Prepared in cooperation with the U.S. Agency for International Development

Large-Scale Digital Geologic Map Databases and Reports of the North Coal District in Afghanistan

By Trent M. Hare, Philip A. Davis, Devon Nigh, James A. Skinner, Jr., John R. SanFilipo, Karen S. Bolm, Corey M. Fortezzo, Donna Galuszka, William R. Stettner, Shafiqullah Sultani, and Billal Nader

Data Series 317
2008

U.S. Department of the Interior
U.S. Geological Survey
Contents

Introduction ........................................................................................................................................................... 1
Characteristics of the Large-Scale Maps .......................................................................................................... 2
Map Rectification ................................................................................................................................................. 4
Production of GIS Map Databases ................................................................................................................... 4
Acknowledgments ............................................................................................................................................... 5
Published and Previously Unpublished Sources ............................................................................................ 5

Figures

1. Index map showing locations of maps listed in tables 1 and 2 .................................................................... 2

Tables

1. Characteristics of rectified map products contained in this database .............................................................. 18
2. Previously unpublished Afghanistan reports and available plates and a relevant plate from a German publication ................................................................. 21
Large-Scale Digital Geologic Map Databases and Reports of the North Coal District in Afghanistan

By Trent M. Hare¹, Philip A. Davis², Devon Nigh¹, James A. Skinner, Jr.¹, John R. SanFilipo³, Karen S. Bolm², Corey M. Fortezzo¹, Donna Galuszka¹, William R. Stettner³, Shafiquullah Sultani⁴, and Billal Nader⁴

Introduction

In 2004, the U.S. Agency for International Development (USAID) and the U.S. Trade and Development Agency (USTDA) contracted with the U.S. Geological Survey (USGS) to assess the natural resources of Afghanistan and to concentrate on those resources related to the economic development of that country, including oil and gas, coal, mineral, and water resources. All of these assessments require geologic, structural, and topographic information of the country at greater scales and improved accuracies than those exhibited by the existing published, countrywide, 1:500,000-scale maps, which were compiled several decades ago by former Soviet and European agencies. Therefore, one of the first steps in the assessment process was to compile digital Geographic Information Systems (GIS) databases of selected unpublished maps and associated materials archived at the Afghanistan Geological Survey (AGS). Concurrently, the British Geological Survey (BGS) worked at the AGS to catalogue and scan many of its library reports. These reports describe the maps and associated databases that have been digitally captured by both the AGS and BGS (report numbers included in sources) and the map databases that have been thus far converted by the USGS to GIS databases for the coal resource assessment.

Most of the historical coal exploration is concentrated in north-central Afghanistan, a region referred to as the “North Coal District,” and almost all of the coal-related maps found within the AGS archives to date cover various locations within that district (fig. 1). Most of the maps included herein were originally scanned during USGS site visits to Kabul in November 2004 and February 2006. The scanning was performed using equipment purchased by USAID and USTDA and installed at the AGS by USGS. Many of these maps and associated reports exist as single unpublished copies in the AGS archives, so these efforts served not only to provide a basis for digital capturing, but also as a means for preserving these rare geologic maps and reports. The data included herein represent most of the coal-related reports and maps that are available in the AGS archives. This report excludes the limited cases when a significant portion of a report’s text could not be located, but it does not exclude reports with missing plates.

¹ U.S. Geological Survey, 2255 North Gemini Drive, Flagstaff, AZ 86001
² U.S. Geological Survey, 520 N. Park Avenue, Tucson, AZ 85719
³ U.S. Geological Survey, 12201 Sunrise Valley Drive, Reston, VA 20192
⁴ Afghanistan Geological Survey, Kabul, Afghanistan
Figure 1. Index map showing locations of scanned coal maps included in this publication. See table 1 for more information about each map. Maps within colored boxes and/or white leaders exist as GIS databases. Report labels with black leaders have rectified images but no GIS files. White triangles show a few city names and the black triangle shows Kabul, the Afghanistan capital. Report numbers, only for VOTU maps, refer to AGS and BGS reports and are included in the file names (tables 1, 2) and directories. Abbreviation: 50K = 1:50,000 scale.

Characteristics of the Large-Scale Maps

Most of the North Coal District was mapped as a 1:100,000-scale map series in the late 1960s (Mikhailov and others, 1967). This mapping was contracted to V/O Technoexport USSR (now named Technoexport, Foreign Trade Company Ltd., Czech Republic but referred to here by its old abbreviation as VOTU), which was a quasi-government former Soviet consultancy. These geologic maps delineate rock and alluvial units and faults, although fault types are not distinguished. There is fairly good unit correspondence along the different map borders within
the region. A set of tectonic maps that covers the same area as the 1:100,000-scale geologic map series at 1:300,000-scale was also produced by VOTU. Although these tectonic maps do not have all the fine-scale faults shown on the geologic map series, the tectonic maps delineate all of the major structural elements mapped within the North Coal District, such as anticlines, synclines, troughs, domes, nappes, and normal, reverse, and thrust faults, as well as major interpretive tectonic map units.

The Federal Institute for Earth Research in Germany, now known as the Federal Institute for Geosciences and Natural Resources (Bundesanstalt für Geowissenschaften und Rohstoffe, BGR) and their Afghan trainees mapped the geology of four separate areas within the North Coal District at scales ranging from 1:25,000 to 1:250,000 (Gabert, 1964; Hinze, 1964; Weippert, 1964). Their mapped geology differs somewhat from the geology depicted on the VOTU map series. Although some of the BGR geologic maps were labeled “reconnaissance maps,” the mapped geology appears to be quite accurate on the basis of our reconnaissance field investigations conducted in 2006. We include a correlation diagram, modified from Wirtz (1964), in table 2 that shows the correspondence of geologic units between these BGR map areas.

The largest scale maps for the North Coal District were found within the VOTU reports for specific coal prospects. The reports include both geologic and thematic coal maps, typically at a scale of 1:5,000. The thematic maps provide a variety of information about the coal resources, such as transect locations, drill-hole and trench locations, coal-bed intercept thickness and depth, coal seam crop lines, isopleths of seam thickness and structural elevation, and descriptions of various coal-grade parameters such as weight percentages of ash, volatiles, sulfur, and paraffin. These maps are generally referred to as maps of the “Factual or Actual Materials” by VOTU; they are referred to as “coal-seam intercept maps” in the unpublished and published sources section.

All of these maps were digitally scanned at AGS using 200 dot-per-inch (dpi) resolution, which was sufficient to maintain the finest detail on each map while maintaining manageable file sizes. Many of the maps are discolored, wrinkled, and marred from decades of exposure and use, and some maps were incomplete. Our scanned maps and their final GIS databases facilitate the preservation of these typically unique data. In addition to the geologic and thematic maps, we also scanned ancillary graphics from the reports that would assist in map interpretations, such as map indexes, correlation diagrams, geophysical and lithologic logs, and cross sections (table 2). Some reports without graphics are also included; these contain prospecting and coal-quality information from a number of sources, notably from BGR and the U.S. Bureau of Mines. All of the original scanned products exist within this USGS data series in a lossless Geospatial Tag Image File (GeoTIFF), Joint Photographic Experts Group (JPEG), or Portable Document Format (PDF) format. A complete list of the map products is contained in table 1, which lists the map file name including rectification level, scale, availability of GIS database, and source. Figure 1 shows the locations of the GIS maps included in this database. A complete list of the ancillary databases is contained in table 2, which lists the file name and source citation. The spelling of place names in this report is generally that used by the report authors and may not be authoritative.
Map Rectification

Before the maps were converted to GIS databases, they were georegistered to a standard map projection. The Universal Transverse Mercator (UTM) projection provides good local positional accuracy; the area that encompasses the scanned map collection resides within UTM Zone 42. Therefore, all maps that could be geographically controlled were converted to this map projection based on the WGS84 datum. Maps having either geographic coordinates or identifiable cultural and physiographical features were rectified to some degree. Regardless of our ability to rectify the maps, we include the original scanned images of all available unpublished maps in our database. Maps having geographic coordinates were rectified to the UTM map projection using the map’s stated coordinates (Level1 rectification; table 1) and most of the maps could be controlled to this level. Many of the VOTU 1:5,000-scale maps are at such large scale that there are no identifiable land features to allow more accurate rectification (Level2) than that provided by map coordinates.

Maps that did have identifiable cultural or physiographic features, even if they had no geographic coordinates, were controlled to our 14-m Landsat image base, which has 50-m positional accuracy (Davis, 2006). This rectification is referred to as Level2 in table 1. The number of control points used to perform Level2 rectification and the resulting positional accuracy of the map depended on the spatial density of identifiable land features on the map. Generally, maps at 1:25,000-scale or smaller could be processed to Level2.

The individual maps within the 1:100,000-scale VOTU geologic map series and the 1:300,000-scale VOTU tectonic map series were initially controlled to Level1 in order to maintain unit correspondence between adjacent maps. The Level1 versions of these maps were then digitally mosaicked into a single map image and the resulting map mosaic was then registered to the Landsat image base using ~1,200 control points and a fourth-order polynomial transformation. The two Russian tectonic maps (at 1:300,000-scale) used three different polynomial orders for their Level2 rectification, because no single transformation provided adequate spatial correspondence to the Landsat image base across the entire map area.

The BGR reconnaissance maps also required numerous control points and a high-order polynomial transformation to make the maps correspond to the Landsat image base. These controlled BGR maps show the most spatial distortion because field mapping did not use a controlled base map. The polynomial order used to geometrically transform each scanned map to a controlled map base depended on the condition of the original map in the library archive.

Production of GIS Map Databases

Once the scans were rectified to Level 2, they were brought into the GIS application ArcMap by Environmental Systems Research Institute (ESRI). A Personal Geodatabase was created for each map to store the feature types (points, lines or polygons) and attributes (geologic units, structure type). Most of the geologic contacts and structural features were hand digitized using a Cintiq draw-screen monitor by Watcom. A few maps were completed using a Watcom pen tablet or simply using a mouse. The coordinate accuracy for these interactive displays is ±0.5 mm with a maximum capture rate of 100 points/second. After the contact and feature class was cleaned and merged into polygons, attributes were assigned to each polygon. Most layers contain a confidence field abbreviated as “conf.” Any values stored in this field except 0
indicate that the original paper map was difficult to read and (or) interpret. Though all map elements were spot checked by another team member prior to finalization, some errors could still exist due to the sheer number and intricacies of feature classes.

The vector files are released using the ESRI Personal Geodatabase, ESRI shapefile vector format, and the open Geography Markup Language (GML) format. Scanned images are available in JPEG and, when rectified, GeoTIFF format. Metadata, as required by the USGS and the Federal Geographic Data Committee (FGDC), is also included. With the exception of the VOTU 1:100,000-scale North Coal District series, which was merged from 10 separate tiles into one large file, all the maps have unique legends and attributes, which are described in the metadata. The original legends are available on the scanned map sheet but also clipped out and saved next to the vector files. All vector files are stored in the same projection as the rectified scanned images, UTM Zone 42, using the WGS84 datum. For a list of the maps that were digitized for this publication see table 1.

Acknowledgments

The authors wish to acknowledge the contributions made by the staff of the AGS Records and Coal Departments whose valuable assistance made it possible to locate and catalogue the data provided herein. We especially acknowledge the efforts of particular members of the coal team: Engineer Saifuddin Aminy (Team Leader); Engineer Gul Pacha Azizi; Engineer Abdul Haq Barakati; Engineer Abdul Basir; Engineer Mohammad Daoud; Engineer Abdullah Ebadi; Engineer Abdul Ahad Omaid; Engineer Spozmy; and Engineer Shapary Tokhi. The ongoing efforts of Engineer Mir M. Atiq Kazimi (Team leader); Engineer M. Anwar Housinzada; and Engineer Shereen Agha of the AGS Records Department to organize and catalogue the AGS material were invaluable in locating and preserving these data. The efforts of the entire AGS staff to personally preserve these data during war time, in the absence of virtually any supporting infrastructure, was truly remarkable. The efforts by the British Geological Survey (BGS) to assist the AGS in archiving these data, and the personal assistance provided by BGS (notably Robert McIntosh), to the USGS teams were also appreciated. The logistical support provided by the U.S. Embassy in Kabul, particularly the Afghanistan Reconstruction Group, was critical to the success of the USGS teams while in Afghanistan. Finally, the efforts of the Minister of the Ministry of Mines and Industries (M. Ibrahim Adel) to support the USGS coal resource assessment in Afghanistan, in both his current and former role as President of the Mines Affairs Department was vital to this effort.

Published and Previously Unpublished Sources

Plate 1 – Areal map of works region of geological-prospecting crew for coal and coal deposit distribution, scale 1:250,000, compiled by N.S. Kudriashev and G.N. Saidalikhodjaev.

Plate 2 – Sketch geological map of the Shabashak coal deposit area, scale 1:25,000, compiled by B.N. Androsov and G.N. Saidalikhodjaev.

Plate 4 - Map of factual materials of the Shabashak coal deposit area, scale 1:25,000, compiled by B.N. Androsov and G.N. Saidalikhodjaev.

Plate 5 - Map of factual materials of Shabashak coal deposit, scale 1:5,000, compiled by G.N. Saidalikhodjaev and I.I. Marshansky.

Plate 6 - Hydrogeological map of Shabashak coal deposit (schematic), scale 1:5,000, compiled by G. Kulinich and B. Marinov.

Plate 7 – Geological sections for geological map of the Shabashak coal deposit, scale 1:5,000, 2 sheets (sheet 1 = sections I-IV; sheet 2 = sections V-VIII), compiled by G.N. Saidalikhodjaev, N.S. Kudriashev, and I.I. Marshansky.

Plate 8 – Reserve calculation plan of coal seams nos. 1 and 3, scale 1:5,000, compiled by G.N. Saidalikhodjaev.

Plate 9 – Reserve calculation plan of coal seam no. 5, scale 1:5,000, compiled by G.N. Saidalikhodjaev and N.S. Kudriashev.

Plate 10 – Reserve calculation plan of coal seam no. 7, scale 1:5,000, compiled by G.N. Saidalikhodjaev and N.S. Kudriashev.

Plate 11 – Reserve calculation plan of coal seam no. 8, scale 1:5,000, compiled by G.N. Saidalikhodjaev and N.S. Kudriashev.

Plate 12 – Reserve calculation plan of coal seam no. 13, scale 1:5,000, compiled by G.N. Saidalikhodjaev and N.S. Kudriashev.

Plate 13 – Reserve calculation plan of coal seam no. 14, scale 1:5,000, compiled by G.N. Saidalikhodjaev and N.S. Kudriashev.

Plate 14 – Reserve calculation plan of coal seam no. 16, scale 1:5,000, compiled by G.N. Saidalikhodjaev and N.S. Kudriashev.

Plate 15 – Reserve calculation plan of coal seam no. 22, scale 1:5,000, compiled by G.N. Saidalikhodjaev and N.S. Kudriashev.

Plate 16 – Reserve calculation plan of coal seam no. 23, scale 1:5,000, compiled by G.N. Saidalikhodjaev and N.S. Kudriashev.

Plate 17 – Reserve calculation plan of coal seams nos. 27 and 29, scale 1:5,000, compiled by G.N. Saidalikhodjaev and N.S. Kudriashev.

Plate 18 – Shabashak coal deposit: Confronting the normal stratigraphic sections of the coal bearing rock mass, scale 1:500 (columnar section) and 1:5,000 (correlation diagram), compiled by N.S. Kudriashev, S. Kondratjuk, G.N. Saidalikhodjaev, and I.I. Marshansky.

Plate 19 – Normal coal seam sections (seams 1-13), scale 1:50, compiled by G.N. Saidalikhodjaev.

Plate 20 - Normal coal seam sections (seams 14-27), scale 1:50, compiled by D.A. Manuchariants.

Plate 21 – Normal sections of coal seams in wells, scale 1:50, compiled by S. Kondratjuk and N.S. Kudriashev.

Plate 22 – Geological section of well no. 1, scale 1:200, compiled by S. Kondratjuk, B. Shakhovsky, and N.S. Kudriashev.

Plate 23 - Geological section of well no. 2, scale 1:200, compiled by S. Kondratjuk, B. Shakhovsky, and N.S. Kudriashev.
Plate 24 - Geological section of well no. 3, scale 1:200, compiled by S. Kondratjuk, B. Shakhoversky, and N.S. Kudriashev.
Plate 25 - Geological section of well no. 4, scale 1:200, compiled by S. Kondratjuk, B. Shakhoversky, and N.S. Kudriashev.
Plate 26 - Geological section of well no. 5, scale 1:200, compiled by S. Kondratjuk, B. Shakhoversky, and N.S. Kudriashev.
Plate 27 - Geological section of well no. 6, scale 1:200, compiled by S. Kondratjuk, B. Shakhoversky, and N.S. Kudriashev.
Plate 28 - Geological section of well no. 7, scale 1:200, compiled by S. Kondratjuk, B. Shakhoversky, and N.S. Kudriashev.
Plate 29 – Coal seam section of well no. 1, scale 1:50, compiled by S. Kondratjuk, B. Shakhoversky, and N.S. Kudriashev.
Plate 30 – Coal seam section of well no. 3, scale 1:50, compiled by S. Kondratjuk, B. Shakhoversky, and N.S. Kudriashev.
Plate 31 – Coal seam section of well no. 4, scale 1:50, compiled by S. Kondratjuk, B. Shakhoversky, and N.S. Kudriashev.
Plate 32 – Coal seam section of well no. 5, scale 1:50, compiled by S. Kondratjuk, B. Shakhoversky, and N.S. Kudriashev.
Plate 33 – Coal seam section of well no. 6, scale 1:50, compiled by S. Kondratjuk, B. Shakhoversky, and N.S. Kudriashev.
Plate 34 – Coal seam section of well no. 7, scale 1:50, compiled by S. Kondratjuk, B. Shakhoversky, and N.S. Kudriashev.
Plate 35 – Graphs of well deviation (wells 2-6), scale 1:1,000 and 1:5,000, 2 sheets, compiled by N.S. Kudriashev.
Plate 36 – Coal seam correlations from logged data, scale 1:50, compiled by B. Shakhoversky.
Plate 37 – Sketch of adit no. 1, scale 1:50, compiled by N.S. Kudriashev.
Plate 38 – Sketch of adit no. 2, scale 1:50, compiled by N.S. Kudriashev.
Plate 39 – Sketch of adit no. 3, scale 1:50, compiled by N.S. Kudriashev.
Plate 40 – Sketch of adit no. 4, scale 1:50, compiled by N.S. Kudriashev.
Plate 41 – Sketch of adit no. 5, scale 1:50, compiled by N.S. Kudriashev.
Plate 42 – Sketch of adit no. 6, scale 1:50, compiled by N.S. Kudriashev.
Plate 43 – Sketch of adit no. 7, scale 1:50, compiled by N.S. Kudriashev.
Plate 44 – Sketch of trench no. 1, scale 1:200, compiled by S. Kondratjuk.
Plate 45 – Sketch of trench no. 2, scale 1:200, compiled by N.S. Kudriashev.
Plate 46 – Sketch of trench no. 3, scale 1:200, compiled by I.I. Marshansky.
Plate 47 – Sketch of trench no. 4, scale 1:200, compiled by D.A. Manuchariants.
Plate 49 – Pump test of no. 3 from hole no. 3, compiled by B. Marinov and G. Kulinich.
Plate 50 – Pump test of no. 1 from hole no. 2, compiled by B. Marinov and G. Kulinich.
Plate 51 – Pump test of no. 2 from hole no. 2, compiled by B. Marinov and G. Kulinich.
Plate 52 – Diagrams showing dependence of water levels in bore pit no. 12 lowering water level in hole no. 2, compiled by B. Marinov and G. Kulinich.
Plate 53 – Normal sections of coal seams nos. 18 and 19-20, compiled by D.A. Manuchariants.

Azimi, N.A., Giruvol, M.T., and Zaycev, V.N., 1977, Report on results of revised research of coal occurrences of Doaba region and copper occurrences of Saygan region (Surkhob
basin): Unpublished report by the Afghanistan Ministry of Mine and Industries, Kabul, 9 p, (in Russian) [BGS no. 1188].


Plate 1 – Geological map of the work area, scale 1:50,000, compiled by report authors.
Plate 2 – Schematic geologic map of the coal deposits at Karkar, scale 1:5,000, compiled by report authors.
Plate 4 – Standard geologic-technical order for bore-hole project plan, compiled by report authors.

Clausen, J.H., 1965, Mine air samples and coal samples taken from Darra-i-Suf: U.S. Bureau of Mines, Kabul, 20 p, (in English) [BGS no. 348].

Czerski, C., 1944, Coke problem in Afghanistan: Unpublished report, unknown affiliation, 11 p, (in English) [BGS no. 515].


Drath, I.A., 1939, Possibilities and the means of development of coal-mining in Shisha Walung, Dhare Souf, and surrounding regions: Unpublished report by the Afghanistan Ministry of Mines, 33 p, (in English) [AGS no. 252].


Dronov, V.I., and Leven, E. Ya., 1971, Coal-bearing deposits of the western part of Bandi-Turkestan range (northwest Afghanistan): Unpublished report by V/O Technoexport USSR to the Afghanistan Ministry of Mines and Industries, 3 p, (in Russian) [AGS no. 1318].

Fox, C.S., 1936, The prospects for coal mining in Afghanistan: Geological Survey of India, 49 p, (in English) [BGS no. 488].

Plate 17 - Geological map of the region of Karkar, scale 1:25,000, compiled by G. Gabert and D. Weippert.


Gupta, K.L., and Darma Rao, P., 1979, Coal plan 1358-1362: Unpublished by the Indian Technical Economic Cooperation Programme to the North Coal Department, Kabul, 34 p, (in English) [BGS 528].

Hamer, P.O., 1954, Analyses of coal samples from Sabsak coal field in Herat Province and from Darra-i-Suf coal field in Mazar-i-Sharif Province: U.S. Bureau of Mines, Kabul, 11 p, (in English) [BGS no. 194].


Plate 14 - Geological map of the area of Čāl near Jškameš, Province of Kataghan (northeast Afghanistan), 1:50,000-scale, compiled by C. Hinze.
Plate 15 - Geologic section through the area near Čāl, north of Iškameš, Province of Kataghan, northeastern Afghanistan, compiled by C. Hinze.
Plate 16 - Geological reconnaissance map of the eastern north flank of Hindukush between Narin and Kesem (northeast Afghanistan), 1:250,000-scale, compiled by C. Hinze.

Jacob, H., 1961, Ergebnisse der untersuchung von kohlenproben aus verschiedenen lagerstatten Afghanistan [Translation: Results of the examination of coal assays from various beds in Afghanistan]: Bundesanstalt für Bodenforschung, Hannover, Germany, 95 p, 5 Plates, (in German) [AGS no. 129].

Plate 1 - Sketch map of coal occurrences in north Afghanistan.
Plate 2 - Site plan of the sample analysis locations in the Darra Tor (Dahan-i-Tor) district, scale 1:20,000.
Plate 3 - Chemistry of Afghanistan coal rocks - H/C and O/C atomic ratios.
Plate 4 - Chemistry of Afghanistan coal rocks - caloric value (kcal/kg) and ash content (%).
Plate 5 - Chemistry of Afghanistan coal rocks - caloric value (kcal/kg) and volatile components (%).

Jacob, H., 1963, Additional Report on Coal Properties of Dahne-i-Tor (Darra-i-Suf, Lower Seam), Appendix to DGMA Report on Coal Investigations in Afghanistan, German Geological Mission in Afghanistan, Kabul, 4 p, (in English) [AGS no. 142].
Kotov, A. J., 1968, Project of the prospecting works at the Karkar-Dudkash deposit for 1968, Unpublished report by V/O Technoexport USSR (contract 1378) to the Afghanistan Ministry of Mines and Industries, Kabul, 22 p, 4 Plates, (in English) [AGS no. 840].

Plate 1 – Sheet 221-F: Geological map, part of Baghlan Province, scale 1:100,000, compiled by K.Y. Mikhailov, V.V. Kulakov, V.P. Kolchanov, and B.R. Pashkov.
Plate 2 – Geological map of the Karkar-Dudkash deposit, scale 1:5,000, compiled by V. Miroshnichenko.
Plate 3 – Geological sections along lines I-I’ to XII-XII’, scale 1:5,000, compiled by V. Miroshnichenko.
Plate 4 – Gypsometric plan of the Karkar-Dudkash deposit coal seam, scale 1:5,000, compiled by V. Miroshnichenko.


Plate 1 – Areal map of work region of geological prospecting crew on coal, scale 1:250,000, compiled by N.S. Kudryashov and G.N. Saidalikhodjaev.


Plate 1 – Diagram of the locations of the primary coal areas in Afghanistan, scale 1:4,000,000, compiled by V.I. Kulakov.
Plate 2 – Schematic geological map of coal-bearing areas at Darra-i-Suf, scale 1:50,000, compiled by V.I. Kulakov.
Plate 3 – Schematic geological map of Shabashak deposits, scale 1:5,000, compiled by V.I. Kulakov.
Plate 4 – Coal deposits of Shabashak. geologic cross sections, scale 1:5,000, compiled by V.I. Kulakov.
Plate 5 – Coal deposits of Shabashak, block diagram of reserves, scale 1:10,000, compiled by V.I. Kulakov.
Plate 6 – Schematic geological map of the coal deposits at Darwasa, scale 1:10,000, compiled by V.I. Kulakov.
Plate 7 – Coal deposits of Darwasa, geologic cross sections, scale 1:10,000, compiled by V.I. Kulakov.
Plate 8 – Coal deposits of Darwasa, block diagram of reserves, scale 1:10,000, compiled by V.I. Kulakov.
Plate 9 – Schematic geological map of coal deposits at Lela, scale 1:5,000, compiled by V.I. Kulakov.
Plate 10 – Coal deposits of Lela. Geologic cross sections, scale 1:5,000, compiled by V.I. Kulakov.
Plate 11 – Coal deposits of Lela. Block diagram of reserves, scale 1:10,000, compiled by V.I. Kulakov.
Plate 12 – Legend to the generalized geologic map and geologic cross sections, scale 1:5,000 and 1:10,000.


Plate 1 – Index map of coal-party work areas in 1978, scale 1:2,000,000, compiled by M. Akram.
Plate 2 – Schematic geological map of the eastern part of the Saghan-Eshpushta coal region, scale 1:25,000, compiled by A. Vakab and H.A. Valisha.
Plate 3 - Map of the actual material in the search areas of the coal party, scale 1:25,000, compiled by A. Vakab and A. Valisha.
Plate 4 – Schematic geological map of the Kilij coal deposits, scale 1:5,000, compiled by V.E. Kulakov and S.M. Omar Faruk.
Plate 5 - Map of the actual material in the search areas of the Kilij coal deposits, scale 1:5,000, compiled by S.M. Omar Faruk.
Plate 6 – Schematic geological map of Eshpushta-Barfak area (Coal-mining District of Gul-e-Sang), scale 1:5,000, compiled by G. Rezo and A. Kode.
Plate 7 - Map of the actual material of the Eshpushta-Barfak area (Coal-mining District of Gul-e-Sang), scale 1:5,000, compiled by G. Rezo and A. Kode.
Plate 8 – Kilij coal deposits, normal sections of coal seams with test results, scale 1:50, compiled by S.M. Omar Faruk and V.E. Kulakov.
Plate 9 – Normal sections of coals seams with test results (Gul-e-Sang deposit, Kamard district, Karimak, and Barfak), scale 1:50, compiled by V.E. Kulakov and S.M. Omar Faruk.
Plate 10 – Geological column of bore hole no. 1, scale 1:200.


Plate 1 – Index map of coal-party work areas in 1979, scale 1:4,000,000, compiled by T. Akrat.
Plate 2 – Schematic geological map of Darra-i-Suf coal area, scale 1:50,000, compiled by Yu. Michaelovet.
Plate 3 – Schematic geological map of the Shabashak deposit, scale 1:5,000, compiled by B.N. Androsova and N.S. Kudrayasheva.
Plate 4 – Geological cross sections, scale 1:5,000, compiled by V.I. Kulakov.


Plate 1 - Index map and geological maps of the coal-bearing areas of north-eastern Afghanistan at a scale of 1:200,000 (on a topographic base at a scale of 1:100,000), Mirzad, S.H. and Manuchariants, O.A., eds., compiled by K.Y. Mikhailov, V.P. Kolchanov, V.V. Kulakov, B.R. Pashkov, B.N. Androsov, M.A. Chalyan, M.A. Munshizadah, M.Sh. Rustamie, and M.N. Fahimie.

1a - Sheet 221-F: Geological map, part of Bāghlan Province, scale 1:100,000, compiled by K.Y. Mikhailov, V.V. Kulakov, V.P. Kolchanov, and B.R. Pashkov.
1b - Sheet 222-C: Geological map, part of Tākhār Province, scale 1:100,000, compiled by K.Y. Mikhailov, V.P. Kolchanov, B.R. Pashkov, and B.N. Androsov.
1c - Sheet 222-D: Geological map, part of Farkhār Province, scale 1:100,000, compiled by K.Y. Mikhailov, V.P. Kolchanov, and B.R. Pashkov.
1e - Sheet 502-A, C: Geological map, part of Balkh [now Samangān] Province, scale 1:100,000, including sections A-B and C-D, compiled by K.Y. Mikhailov, V.P. Kolchanov, V.V. Kulakov, B.R. Pashkov, B.N. Androsov, and M.A. Chalyan.
1f - Sheet 502-B: Geological map, part of Samangān Province, scale 1:100,000, compiled by K.Y. Mikhailov, V.P. Kolchanov, B.R. Pashkov, and M.A. Chalyan.
1g - Sheet 502-D, F: Geological map, part of Samangān and Bāmyan Provinces, scale 1:100,000, compiled by K.Y. Mikhailov, V.P. Kolchanov, B.R. Pashkov, V.V. Kulakov, and B.N. Androsov.
1i - Sheet 503-B, D; 504-A: Geological map, part of Bāghlan Province, scale 1:100,000, compiled by K.Y. Mikhailov, V.V. Kulakov, V.P. Kolchanov, and B.R. Pashkov.
1j - Sheet 503-C (and part of 503-E): Geological map, part of Bāghlan Province, scale 1:100,000, compiled by K.Y. Mikhailov, V.V. Kulakov, V.P. Kolchanov, B.R. Pashkov, and M.A. Chalyan.

Plate 2 – Legend to geological maps (includes an edited version that reduced aging effects and an English translated version).
Plate 3 – Geological sections (16 sections), 2 sheets, scale 1:100,000.
Plate 4 – Summary stratigraphic columns (4 columns).
Plate 5 – Tectonic map of the coal-bearing regions of north-eastern Afghanistan, scale 1:300,000, 2 sheets, compiled by V.P. Kolchanov.
Plate 6 – Maps of useful minerals of coal-bearing areas of north-eastern Afghanistan at a scale of 1:200,000 (on a topographic base at a scale of 1:100,000), Mirzad, S.H. and Manuchariants, O.A., eds., compiled by K.Y. Mikhailov, V.P. Kolchanov, V.V. Kulakov, B.R. Pashkov, B.N. Androsov, M.A. Chalyan, M.A. Munshizadah, M.Sh. Rustamie, and M.N. Fahimie.

12

Plate 8 – Geomorphological map of coal-bearing regions of north-eastern Afghanistan, scale 1:300,000, compiled by K.Y. Mikhailov (2 sheets combined).

Plate 9 – Generalized hydrogeological map of coal-bearing areas of north-eastern Afghanistan, scale 1:500,000, compiled by V.V. Kulakov.


Plate 1 – Geological map, scale 1:200,000, on a 1:100,000-scale topographical base.
Plate 2 – Map of mineral resources and water-bearing points (combined), scale 1:200,000, on a 1:100,000-scale topographical base.
Plate 3 – Map of factual materials, scale 1:200,000, on a 1:100,000-scale topographical base.
Plate 4 – Sketch tectonic map, scale 1:300,000.
Plate 5 – Geomorphological map, scale 1:300,000.

Miroshnichenko, V.E., and Ksenofontov, I.V., 1968a, Report about search-prospecting and revisory works for coal, carried out by coal-prospecting party in 1967: Unpublished report by V/O Technoexport USSR (contract 1378) to the Afghanistan Ministry of Mines and Industries, Kabul, 96 p., 15 plates, (in English) [BGS no. 35].

Plate 1 – Map of coal deposits and coal occurrences of Afghanistan.
Plate 2 – Sheet 502-A, C: Geological map, part of Balkh [now Samangān] Province, 1:100,000-scale, including sections A-B and C-D, compiled by K.Y. Mikhailov, V.P. Kolchanov, V.V. Kulakov, B.R. Pashkov, B.N. Androsov, and M.A. Chalyan.
Plate 3 – Geological schematic of the northern Shabashek and Regbulak sections.
Plate 4 – Geological sections by lines I-II, II-II, III-III-, and IV-IV.
Plate 5 – Comparison of normal stratigraphic sections by mining openings and bore holes.
Plate 6 – Coal reserve calculation plan by seam 7.
Plate 7 – Sketch of pits 1, 2, and 4.
Plate 8 – Sketch of trenches 1 and 3.
Plate 9 – Sketch of trenches 4, 5, 10, 10a, 15, and 16.
Plate 10 – Scheme of correlation of logging diagram by bore holes 8, 9, and 4.
Plate 11 – Geological-geophysical section by hole 8.
Plate 12 – Geological-geophysical section by hole 9.
Plate 13 – Geological schematic map of the Lela carboniferous deposit.
Plate 14 – Geological schematic map of the Siakh-Shirin-Tagou interfluve.
Plate 15 – Sketch of trenches 1-6 at the Mirza-Volang section.


Plate 1 - Sheet 502-A, C: Geological map, part of Balkh [now Samangān] Province, 1:100,000-scale, including sections A-B and C-D, compiled by K.Y. Mikhailov, V.P. Kolchanov, V.V. Kulakov, B.R. Pashkov, B.N. Androsov, and M.A. Chalyan.
Plate 2 – Geological schematic map of the carbonaceous deposit “Darwaza,” scale 1:10,000, compiled by V. E. Miroshnichenko.

Murphy, C.G., and Owings, C.W., 1951, Program for developing the Ishpushta and Karkar coal mines for the Royal Afghan government: Unpublished report by U.S. Bureau of Mines, Kabul, 47 p, (in English) [AGS no. 501].


Plate 1 - Geological map of the coal deposit areas of Karkar and Dudkash, scale 1:50,000, compiled by K.Y. Mikhailov.
Plate 2 - Geological map of the Karkar and Dudkash coal deposits, scale 1:5,000, compiled by S.S. Lim and V.I. Muzyka.
  2a - Sheet N1, Jare Lalm Area.
  2b - Sheet N2, Karkar Area.
  2c - Sheet N3, Dudkash Area.
  2d - Sheet N4, Sangbor Area.
Plate 3 – Stratigraphic columns, compiled by S.S. Lim.
Plate 4 - Map of the actual material of the Karkar and Dudkash coal deposits, scale 1:5,000, compiled by S.S. Lim and V.I. Muzyka.
  4a - Sheet N1, Jare Lalm Area.
  4b - Sheet N2, Karkar Area.
4c - Sheet N3, Dudkash Area.
4d - Sheet N4, Sangbor Area.
Plate 5 – Legend to the geologic and actual material maps at 1:5,000 scale.
Plate 6 – Correlation diagram of Lower and Middle (up to the Batski Formation) Jurassic, scale 1:1,000, compiled by S.S. Lim.
Plate 7 – Correlation diagram of Middle (from Batski Formation) to Upper Jurassic, scale 1:1,000, compiled by S.S. Lim.
Plate 8 – Geological sections along exploration profiles, scale 1:1,000, compiled by V.I. Muzika.
Plate 9 – Geological sections along aligned bore holes and trenches, scales 1:50 to 1:1,000, compiled by V.I. Muzika.
Plate 10 – Schematic gypsometric ground plan for coal seam 11, scale 1:5,000, compiled by V.I. Muzika.
Plate 11 – Structural columns of coal seams, scale 1:50, compiled by V.I. Muzika.
11a – Sheet 1 (seams 1-10)
11b – Sheet 2 (seam 11)
Plate 12 – Geological sections along exploration bore holes, scale 1:200, compiled by V.I. Muzika.
12a – bore hole no. 1
12b – bore hole no. 2
12c – bore hole no. 3
12d – bore hole no. 4
12e – bore hole no. 7
12f – bore hole no. 8
12g – bore hole no. 9
12h – bore hole no. 10
12i – bore hole no. 11
12j – bore hole no. 12
12k – bore hole no. 13
12l – bore hole no. 14
12m – bore hole no. 15
Plate 13 – Geological sections along map-based bore holes, scale 1:500, compiled by V.I. Muzika.
13a – bore hole no. 112
13b – bore hole no. 113
13c – bore hole no. 114
13d – bore hole no. 116
13e – bore hole no. 118
13f – bore hole no. 119
13g – bore hole no. 120
13h – bore hole no. 121
13i – bore hole no. 126
13j – bore hole no. 127
13k – bore hole no. 6

Ode, W.H., 1959, Analyses of coal samples from Sabsak coal field in Herat Province:
Unpublished report by U.S. Bureau of Mines, Kabul, 6 p, (in English) [BGS no. 340].
Owings, C.W., 1952, Fires at Karkar coal mine: Unpublished report by U.S. Bureau of Mines, 8 p, (in English) [BGS no. 505].


Plate 1a – Site plan of prospects, Darra-i-Suf coal field in the Dahne-i-Tor region, west sheet, scale 1:5,000.
Plate 1b – Site plan of prospects, Darra-i-Suf coal field in the Dahne-i-Tor region, east sheet, scale 1:5,000.
Plate 2 – Macropetrographical columnar sections of the Darra Tor coal mine (Darra-e-Suf), scale 1:25.


Plate 1 – The coal occurrences within Darra-i-Suf (N. Afghanistan).
Plate 2 – Stratigraphic columns within the Dahan-i-Tor region.
Plate 3 – Distribution of the Saighan Series and the gross fold structure in the Darra-i-Suf coal region.
Plate 4 – The coal occurrences within the Darra Tor sheet.
Plate 5 – Sketch plan of the work coordination with projection of the planar excavation in the Dhana-i-Tor coal region.
Plate 6 – Adit 1
Plate 7 – Adit 2
Plate 8 – Adit 3
Plate 9 – Transverse profile through the southern Dahan-i-Tor valley.
Plate 10 – Growing excavation works towards further development of coal supplies in the Darra Tor sheet.
Plate 11 – The coal occurrences in Shabashak, the project plan for tunneling.
Plate 12 – Shabashak, cross section along the project’s main transect in the southwest river valley.
Plate 13 – Sketch of coal strata with test withdrawal sites.
Plate 14 – Test pits in inclined strata at Dahan-i-Tor (Darra-i-Suf).
Plate 15 – Darra Tor coal mine (Darra-e-Suf) North Afghanistan.
Plate 16 – Test pits in flat strata at Dahan-i-Tor (Darra-i-Suf).


Plate 18 - Geological reconnaissance map of the area Doab-Saighan-Hajar (northern Afghanistan), 1:120,000-scale, compiled by D. Weippert.

Plate 19 - Sections of the geological map of the Doab-Saighan-Hajar region (north Afghanistan), compiled by D. Weippert.

West, W.D., 1940, Progress report on the work of the government of India’s coal survey party in Afghanistan during 1940: Geological Survey of India, 93 p., 20 Plates (embedded in report), (in English) [BGS no. 415].


Table 1 – Unit correlations within north coal district, compiled by D. Wirtz [modified here to include only map areas considered by Gabert (1964), Hinze (1964), and Weippert (1964)].
Table 1. Characteristics of rectified map products contained in this database.

<table>
<thead>
<tr>
<th>Rectified Map Products</th>
<th>Scale</th>
<th>GIS</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beihefte zum Geologischen Jahrbuch (BGR) Products</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gabert[1964]_Plate17_RECTIFIED_Level2_AGS.tif</td>
<td>25,000</td>
<td>Yes</td>
<td>Gabert (1964)</td>
</tr>
<tr>
<td>Hinze[1964]_Plate14_RECTIFIED_Level2_AGS.tif</td>
<td>50,000</td>
<td>Yes</td>
<td>Hinze (1964)</td>
</tr>
<tr>
<td>Hinze[1964]_Plate16_RECTIFIED_Level2_AGS.tif</td>
<td>250,000</td>
<td>Yes</td>
<td>Hinze (1964)</td>
</tr>
<tr>
<td>Weippert[1964]_Plate18_RECTIFIED_Level2_AGS.tif</td>
<td>120,000</td>
<td>Yes</td>
<td>Weippert (1964)</td>
</tr>
<tr>
<td>V/O Technoexport USSR (VOTU) Products</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Report_0010_Plate1_RECTIFIED_Level2_AGS.tif</td>
<td>100,000</td>
<td></td>
<td>Mikhailov and others (1965)</td>
</tr>
<tr>
<td>Report_0010_Plate2_RECTIFIED_Level2_AGS.tif</td>
<td>100,000</td>
<td></td>
<td>Mikhailov and others (1965)</td>
</tr>
<tr>
<td>Report_0035_Plate3_RECTIFIED_Level2_AGS.tif</td>
<td>5,000</td>
<td>Yes</td>
<td>Miroshnichenko and Ksenofontov (1968a)</td>
</tr>
<tr>
<td>Report_0035_Plate14_RECTIFIED_Level2_AGS.tif</td>
<td>250,000</td>
<td></td>
<td>Miroshnichenko and Ksenofontov (1968a)</td>
</tr>
<tr>
<td>Report_0129_Plate2_RECTIFIED_Level2_AGS.tif</td>
<td>unknown</td>
<td></td>
<td>Jacob (1961)</td>
</tr>
<tr>
<td>Report_0131_Plate1a_RECTIFIED_Level2_AGS.tif</td>
<td>unknown</td>
<td></td>
<td>Seibdrat (1961)</td>
</tr>
<tr>
<td>Report_0473_Plate4_RECTIFIED_Level1_AGS.tif</td>
<td>5,000</td>
<td></td>
<td>Androsov and others (1965)</td>
</tr>
<tr>
<td>Report_0473_Plate5_RECTIFIED_Level2_AGS.tif</td>
<td>5,000</td>
<td></td>
<td>Androsov and others (1965)</td>
</tr>
<tr>
<td>Report_0473_Plate6_RECTIFIED_Level2_AGS.tif</td>
<td>5,000</td>
<td></td>
<td>Androsov and others (1965)</td>
</tr>
<tr>
<td>Report_0473_Plate8-1_RECTIFIED_Level1_AGS.tif</td>
<td>5,000</td>
<td></td>
<td>Androsov and others (1965)</td>
</tr>
<tr>
<td>Report_0473_Plate8-2_RECTIFIED_Level1_AGS.tif</td>
<td>5,000</td>
<td></td>
<td>Androsov and others (1965)</td>
</tr>
<tr>
<td>Report_0473_Plate9_RECTIFIED_Level1_AGS.tif</td>
<td>5,000</td>
<td></td>
<td>Androsov and others (1965)</td>
</tr>
<tr>
<td>Report_0473_Plate10_RECTIFIED_Level1_AGS.tif</td>
<td>5,000</td>
<td></td>
<td>Androsov and others (1965)</td>
</tr>
<tr>
<td>Report_0473_Plate11_RECTIFIED_Level1_AGS.tif</td>
<td>5,000</td>
<td></td>
<td>Androsov and others (1965)</td>
</tr>
<tr>
<td>Report_0473_Plate12_RECTIFIED_Level1_AGS.tif</td>
<td>5,000</td>
<td></td>
<td>Androsov and others (1965)</td>
</tr>
<tr>
<td>Report_0473_Plate13_RECTIFIED_Level1_AGS.tif</td>
<td>5,000</td>
<td></td>
<td>Androsov and others (1965)</td>
</tr>
<tr>
<td>Report_0473_Plate14_RECTIFIED_Level1_AGS.tif</td>
<td>5,000</td>
<td></td>
<td>Androsov and others (1965)</td>
</tr>
<tr>
<td>Report_0473_Plate15_RECTIFIED_Level1_AGS.tif</td>
<td>5,000</td>
<td></td>
<td>Androsov and others (1965)</td>
</tr>
<tr>
<td>Image Path</td>
<td>Scale</td>
<td>Yes</td>
<td>Authors (Year)</td>
</tr>
<tr>
<td>---------------------------------------------------------------------------</td>
<td>-------</td>
<td>-----</td>
<td>-----------------------</td>
</tr>
<tr>
<td>Report_0473_Plate16_RECTIFIED_Level1_AGS.tif</td>
<td>5,000</td>
<td></td>
<td>Androsov and others</td>
</tr>
<tr>
<td>Report_0473_Plate17-1_RECTIFIED_Level1_AGS.tif</td>
<td>5,000</td>
<td></td>
<td>Androsov and others</td>
</tr>
<tr>
<td>Report_0473_Plate17-2_RECTIFIED_Level1_AGS.tif</td>
<td>5,000</td>
<td></td>
<td>Androsov and others</td>
</tr>
<tr>
<td>Report_0485_Plate1a_RECTIFIED_Level1_AGS.tif</td>
<td>100,000</td>
<td>Yes</td>
<td>Mikhailov and others</td>
</tr>
<tr>
<td>Report_0485_Plate1a_Colored_RECTIFIED_Level1_AGS.tif</td>
<td>100,000</td>
<td>Yes</td>
<td>Mikhailov and others</td>
</tr>
<tr>
<td>Report_0485_Plate1b_RECTIFIED_Level1_AGS.tif</td>
<td>100,000</td>
<td>Yes</td>
<td>Mikhailov and others</td>
</tr>
<tr>
<td>Report_0485_Plate1b_Colored_RECTIFIED_Level1_AGS.tif</td>
<td>100,000</td>
<td>Yes</td>
<td>Mikhailov and others</td>
</tr>
<tr>
<td>Report_0485_Plate1c_RECTIFIED_Level1_AGS.tif</td>
<td>100,000</td>
<td>Yes</td>
<td>Mikhailov and others</td>
</tr>
<tr>
<td>Report_0485_Plate1c_Colored_RECTIFIED_Level1_AGS.tif</td>
<td>100,000</td>
<td>Yes</td>
<td>Mikhailov and others</td>
</tr>
<tr>
<td>Report_0485_Plate1d_RECTIFIED_Level1_AGS.tif</td>
<td>100,000</td>
<td>Yes</td>
<td>Mikhailov and others</td>
</tr>
<tr>
<td>Report_0485_Plate1d_Colored_RECTIFIED_Level1_AGS.tif</td>
<td>100,000</td>
<td>Yes</td>
<td>Mikhailov and others</td>
</tr>
<tr>
<td>Report_0485_Plate1e_Colored_RECTIFIED_Level1_AGS.tif</td>
<td>100,000</td>
<td>Yes</td>
<td>Mikhailov and others</td>
</tr>
<tr>
<td>Report_0485_Plate1f_RECTIFIED_Level1_AGS.tif</td>
<td>100,000</td>
<td>Yes</td>
<td>Mikhailov and others</td>
</tr>
<tr>
<td>Report_0485_Plate1g_RECTIFIED_Level1_AGS.tif</td>
<td>100,000</td>
<td>Yes</td>
<td>Mikhailov and others</td>
</tr>
<tr>
<td>Report_0485_Plate1g_Colored_RECTIFIED_Level1_AGS.tif</td>
<td>100,000</td>
<td>Yes</td>
<td>Mikhailov and others</td>
</tr>
<tr>
<td>Report_0485_Plate1h_RECTIFIED_Level1_AGS.tif</td>
<td>100,000</td>
<td>Yes</td>
<td>Mikhailov and others</td>
</tr>
<tr>
<td>Report_0485_Plate1h_Colored_RECTIFIED_Level1_AGS.tif</td>
<td>100,000</td>
<td>Yes</td>
<td>Mikhailov and others</td>
</tr>
<tr>
<td>Report_0485_Plate1i_RECTIFIED_Level1_AGS.tif</td>
<td>100,000</td>
<td>Yes</td>
<td>Mikhailov and others</td>
</tr>
<tr>
<td>Report_0485_Plate1i_Colored_RECTIFIED_Level1_AGS.tif</td>
<td>100,000</td>
<td>Yes</td>
<td>Mikhailov and others</td>
</tr>
<tr>
<td>Report_0485_Plate1j_RECTIFIED_Level1_AGS.tif</td>
<td>100,000</td>
<td>Yes</td>
<td>Mikhailov and others</td>
</tr>
<tr>
<td>Report_0485_Plate1j_Colored_RECTIFIED_Level1_AGS.tif</td>
<td>100,000</td>
<td>Yes</td>
<td>Mikhailov and others</td>
</tr>
<tr>
<td>Report_0485_Plate1j_Mosaic_RECTIFIED_Level2_AGS.tif</td>
<td>100,000</td>
<td>Yes</td>
<td>Mikhailov and others</td>
</tr>
<tr>
<td>Report_0485_Plate5a_RECTIFIED_Level2_AGS.tif</td>
<td>300,000</td>
<td>Yes</td>
<td>Mikhailov and others</td>
</tr>
<tr>
<td>Report_0485_Plate5b_RECTIFIED_Level2_AGS.tif</td>
<td>300,000</td>
<td>Yes</td>
<td>Mikhailov and others</td>
</tr>
<tr>
<td>Report_0485_Plate6a_RECTIFIED_Level1_AGS.tif</td>
<td>100,000</td>
<td></td>
<td>Mikhailov and others</td>
</tr>
<tr>
<td>Report_0485_Plate6b_RECTIFIED_Level1_AGS.tif</td>
<td>100,000</td>
<td></td>
<td>Mikhailov and others</td>
</tr>
<tr>
<td>Report_0485_Plate6e_RECTIFIED_Level1_AGS.tif</td>
<td>100,000</td>
<td></td>
<td>Mikhailov and others</td>
</tr>
<tr>
<td>Report_0485_Plate6f_RECTIFIED_Level1_AGS.tif</td>
<td>100,000</td>
<td></td>
<td>Mikhailov and others</td>
</tr>
<tr>
<td>Report_0485_Plate6g_RECTIFIED_Level1_AGS.tif</td>
<td>100,000</td>
<td>Mikhailov and others (1967)</td>
<td></td>
</tr>
<tr>
<td>Report_0485_Plate6h_RECTIFIED_Level1_AGS.tif</td>
<td>100,000</td>
<td>Mikhailov and others (1967)</td>
<td></td>
</tr>
<tr>
<td>Report_0485_Plate6j_RECTIFIED_Level1_AGS.tif</td>
<td>100,000</td>
<td>Mikhailov and others (1967)</td>
<td></td>
</tr>
<tr>
<td>Report_0840_Plate2_RECTIFIED_Level2_AGS.tif</td>
<td>5,000</td>
<td>Kotov (1968)</td>
<td></td>
</tr>
<tr>
<td>Report_0840_Plate4_RECTIFIED_Level2_AGS.tif</td>
<td>5,000</td>
<td>Kotov (1968)</td>
<td></td>
</tr>
<tr>
<td>Report_1068_Plate2_RECTIFIED_Level1_BGS.tif</td>
<td>10,000</td>
<td>Miroshnichenko and Ksenofontov (1968b)</td>
<td></td>
</tr>
<tr>
<td>Report_1383_Plate2_RECTIFIED_Level2_AGS.tif</td>
<td>25,000</td>
<td>Yes Kulakov and others (1979)</td>
<td></td>
</tr>
<tr>
<td>Report_1383_Plate3_RECTIFIED_Level2_AGS.tif</td>
<td>25,000</td>
<td>Yes Kulakov and others (1979)</td>
<td></td>
</tr>
<tr>
<td>Report_1383_Plate4_RECTIFIED_Level2_AGS.tif</td>
<td>5,000</td>
<td>Yes Kulakov and others (1979)</td>
<td></td>
</tr>
<tr>
<td>Report_1383_Plate5_RECTIFIED_Level2_AGS.tif</td>
<td>5,000</td>
<td>Yes Kulakov and others (1979)</td>
<td></td>
</tr>
<tr>
<td>Report_1383_Plate6_RECTIFIED_Level2_AGS.tif</td>
<td>5,000</td>
<td>Yes Kulakov and others (1979)</td>
<td></td>
</tr>
<tr>
<td>Report_1383_Plate7_RECTIFIED_Level2_AGS.tif</td>
<td>5,000</td>
<td>Kulakov and others (1979)</td>
<td></td>
</tr>
<tr>
<td>Report_1748_Plate2_RECTIFIED_Level2_BGS.tif</td>
<td>50,000</td>
<td>Kulakov and Omar (1979)</td>
<td></td>
</tr>
<tr>
<td>Report_1753_Plate1_Colored_RECTIFIED_Level2_AGS.tif</td>
<td>50,000</td>
<td>Muzika and Lim (1976)</td>
<td></td>
</tr>
<tr>
<td>Report_1753_Plate2a_RECTIFIED_Level2_BGS.tif</td>
<td>5,000</td>
<td>Yes(^4) Muzika and Lim (1976)</td>
<td></td>
</tr>
<tr>
<td>Report_1753_Plate2b_Colored_RECTIFIED_Level2_BGS.tif</td>
<td>5,000</td>
<td>Yes(^4) Muzika and Lim (1976)</td>
<td></td>
</tr>
<tr>
<td>Report_1753_Plate2c_Colored_RECTIFIED_Level2_BGS.tif</td>
<td>5,000</td>
<td>Yes(^4) Muzika and Lim (1976)</td>
<td></td>
</tr>
<tr>
<td>Report_1753_Plate2d_Colored_RECTIFIED_Level2_BGS.tif</td>
<td>5,000</td>
<td>Yes(^4) Muzika and Lim (1976)</td>
<td></td>
</tr>
<tr>
<td>Report_1753_Plate2e_Colored_Mosaic_RECTIFIED_Level2_BGS.tif</td>
<td>5,000</td>
<td>Yes(^4) Muzika and Lim (1976)</td>
<td></td>
</tr>
<tr>
<td>Report_1753_Plate4a_RECTIFIED_Level2_BGS.tif</td>
<td>5,000</td>
<td>Yes Muzika and Lim (1976)</td>
<td></td>
</tr>
<tr>
<td>Report_1753_Plate4b_RECTIFIED_Level2_BGS.tif</td>
<td>5,000</td>
<td>Yes Muzika and Lim (1976)</td>
<td></td>
</tr>
<tr>
<td>Report_1753_Plate4c_RECTIFIED_Level2_BGS.tif</td>
<td>5,000</td>
<td>Yes Muzika and Lim (1976)</td>
<td></td>
</tr>
<tr>
<td>Report_1753_Plate4d_RECTIFIED_Level2_BGS.tif</td>
<td>5,000</td>
<td>Yes Muzika and Lim (1976)</td>
<td></td>
</tr>
</tbody>
</table>

1Rectification based only on map coordinates is Level1; rectification based on controlled Landsat image base is Level2. Products scanned by Afghanistan Geological Survey are designated as AGS; those scanned by British Geological Survey are designated as BGS.
2Yes, if map was converted to a GIS database.
3Maps were digitized but were merged and controlled to the Report_0485_Plate1_Mosaic_RECTIFIED_Level2_AGS image base.
4Maps were digitized but were merged and controlled to the Report_1753_Plate2e_Colored_Mosaic_RECTIFIED_Level2_BGS image base.
Table 2. Database for previously unpublished Afghanistan reports and available plates and a relevant plate from a German publication.

<table>
<thead>
<tr>
<th>Beihefte zum Geologischen Jahrbuch (BGR)</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wirtz[1964].Table 1[modified].AGS.pdf</td>
<td>Wirtz (1964)</td>
</tr>
<tr>
<td><strong>Unpublished Afghanistan Reports</strong></td>
<td></td>
</tr>
<tr>
<td>Report_0010_AGS</td>
<td>Mikhailov and others (1965)</td>
</tr>
<tr>
<td>Report_0035_AGS</td>
<td>Miroshnichenko and Ksenofontov (1968a)</td>
</tr>
<tr>
<td>Report_0129_AGS</td>
<td>Jacob (1961)</td>
</tr>
<tr>
<td>Report_0130_AGS</td>
<td>Seibdrat and Weippert (1963)</td>
</tr>
<tr>
<td>Report_0131_AGS</td>
<td>Seibdrat (1961)</td>
</tr>
<tr>
<td>Report_0142_AGS</td>
<td>Jacob (1963)</td>
</tr>
<tr>
<td>Report_0194_BGS</td>
<td>Hamer (1954)</td>
</tr>
<tr>
<td>Report_0252_AGS</td>
<td>Drath (1939)</td>
</tr>
<tr>
<td>Report_0340_BGS</td>
<td>Ode (1959)</td>
</tr>
<tr>
<td>Report_0348_BGS</td>
<td>Clausen (1965)</td>
</tr>
<tr>
<td>Report_0415_BGS</td>
<td>West (1940)</td>
</tr>
<tr>
<td>Report_0473_AGS</td>
<td>Androsov and others (1965)</td>
</tr>
<tr>
<td>Report_0481_AGS</td>
<td>Kudryashov and others (1966)</td>
</tr>
<tr>
<td>Report_0485_BGS and Report_0819_BGS</td>
<td>Mikhailov and others (1967)</td>
</tr>
<tr>
<td>Report_0488_BGS</td>
<td>Fox (1936)</td>
</tr>
<tr>
<td>Report_0490_BGS</td>
<td>Graham (1956)</td>
</tr>
<tr>
<td>Report_0491_BGS</td>
<td>Permitina and others (1965)</td>
</tr>
<tr>
<td>Report_0501_AGS</td>
<td>Murphy and Owings (1951)</td>
</tr>
<tr>
<td>Report_0505_BGS</td>
<td>Owings (1952)</td>
</tr>
<tr>
<td>Report_0507_BGS</td>
<td>Walsh (1950)</td>
</tr>
<tr>
<td>Report_ID</td>
<td>Author/Reference</td>
</tr>
<tr>
<td>----------------------</td>
<td>-----------------------------------</td>
</tr>
<tr>
<td>Report_0515_AGs</td>
<td>Czerski (1944)</td>
</tr>
<tr>
<td>Report_0518_BGS</td>
<td>Walsh (1949)</td>
</tr>
<tr>
<td>Report_0528_BGS</td>
<td>Gupta and Dharma Rao (1979)</td>
</tr>
<tr>
<td>Report_0840_AGs</td>
<td>Kotov (1968)</td>
</tr>
<tr>
<td>Report_1068_BGS</td>
<td>Miroshnichenko and Ksenofontov (1968b)</td>
</tr>
<tr>
<td>Report_1188_BGS</td>
<td>Azimi and others (1977)</td>
</tr>
<tr>
<td>Report_1309_AGs</td>
<td>Dronov and others (1971)</td>
</tr>
<tr>
<td>Report_1318_AGs</td>
<td>Dronov and Leven (1971)</td>
</tr>
<tr>
<td>Report_1383_AGs</td>
<td>Kulakov and others (1979)</td>
</tr>
<tr>
<td>Report_1635_AGs</td>
<td>Bgradyan and Masud (1988)</td>
</tr>
<tr>
<td>Report_1748_BGS</td>
<td>Kulakov and Omar (1979)</td>
</tr>
<tr>
<td>Report_1751_BGS</td>
<td>Kulakov (1979)</td>
</tr>
<tr>
<td>Report_1753_BGS</td>
<td>Muzika and Lim (1976)</td>
</tr>
</tbody>
</table>

1 Unpublished reports scanned by Afghanistan Geological Survey are designated as AGS; those scanned by British Geological Survey are designated as BGS.