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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

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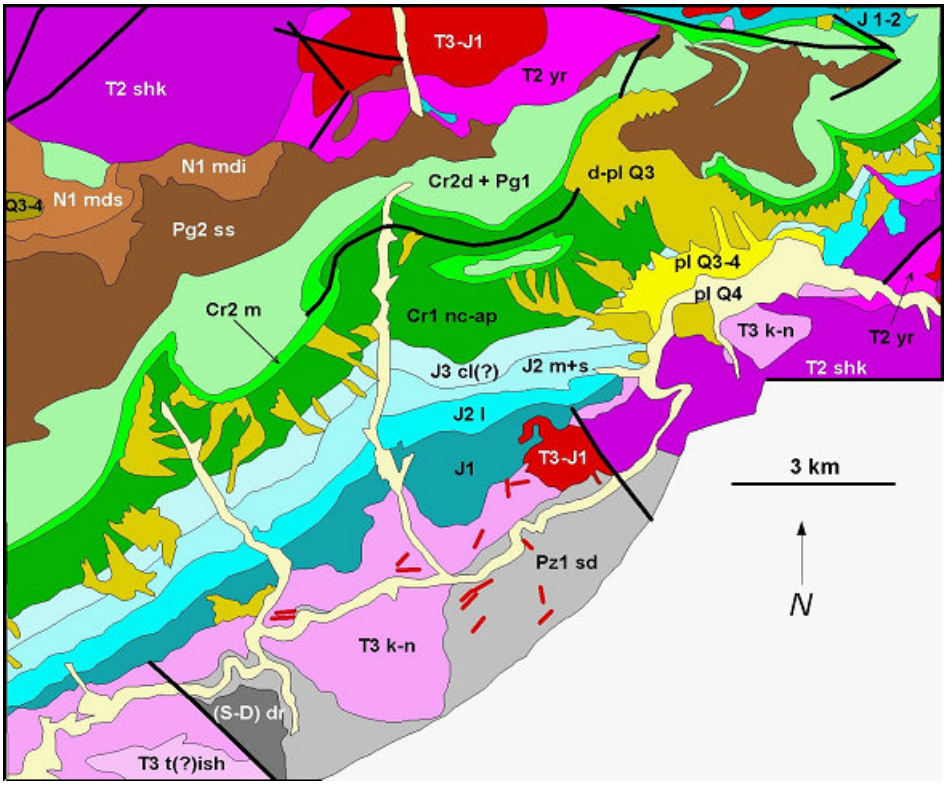

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Introduction

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first steps in the assessment process was to compile digital Geographic Information Systems (GIS) databases of selected unpublished maps and associated materials archived at the Afghanistan Geological Survey (AGS).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

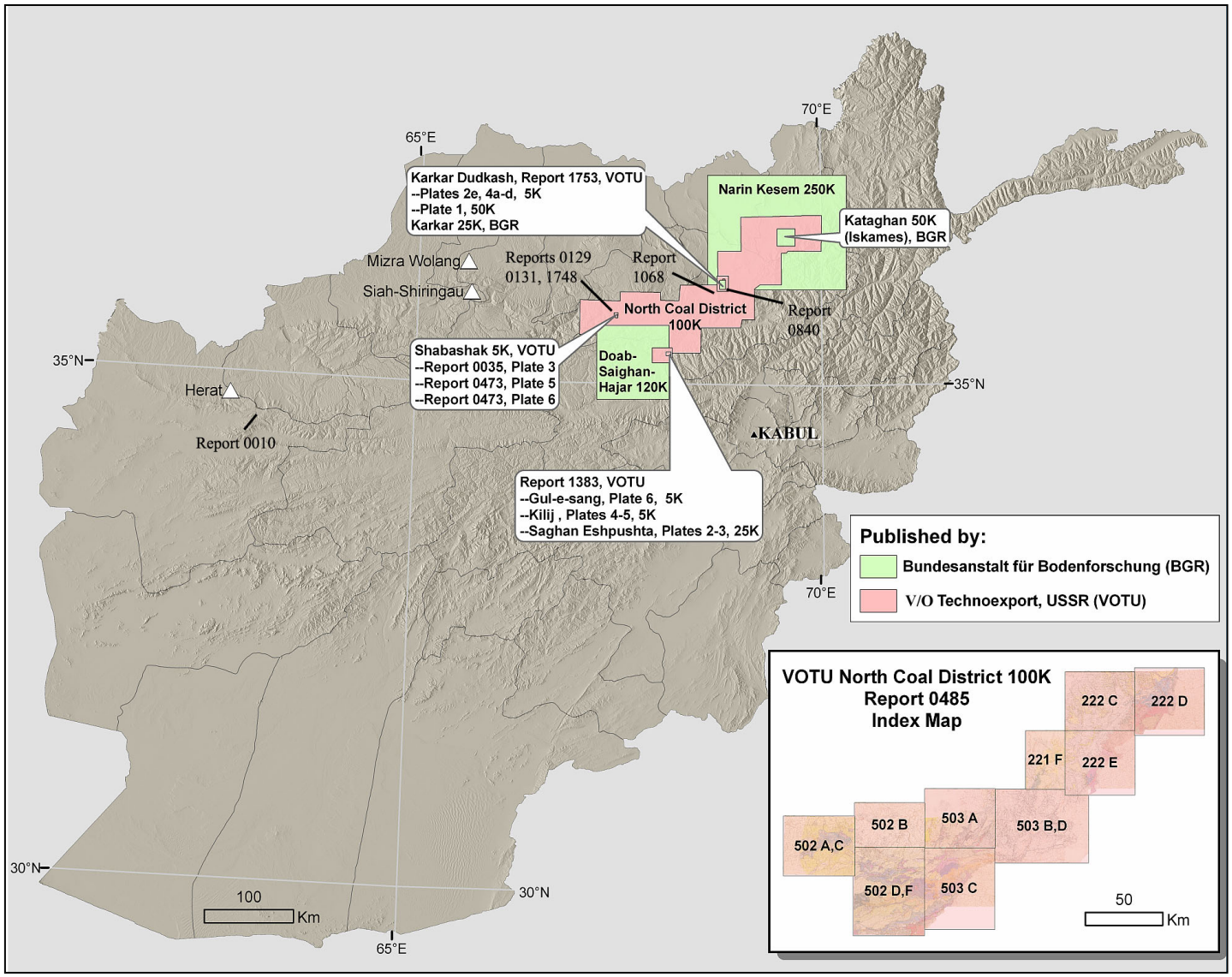

Figure 1. Index map showing locations of scanned coal maps included in this publication. See table 1 for more information about each map. Maps within colored boxes and/or white leaders exist as GIS databases. Report labels with black leaders have rectified images but no GIS files. White triangles show 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.

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Published and Previously Unpublished Sources

Androsov, B.N., Kudriashev, N.S., Saidalikhodjaev, G.N., and Marshansky, I.I., 1965, Report of geological-reconnaissance works at the Shabashak coal deposit in 1963-1964: Unpublished report by V/O Technoexport USSR (contract no. 640) to the Afghanistan Ministry of Mines and Industries, Kabul, 3 Volumes: Vol. I (English text), 156 p.; Vol. II (tables of reserve calculation and annexes with initial data, mostly Russian), 238 p.; Vol. III (graphics annexes), 54 plates (1 plate missing but similar to Plate 5), [BGS no. 473].

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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].

Bagradyan, Yu. M., and Masud, R.M., 1988, Program of prospecting-evaluation works in northern part of coal deposit Karkar (Baglan Province) for 1988-1990: Unpublished report by V/O Technoexport USSR (contract no. 55-189/02900) to the Afghanistan Ministry of Mines and Industries, Kabul, 17 p, 4 Plates – 1 missing, [BGS no. 1635] (in Russian).

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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].

Davis, P.A., 2006, Calibrated Landsat ETM+ nonthermal-band image mosaics of Afghanistan: U.S. Geological Survey Open-File Report 2006-1345, 18 p.

Dharma Rao, P., and Gupta, K.L., 1980, Short-report on reorganization of Karkar mine (Pul-e-Khumri area, North Coal Department): Unpublished report by the Indian Technical Economic Cooperation Programme, Kabul, 76 p, 8 Plates (embedded in report), (in English) [AGS no. 1966].

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., Kalimulin, S. M., and Kochetkov, A.N., 1971, Coal-bearing deposits of the eastern part of Firuzkokh Range (northwest Afghanistan): Unpublished report by V/O Technoexport USSR to the Afghanistan Ministry of Mines and Industries, 5 p, (in Russian) [AGS no. 1309].

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].

Gabert, G., 1964, Zur Geologie des Gebietes von Karkar (Nordost-Afghanistan) [Translation: The geology of the Karkar region (northeast Afghanistan)], *in* Wirtz, D., ed., Zur

Geologie von Nordost- und Zentral-Afghanistan: Beihefte zum Geologischen Jahrbuch, Beihefte zum Geologischen Jahrbuch, v. 70, Bundesanstalt für Bodenforschung, Hannover, Germany, p. 77-98 (in German).

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Graham, H.D., 1956, Safety in coal mining for Afghanistan: U.S. Bureau of Mines, Kabul, 215 p, (in English) [BGS no. 490].

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].

Hinze, C., 1964, Die geologische Entwicklung der oestlichen Hindukush – Nordflanke (Nord-Ost-Afghanistan) [Translation: The geological development of the north flank of the eastern Hindukush (northeast Afghanistan)], *in* Wirtz, D., ed., Zur Geologie von Nordost- und Zentral-Afghanistan: Beihefte zum Geologischen Jahrbuch, v. 70, Bundesanstalt für Bodenforschung, Hannover, Germany, p. 19-76 (in German).

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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].

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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].

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Plate 4 – Gypsometric plan of the Karkar-Dudkash deposit coal seam, scale 1:5,000, compiled by V. Miroshnichenko.

Kudryashov, N.S., Sanjapov, A.T., and Androsov, B.N., 1966, Report on the geological work, carried out by the coal-prospecting party in northern Afghanistan in 1965: Unpublished report by V/O Technoexport USSR (contracts 640 and 1378) to the Afghanistan Ministry of Mines and Industries, Kabul, 3 Volumes: Vol. I (English text), 121 p; Vol. II (Russian text), 131 p; Vol. III (graphics annex), 28 Plates (27 missing), [BGS no. 481].

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.

Kulakov, V.I., 1979, Project on the geological survey at the Darra-i-Suf coal region for 1980-1984: Unpublished report by V/O Technoexport USSR (contracts 55-189/02900) to the Afghanistan Ministry of Mines and Industries, Kabul, 88 p, 12 Plates, (in Russian) [BGS no. 1751].

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

Plate 11 – Coal deposits of Lela. Block diagram of reserves, scale 1:10,000, compiled by V.I. Kukalov.
Plate 12 – Legend to the generalized geologic map and geologic cross sections, scale 1:5,000 and 1:10,000.

Kulakov, V.I., Omar Faruk, S.M., Rezo, G., Vakab, A., Valisha, H.A., Osef, M., and Masum, M., 1979, Results of prospecting and prospecting-evaluation works in eastern part of Saghan-Eshpushta coal region (Report of coal group on works in 1978): Unpublished report by V/O Technoexport USSR (contracts 55-187/11500) to the Afghanistan Ministry of Mines and Industries, Kabul, 66 p., 10 Plates, (in Russian) [BGS no. 1383].

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.

Kulakov, V.I., and Omar, S., 1979, Proposal of the geological and explorational works at the Shabashak coal deposit in the year 1979: Unpublished report by V/O Technoexport USSR (contracts 55-187/11500) to the Afghanistan Ministry of Mines and Industries, Kabul, 52 p, 4 Plates, (in Russian) [BGS no. 1748].

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.

Mikhailov, K.Y., Kolchanov, V.P., Kulakov, V.V., Pashkov, B.R., Androsov, B.N., and Chalyan, M.A., 1967, Report of the geological-surveying works at 1:200,000 scale in the coal bearing regions of the northeastern Afghanistan–Map sheets: 222-C, 502-D, 503-B; parts

of map sheets: 221-F, 222-D, 222-F, 502-A, 502-B, 502-C, 502-F, 503-A, 503-C, 503-D, 503-E, and 504-A; Unpublished report by V/O Technoexport USSR (contracts 640 and 1378) to the Afghanistan Ministry of Mines and Industries, Kabul, 2 Volumes: Vol. I (English text; [BGS no 819], 406 p; Russian text, [BGS no. 485], 442 p); Vol. II (graphics annex), 31 Plates.

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 Manucharians, 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.

1d - Sheet 222-E: Geological map, part of Tākhār and Bāghlan Provinces, scale 1:100,000, compiled by K.Y. Mikhailov, B.N. Androsov, 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.

1h - Sheet 503-A: Geological map, part of Bāghlan and Samangān Provinces, scale 1:100,000, compiled by K.Y. Mikhailov, V.P. Kolchanov, and B.R. Pashkov.

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 Manucharians, 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.

6a - Sheet 221-F: Mineral map, part of Bāghlan Province, scale 1:100,000, compiled by K.Y. Mikhailov, V.V. Kulakov, V.P. Kolchanov, and B.R. Pashkov.
6b - Sheet 222-C: Mineral map, part of Tākhār Province, scale 1:100,000, compiled by K.Y. Mikhailov, V.P. Kolchanov, B.R. Pashkov, and B.N. Androsov.
6e - Sheet 502-A, C: Mineral map, part of Balkh [now Samangān] Province, scale 1:100,000, compiled by K.Y. Mikhailov, V.P. Kolchanov, V.V. Kulakov, B.R. Pashkov, B.N. Androsov, and M.A. Chalyan.
6f - Sheet 502-B: Mineral map, part of Samangān Province, scale 1:100,000, compiled by K.Y. Mikhailov, V.P. Kolchanov, B.R. Pashkov, and M.A. Chalyan.
6g - Sheet 502-D, F: Mineral 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.
6h - Sheet 503-A: Mineral map, part of Bāghlan and Samangān Provinces, scale 1:100,000, compiled by K.Y. Mikhailov, V.P. Kolchanov, and B.R. Pashkov.
6j - Sheet 503-C (and part of 503-E): Mineral map, part of B ghlan Province, scale 1:100,000, compiled by K.Y. Mikhailov, V.V. Kulakov, V.P. Kolchanov, B.R. Pashkov, and M.A. Chalyan.
Plate 7 – Legend to the mineral maps, 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.
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.

Mikhailov, K.Y., Kulakov, V.V., Kolchanov, V.P., and Pashkov, B.R, 1965, Report of geological surveying works for coal, scale 1:200,000. Part I: Herat Province: Unpublished report by V/O Technoexport USSR (contract 640) to Afghanistan Ministry of Mines and Industries, Kabul, 151 p., 58 Figures, 6 Plates (1 missing), (in English) [BGS no. 10].

Plate 1 – Geological map, scale 1:200,000, on 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.
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Plate 15 – Sketch of trenches 1-6 at the Mirza-Volang section.

Miroshnichenko, V.E., and Ksenofontov, I.V., 1968b, Report of coal-prospecting party about search works at the Darwasa coal-bearing deposit for 1967: Unpublished report by V/O Technoexport USSR (contracts 1378 and 50728) to the Afghanistan Ministry of Mines and Industries, Kabul, 43 p., 2 plates, (in Russian) [BGS no. 1068].

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].

Muzika, V.I., and Lim, S.S., 1976, Report of exploration works in the coal bearing regions of Karkar and Dudkash in the years 1974–76: Unpublished report by V/O Technoexport USSR (contract 55-184/17500) to the Afghanistan Ministry of Mines and Industries, Kabul, 2 Volumes: Vol. I (Russian text), 166 p; Vol. II (graphics annex), 42 Plates, [BGS no. 1753].

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.
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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.
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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
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13a – bore hole no. 112
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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].

Permitina, K.S., Vetrova, A.K., and Lobanova, L.I., 1965, Investigation of coals of the Shabashak deposit, Afghanistan: Unpublished report by Eastern Scientific-Research Coal-Chemical Institute (Technoexport contract 640), Sverdlovak, 67 p, (in English) [BGS no. 491].

Seibdrat, H., 1961, Bericht über die Ergebnisse einer Befahrung des Kohlenrevieres von Darra-i-Suf im Oktober 1961 [Translation: Report on the results of travel in the coal region of Darra-i-Suf in October 1961], Deutsche Geologische Mission, 6 p, 3 Plates, (in German) [AGS no. 131].

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.

Siebdrat, H., and Weippert, D., 1963, Zwischenbericht über die Geologischen Arbeiten zum Kohlengebiet von Darra-i-Suf mit Vorschlagen für Bergbauliche Massnahmen [Translation: Interim report on the geologic workings in the Darra-i-Suf coal region with recommendations for mining actions], Deutsche Geologische Mission, 29 p, 16 Plates (in German) [AGS no. 130].

Plate 1 – The coal occurrences within Darra-i-Suf (N. Afghanistan).
Plate 2 – Stratigraphic columns within the Dahan-i-Tor region.
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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).

Walsh, M.A., 1949, Ishpushta coal mine: Unpublished report of U.S. Bureau of Mines to the Afghanistan Ministry of Mines and Industries, Kabul, 62 p, (in English and Dari) [BGS no. 518].

Walsh, M.A., 1950, Development of coal reserves at Ishpushta: Unpublished report of U.S. Bureau of Mines to the Afghanistan Ministry of Mines and Industries, Kabul, 31 p, (in English) [BGS no. 507].

Weippert, D., 1964, Zur Geologie des Gebietes von Doab-Saighan-Hajar (Nord Afghanistan) [Translation: The geology of the Doab-Saighan-Hajar region (north Afghanistan)], *in* Wirtz, D., ed., Zur Geologie von Nordost- und Zentral-Afghanistan: Beihefte zum Geologischen Jahrbuch Beihefte zum Geologischen Jahrbuch, v. 70, Bundesanstalt für Bodenforschung, Hannover, Germany, pp. 153-184 (in German).

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].

Wirtz, D., 1964, Zur Regionalgeologischen Stellung der Afghanistan Gebirge, Einführung und Gesamtübersicht, [Translation: The regional geologic setting of the Afghanistan mountain ranges, introduction and overview], *in* Wirtz, D., ed., Zur Geologie von Nordost- und Zentral-Afghanistan: Zur Geologie von Nordost- und Zentral-Afghanistan: Beihefte zum Geologischen Jahrbuch, v. 70, Bundesanstalt für Bodenforschung, Hannover, Germany, pp. 15-18 (in German).

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.

Rectified Map Products[1]	Scale	GIS[2]	Source
Beihefte zum Geologischen Jahrbuch (BGR) Products			
Gabert[1964]_Plate17_RECTIFIED_Level2_AGS.tif	25,000	Yes	Gabert (1964)
Hinze[1964]_Plate14_RECTIFIED_Level2_AGS.tif	50,000	Yes	Hinze (1964)
Hinze[1964]_Plate16_RECTIFIED_Level2_AGS.tif	250,000	Yes	Hinze (1964)
Weippert[1964]_Plate18_RECTIFIED_Level2_AGS.tif	120,000	Yes	Weippert (1964)
V/O Technoexport USSR (VOTU) Products			
Report_0010_Plate1_RECTIFIED_Level2_AGS.tif	100,000		Mikhailov and others (1965)
Report_0010_Plate2_RECTIFIED_Level2_AGS.tif	100,000		Mikhailov and others (1965)
Report_0035_Plate3_RECTIFIED_Level2_AGS.tif	5,000	Yes	Miroshnichenko and Ksenofontov (1968a)
Report_0035_Plate14_RECTIFIED_Level2_AGS.tif	250,000		Miroshnichenko and Ksenofontov (1968a)
Report_0129_Plate2_RECTIFIED_Level2_AGS.tif	unknown		Jacob (1961)
Report_0131_Plate1a_RECTIFIED_Level2_AGS.tif	unknown		Seibdrat (1961)
Report_0473_Plate4_RECTIFIED_Level1_AGS.tif	5,000		Androsov and others (1965)
Report_0473_Plate5_RECTIFIED_Level2_AGS.tif	5,000	Yes	Androsov and others (1965)
Report_0473_Plate6_RECTIFIED_Level2_AGS.tif	5,000	Yes	Androsov and others (1965)
Report_0473_Plate8-1_RECTIFIED_Level1_AGS.tif	5,000		Androsov and others (1965)
Report_0473_Plate8-2_RECTIFIED_Level1_AGS.tif	5,000		Androsov and others (1965)
Report_0473_Plate9_RECTIFIED_Level1_AGS.tif	5,000		Androsov and others (1965)
Report_0473_Plate10_RECTIFIED_Level1_AGS.tif	5,000		Androsov and others (1965)
Report_0473_Plate11_RECTIFIED_Level1_AGS.tif	5,000		Androsov and others (1965)
Report_0473_Plate12_RECTIFIED_Level1_AGS.tif	5,000		Androsov and others (1965)
Report_0473_Plate13_RECTIFIED_Level1_AGS.tif	5,000		Androsov and others (1965)
Report_0473_Plate14_RECTIFIED_Level1_AGS.tif	5,000		Androsov and others (1965)
Report_0473_Plate15_RECTIFIED_Level1_AGS.tif	5,000		Androsov and others (1965)

Report_0473_Plate16_RECTIFIED_Level1_AGS.tif	5,000		Androsov and others (1965)
Report_0473_Plate17-1_RECTIFIED_Level1_AGS.tif	5,000		Androsov and others (1965)
Report_0473_Plate17-2_RECTIFIED_Level1_AGS.tif	5,000		Androsov and others (1965)
Report_0485_Plate1a_RECTIFIED_Level1_AGS.tif	100,000	Yes[3]	Mikhailov and others (1967)
Report_0485_Plate1a_Colored_RECTIFIED_Level1_AGS.tif	100,000	Yes[3]	Mikhailov and others (1967)
Report_0485_Plate1b_RECTIFIED_Level1_AGS.tif	100,000	Yes[3]	Mikhailov and others (1967)
Report_0485_Plate1b_Colored_RECTIFIED_Level1_AGS.tif	100,000	Yes[3]	Mikhailov and others (1967)
Report_0485_Plate1c_RECTIFIED_Level1_AGS.tif	100,000	Yes[3]	Mikhailov and others (1967)
Report_0485_Plate1c_Colored_RECTIFIED_Level1_AGS.tif	100,000	Yes[3]	Mikhailov and others (1967)
Report_0485_Plate1d_RECTIFIED_Level1_AGS.tif	100,000	Yes[3]	Mikhailov and others (1967)
Report_0485_Plate1d_Colored_RECTIFIED_Level1_AGS.tif	100,000	Yes[3]	Mikhailov and others (1967)
Report_0485_Plate1e_Colored_RECTIFIED_Level1_AGS.tif	100,000	Yes[3]	Mikhailov and others (1967)
Report_0485_Plate1f_RECTIFIED_Level1_AGS.tif	100,000	Yes[3]	Mikhailov and others (1967)
Report_0485_Plate1g_RECTIFIED_Level1_AGS.tif	100,000	Yes[3]	Mikhailov and others (1967)
Report_0485_Plate1g_Colored_RECTIFIED_Level1_AGS.tif	100,000	Yes[3]	Mikhailov and others (1967)
Report_0485_Plate1h_RECTIFIED_Level1_AGS.tif	100,000	Yes[3]	Mikhailov and others (1967)
Report_0485_Plate1h_Colored_RECTIFIED_Level1_AGS.tif	100,000	Yes[3]	Mikhailov and others (1967)
Report_0485_Plate1i_RECTIFIED_Level1_AGS.tif	100,000	Yes[3]	Mikhailov and others (1967)
Report_0485_Plate1i_Colored_RECTIFIED_Level1_AGS.tif	100,000	Yes[3]	Mikhailov and others (1967)
Report_0485_Plate1j_Colored_RECTIFIED_Level1_AGS.tif	100,000	Yes[3]	Mikhailov and others (1967)
Report_0485_Plate1j_Mosaic_RECTIFIED_Level2_AGS.tif	100,000	Yes[3]	Mikhailov and others (1967)
Report_0485_Plate5a_RECTIFIED_Level2_AGS.tif	300,000	Yes	Mikhailov and others (1967)
Report_0485_Plate5b_RECTIFIED_Level2_AGS.tif	300,000	Yes	Mikhailov and others (1967)
Report_0485_Plate6a_RECTIFIED_Level1_AGS.tif	100,000		Mikhailov and others (1967)
Report_0485_Plate6b_RECTIFIED_Level1_AGS.tif	100,000		Mikhailov and others (1967)
Report_0485_Plate6e_RECTIFIED_Level1_AGS.tif	100,000		Mikhailov and others (1967)
Report_0485_Plate6f_RECTIFIED_Level1_AGS.tif	100,000		Mikhailov and others (1967)

Report_0485_Plate6g_RECTIFIED_Level1_AGS.tif	100,000		Mikhailov and others (1967)
Report_0485_Plate6h_RECTIFIED_Level1_AGS.tif	100,000		Mikhailov and others (1967)
Report_0485_Plate6j_RECTIFIED_Level1_AGS.tif	100,000		Mikhailov and others (1967)
Report_0840_Plate2_RECTIFIED_Level2_AGS.tif	5,000		Kotov (1968)
Report_0840_Plate4_RECTIFIED_Level2_AGS.tif	5,000		Kotov (1968)
Report_1068_Plate2_RECTIFIED_Level1_BGS.tif	10,000		Miroshnichenko and Ksenofontov (1968b)
Report_1383_Plate2_RECTIFIED_Level2_AGS.tif	25,000	Yes	Kulakov and others (1979)
Report_1383_Plate3_RECTIFIED_Level2_AGS.tif	25,000	Yes	Kulakov and others (1979)
Report_1383_Plate4_RECTIFIED_Level2_AGS.tif	5,000	Yes	Kulakov and others (1979)
Report_1383_Plate5_RECTIFIED_Level2_AGS.tif	5,000	Yes	Kulakov and others (1979)
Report_1383_Plate6_RECTIFIED_Level2_AGS.tif	5,000	Yes	Kulakov and others (1979)
Report_1383_Plate7_RECTIFIED_Level2_AGS.tif	5,000		Kulakov and others (1979)
Report_1748_Plate2_RECTIFIED_Level2_BGS.tif	50,000		Kulakov and Omar (1979)
Report_1753_Plate1_Colored_RECTIFIED_Level2_AGS.tif	50,000		Muzika and Lim (1976)
Report_1753_Plate2a_RECTIFIED_Level2_BGS.tif	5,000	Yes[4]	Muzika and Lim (1976)
Report_1753_Plate2b_Colored_RECTIFIED_Level2_BGS.tif	5,000	Yes[4]	Muzika and Lim (1976)
Report_1753_Plate2c_Colored_RECTIFIED_Level2_BGS.tif	5,000	Yes[4]	Muzika and Lim (1976)
Report_1753_Plate2d_Colored_RECTIFIED_Level2_BGS.tif	5,000	Yes[4]	Muzika and Lim (1976)
Report_1753_Plate2e_Colored_Mosaic_RECTIFIED_Level2_BGS.tif	5,000	Yes[4]	Muzika and Lim (1976)
Report_1753_Plate4a_RECTIFIED_Level2_BGS.tif	5,000	Yes	Muzika and Lim (1976)
Report_1753_Plate4b_RECTIFIED_Level2_BGS.tif	5,000	Yes	Muzika and Lim (1976)
Report_1753_Plate4c_RECTIFIED_Level2_BGS.tif	5,000	Yes	Muzika and Lim (1976)
Report_1753_Plate4d_RECTIFIED_Level2_BGS.tif	5,000	Yes	Muzika and Lim (1976)

[1]Rectification 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.

[2]Yes, if map was converted to a GIS database.

[3]Maps were digitized but were merged and controlled to the Report_0485_Plate1_Mosaic_RECTIFIED_Level2_AGS image base.

[4]Maps 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.

Beihefte zum Geologischen Jahrbuch (BGR)	Source
Wirtz[1964]_Table 1[modified]_AGS.pdf	Wirtz (1964)
Unpublished Afghanistan Reports[1]	
Report_0010_AGS	Mikhailov and others (1965)
Report_0035_AGS	Miroshnichenko and Ksenofontov (1968a)
Report_0129_AGS	Jacob (1961)
Report_0130_AGS	Seibdrat and Weippert (1963)
Report_0131_AGS	Seibdrat (1961)
Report_0142_AGS	Jacob (1963)
Report_0194_BGS	Hamer (1954)
Report_0252_AGS	Drath (1939)
Report_0340_BGS	Ode (1959)
Report_0348_BGS	Clausen (1965)
Report_0415_BGS	West (1940)
Report_0473_AGS	Androsov and others (1965)
Report_0481_AGS	Kudryashov and others (1966)
Report_0485_BGS and Report_0819_BGS	Mikhailov and others (1967)
Report_0488_BGS	Fox (1936)
Report_0490_BGS	Graham (1956)
Report_0491_BGS	Permitina and others (1965)
Report_0501_AGS	Murphy and Owings (1951)
Report_0505_BGS	Owings (1952)
Report_0507_BGS	Walsh (1950)

Report_0515_AGS	Czerski (1944)
Report_0518_BGS	Walsh (1949)
Report_0528_BGS	Gupta and Dharma Rao (1979)
Report_0840_AGS	Kotov (1968)
Report_1068_BGS	Miroshnichenko and Ksenofontov (1968b)
Report_1188_BGS	Azimi and others (1977)
Report_1309_AGS	Dronov and others (1971)
Report_1318_AGS	Dronov and Leven (1971)
Report_1383_AGS	Kulakov and others (1979)
Report_1635_AGS	Bagradyan and Masud (1988)
Report_1748_BGS	Kulakov and Omar (1979)
Report_1751_BGS	Kulakov (1979)
Report_1753_BGS	Muzika and Lim (1976)
Report_1966_AGS	Dharma Rao and Gupta (1980)

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