



Prepared in cooperation with the NorthPlatte, South Platte, and Twin Platte Natural Resource Districts, Nebraska

Airborne Geophysical Surveys Conducted in Western Nebraska, 2010—Contractor Reports and Data

By U.S. Geological Survey Crustal Geophysics and Geochemistry Science Center

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Contents

Executive Summary	1
Appendixes	3
Appendix 1. Contractor Report Aarhus Geophysics/SkyTEM Canada, Inc.—Data Acquisition from Nebraska, USA	4
Report File: 20140203_Nebraska_Report_updated.pdf	4
Data File: 20100901_DataDelivery.zip	4
Appendix 2. Contractor Reports, Aarhus Geophysics ApS—Data Processing and Inversion of SkyTEM Data, Nebraska, USA	4
Report File: SkyTEM USGS UTM13_complete.pdf	4
Report File: SkyTEM USGS UTM14_complete.pdf	4
Data File: ascii_files.zip	4

Figure

1. SkyTEM Canada, Inc., survey flight lines, western Nebraska, flown in 2010.....	2
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Executive Summary

This report contains three contractor reports and data files for an airborne electromagnetic survey flown from June 28 to July 7, 2010. The first report; “SkyTEM Survey: Nebraska, USA, Data” describes data acquisition and processing from a time-domain electromagnetic and magnetic survey performed by SkyTEM Canada, Inc. (the North American SkyTEM subsidiary), in western Nebraska, USA, (fig. 1). Digital data for this report are given in Appendix 1. The airborne geophysical data from the SkyTEM survey subsequently were processed and inverted by Aarhus Geophysics ApS, Aarhus, Denmark, to produce resistivity depth sections along each flight line. The result of that processing is described in two reports presented in Appendix 2, “Processing and inversion of SkyTEM data from USGS Area UTM-13” and “Processing and inversion of SkyTEM data from USGS Area UTM-14.”

Funding for these surveys was provided by the North Platte Natural Resources District, the South Platte Natural Resources District, and the Twin Platte Natural Resources District, in Scottsbluff, Sidney, and North Platte, Nebraska, respectively. Any additional information concerning the geophysical data may be obtained from the U.S. Geological Survey Crustal Geophysics and Geochemistry Science Center, Denver, Colorado.

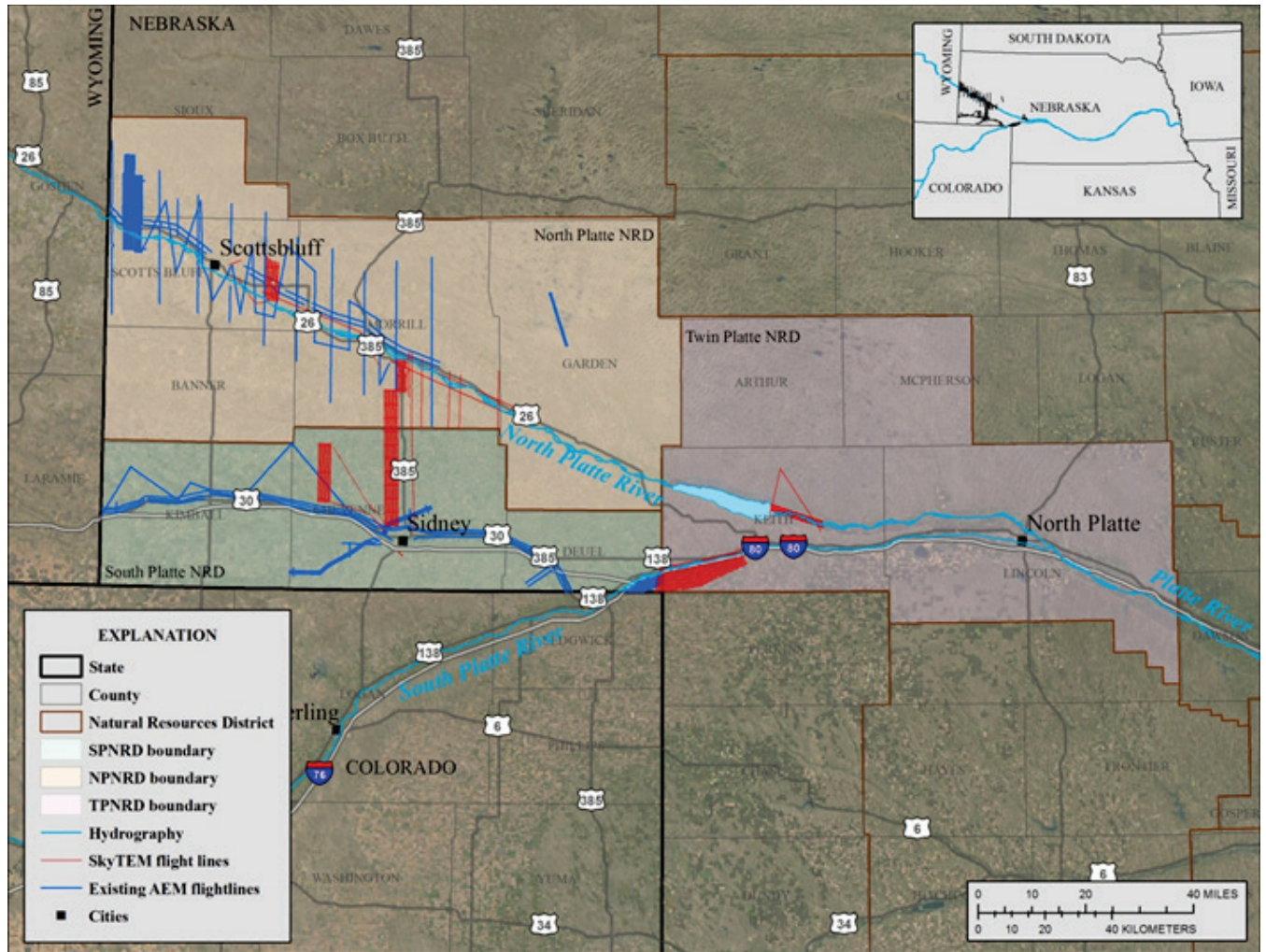


Figure 1. Location of SkyTEM Canada, Inc., geophysical survey flight lines (shown in bright red) in western Nebraska. Also shown are natural resource districts which were cooperators in the airborne electromagnetic survey. Modified from SkyTEM Canada, Inc. contractor report (see Appendix 1, this publication). [Abbreviations: AEM, airborne electromagnetic survey flightlines (already existing and shown here in bright blue); NRD, Natural Resource District; NPNRD, North Platte Natural Resources District; SPNRD, South Platte Natural Resources District; TPNRD, Twin Platte Natural Resources District]

Appendixes

Appendix 1. Contractor Report Aarhus Geophysics/SkyTEM Canada, Inc.—Data Acquisition from Nebraska, USA

The contractor report provides details of project design and data acquisition over some 1900 km of flight lines in western Nebraska, including instrumentation and set-up, method(s) to synchronize data, calibration of the electromagnetic system (to accommodate differences between the North American power grid and the Danish National Reference site with its different grid frequency), and quality assurance for the data set. Protocols also describe data acquisition with detailed maps, weather reports, and base-station information. Application of the digital elevation model and data processing are discussed in detail. Location information from differential global positioning (DGPS) provided extreme accuracy and was used in data acquisition and as input to the processing flow. Residual magnetic field was the product of the processed data, from which total magnetic intensity was recalculated.

Similarly, the report presents all elements of the inversion and modeling of the Nebraska SkyTEM data. Inversion was performed as a regularized, damped, least-squares inversion along the profiles with a 1-D, 30-layer model. The inversion produced a model for approximately every 4 m along the flight line. Resulting models are presented as model sections (profiles) and as resistivity grids.

Data files include the following:

Report File: 20140203_Nebraska_Report_updated.pdf (note: appendixes 4, 5, and 6 of this file are given in the data delivery file listed below, and appendix 7 describes the format for delivered digital data).

Data File: 20100901_DataDelivery.zip (1.09 gigabytes).

Appendix 2. Contractor Reports, Aarhus Geophysics ApS—Data Processing and Inversion of SkyTEM Data, Nebraska, USA

Processing and Inversion of SkyTEM Data from USGS Nebraska Area UTM–13

Processing and Inversion of SkyTEM Data from USGS Nebraska Area UTM–14

This appendix contains processed data and two sets of inversions and models in two geographic areas (listed above). Two contractor reports present data (in a separate zipped file) processed and inverted by Aarhus Geophysics ApS, Aarhus, Denmark, after data acquisition from airborne time-domain electromagnetic geophysical surveys in Nebraska in 2010, located within the UTM Zone–13 and UTM Zone–14 reference meridians. Total processed line length was about 1890 km; included maps illustrate location of the lines. Full details of the processing and the subsequent inversion appear in reports for the UTM–13 and UTM–14 areas, respectively, including flight-line locations and profiles, inversion quality-control maps, and average resistivity maps at various depth intervals. Relevant file names include:

Report File: SkyTEM USGS UTM13_complete.pdf

Report File: SkyTEM USGS UTM14_complete.pdf

Data File: ascii_files.zip [data files]

Note that data appear as ascii-format files, in a file named ascii_files.zip (approximately 74 megabytes).

Files to accompany this report are provided electronically through links from the USGS Publications Warehouse web site. (See suggested citation, this report, for full URL address.)