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COPPER, LEAD, ZINC, ANTIMONY, AND ARSENIC IN PAKISTN

By

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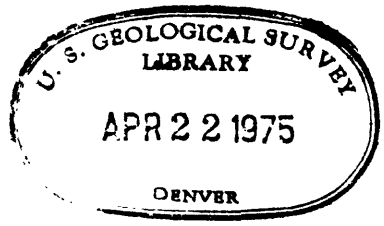

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ABSTRACT

Copper localities that merit geological investigation are found in the western Chagai District, in North Waziristan Agency, and in the Salt Range in Mianwali and Sargodha Districts. No high-grade deposits have been reported from these areas and if deposits are developed they will likely be low-grade, high-tonnage, disseminated deposits. Those localities reported from Chitral State are too remote and inaccessible to be of interest now. All lead localities found to date are of minor importance; there has been small production at one locality in Chagai District and in the southern part of the Hazara District. Zinc, antimony, and arsenic are sparse in Pakistan and no important localities of these metals are reported.

INTRODUCTION

The descriptions of copper, lead, zinc, antimony, and arsenic localities in this report are brief summaries of information taken from published references and unpublished reports in the files of the Geological Survey of Pakistan; also included are field observations by the author and geologists of the Geological Survey of Pakistan, Quetta, and the U. S. Geological Survey, working under a project sponsored by the Agency for International Development, U. S. Department of State, and the Government of Pakistan. The descriptions of mineral localities are grouped geographically by divisions and districts in Pakistan and are numbered in sequence with reference to nearby localities. The chemical symbol of each metal serves as a prefix to each number. The localities are identified by these numbers (See fig. 1, and 2, 3, 4, 5, 6, and 7); reports containing references to the localities are listed at the end of this report. In general, the information available about specific mineral localities in the report references is sketchy, and the size of the deposit is seldom given, an indication that the investigation reported was very brief. The data presented herein are are based on investigations as of 1964.

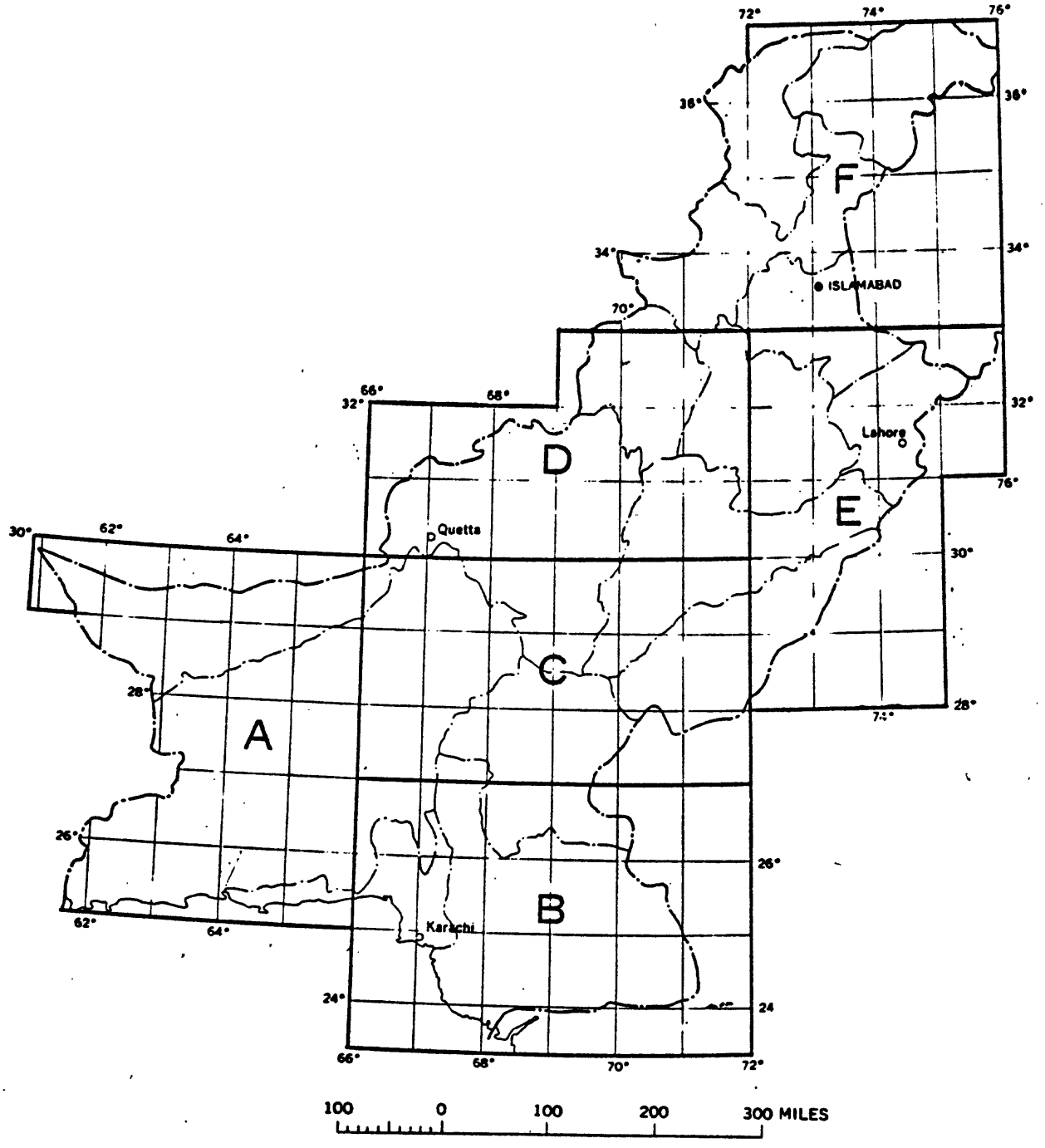

Figure 1. Index map of Pakistan showing areas covered by individual base sheets.

Not all copper, lead, zinc, antimony, and arsenic localities in Pakistan are listed. Only those deposits are included about which sufficient information was found to provide at least a minimum evaluation of the locality in terms of location, geologic setting, minerals present, and their mode of emplacement. There are no reports on detailed geological studies of any of the localities.

The overall impression gained from the review of available reports is that deposits of the base metals in Pakistan are, at best, of marginal economic value. Except for the possibility of developing some high-tonnage, low-grade copper deposits, the mineral potential of Pakistan in terms of the metals reported is not encouraging insofar as the development of a large-scale mining industry is concerned. The minerals available can likely be used for supplying

local industries and enterprises. However, this conclusion does not preclude detailed investigations of many deposits in the hope of delimiting possibly significant reserves. Some of the localities warrant detailed study and these are briefly discussed.

Copper

Forty-seven copper localities are briefly described in this report. Not enough information is available about these localities, many of which are isolated, to make recommendations concerning the type of investigations which should be undertaken. Other localities that merit further study are listed below in order of priority.

1. Localities in Chagai District, Quetta Division (fig. 2)

   a. The Saindak (Cu-4) - Amir Chah (Cu-5) area in the western part of the district contains scattered outcrops of intrusive rock, some of which contains disseminated copper minerals. Investigation of these localities and others that might be found in the area should be made. The copper mineralization is associated with widespread metamorphism in the area and has also been found in volcanic and sedimentary rocks to the northwest of Saindak near Kirtaka (Cu-3) and Robat (Cu-2).

   b. A variety of copper minerals are found in a large area near Amuri (Cu-7) in fissures and replacing basalt. Investigations in this area should be directed at determining the feasibility of establishing a large-tonnage low-grade copper deposit.

   c. There are several localities scutheast of Nok Chah (Cu-9) where copper mineralization has been found at the contact of volcanic and intrusive rocks and in veins in shale and slate. One of these localities, at the head of Bandagan Kaur, was mapped and drilled by the Geological Survey of Pakistan in association with Pakistan Industries Ltd. Detailed results of the drilling are

not known, but it is supposed that the preliminary estimates of only about 7,000 tons of copper-mineralized (percentage of copper not specified) rock has been confirmed. It is believed that insufficient prospecting has been done in these localities and it is recommended that further investigation be made in the area in the hope that deposits with sizeable tonnage might be found.

2. Localities in North Waziristan Agency of Dera Ismail Khan Division (Fig. 5)

At these localities (Cu-17, 18, 19, 20) and probably others not yet described, copper mineralization is associated with metamorphosed volcanic rocks and sediments. The entire area should be investigated because of the likelihood that widespread regional copper mineralization extends as far north as Parachinar in Kurram Agency (Cu-22) (fig. 7) and, reportedly, to the west in Afghanistan, centering in the Safed Koh Range.

3. Disseminated copper in the Salt Range of Sargodha and Mianwali Districts of Sargodha Division (figs. 5 and 6)

At localities Cu-44, 45, 46, and 47 in the central and western Salt Range, malachite and cuprite associated with much barite and rare galena are found in the "Speckled sandstone" of Late Permian age. Samples from all localities examined in this formation contain copper; this includes the area from Nammal gorge eastward to Nilawahan gorge, an inferred strike length of about 65 miles possibly containing copper mineralized rock. The mineralization is generally weak; the highest tenor observed did not exceed 2 or 3 percent copper in samples from

one 10-inch bed. As many as four beds of weakly mineralized sandstone, each ranging in thickness from a few inches to 6 feet, have been found in a section as much as 100 feet thick in the upper portion of the "Speckled sandstone". The importance of investigating this extensively copper-mineralized zone is indicated by the possibility of establishing a high-tonnage, low-grade disseminated copper deposit.

4. Localities in Chitral State (fig. 7)

Nine localities (Cu-28 to 36) in Chitral are described, but the information is quite limited. The distribution of the localities indicates widespread copper mineralization in the region and extending westward into Afghanistan. However, owing to the inaccessibility of Chitral, it is not likely that deposits of copper in this area would be economic.

Lead

All 26 lead localities described are of minor importance, although there has been some small production from Dirang Kalat (Pb-4) in Chagai District (fig. 2) and Paswal (Pb-10) and Mihal (Pb-12) in Hazara District (fig. 7). The most promising area in which to prospect for sizeable lead deposits is in the gossan and replacement deposits in the Khuzdar area (Pb-5) in Kalat Division (fig. 4). Ten localities (Pb-16 to 25) are in Chitral (fig. 7), but information on them is sketchy and they are in remote and inaccessible areas.

DESCRIPTION OF COPPER LOCALITIES

		Survey of Pakistan sheet no.	Coordinates
KALAT DISTRICT KALAT DIVISION			
Cu-1	Johan (fig. 4): Concretions of malachite and azurite, in some places with a core of sulphide, reported in talus of the Eocene coal measures between Ziarat, Quetta Division (30°23'N; 67°44' E) and Johan Ref.: Vredenburg, 1909	34 K	29°20'N; 66°59'E
CHAGAI DISTRICT QUETTA DIVISION			
Cu-2	Robat (fig. 2): Copper sulfides in acid intrusives in the Lar Koh area in the extreme western tip of West Pakistan Ref.: Vredenburg, 1901 Gee, 1947 Heron, 1954	30 C	29°47'N; 60°56'E
Cu-3	Kirtaka (fig. 2): Copper carbonate and sulphide in calcite veins (up to 6 in. thick) cutting massive Cretaceous conglomerate (minimum 65 feet of section) on Kachao road 8 miles NW of Kirtaka Ref.: Personal observation of author, 1961	30 G	29°29'N; 61°23'E
Cu-4	Saindak (fig. 2) a) Copper minerals and pyrite disseminated in diorite of post-middle Eocene age in an area of about one square mile 3 miles east of Saindak, and	30 G	29°18'N; 61°33'E

Cu-6	Patkok (fig. 2): Veinlets of copper carbonate, sulfide and silicate associated with a basic dike (Late Cretaceous or Paleocene age); 5 miles E of Patkok Ref.: Ahmad, M.I., Geol. Surv. of Pakistan, written communication	30 O	29°27'N; 63°23'E
Cu-7	Amuri (fig. 2): Copper sulphides, chrysocolla, native copper, and malachite in fissures and replacing basalt (Late Cretaceous or Eocene) over large area Ref.: Schmidt, R.G., U.S. Geol. Surv., written communication, 1962	30 O	29°15'N; 63°35'E
Cu-8	Dalbandin (fig. 2): Copper sulphide and carbonate in quartz veins in shear zone in syenite stock (Late Cretaceous to Eocene), 12 miles SSW of Dalbandin Ref.: Schmidt, R.G., U.S. Geol. Surv., written communication, 1961	34 D	28°52'N; 64°24'E
Cu-9	Nok Chah (fig. 2): a) Copper sulfides, carbonate, and silicate with pyrite and limonite, associated with magnetite and some hematite at contact of volcanic tuff and syenite, monzonite, and diorite (Late Cretaceous to Eocene) in a shear zone at head of Bandagan Kaur (development work done in 1962, including drilling by Geol. Survey Pakistan); 17 miles SE of Nok Chah, and ..... b) In nearby Kimri Nala, 12-inch quartz vein in diorite with copper sulfides, carbonates, sphalerite, and pyrite, and ..... c) In nearby Jadino Nala, disseminated grains of chalcopyrite, chrysocolla, and pyrite in tuff at contact with syenite-monzonite rocks Ref.: Ahmed, Waheeduddin.	34 D	28°57'N; 64°45'E

d) Copper minerals in veins cutting slates and shales (Cretaceous); 15 miles E of Nok Chah, W of Kopadhdhar Mtn. — 34 D — 28°57'N; 64°45'E
Ref.: Crookshank, 1954

e) Copper sulphides and carbonate associated with garnet, epidote, specularite, and magnetite in crystal tuffs and agglomerates (Cretaceous to Eocene); 10 miles SE of Nok Chah in Ras Koh range
Ref.: Schmidt, R.G., U.S. Geol. Surv., written communication, 1961

f) Chalcopyrite in veins and shear zones in half-mile long exposure of hornfelsic metamorphosed volcanic agglomerate and tuffs near contact with diorite, (all Cretaceous to Eocene) at Pokus Nala (28°51'; 65°6'); 11.5 miles by jeep track and footpaths of 51 miles and 6 furlong road marker E of Dalbandin
Ref.: Schmidt, R.G., U.S. Geol. Surv., written communication, 1961

Cu-10 Koh Marani (fig. 2): — 34 C — 29°28'N; 64°25'E

a) Chalcopyrite and malachite associated with galena and hematite in quartz vein in andesite porphry (Cretaceous to Eocene) of Koh Marani Mtn.; 18 miles NW of Chagai (29°18'; 64°44')
Ref.: Crookshank, 1950

b) Quartz-siderite vein with copper sulphides and carbonate and hematite in granodiorite and tuff at Balanosh; 12 miles W of Chagai (29°18'; 64°44')
Ref.: Poughon, 1961-A

c) Weak copper mineralization in joints in granodiorite (Cretaceous to Eocene), 25 miles SW of Chagai (29°18'; 64°44') in headwaters of Gird river
Ref.: Poughon, 1961-A

QUETTA-PISHIN DISTRICT
QUETTA DIVISION

Cu-11 Kojak Pass (fig. 5): 34 J 30°51'N; 66°35'E
Copper minerals in white quartz vein in the Kojak Pass-Amran Range area
Ref.: Hutton, 1846
Greisbach, 1881

Cu-12 Silad (fig. 5): 34 J 30°48'N; 66°49'E
Chalcopyrite traces associated with stibnite in carbonate vein cutting shale and sandstone of the Shaigalu Formation (Late Miocene); 4 miles N of Silad, 13 miles NE of Qila Abdullah (30°43'; 66°37')
Ref.: Klinger and Matzko, 1964, written communication.

LORALAI DISTRICT
QUETTA DIVISION

Cu-13 Ziarat (fig. 5): 34 N 30°23'N; 67°44'E
Concretions of malachite and azurite, in some cases with a core of sulphide, reported in talus of the Eocene coal measures between Ziarat and Johan (29°20'; 66°59') in Kalat Division
Ref.: Vredenburg, 1909

ZHOB DISTRICT
QUETTA DIVISION

Cu-14 Tor Tangi (fig. 5): 34 N 30°33'N; 67°47'E
Traces of copper minerals with magnetite in lenses of serpentinized ultrabasic rock (Late Cretaceous or Eocene); 20 miles S of Hindubagh (30°50'; 67°45')
Ref.: Bogue, R.G., written communication, 1960
Davies, G. E., written communication, 1962

Cu-15 Nasai (fig. 5): 39 B 30°50'N; 68°02'E
Copper sulphides in contact zone between shale of Dungan Formation (Paleocene) and ultrabasic rocks (Cretaceous or early Eocene); 2 miles SE of Bagh which is 11 miles SE of Nasai
Ref.: J.A. Reinemund, written communication, 1962

Cu-16 Fort Sandeman (fig. 5): 39 E 31°21'N; 69°26'E
Copper sulphides and carbonates with manganese and pyrrhotite associated with the chromite-bearing ultrabasic rocks (Late Cretaceous or Eocene) of the area:

a) In the Sange Gar area, 12 miles N of Fort Sandeman;

b) The Zizha area, 15 miles NE of Fort Sandeman;

c) Shin Gar area, 9 miles SE of Fort Sandeman;

d) Otman, near Jalat Killi and

e) In the tribal area N and NE of Fort Sandeman at Sulaiman Dawal and Ollaskar, E of Pakhraj Kila

Ref.: Heron, 1954

NORTH WAZIRISTAN AGENCY
DERA ISMAIL KHAN DIVISION

Cu-17 Boya Scout Post (fig. 5): 38 H 32°58'N; 69°56'E
Small veins of copper minerals in serpentinized lava flows between Boya Scout Post and Datta Khel (32°45'; 69°05')
Ref.: Heron, 1954

Cu-18 Mami Rogha (fig. 5): 38 H 32°50'N; 69°51'E
Malachite disseminated in serpentinized basic and ultrabasic intrusives and lava flows
Ref.: Asrarullah, 1957-A

Cu-19 Spin Kamar (fig. 5): 38 H 32°42'N; 69°47'E
Cuprite-bearing veins in maroon colored mudstone associated with igneous rocks. Native copper reported in mountains near Afghanistan border
Ref.: Asrarullah, 1957-A

Traces chalcopyrite in heavy mineral concentrate from near mouth of Ushu Gol, near Kalam — 43 A — 35°44'N; 72°40'E
Ref.: Matzko, J.J., written communication (Lab report), 1962

DIR STATE
PESHAWAR DIVISION

Cu-25 Lal Qila (fig. 7): — 38 N — 34°55'N; 71°45'E
Spectrographically determined copper in pyrite, disseminated in quartz veins in hornblende-schist, amphibolite, and gneiss of probable early Tertiary age. Pyrite as much as 20 percent of vein rock
Ref.: Ahmed, W.

Cu-26 Kambot (fig. 7): — 38 N — 34°59'N; 71°40'E
Copper sulphides, pyrite, and pyrrhotite in quartz vein cutting granodiorite (age not stated) 1 mile N of Kambot village
Ref.: Ahmed, W.

Cu-27 Ashnamal (fig. 7); — 43 A — 35°13'N; 72°14'E
a) Copper sulphides disseminated in quartz veins cutting diorite granite and metamorphic rocks (age not stated) at five localities within 1 mile radius of Ashnamal village and .....

b) The same at one locality near Shadia village, 1.5 miles NW of Ashnamal and .....

c) The same at one locality ½ mile N of Tarpatar village, 6 miles SW of Ashnamal
Ref.: Ahmed, W.

CHITRAL STATE
PESHAWAR DIVISION

Cu-28 Mirkani (fig. 7): 38 M 35°27'N; 71°45'E
Traces of copper mineralization in crevices in the Mirkani Granite N of Lawari Pass, along Chitral River on road from Dir to Drosh. The granite extends SW along the Chitral River into Afghanistan and copper mineralization is reported in granite near basic dikes
Ref.: Pascoe, 1923
Coulson, 1940

Cu-29 Shishi valley (fig. 7): 38 M 35°35'N; 71°55'E
Copper carbonate in veinlets in agglomerate associated with crystalline limestone and gneiss (no age stated) in the Shishi River valley, an E tributary of the Chitral (Kunar) River, NW of Drosh
Ref.: Rahman, 1949

Cu-30 Parabeck (fig. 7): 38 M 35°59'N; 71°24'E
Hematite with associated minor amounts of copper and lead minerals in quartzite and slate Mesozoic age in Gufti Gol; 2 miles W of Parabeck village, 4 miles SE of Imirdin village at head of Lutkho River valley at 14,000 feet elevation
Ref.: Ali, S.T., 1950

Cu-31 Imirdin (fig. 7): 37 P 36°03'N; 71°23'E
Chalcopyrite and galena in quartz vein (3.5 feet wide) and stringers in quartzite and slate of Mesozoic age, 2 miles SW of Imirdin village near head of Lutkho River valley at 13,000 feet elevation
Ref.: Ali, S.T., 1950

Cu-32 Dommel Nissa (fig. 7): 37 P 35°22'N; 71°39'E
Copper mineralization in crevices in granite associated with basic dikes (no age stated) near Dommel Nissa on Chitral River
Ref.: Ali, S.T., 1959

Cu-33 Chapali (fig. 7): 42 D 36°20'N; 72°36'E
Azurite disseminated in white quartzite (no age stated) at Chapali and Chapchirag (36°20'; 72°40') in the Mastuj district
Ref.: Heron, 1954

Cu-34 Pakhturi (fig. 7): 42 D 36°22'N; 72°17'E
Copper sulphides and galena in numerous quartz veins cutting shale, quartzite, phyllite, and limestone of early Carboniferous age; 2 miles N of Pakhturi village, 14 miles W of Mastuj (36°17'; 72°30')
Ref.: Ali, S. T., 1950

Cu-35 Rain (fig. 7): 42 D 36°24'N; 72°23'E
A 2.5 to 3 foot vein with galena and minor quantity of copper cutting shale quartzite and limestone of early Carboniferous age in Melph Gol, 2 miles upstream from Rain village
Ref.: Ali, S. T., 1950

Cu-36 Yarkun Valley (fig. 7): 42 D 36°35'N; 72°53'E
Stringers of chalcocite and azurite in limestone and granite-gneiss (no age stated) near Kanhur and in Wassam Gol and Gazin Gol in the Yarkum River valley
Ref.: Heron, 1954

GILGIT AGENCY
KASHMIR

Cu-37 Jotial Nala (fig. 7): 43 I 35°51'N; 74°20'E
Copper minerals and pyrite in quartz veins as much as 6 feet wide cutting hornblende gneiss and schist which are intruded by granite (no age stated) in Jotial Nala, 3 miles above its mouth which is 5 miles S of the confluence of the Gilgit and Hunza Rivers. The Nala is about 5 miles long and has a gradient of about 1,800 feet per mile
Ref.: Kazmi, 1951

Cu-38 Murkni (fig. 7): 43 I 36°00'N;74°24'E
Malachite in quartz vein cutting schist (age not stated); 1.5 miles SW of Murkni village in Daimyer Nala, 8 miles above its mouth which is on the E bank of the Hunza River 2 miles above its confluence with the Gilgit River
Ref.: Kazmi, 1951

Cu-39 Indus, Gilgit, Nagar and Hunza rivers (fig. 7):
Chalcopyrite reported from the heavy mineral sands of the alluvium from these rivers. The mineral is not reported from any of the small tributaries to the rivers
Ref.: Danilchik and Tahirkheli, 1959
Tahirkheli, 1960
Zeschke, 1959

HAZARA DISTRICT
PESHAWAR DIVISION

Cu-40 Galdanian (fig. 7): 43 F 34°15'N; 73°19'E
Malachite in sandstone (age not stated) associated with sedimentary hematite deposits 10 miles NE of Abbottabad
Ref.: Kleiber, 1958

Cu-41 Phalkot (fig. 7): 43 F 34°09'N; 73°22'E
Malachite and chalcopyrite in vein cutting the Hazara Slate (possible Precambrian age) at Phalkot village in Bagnotar Nala, 2.5 miles NE of where it is crossed by the Abbottabad-Nathiagali road
Ref.: Ali, S.T., verbal communication, 1961

Cu-42 Dakar Pesar (fig. 7): 43 F 34°04'N; 73°11'E
Specimens with copper minerals were sent to the Geol. Survey of Pakistan in 1952, from this locality, near Jabri, Haripur Tehsil
Ref.: Heron, 1954

Cu-43 Babusar (fig. 7): 43 F 35°08'N; 74°02'E
Chalcopyrite and pyrrhotite with fluorite in quartz veins cutting metamorphic rocks of the Salkhala Series (Precambrian) associated with intrusives (early Tertiary or pre-Tertiary); between Morang and Babusar Pass (35°08'; 74°02')
Ref.: Wadia, 1931

SARGODHA-MIANWALI DISTRICT
SARGODHA DIVISION

Cu-44 Nilawahan Gorge (fig. 6): 43 D 32°39'N; 72°36'E
Cuprite and malachite in sandstone beds of the "Speckled sandstone" of late Paleozoic age in the gorge formed in the escarpment of the central Salt Range

Cu-45 Kattha (fig. 6): 43 D 32°31'N; 72°26'E
Cuprite and malachite in sandstone bed in the "Speckled sandstone" of late Paleozoic age on either side of Chambal Wal Gorge in the escarpment of the central Salt Range, N of Kattha. This is the locality in which older references (Fleming, 1852; Theobald, 1854; Wynne, 1878) report presence of copper nodules in float

Cu-46 Warcha (fig. 5): 38 P 32°29'N; 71°59'E
Malachite and cuprite in four sandstone beds in the "Speckled sandstone" of late Paleozoic age, in western Salt Range escarpment

Cu-47 Musa Khel (fig. 5): 38 P 32°38'N; 71°45'E
Malachite and cuprite found in several sandstone beds of the "Speckled sandstone" of late Paleozoic age in a section at least 100 feet thick in all the nalas in the escarpment of the western Salt Range from 1 mile S of Nammal Gorge to the vicinity of the Turta Rest House, 3 miles E of Musa Khel

Note: Localities in the "Speckled sandstone" were found during field investigations (White and Abbas, 1964) in the late fall and early winter 1961. The mineralized sandstone, frequently associated with glauconitic beds, includes abundant goethite and hematite, common malachite and cuprite, barite and traces of galena, copper sulphide, pyrite, and fluorite. The copper mineralization is weak but has been found in several beds in a section as much as 100 feet thick. There is an inferred strike length of possibly copper-mineralized sandstone of about 65 miles, the approximate distance from Nilawahan gorge to Nammal gorge

Ref.: Fleming, 1852
Theobald, 1854
Wynne, 1878
White and Abbas, 1964, written communication

DESCRIPTION OF LEAD LOCALITIES

		Survey of Pakistan sheet no.	Coordinates
CHAGAI DISTRICT QUETTA DIVISION			
Pb-1	Saindak (fig. 2): Galena (about 3%) in 10-inch wide calcite vein cutting basalt dike in Paleocene agglomerate, extending for probably several hundred feet in Koh Saindak, and ..... weak galena with copper mineralization in hydrothermal sulphide deposit in Eocene volcanic agglomerate, traced over 1.5 miles in Zonk Nala 2 miles SE of Saindak Ref.: Schmidt, R.G., written communication, 1962 Ahmad, M.I., 1943 Vredenburg, 1901	30 G	29°18'N; 61°33'E
Pb-2	Maski Chah (fig. 2): Galena associated with pyrite and malachite in quartz vein in the Tozghi massif granodiorite with aplite and microdiorite, all of Late Cretaceous to Eocene age, 8 miles W of Maski Chah Ref.: Poughon, 1961-B	30 K	29°01'N; 62°26'E
Pb-3	Koh Marani (fig. 2): Weak galena and copper sulphide mineralization with hematite in quartz veins in andestite porphry of Cretaceous to Eocene age, 18 miles NW of Chagai (29°18'; 64°44') Ref.: Ahmad, M.I., 1962 Crookshank, 1950	34 C	29°28'N; 64°25'E
Pb-4	Dirang Kalat (fig. 2): Galena, sphalerite, and pyrite in a quartz and calcite breccia in a fault zone in trachyte dike cutting Cretaceous rhyolite tuffs near top of Dirange Kalat hill, 5 miles N of Ziarat Balanosh or 15 miles NW of Chagai (29°18'; 64°44'). Deposit has been mined on small scale Ref.: Ahmad, M.I., 1962 Poughon, 1961-A Crookshank, 1950	34 C	29°28'N; 64°33'E

KHUZDAR DISTRICT
KALAT DIVISION

Pb-5 Khuzdar (fig. 4): 35 I 27°47'N; 66°35'E

a) Galena associated with pyrite and traces of copper carbonate in a porous gossan several hundred feet long in limestone of Jurassic age, 4 miles SE of Gunga or 10 miles SW of Khuzdar

Ref.: Schmidt, R.G., written communication, 1961
Klinger, F.L., written communication, 1962

b) Galena associated with siderite, limonite, and calcite as replacements in siliceous beds in Jurassic limestone (undifferentiated) in what are probably ancient mines near Shekran, 15 miles NW of Khuzdar

Ref.: Schmidt, R.G., written communication, 1961
Tipper, 1909
Griesbach, 1881
Vredenburg, 1909
Hughes, 1877
LeMessurier, 1844
Masson, 1843

SARGODHA DISTRICT
SARGODHA DIVISION

Pb-6 Karangli hill (fig. 6): 43 H 32°46'N; 73°05'E

Galena disseminated in the Cambrian magnesian sandstone near top of Karangli hill

Ref.: Personal observation of author, 1961
Fleming, 1848
Wynne, 1878

Pb-7 Khewra (fig. 6): 43 H 32°39'N; 73°04'E

Disseminations of galena in traces in the Cambrian magnesian sandstone above Khewra on the West side of the gorge near a Hindu temple

Ref.: Fleming, 1849

Pb-8	Musa Khel (fig. 5): Traces of galena associated with malachite and iron oxides in the "Speckled sandstone" of late Paleozoic age at Turta Rest House, 3 miles E of Musa Khel Ref.: White and Abbas, 1962, written communication	38 P	32°37'N; 71°45'E

HAZARA DISTRICT
PESHAWAR DIVISION

Pb-9	Faquir Mohammad (fig. 7): Traces of galena in quartz-barite veins cutting Eocene limestone, ½ mile SW of Faquir Mohammad village; and	43 G	33°57'N; 73°09'E
Pb-10	Paswal (fig. 7): Galena with minor amounts of pyrite, sphalerite, and chalcopyrite in a fracture zone with quartz stringers, in the Hazara Slate of probable Precambrian age at Paswal village. Small amounts of galena have been mined from an adit and an incline; and	43 F	34°12'N; 73°07'E
Pb-11	Hal (fig. 7): Galena in thin stringers of quartz in well cemented sandstone of the Hazara Slate of probable Precambrian age, just S of Hal village; and	43 F	34°11'N; 73°03'E
Pb-12	Mihal (fig. 7): Galena in quartz veins in shear zone in Hazara Slate of probable Precambrian age at Mihal village. 100 foot adit has been driven in deposit; and	43 F	34°09'N; 73°08'E
Pb-13	Kokal (fig. 7): Pods of galena in quartz vein in a shear zone developed in siltstone in the Hazara Slate of probable Precambrian age, 3/4 mile SW of Kokal village Ref.: Ali, Calkins, and Offield, 1964	43 F	34°27'N; 73°26'E

MARDAN DISTRICT
PESHAWAR DIVISION

Pb-14 Panjpir (fig. 7): 43 B 34°06'N; 72°29'E
Traces of galena in quartz vein in the southern slopes of Panjpir Ghar hill just N of Panjpir
Ref.: Heron, 1954

SWAT STATE
PESHAWAR DIVISION

Pb-15 Ushu (fig. 7): 43 A 35°44'N; 72°40'E
Galena and sphalerite with some pyrite and chalcopyrite in quartz, carbonate and epidote veins in diorite (unspecified age) as much as 140 ft. long and 2 to 5 ft. wide in Falak Sair in headwaters of Ushu Gol 22 miles NNE of Kalam (35°34'; 72°43')
Ref.: Tahirkheli, 1959
Ali, S.T., 1957

CHITRAL STATE
PESHAWAR DIVISION

Pb-16 Ghirat (fig. 7): 38 M 35°41'N; 71°46'E
Galena with associated stibnite in quartz vein (country rock and its age not stated). Weak mineralization in vein as much as 7 feet wide and 1300 feet long. In Ghirat Gol near Ghirat village. Has been mined locally
Ref.: Rahman, 1949

Pb-17 Shoghot (fig. 7): 37 P 36°01'N; 71°46'E
Narrow stringers and veinlets of galena in Cretaceous limestone, 2.5 miles SW of Shoghot in Awiret Gol. Old mine workings found here
Ref.: Ali, S.T., 1950

Pb-18 Imirdin (fig. 7): 37 P 36°03'N; 71°23'E
Galena in quartz vein (3.5 feet wide) and stringers with lead and copper minerals cutting Mesozoic quartzite and slate, 2 miles SW of Imirdin village
Ref.: Ali, S.T., 1950

Pb-19	Parabeck (fig. 7): Hematite with associated minor amounts of copper and lead minerals in quartzite and slate of Mesozoic age in Gufti Gol, 2 miles W of Parabeck village, 4 miles SE of Imirdin village at head of Lutko river valley at 14,000 feet elevation Ref.: Ali, S.T., 1950	38 M	35°59'N; 71°24'E
Pb-20	Tashker (fig. 7): Galena disseminated and as stringers in highly metamorphosed shale (no age stated) in cliff at Madashell village on left bank of Ojhor river, W of Tashker village Ref.: Ali, S.T., 1950	37 P	36°03'N; 71°48'E
Pb-21	Muzhigram (fig. 7): Minor stringers of galena in country rock (type and age not stated) and large fragments of galena in nala bed E of Muzhigram in the Arkari valley Ref.: Ali, S.T., 1950	37 P	36°06'N; 71°40'E
Pb-22	Pakhturi (fig. 7): Galena and copper sulphides in numerous quartz veins as much as 3 feet wide and 300 feet long cutting shale, quartzite, phyllite, and limestone of early Carboniferous age 2 miles N of Pakhturi village, 14 miles WNW of Mastuj (36°17'; 72°30'). Has been mined locally. Estimated 80,000 tons of combined copper and lead ore reserves (no analyses listed) Ref.: Ali, S.T., 1950	42 D	36°22'N; 72°17'E
Pb-23	Baig (fig. 7): Galena in quartz veins cutting slates and phyllites (no age stated), 2 miles NE of Baig village on left bank of Barum Galach gol. Some mining has been done Ref.: Ali, S.T., 1950	42 D	36°09'N; 72°01'E
Pb-24	Awi (fig. 7): Jamesonite in quartzite in high ridge of siliceous and partly dolomitic limestone (no age given) 5 miles S of Awi. Some local mining Ref.: Coulson, 1940	42 D	36°16'N; 72°20'E

Pb-25	Rain (fig. 7): Galena with minor amount of copper in 2 to 3 ft. veins cutting shale quartzite and limestone of early Carboniferous age in Melph Gol, 2 miles upstream from Rain village Ref.: Ali, S.T., 1950	42 D	36°24'N; 72°23'E

LAS BELA DISTRICT
KARACHI DIVISION

Pb-26	Bela (fig. 3): As much as 5 percent galena in barite vein, 18 inches thick, 600 feet (minimum) length in shear zone in sandstone of probable Jurassic age, 10 miles E of Bela at 26°15'; 66°28' Ref.: Klinger, F.L., written communication, 1962	35 J	26°14'N; 66°18'E

DESCRIPTION OF ZINC LOCALITIES

		Survey of Pakistan sheet no.	Coordinates
CHAGAI DISTRICT			
QUETTA DIVISION			
Zn-1	Nok Chah (fig. 2): Sphalerite with pyrite and copper sulphides in 12-inch wide quartz veins cutting diorite of Late Cretaceous to Eocene age in Kimri Nala 17 miles SE Nok Chah near Bandagan Kaur Ref.: Ahmed, Waheeduddin	34 D	28°57'N; 64°45'E
Zn-2	Dirang Kalat (fig. 2): Sphalerite with galena and pyrite in a quartz-calcite breccia in fault zone in trachyte dike cutting Cretaceous rhyolite tuffs near top of Dirang Kalat hill, 5 miles N of Ziarat Balanosh or 15 miles NW of Chagai (29°18'; 64°44'). Deposit has been mined on a small scale Ref.: Ahmad, M.I. Poughon, 1961-A Crookshank, 1950	34 C	29°28'N; 64°33'E
DIR STATE			
PESHAWAR DIVISION			
Zn-3	Lal Qila (fig. 7): Spectrographically determined zinc in pyrite-bearing quartz veins in hornblende schist, amphibolite, and gneiss of probable early Tertiary age. Pyrite forms as much as 20% of the vein rock Ref.: Ahmed, Waheeduddin	38 N	34°55'N; 71°45'E

SWAT STATE
PESHAWAR DIVISION

Zn-4 Ushu (fig. 7): 43 A 35°44'N; 72°40'E
Sphalerite and galena with some pyrite and chalcopyrite in quartz, carbonate, and epidote veins in diorite (unspecified age). Eight veins as much as 140 feet long and 2 to 5 feet wide in Falak Sair Gol in headwaters of Ushu Gol, 22 miles NNE of Kalam (35°34'; 72°43')
Ref.: Tahirkheli, 1959
Ali, S.T., 1957

Zn-5 Indus, Gilgit, Nagar and Hunza rivers (fig. 7):
Sphalerite reported from the heavy mineral sands of the alluvium from these rivers. The mineral has not been reported from the tributaries to the rivers
Ref.: Danilchik and Tahirkheli, 1959
Tahirkheli, 1960
Zeschke, 1959

DESCRIPTION OF ANTIMONY LOCALITIES

		Survey of Pakistan sheet no.	Coordinates
KHUZDAR DISTRICT **KALAT DIVISION**			
Sb-1	Shekran (fig. 4): The galena deposit formerly mined contains an appreciable amount of antimony (Tipper, 1909). Bindheimite and traces of smithsonite and hemimorphite have been identified in association with siderite (Heyl, A.V., U.S. Geol. Survey, written communication 1961). Deposits are in siliceous bed in Jurassic limestone (undifferentiated), 12 miles air line NW of Khuzdar Ref.: Tipper, 1909 LeMessurier, 1844	35 I	27°53'N; 66°28'E
QUETTA-PISHIN DISTRICT **QUETTA DIVISION**			
Sb-2	Silad (fig. 5): Stibnite associated with pyrite and minor amounts of copper sulphides in quartz veins in oxidized slate of the Shaigalu Formation of Miocene age, 4.5 miles N of Silad village, 13 miles NE of Qila Abdullah. Deposit being mined on small scale Ref.: Klinger and Matzko, 1962, written communication	34 J	30°48'N; 66°49'E
CHITRAL STATE **PESHAWAR DIVISION**			
Sb-3	Ghirat (fig. 7): Stibnite associated with galena in quartz vein (country rock and its age not stated); weakly mineralized with width as much as 7 feet and length of 1300 feet; in Ghirat Gol near Ghirat village. Stibnite float found in gravel of nearby Yagah Gol. Deposit has been mined locally Ref.: Rahman, 1949	38 M	35°41'N; 71°46'E

Sb-4	Krinj (fig. 7): Stibnite with associated zinkenite and jamesonite in quartz veins as much as 5 feet wide cutting Carboniferous slates at Kamalgol and Augargun mines at Krinj on Lutkho river 13 miles N of Chitral. Mineralization reported traceable intermittently for 2 miles. At least six adits driven in deposits from which 200 or 300 tons or ore per year have been produced. Small scale mining reported continuing Ref.: Sondhi, 1942 Nath, 1944 Ali, S.T., 1950 Heron, 1954	38 M	36°00'N; 71°47'E
Sb-5	Shoghot (fig. 7): Stibnite in 3- to 4-foot quartz vein in Carboniferous slates, 5 miles S of Shoghot village in Awiret Gol. Reported to have good grade of antimony and to have been pitted by locals Ref.: Ali, S.T., 1950	37 P	36°01'N; 71°46'E
Sb-6	Partsan (fig. 7): Stibnite in 3- to 5-foot quartz vein cutting Carboniferous slate 3 miles SW of Partsan village. Five adits are reported driven in deposit which has been mined locally Ref.: Nath, 1944 Ali, S.T., 1950	37 P	36 03'N; 71 52'E

DESCRIPTION OF ARSENIC LOCALITIES

		Survey of Pakistan sheet no.	Coordinates
CHITRAL STATE PESHAWAR DIVISION			
As-1	Lunku (fig. 7): Orpiment and realgar in hydrothermal veins in limestone and shale near contact with basic intrusive (no age stated). Six mines are located a few miles N of Lunku and Mirgasht (36°26'; 72°17') villages in the Tirich valley Mines — Elevation Mirgasht Gol — 11,000 feet Aligot — 13,000 feet Lqndku — 11,000 feet Wizmich — 15,000 feet Moghone Zom — 15,000 feet Stach — 14,000 feet A small production of arsenic minerals has been reported since the early nineteen hundreds Ref.: Tipper, 1921 Coulson, 1940 Ali, S.T., 1953	42 D	36°26'N; 72°22'E
GILGIT AGENCY KASHMIR			
As-2	Jotial Nala (fig. 7): Arsenopyrite associated with pyrite and chalcopyrite in veins 6 to 10 feet wide in hornblende granite gneiss, phyllite, slates, and diorite and hornblende granite (no age stated) Ref.: Crookshank, 1951	43 I	35°51'N; 74°20'E

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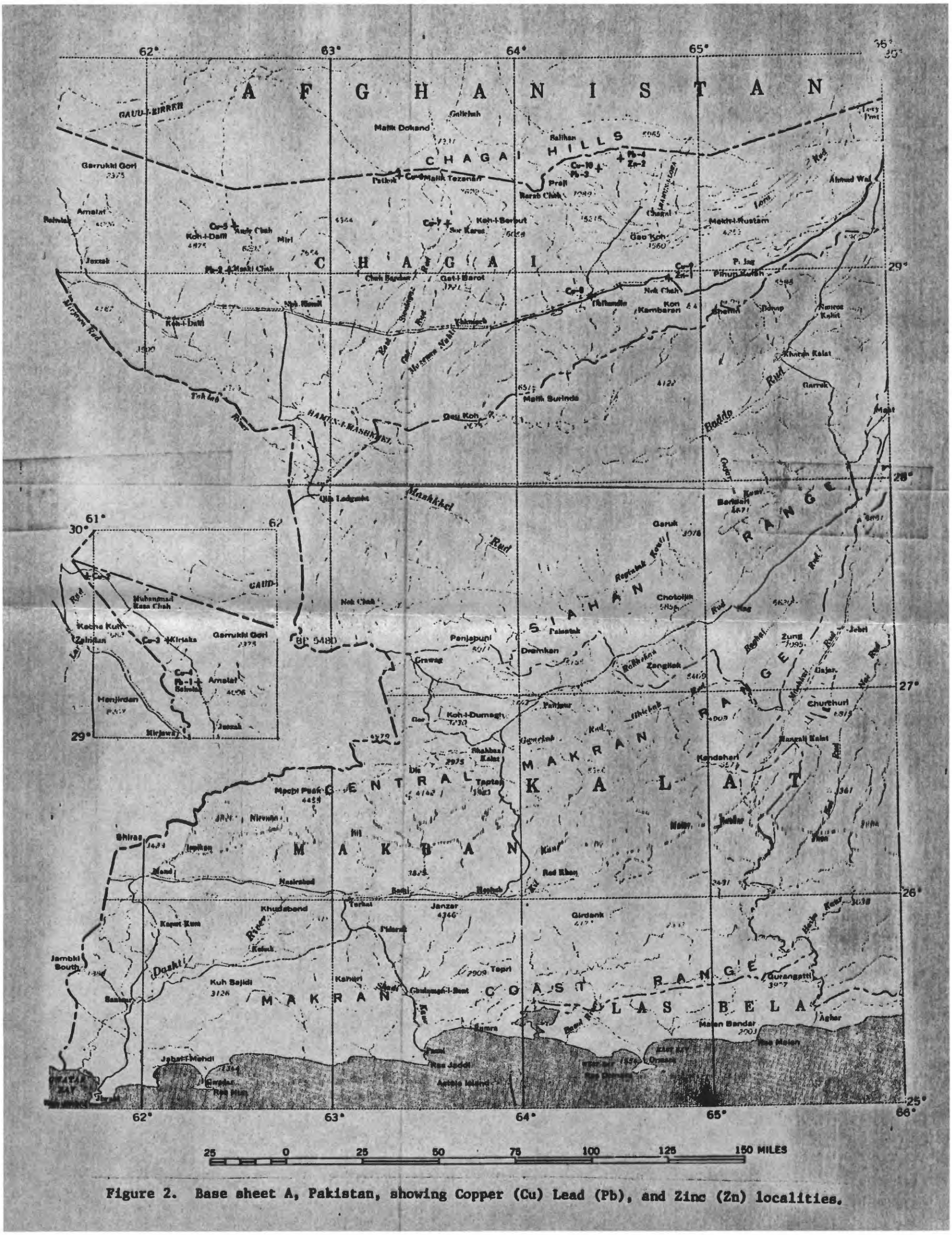

Figure 2. Base sheet A, Pakistan, showing Copper (Cu) Lead (Pb), and Zinc (Zn) localities.

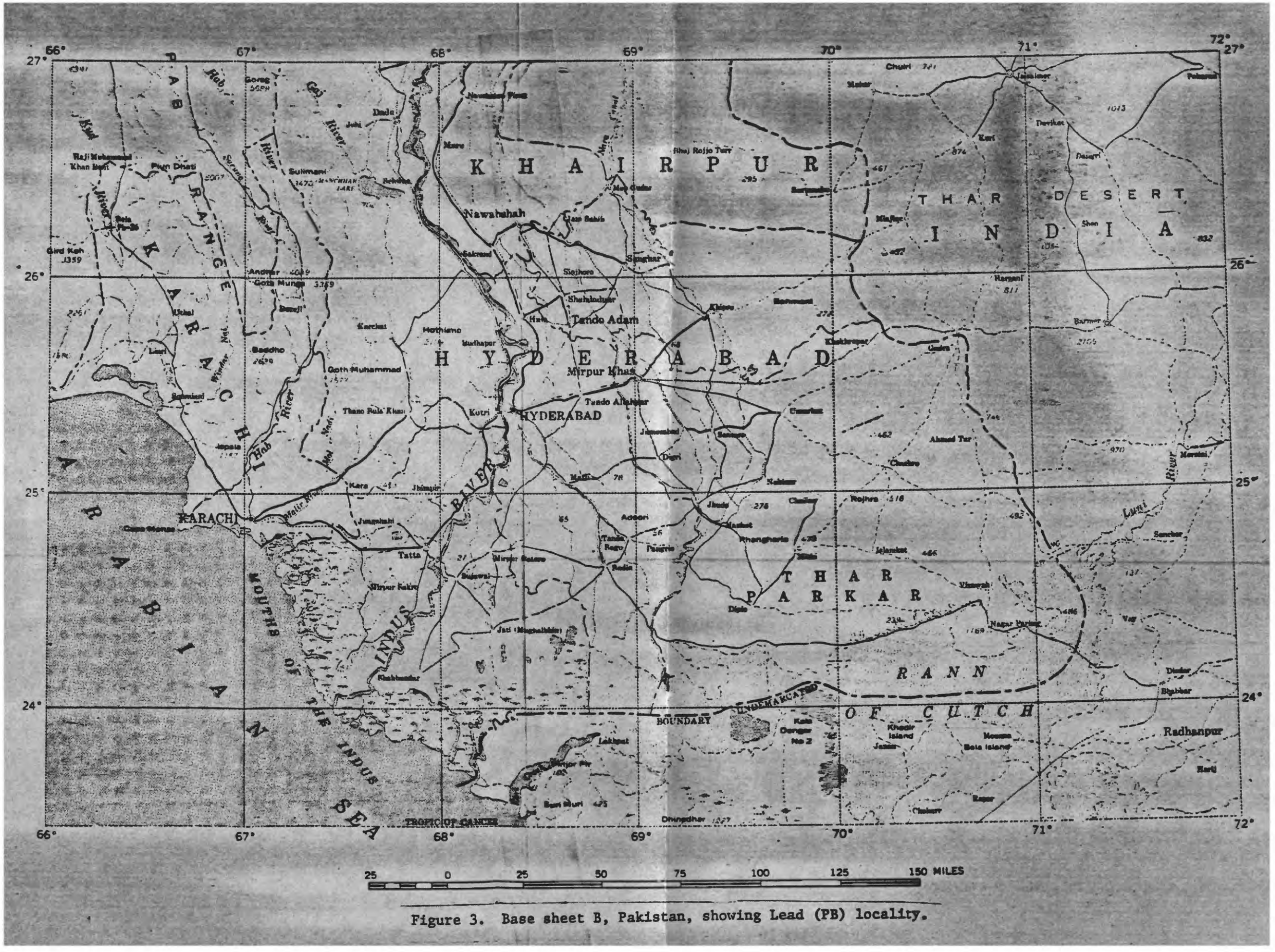

Figure 3. Base sheet B, Pakistan, showing Lead (PB) locality.

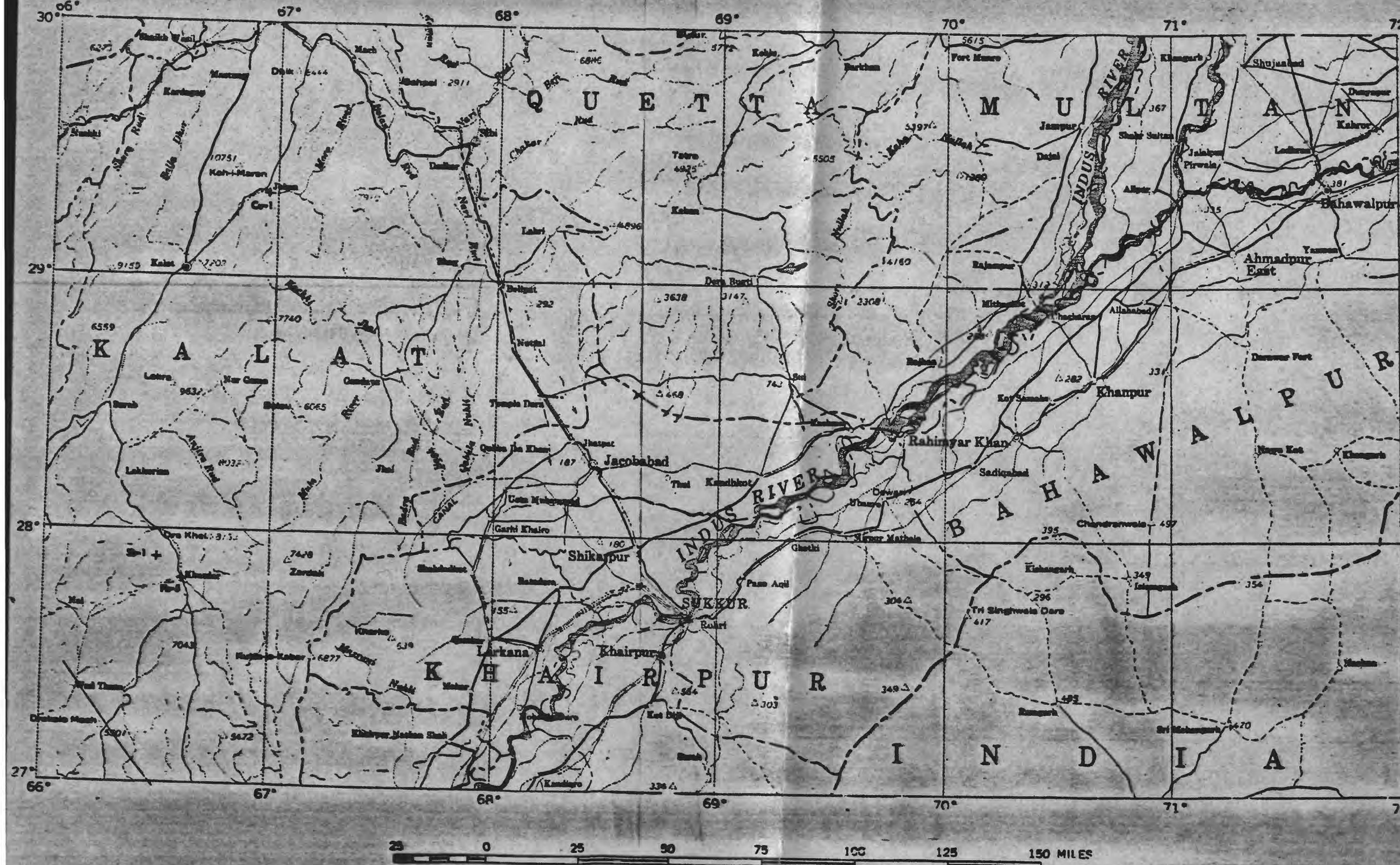

Figure 4. Base sheet C, Pakistan, showing Copper (Cu), Lead (Pb), and Antimony (Sb) localities.

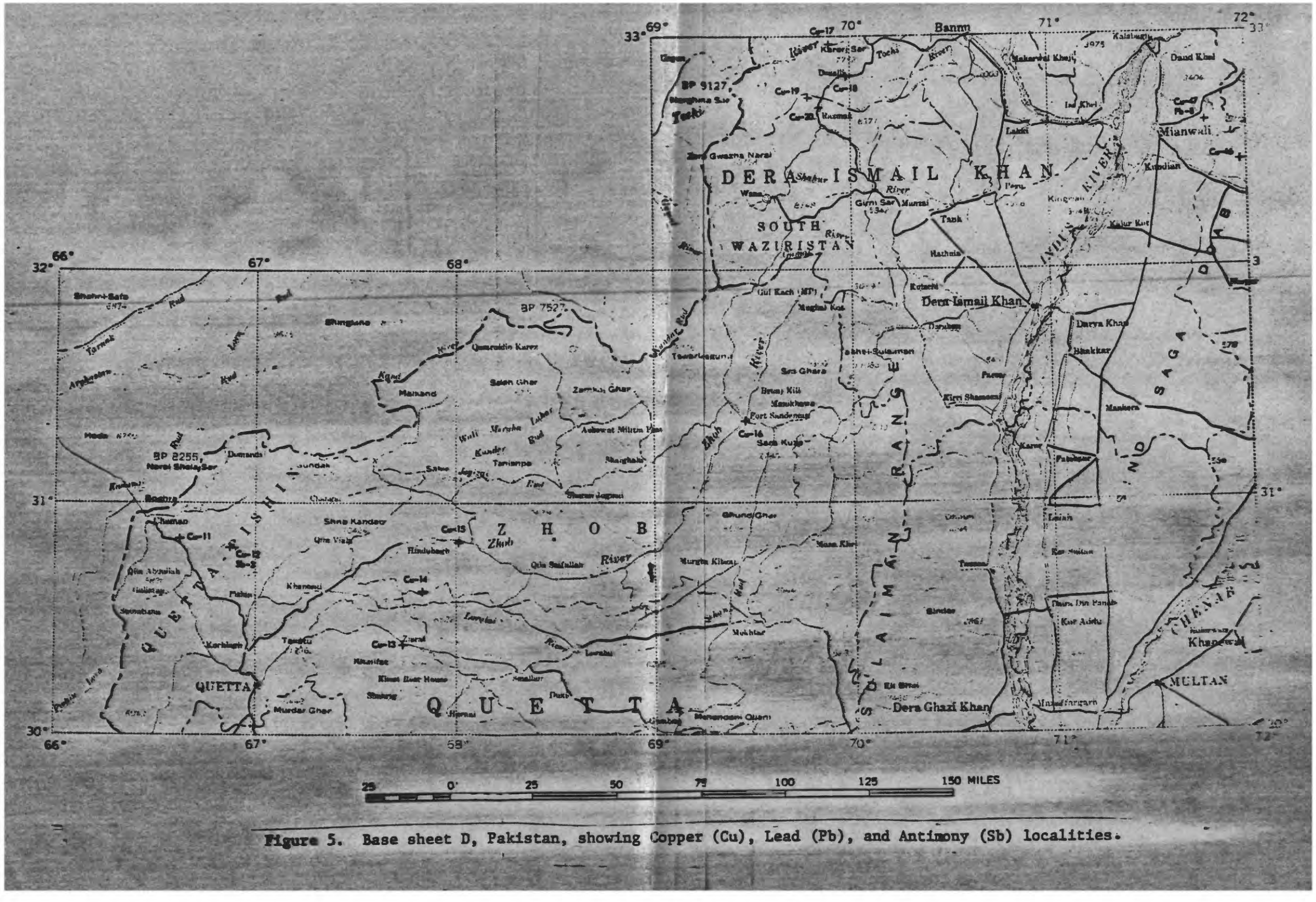

Figure 5. Base sheet D, Pakistan, showing Copper (Cu), Lead (Pb), and Antimony (Sb) localities.

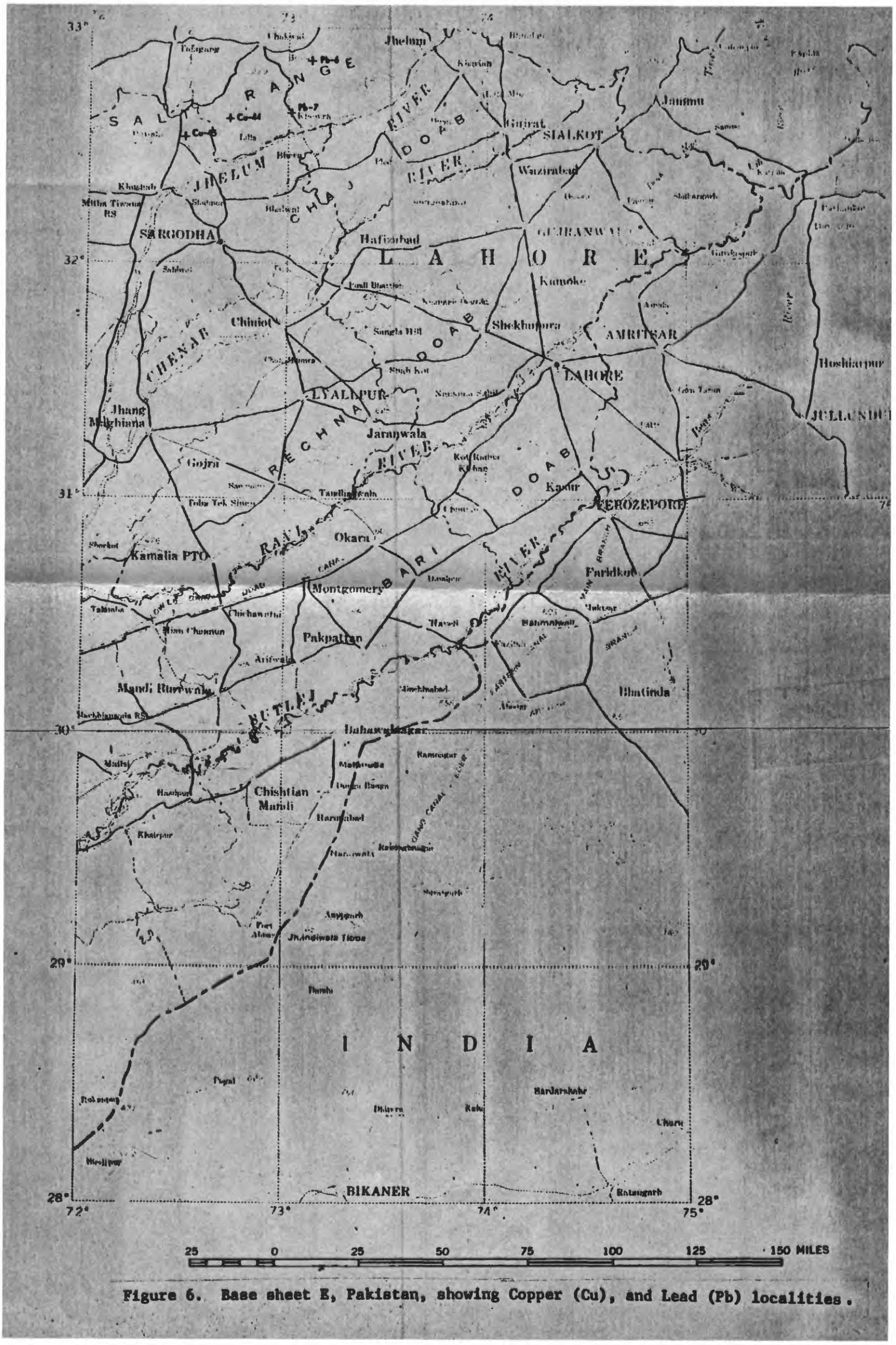

Figure 6. Base sheet E, Pakistan, showing Copper (Cu), and Lead (Pb) localities.

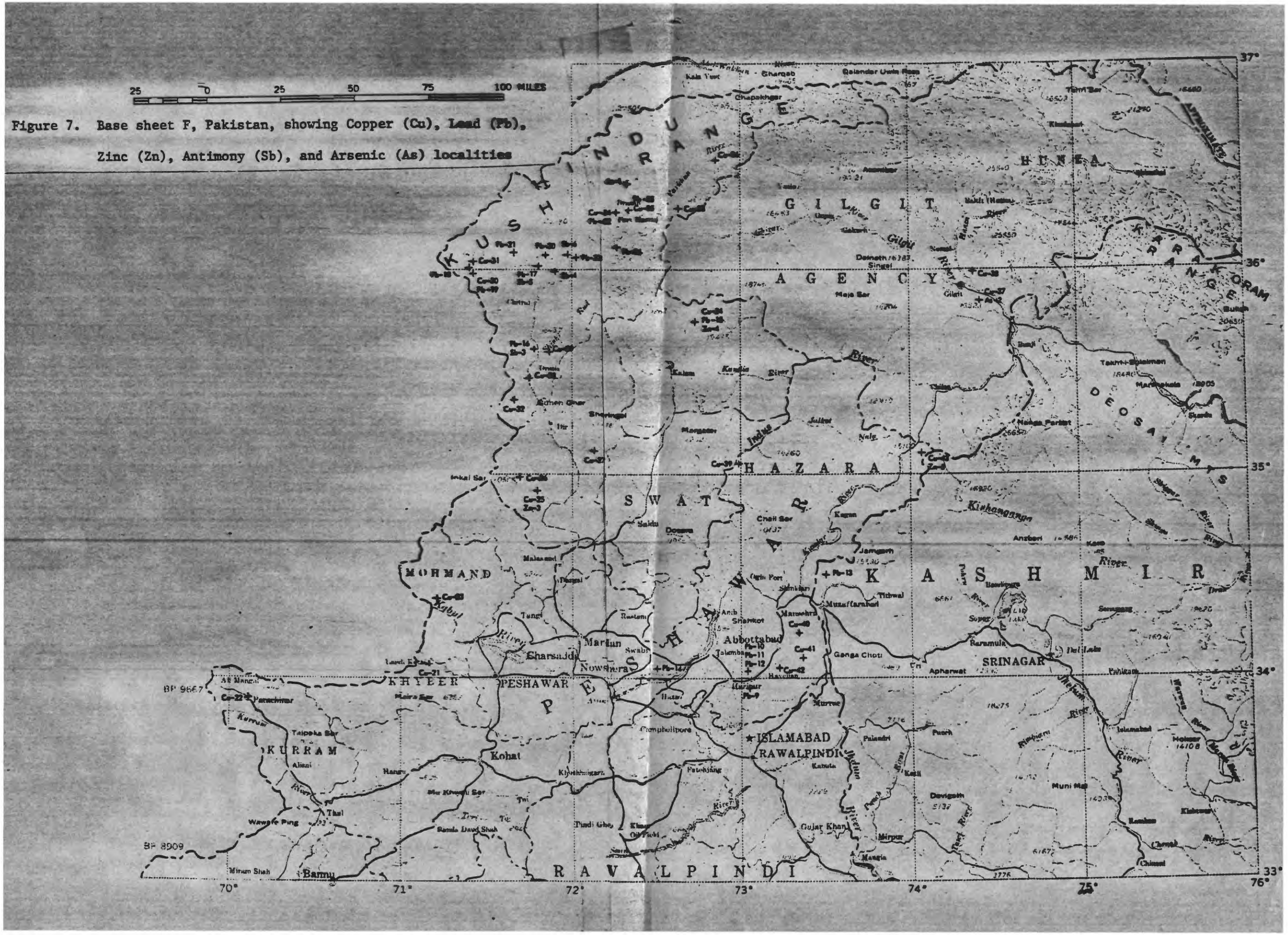

Figure 7. Base sheet F, Pakistan, showing Copper (Cu), Lead (Pb), Zinc (Zn), Antimony (Sb), and Arsenic (As) localities