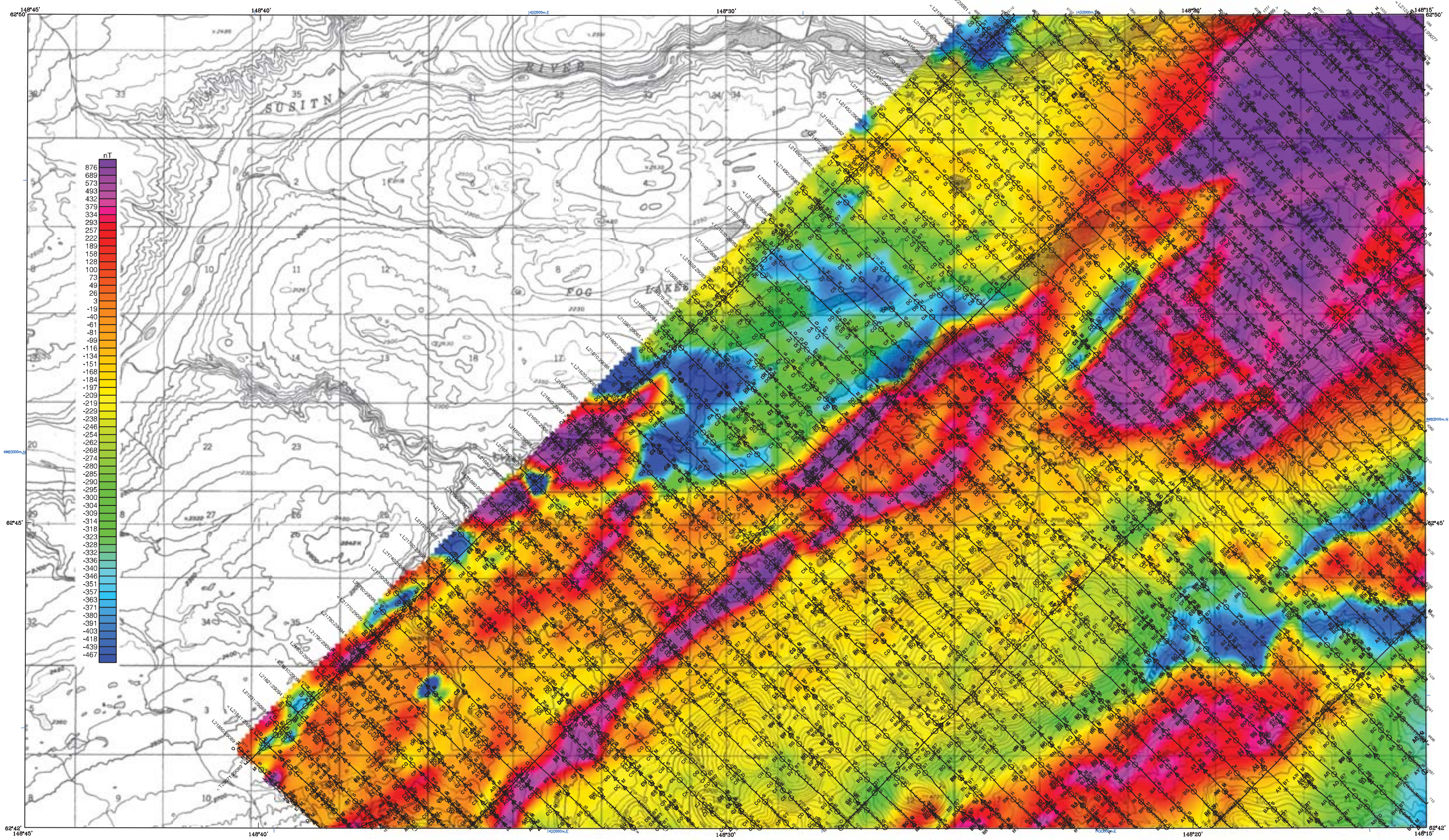


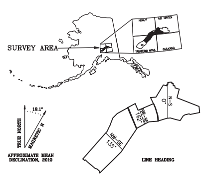
Section outlines from U.S. Geological Survey Talkeetna Mtns. C-3, 1977; C-4, 1960; D-3, 1960; D-4, 1960, Quadrangles, Alaska

SCALE 1:31,680

0.5 0 0.5 1 1.5 2 MILES

0.5 0 0.5 1 1.5 2 2.5 KILOMETERS

CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL

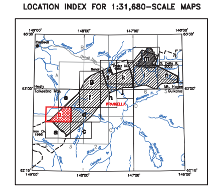


RESIDUAL MAGNETIC FIELD AND DETAILED ELECTROMAGNETIC ANOMALIES WITH TOPOGRAPHY OF THE WRANGELLIA SURVEY AREA, SOUTH-CENTRAL ALASKA

PARTS of TALKEETNA MTNS. C-3, C-4, D-3, and D-4 QUADRANGLES

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

LOCATION INDEX FOR 1:31,680-SCALE MAPS



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ELECTROMAGNETIC ANOMALIES

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

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

Anomaly identifier (C) — Interpretive symbol (H)

Interpretive symbol	Conductor model
B	Bedrock conductor
D	Narrow bedrock conductor ("thin dike")
S	Conductive cover ("horizontal thin sheet")
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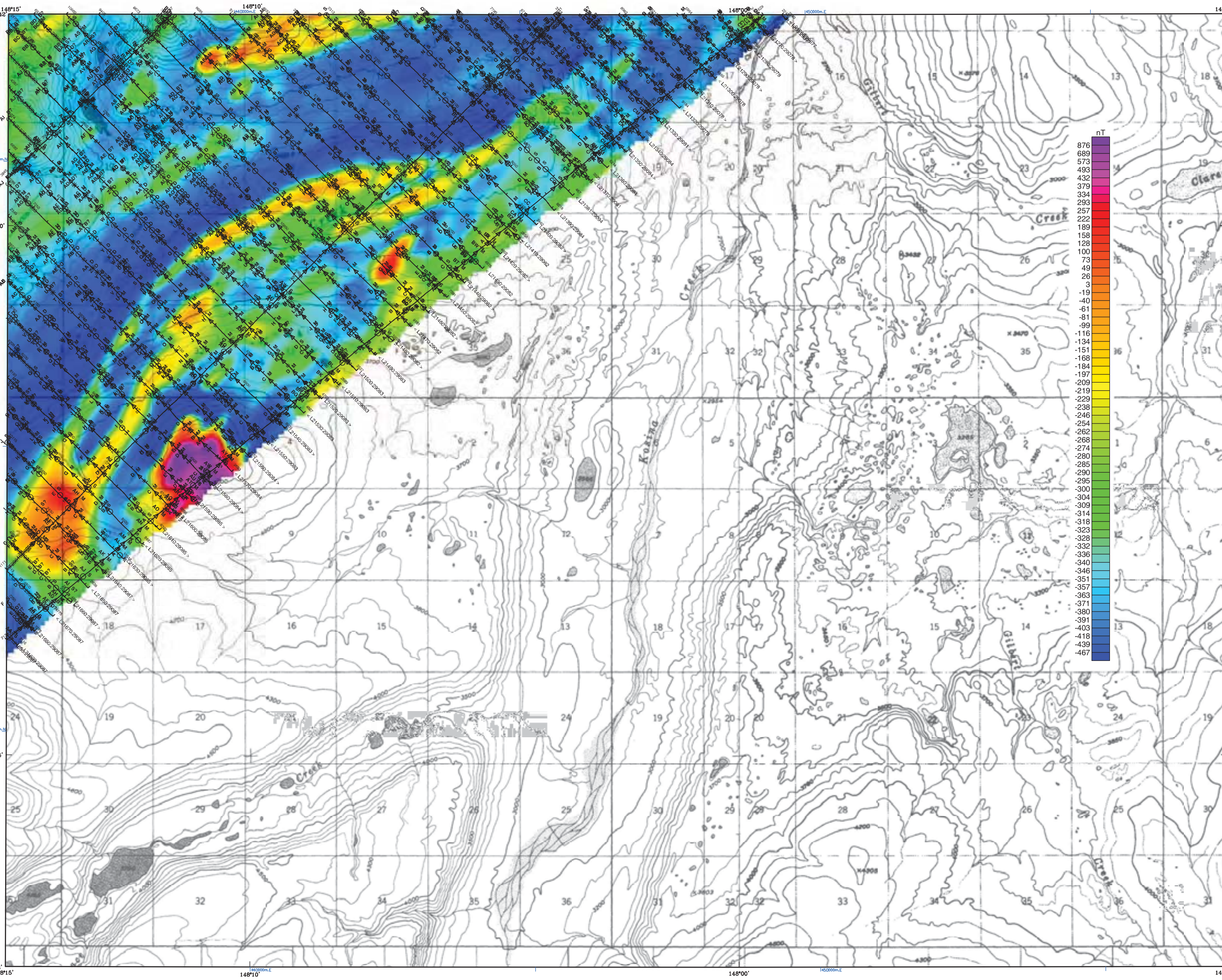


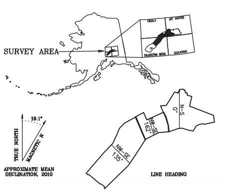
Section outlines from U.S. Geological Survey Talkeetna Mtns. C-2, 1983; C-3, 1977; Quadrangles, Alaska

SCALE 1:31,680

0.5 0 0.5 1 1.5 2 MILES

0.5 0 0.5 1 1.5 2 2.5 KILOMETERS

CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL



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PARTS of TALKEETNA MTNS. C-2 and C-3 QUADRANGLES

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

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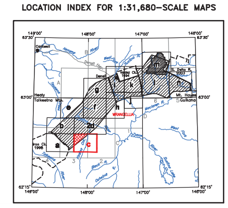

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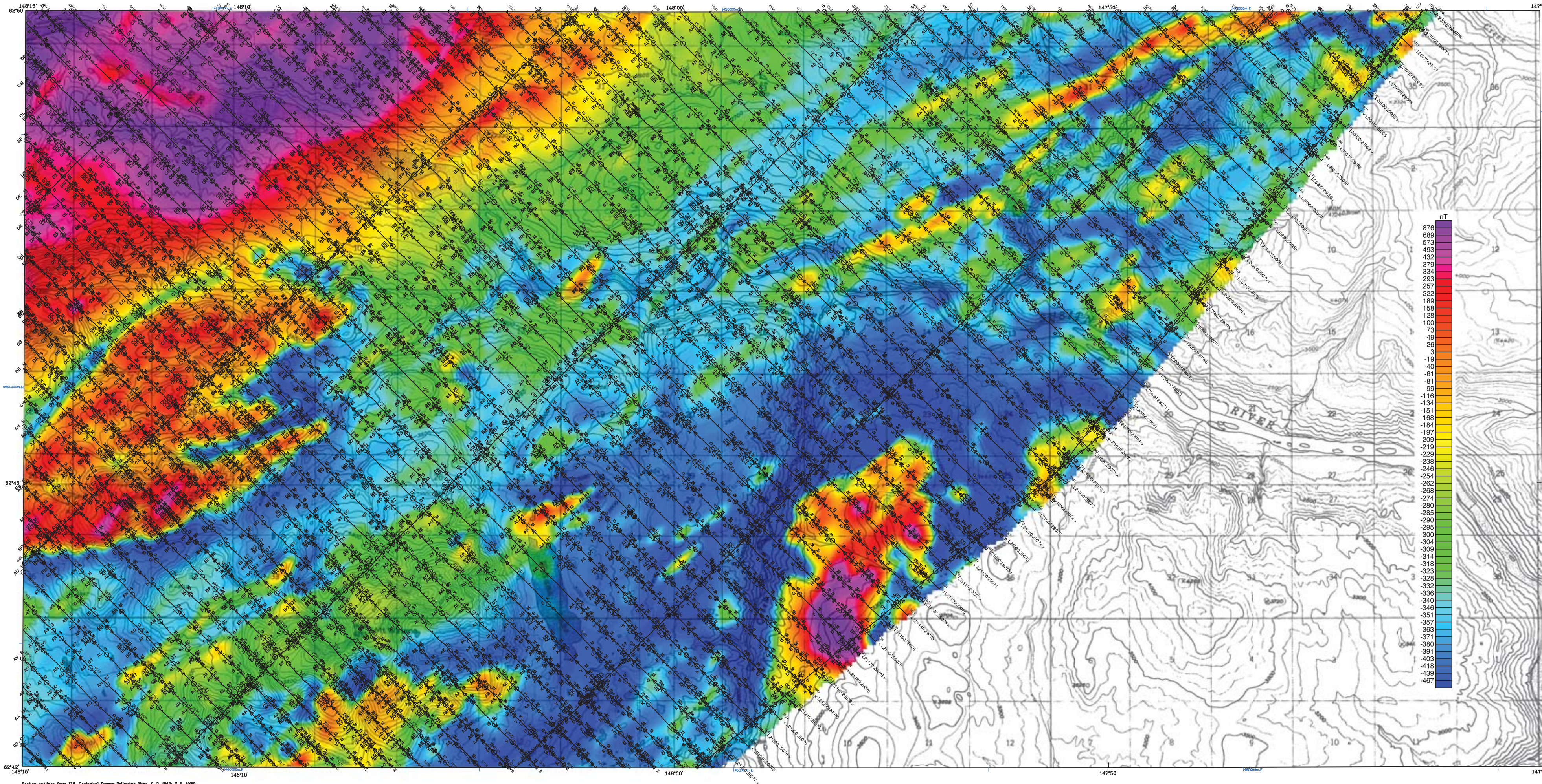


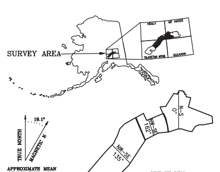
Section outlines from U.S. Geological Survey Talkeetna Mtns. C–2, 1963; C–3, 1977; D–2, 1963; D–3, 1965; Quadrangles, Alaska

SCALE 1:31,680

0.5 0 0.5 1 1.5 2 MILES

0.5 0 0.5 1 1.5 2 2.5 KILOMETERS

CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL



APPROXIMATE MEAN DECLINATION, 2010

LINE HEADING

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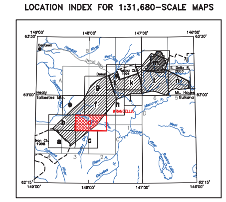
2015

LOCATION INDEX FOR 1:31,680-SCALE MAPS



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. Tie lines were flown perpendicular to the flight lines at intervals of approximately 3 miles.

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ELECTROMAGNETIC ANOMALIES

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

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

Anomaly identifier
Interpretive symbol

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

ELECTROMAGNETICS

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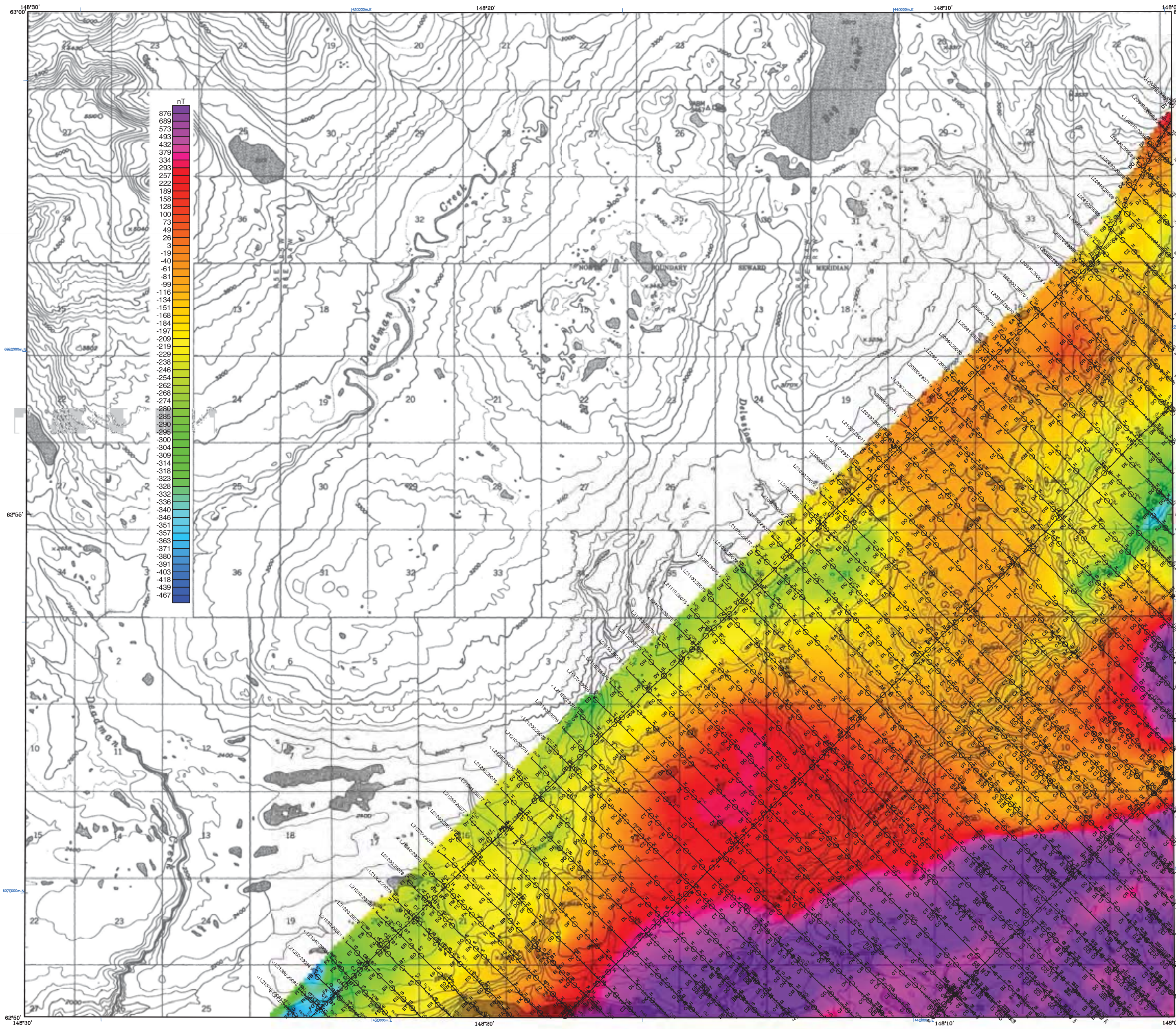


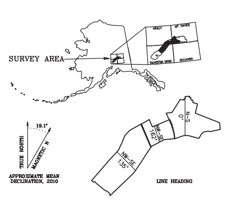
Section outlines from U.S. Geological Survey Talkeetna Mtns. D-3, 1950; Quadrangle, Alaska

SCALE 1:31,680

0.5 0 0.5 1 1.5 2 MILES

0.5 0 0.5 1 1.5 2 2.5 KILOMETERS

CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL



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

PART of TALKEETNA MTNS. D-3 QUADRANGLE

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

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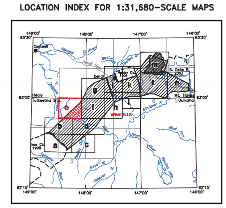

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Arcs indicate the conductor has a thickness >10m
Dip direction
Magnetic correlation in nT

Anomaly	Conductance
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◒	20–50 siemens
⊕	10–20 siemens
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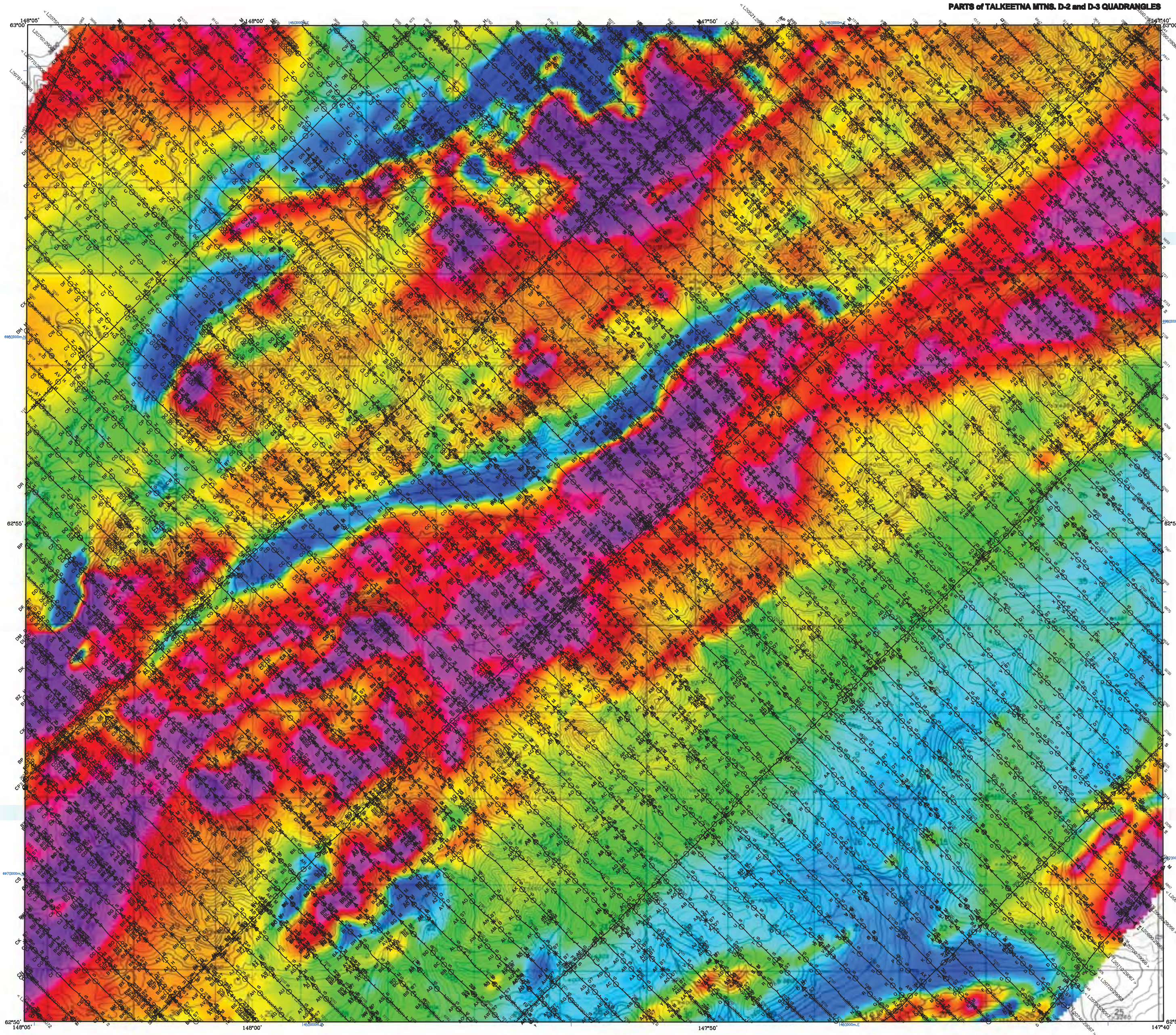
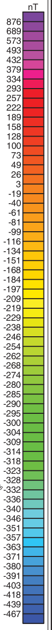




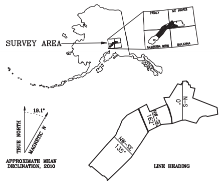
Section outlines from U.S. Geological Survey Talkeetna Mtns. D-2, 1963; D-3, 1965; Quadrangles, Alaska

SCALE 1:31,680

0.5 0 0.5 1 1.5 2 MILES

0.5 0 0.5 1 1.5 2 2.5 KILOMETERS

CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL

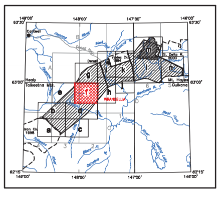


RESIDUAL MAGNETIC FIELD AND DETAILED ELECTROMAGNETIC ANOMALIES WITH TOPOGRAPHY OF THE WRANGELLIA SURVEY AREA, SOUTH-CENTRAL ALASKA

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

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

LOCATION INDEX FOR 1:31,680-SCALE MAPS



ELECTROMAGNETIC ANOMALIES

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

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

Anomaly identifier; C H; Interpretive symbol

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B	Bedrock conductor
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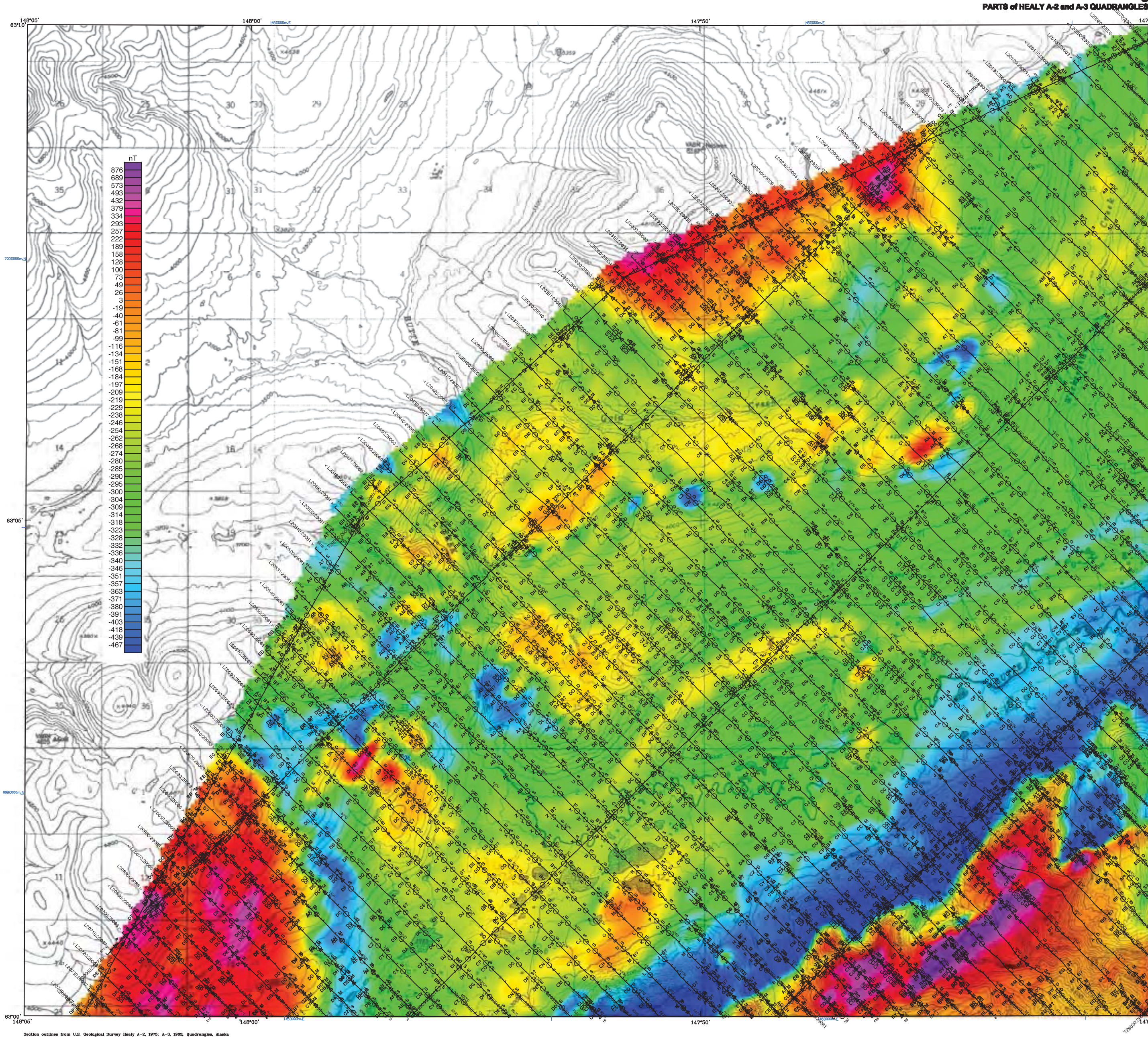


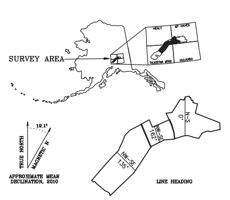
Section outlines from U.S. Geological Survey Healy A-2, 1975; A-3, 1963; Quadrangles, Alaska

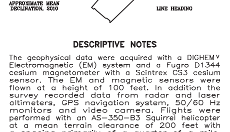
SCALE 1:31,680

0.5 0 0.5 1 1.5 2 MILES

0.5 0 0.5 1 1.5 2 2.5 KILOMETERS

CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL





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PARTS of HEALY A-2 and A-3 QUADRANGLES

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

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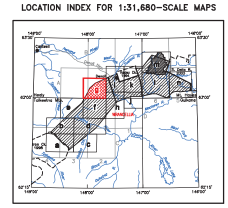

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Dip direction

Magnetic correlation in nT

Anomaly identifier

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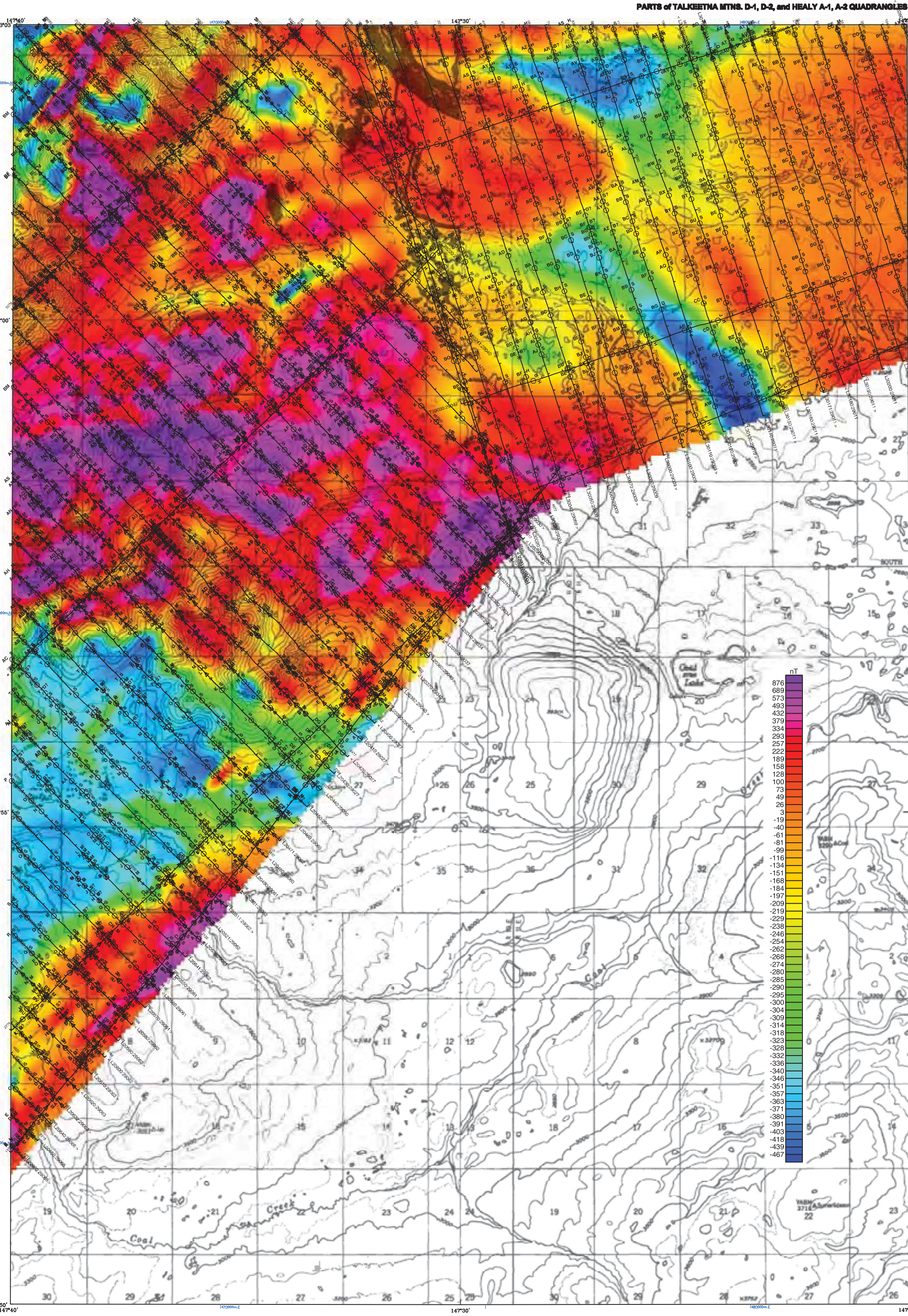

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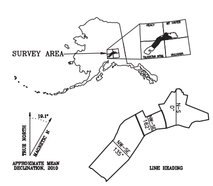

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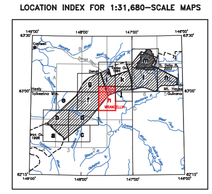

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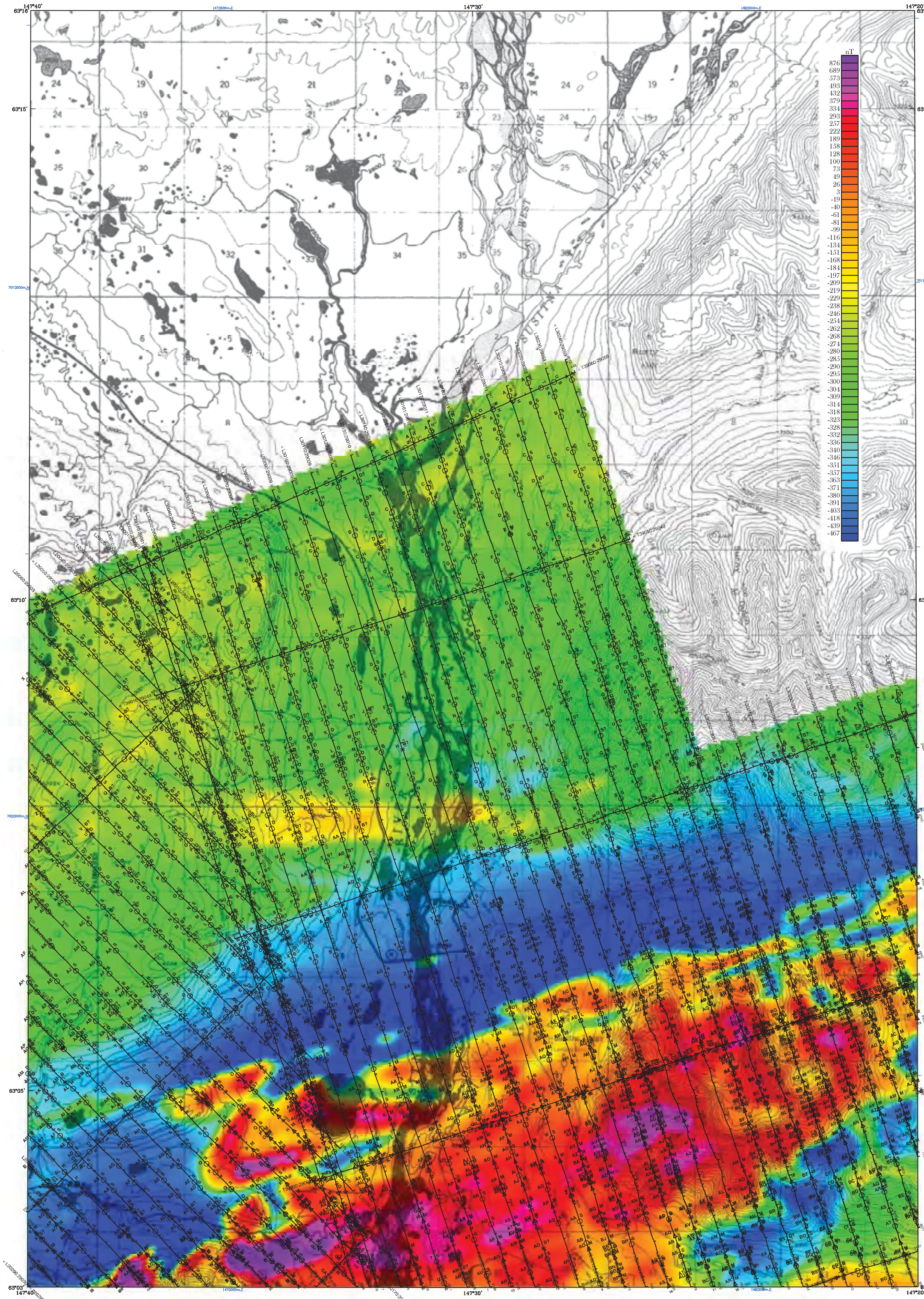
ALASKA DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS

GEOPHYSICAL REPORT 2014-1-15I
PARTS of HEALY A-1, A-2, B-1, and B-2 QUADRANGLES



Section outlines from U.S. Geological Survey Healy A-1, 1973; A-2, 1975; B-1, 1972; B-2, 1994; Quadrangles, Alaska

SCALE 1:31,680
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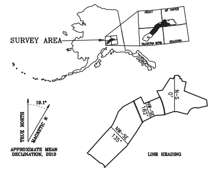
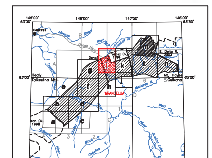
0.5 0 0.5 1 1.5 2 2.5 KILOMETERS
CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL



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 HEALY A-1, A-2, B-1, and B-2 QUADRANGLES

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

ELECTROMAGNETIC ANOMALIES

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

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

Anomaly identifier
Interpretive symbol

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

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The geophysical data were acquired with a DIGHEM^V Electromagnetic (EM) system and a Fugro D1344 cesium magnetometer with a Scintrex CS3 cesium sensor. The EM and magnetic sensors were flown at a height of 100 feet. In addition the survey recorded data from 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. Tie lines were flown perpendicular to the flight lines at intervals of approximately 3 miles.

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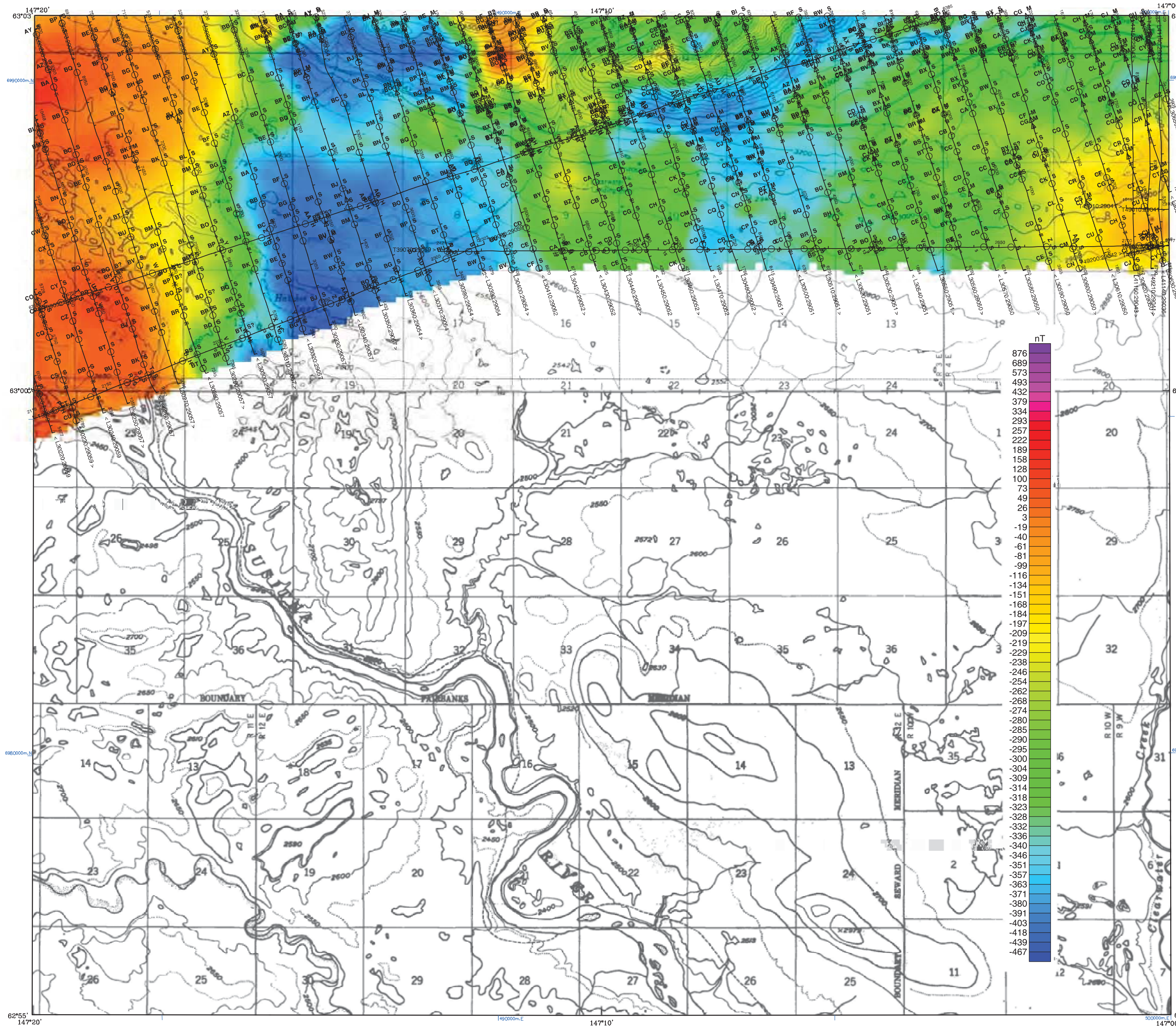


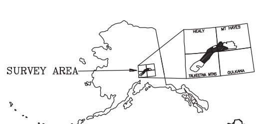
Section outlines from U.S. Geological Survey Talkeetna Mtns. D-1, 1964; Healy A-1, 1973; Quadrangles, Alaska

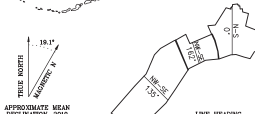
SCALE 1:31,680

0.5 0 0.5 1 1.5 2 MILES

0.5 0 0.5 1 1.5 2 2.5 KILOMETERS

CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL



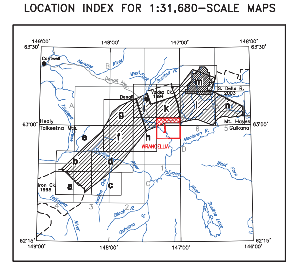


RESIDUAL MAGNETIC FIELD AND DETAILED ELECTROMAGNETIC ANOMALIES WITH TOPOGRAPHY OF THE WRANGELLIA SURVEY AREA, SOUTH-CENTRAL ALASKA

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

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

LOCATION INDEX FOR 1:31,680-SCALE MAPS



ELECTROMAGNETIC ANOMALIES

Anomaly	Conductance
●	>100 siemens
◕	50–100 siemens
◒	20–50 siemens
⊕	10–20 siemens
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F B — Arcs indicate the conductor has a thickness >10m

Dip direction

100 — Magnetic correlation in nT

Anomaly identifier

Interpretive symbol

Interpretive symbol	Conductor model
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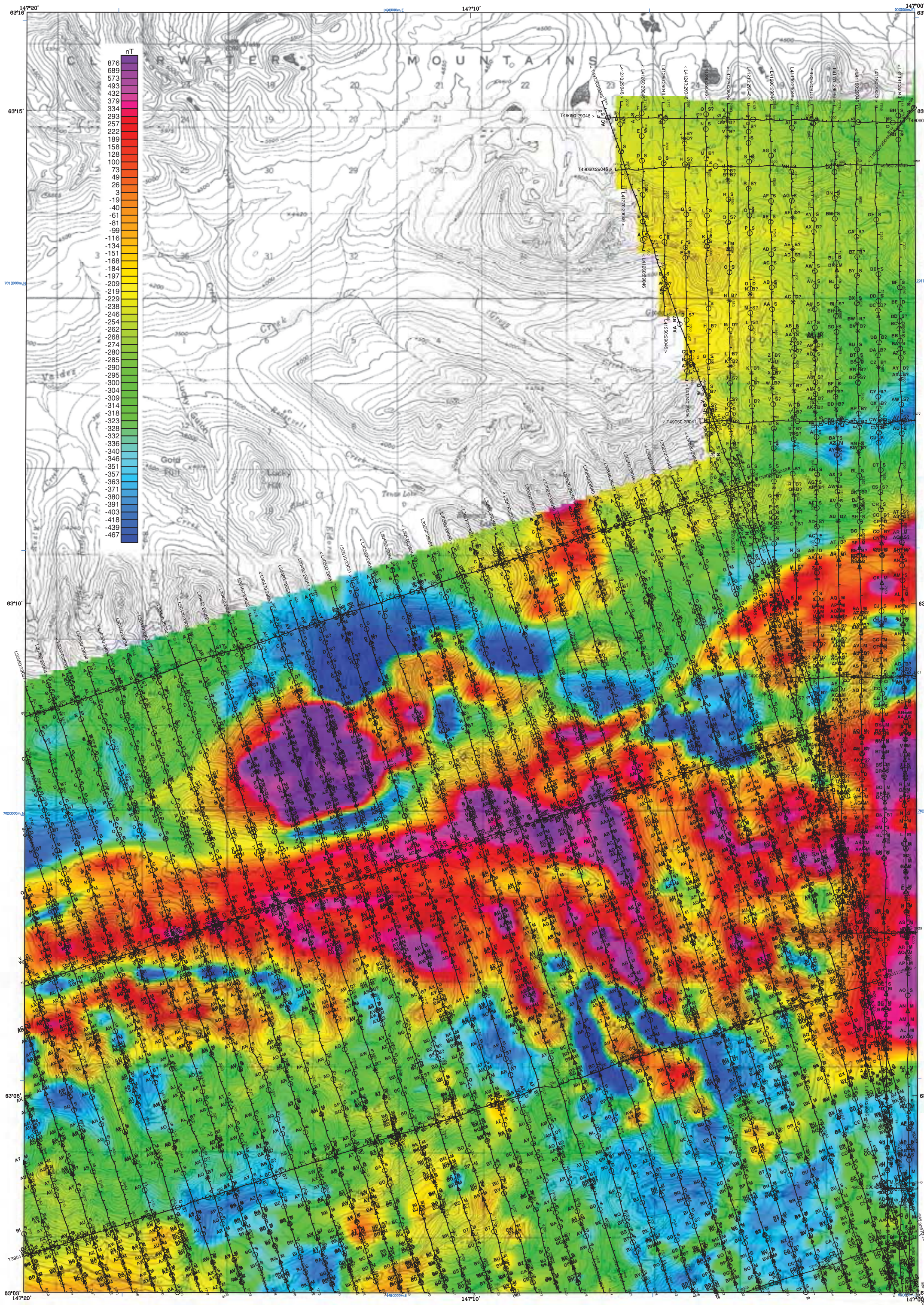
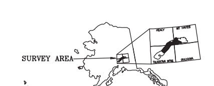


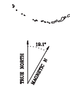
SCALE 1:31,680

0.5 0 0.5 1 1.5 2 MILES

0.5 0 0.5 1 1.5 2 2.5 KILOMETERS

CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL





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

PARTS of HEALY A-1 and B-1 QUADRANGLES

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

ELECTROMAGNETIC ANOMALIES

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

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

Anomaly identifier — C H — Interpretive symbol

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B	Bedrock conductor
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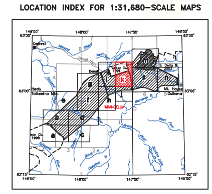
LOCATION INDEX FOR 1:31,680–SCALE MAPS



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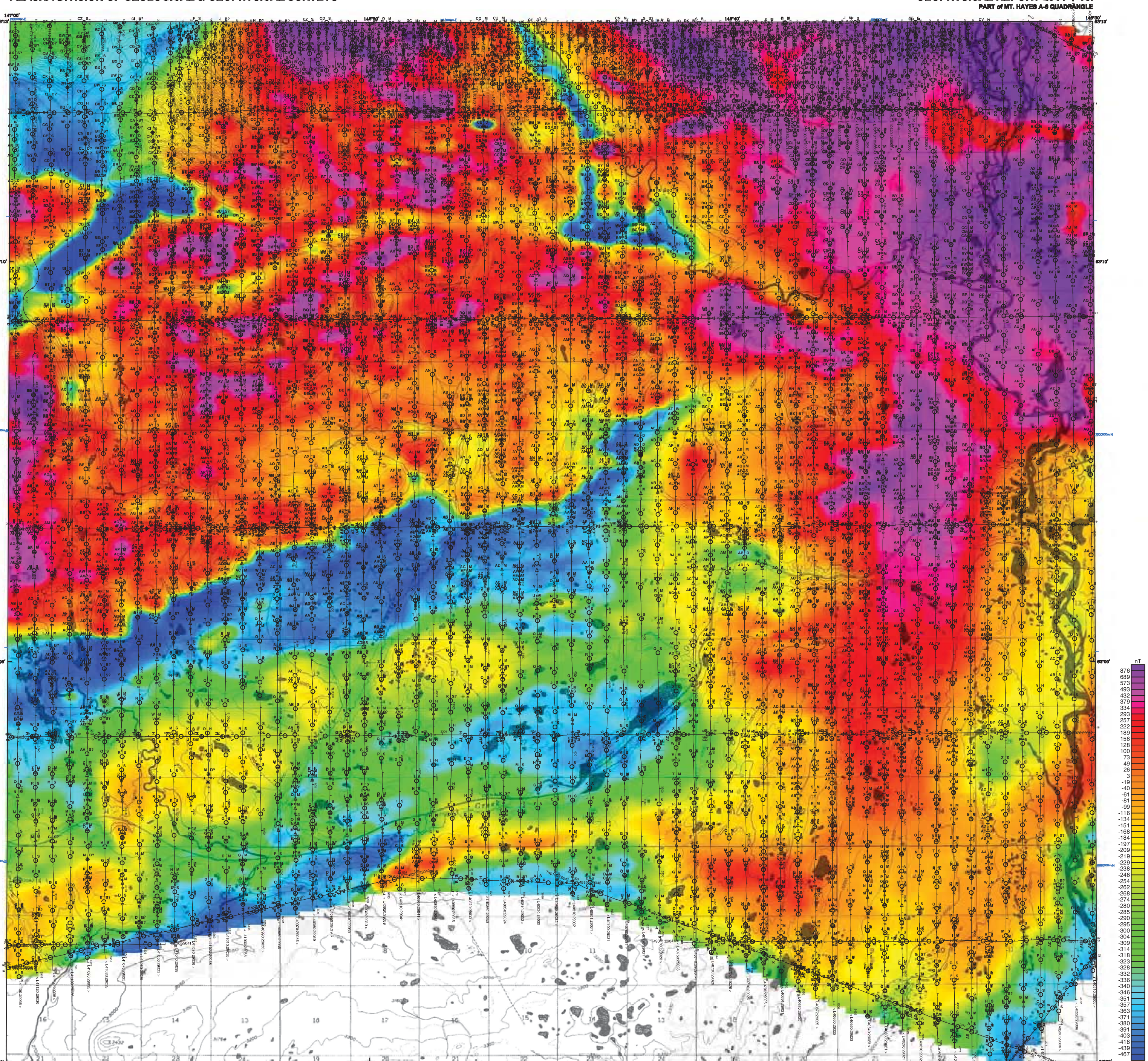


Section outlines from U.S. Geological Survey Mt. Hayes A-6, 1950; Quadrangle, Alaska

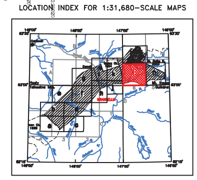
SCALE 1:31,680

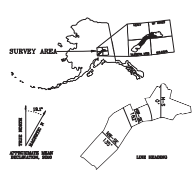
0.5 0 0.5 1 1.5 2 MILES

0.5 0 0.5 1 1.5 2 2.5 KILOMETERS

CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL

LOCATION INDEX FOR 1:31,680-SCALE MAPS





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PART of MT. HAYES A-6 QUADRANGLE

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

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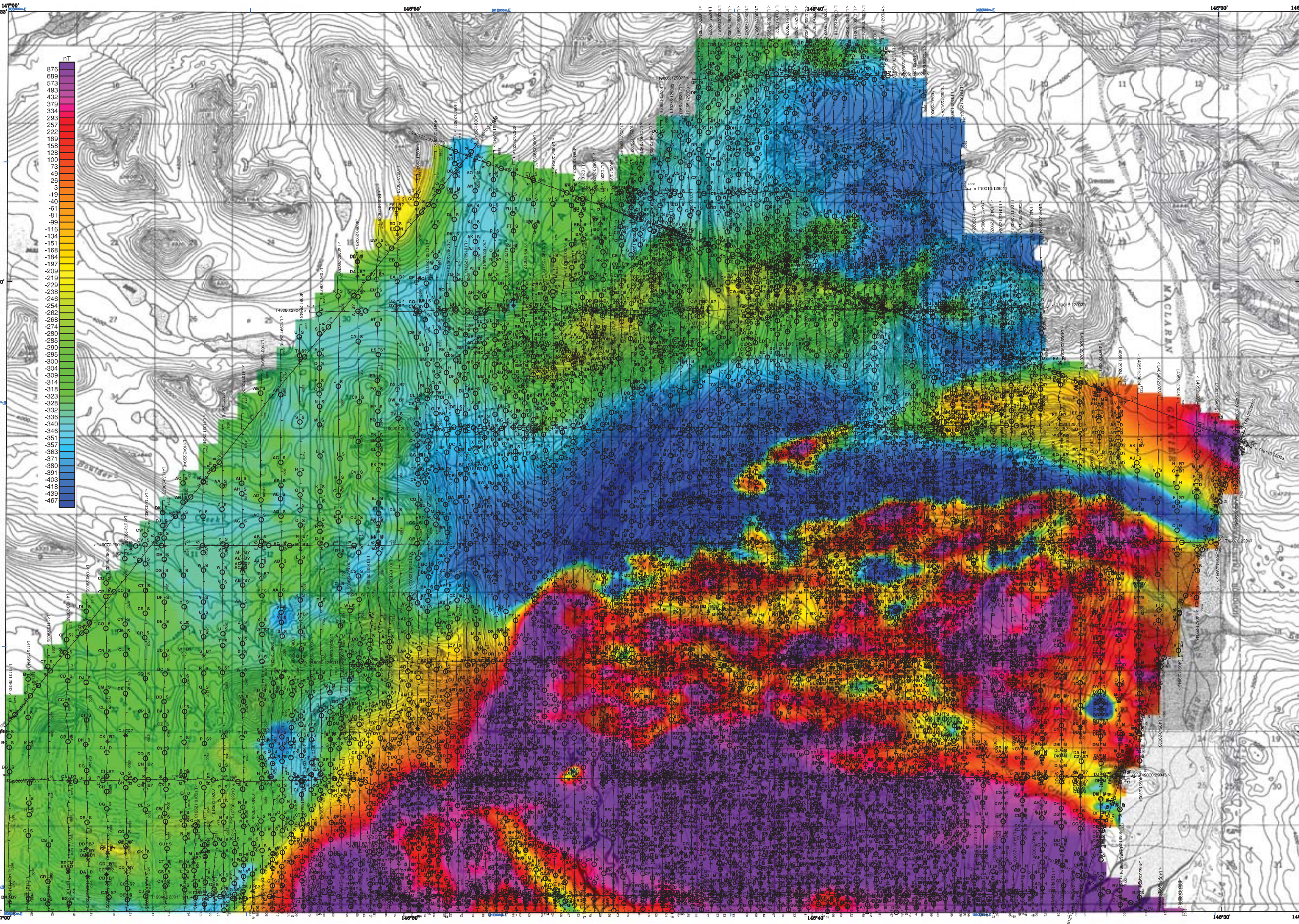

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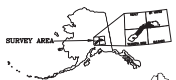
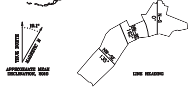
0.5 0 0.5 1 1.5 2 MILES

0.5 0 0.5 1 1.5 2 2.5 KILOMETERS



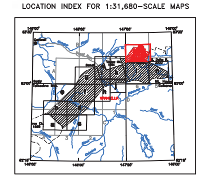


RESIDUAL MAGNETIC FIELD AND DETAILED ELECTROMAGNETIC ANOMALIES WITH TOPOGRAPHY OF THE WRANGELLIA SURVEY AREA, SOUTH-CENTRAL ALASKA

PARTS of MT. HAYES A-5, A-6, B-5, and B-6 QUADRANGLES

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

LOCATION INDEX FOR 1:31,680-SCALE MAPS

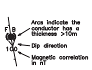


DESCRIPTIVE NOTES

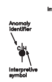
The geophysical data were acquired with a DIGHEM^V Electromagnetic (EM) system and a Fugro D1344 cesium magnetometer with a Scintrex CS3 cesium sensor. The EM and magnetic sensors were flown at a height of 100 feet. In addition the survey recorded data from radar and laser altimeters, GPS navigation 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. Tie 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.

ELECTROMAGNETIC ANOMALIES



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



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

ELECTROMAGNETICS

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

RESIDUAL MAGNETIC FIELD

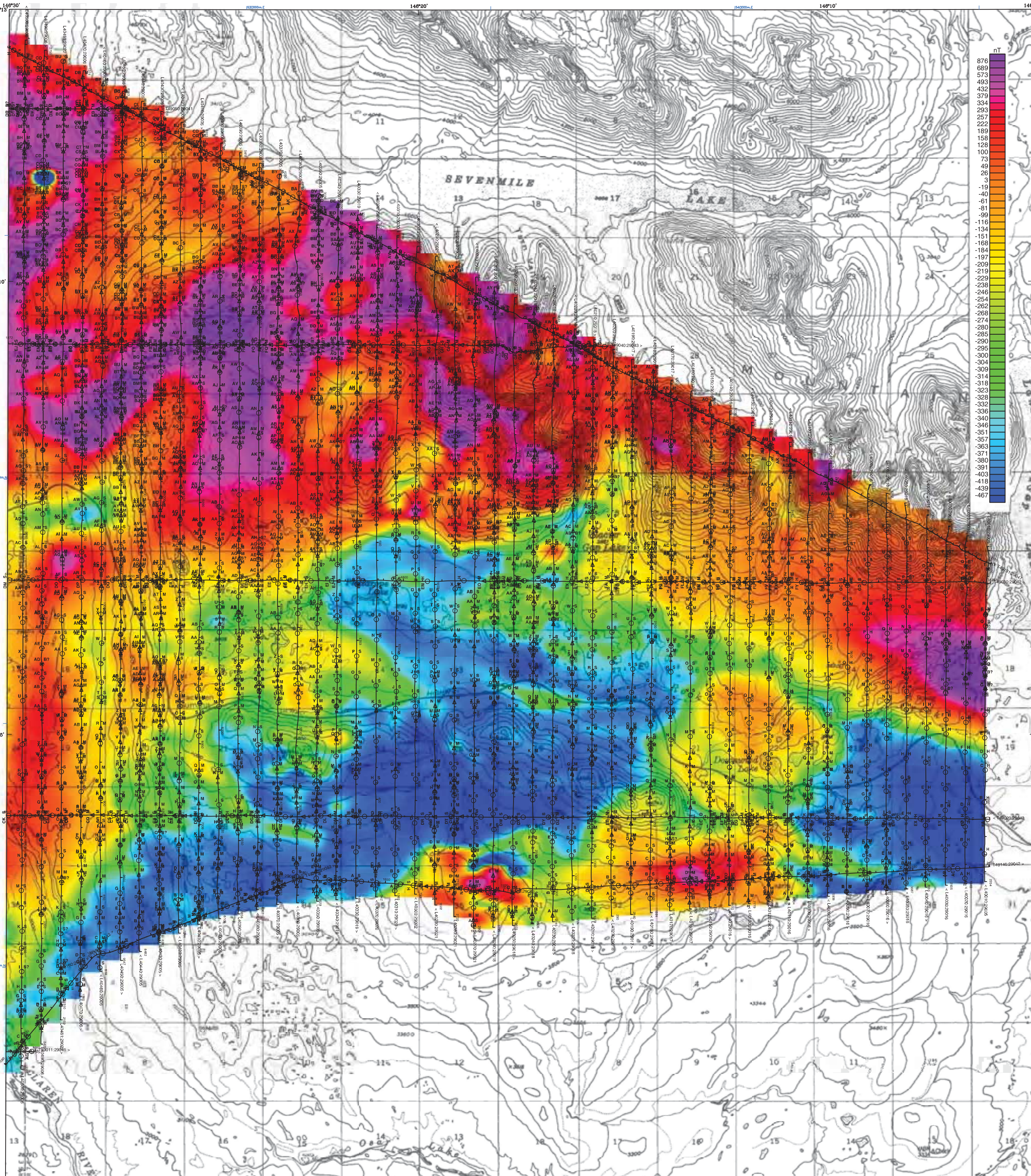
The magnetic total field data were processed using digitally recorded data from a CGG D1344 magnetometer with a Scintrex CS3 cesium sensor. Data were collected at a sampling interval of 0.1 seconds. The magnetic data were (1) corrected for diurnal variations by subtraction of the digitally recorded base 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.

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 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. Airborne geophysical data for the area were acquired and processed by CGG in 2013 and 2014. Previously flown DGGS 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. Millrock Exploration Corporation contributed infill 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 DGGS, 3354 College Road, Fairbanks, Alaska, 99709-3707, and are downloadable for free from the DGGS website (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.



Section outlines from U.S. Geological Survey Mt. Hayes A-5, 1959; Quadrangle, Alaska

SCALE 1:31,680

0.5 0 0.5 1 1.5 2 MILES

0.5 0 0.5 1 1.5 2 2.5 KILOMETERS

CONTOUR INTERVAL 100 FEET
DATUM MEAN SEA LEVEL

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

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by
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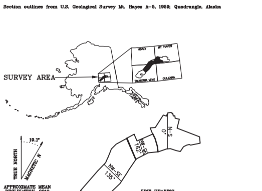

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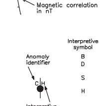

Anomaly	Conductance
●	>100 siemens
◕	50–100 siemens
◒	20–50 siemens
⊕ (quarter filled)	10–20 siemens
⊕	5–10 siemens
○	1–5 siemens
◌	< 1 siemens
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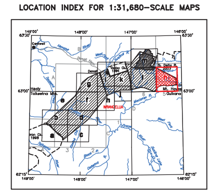

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