UNITED STATES DEPARTMENT OF THE INTERIOR

U.S. GEOLOGICAL SURVEY

Documentation of data format and content to accompany magnetic tape copies

of various data files of the National Coal Resources Data System (NCRDS)—ECOAL,

WCOAL, NEWCOAL, BMALYT, and USCHEM

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This report is preliminary and has not
been reviewed for conformity with U.S.
Geological Survey editorial standards
and stratigraphic nomenclature. Any use
of trade names is for descriptive purposes
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USGS.

Documentation of Data Format and Content to Accompany Magnetic Tape Copies

of Various Data Files of the National Coal Resources Data System (NCRDS) --

ECOAL, WCOAL, NEWCOAL, BMALYT, and USCHEM

Introduction

The location, quantity, and physical and chemical characteristics of

coal and coal-related data are being entered into a computerized U.S. coal

resource data base that has been developed by the U.S. Geological Survey

(USGS).

The computer-based National Coal Resources Data System (NCRDS)

consists of two components. Phase I, which is currently available,

contains published resource and chemical data on an areal basis (fig. 1),

such as State, county, township, or coal field. The data bases included

in Phase I are ECOAL, WCOAL, NEWCOAL, and BMALYT. Phase II is being

developed to store basic point source coal data (e.g., field observations,

drill-hole logs, sample analyses), including: geodetic location; bed thick-

ness; lithology; depth of burial; moisture; ash; sulfur; heat value; and

major-, minor-, and trace-element content (fig. 2). The data bases cur-

rently available in Phase II are USCHEM and USTRAT.

NCRDS was designed as an open-ended system which is constantly updated

and expanded into different areas as requirements arise. Presently, it is

drawing upon a variety of sources within the USGS, other Federal and State

agencies, educational institutions, and the private sector to provide

data for a viable reference and working file for use in basic research

and resource investigations.

Phase I files and one Phase II file, USCHEM, are described in detail

in the following pages. Future writeups will describe additional Phase II

files as they become available.
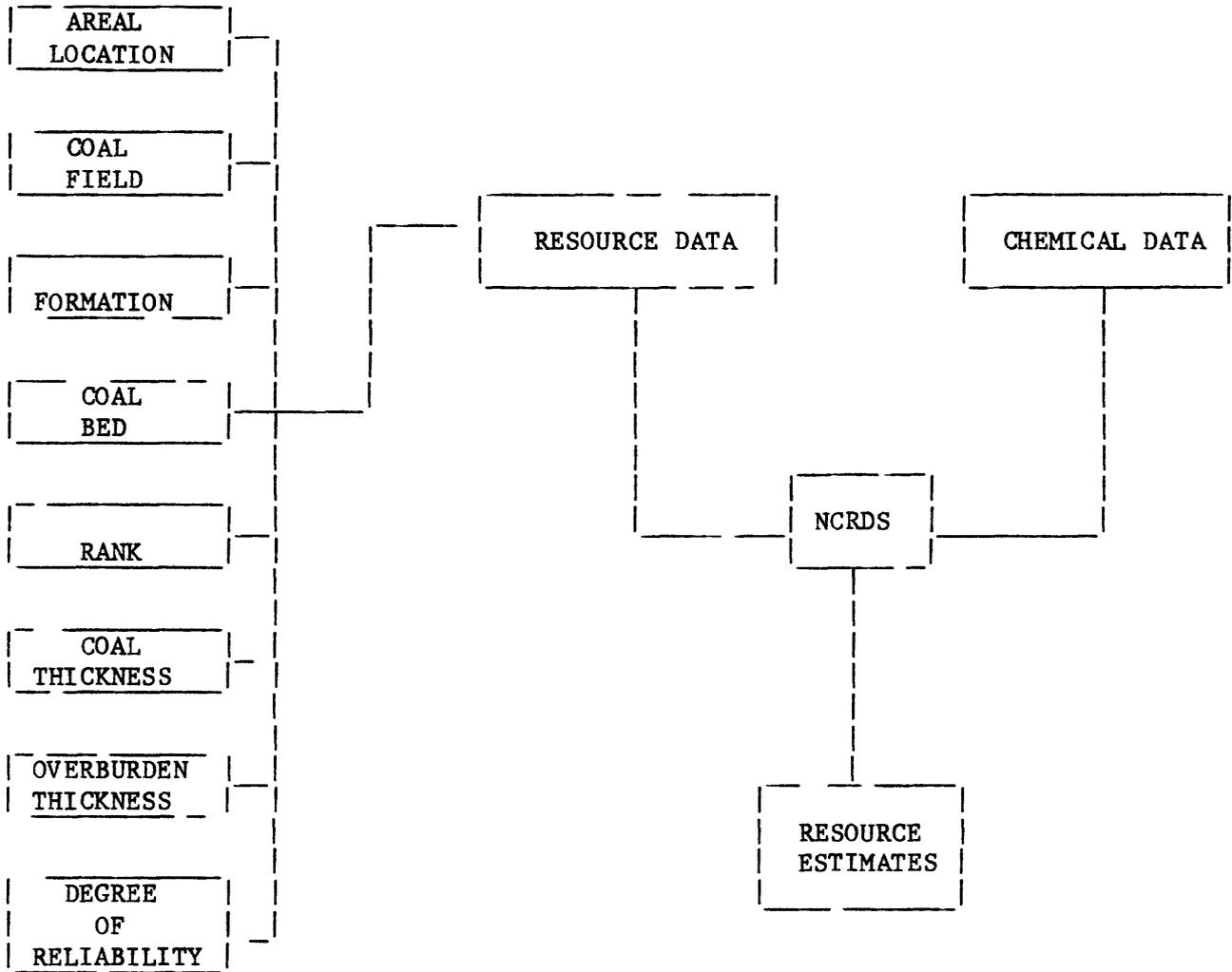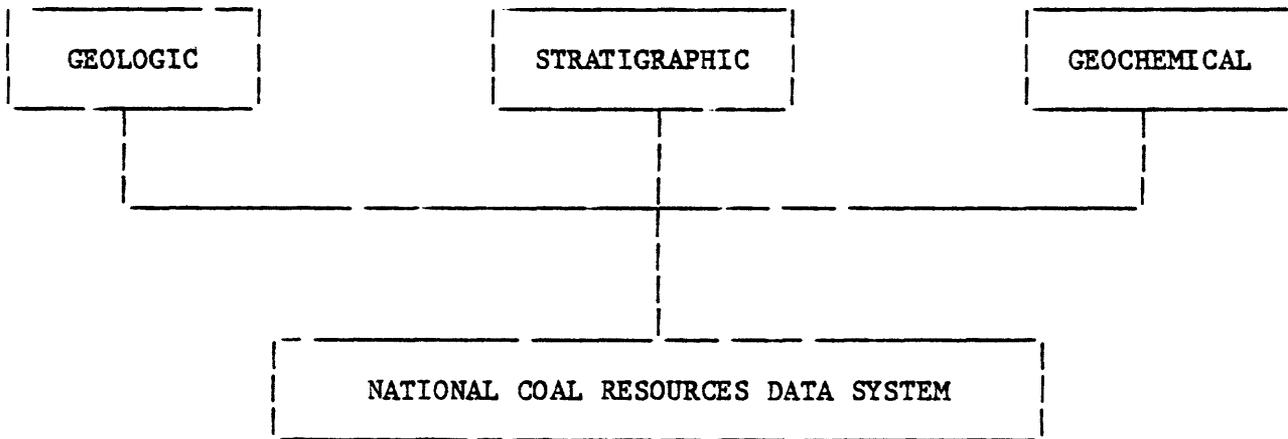
NATIONAL COAL RESOURCES DATA SYSTEM

PHASE I

```
┌─────────────┐
│   AREAL     │──┐
│  LOCATION   │  │
└─────────────┘  │
                 │
┌─────────────┐  │
│   COAL      │──┤
│   FIELD     │  │
└─────────────┘  │
                 │       ┌─────────────────┐      ┌─────────────────┐
┌─────────────┐  │   ┌───│  RESOURCE DATA  │      │  CHEMICAL DATA  │
│  FORMATION  │──┤   │   └─────────────────┘      └─────────────────┘
└─────────────┘  │   │            │                        │
                 │   │            │                        │
┌─────────────┐  │   │            │                        │
│   COAL      │──┼───┘            │                        │
│   BED       │  │                │        ┌─────────┐     │
└─────────────┘  │                │        │  NCRDS  │─────┘
                 │                └────────│         │
┌─────────────┐  │                         └─────────┘
│    RANK     │──┤                              │
└─────────────┘  │                              │
                 │                              │
┌─────────────┐  │                              │
│   COAL      │──┤                              │
│  THICKNESS  │  │                     ┌─────────────────┐
└─────────────┘  │                     │    RESOURCE     │
                 │                     │    ESTIMATES    │
┌─────────────┐  │                     └─────────────────┘
│ OVERBURDEN  │──┤
│ THICKNESS   │  │
└─────────────┘  │
                 │
┌─────────────┐  │
│   DEGREE    │  │
│     OF      │──┘
│ RELIABILITY │
└─────────────┘
```

Figure 1. - Phase I flowchart.

NATIONAL COAL RESOURCES DATA SYSTEM

PHASE II

INPUT DATA

```
┌─ ─ ─ ─┐          ┌─────────────┐          ┌─────────────┐
│ GEOLOGIC │        │ STRATIGRAPHIC │        │ GEOCHEMICAL │
└─ ─ ─ ─┘          └─────────────┘          └─────────────┘
      │                     │                       │
      └─────────────────────┼───────────────────────┘
                            │
            ┌─ ─ ─ ─ ─ ─ ─ ─┴─ ─ ─ ─ ─ ─ ─ ─┐
            │ NATIONAL COAL RESOURCES DATA SYSTEM │
            └─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─┘
                            │
```

OUTPUT DATA

```
┌────────────┬────────────┬────────────┬────────────┬────────────┐
│            │            │            │            │            │
┌──────────┐ ┌──────────┐ ┌────────┐ ┌─────────────┐ ┌──────────┐
│ RESOURCE │ │ MAPS     │ │ TABLES │ │ ANALYSIS    │ │ REGIONAL │
│ ESTIMATES│ │ AND CROSS│ │ AND    │ │ AND MODEL   │ │ STUDIES  │
│          │ │ SECTIONS │ │ GRAPHS │ │ DEVELOPMENT │ │          │
└──────────┘ └──────────┘ └────────┘ └─────────────┘ └──────────┘
```

Figure 2. – Phase II flowchart.

Phase I involves the computerization of existing data on national coal resource estimates (Cargill and others, 1976). The inventory consists of original in the ground and remaining coal resource data by areal units such as: State, county, and coal field (and where possible by bed and township or quadrangle); degree of reliability of data; thickness of coal bed; thickness of overburden; rank; and geologic age. Chemical data may be aggregated into the same areal units as the resource data.

The resource estimates are entered into NCRDS as they are presented in the source document. To date, production data have not been incorporated to bring the resource estimate up to date. This means that if the source document provides an estimate of original resources, that is the way it has been entered into NCRDS; or, if the resources in the source document are remaining in the ground as of January 1, 1959, they are stored in NCRDS as remaining as of January 1, 1959.

The source documents chosen are those cited in USGS Bulletin 1412 "Remaining coal resources of the United States as of January 1, 1974" (Averitt, 1975). The exceptions to this are instances wherein more recent detailed reports have been published, or older but more detailed reports are available.

This inventory will continually be updated or modified by Phase II information as new data for geographic areas become available or as previously assessed areas are restudied, reevaluated, and reestimated.

Phase I files - data reported by geographical <u>area</u>

File Name	Approximate Number of records	Description
ECOAL	16,000	Published coal resource estimates for coal-bearing States east of the Mississippi River by State, county, coal field, geologic age and formation, rank, thickness of coal, thickness of overburden, and reliability of data. Sources of data are included. Also indicated is whether tonnage estimate is for original coal in the ground or that coal remaining as of the date of the publication. Data entry is 95% complete.
WCOAL	16,000	Published coal resource estimates for coal-bearing States west of the Mississippi River. Data elements are the same as those in ECOAL. Data entry is 95% complete.
NEWCOAL	3,000	Published coal resource estimates for various coal-bearing States. Data elements are same as those for ECOAL and WCOAL. This is a working file for all new resource data entry. The records are stored herein until they can be incorporated into ECOAL or WCOAL. Data entry is continual. Caution: the tonnage estimates in this file may duplicate or overlap ECOAL/WCOAL files. Do not add these tonnages to those in ECOAL/WCOAL without careful prior checking.
BMALYT	53,000	Standard U.S. Bureau of Mines chemical analyses (proximate, ultimate, BTU, ash softening temperature, free swelling index and Hardgrove grindability index) on tipple, delivered, and channel coal samples. Analyses are located by State, county, bed code and name, and mine and nearest town code. Apparent rank has been calculated by ASTM formulae.

Scope and Purpose

The scope of ECOAL/WCOAL/NEWCOAL, in terms of data elements, is an estimate of coal tonnage for a defined area (State, county, and sometimes township range/section) and contains published information on coal field, district, province, region, formation, coal bed, depth to coal, (overburden), reliability of data, rank, and thickness of coal. Overburden, reliability, and thickness are given in terms of the standard USGS categories (ranges) (U.S. Geological Survey, 1976). Other information includes identification of the source document from which the tonnage estimates were taken and its year of publication; topographic quadrangle name; base year of the tonnage estimate; and geologic age by System and Series. BMALYT contains State, county, and bed which allow the chemical data to be related to the resource data on a generalized <u>areal</u> basis.

Information for the resource and chemical files is collected from different sources; therefore exact correlations are not possible.

ECOAL/WCOAL/NEWCOAL Data Files and Variables

STATE is the name of the State.

COUNTY is the name of the county.

PMERID is the principal meridian from which a township/range survey was begun, and is given as a numeric code in ECOAL/WCOAL/NEWCOAL records. Table 1 lists the meridians and baselines of the United States rectangular surveys, as provided by the U.S. Bureau of Land Management, as well as the U.S. Bureau of Mines code associated with each name.

Table 1. List of meridian codes in the PMERID file with names.

01	1st Principal
39	1st Scioto River
02	2d Principal
40	2d Scioto River
03	3d Principal
41	3d Scioto River
04	4th Principal
05	5th Principal
06	6th Principal
07	Black Hills
08	Boise
09	Chickasaw
10	Choctaw
11	Cimarron
12	Copper River
42	Ellicott's Line
13	Fairbanks
14	Gila and Salt River
36	Great Miami River
15	Humboldt
16	Huntsville
17	Indian
44	Kateel River
18	Louisiana
19	Michigan
20	Montana Principal
21	Mount Diablo
37	Muskingum River
22	Navajo
23	New Mexico
35	Ohio
38	Ohio River
26	Salt Lake
27	San Bernardino
28	Seward
24	St. Helena
25	St. Stephens
29	Tallahassee
43	Twelve Mile Square
30	Uintah Special
45	Umiat
31	Ute
32	Washington
33	Willamette
34	Wind River
96	Principal meridian and base line unknown
99	Various principal meridians and base lines

TWNSHIP is the township number of the township/range survey. Three digits are provided for the township number, allowing values from 001 to 999. However, no provision has been made for half townships.

NS is the township direction, north or south.

RANGE is the range number, and, like TWNSHIP, three digits are allowed with no provision for half ranges.

EW is the range direction east or west.

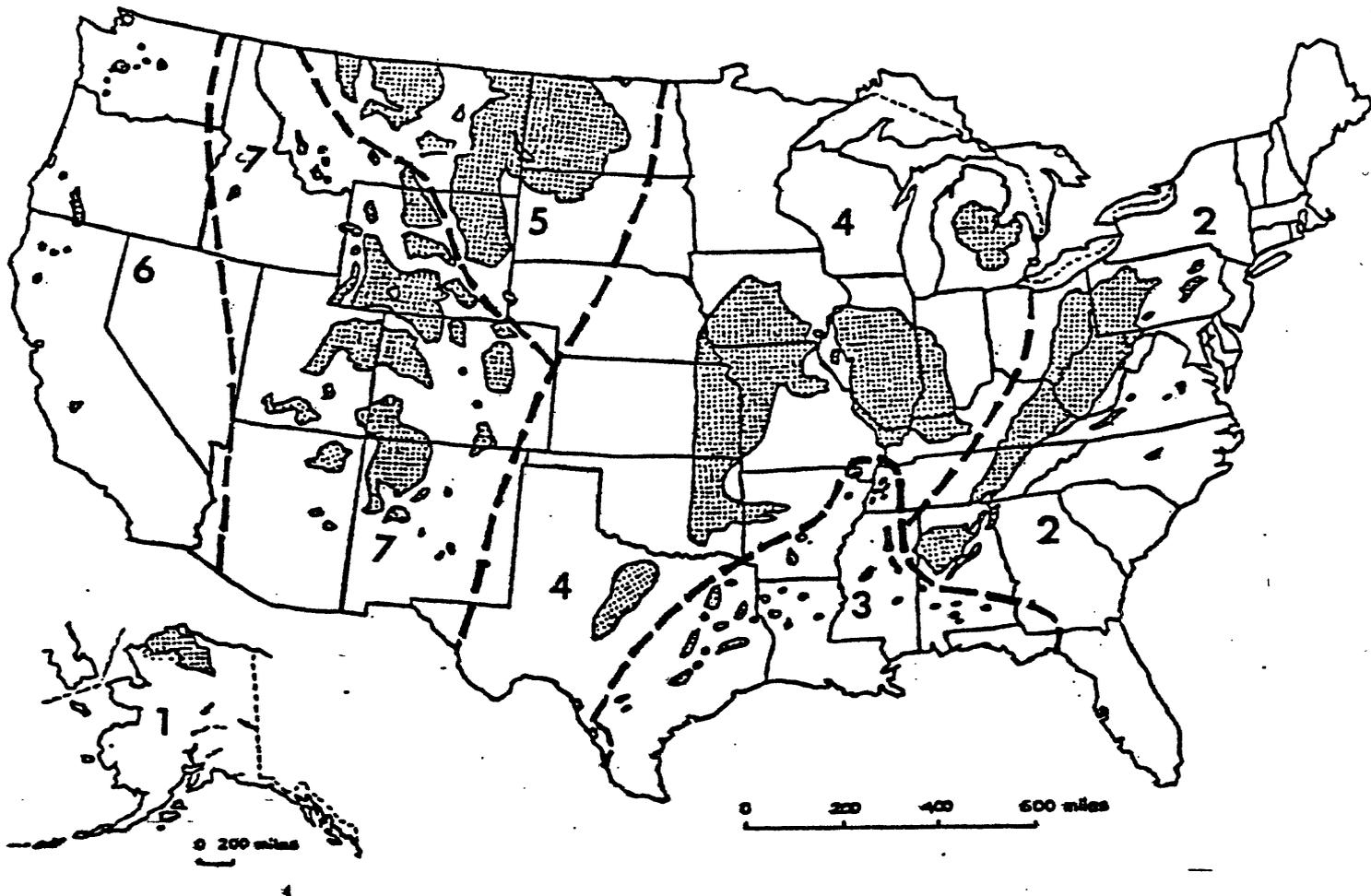SECTION is the section number within a township/range unit. This is a two-digit value usually between 01 and 36.

AAPGPRV is the AAPG (American Association of Petroleum Geologists) province number (Meyer, 1970). The purpose of using this number is to provide a link between the NCRDS and other national energy data systems. The associated geologic provinces, districts, basins, and so on, do not necessarily correspond from one resource to another.

COALPRV is the coal province name. Figure 3 shows the coal provinces of the United States.

REGION is the coal region name and is a subset of coal provinces. Figure 4 shows the coal regions of the United States. The coal regions for the conterminous 48 States correspond to those given by Trumbull (1960). No previous designations have been given to the regions of the Alaska province. Therefore the base map from Barnes (1961) was used to derive logical regional subdivisions for NCRDS use.

FIELD is the coal field name as given in the source.

DISTRICT is a local area designator applicable mainly to the Alaskan areas. These names are, in many cases, interchangeable with field names, implying no hierarchical difference between district and field. This
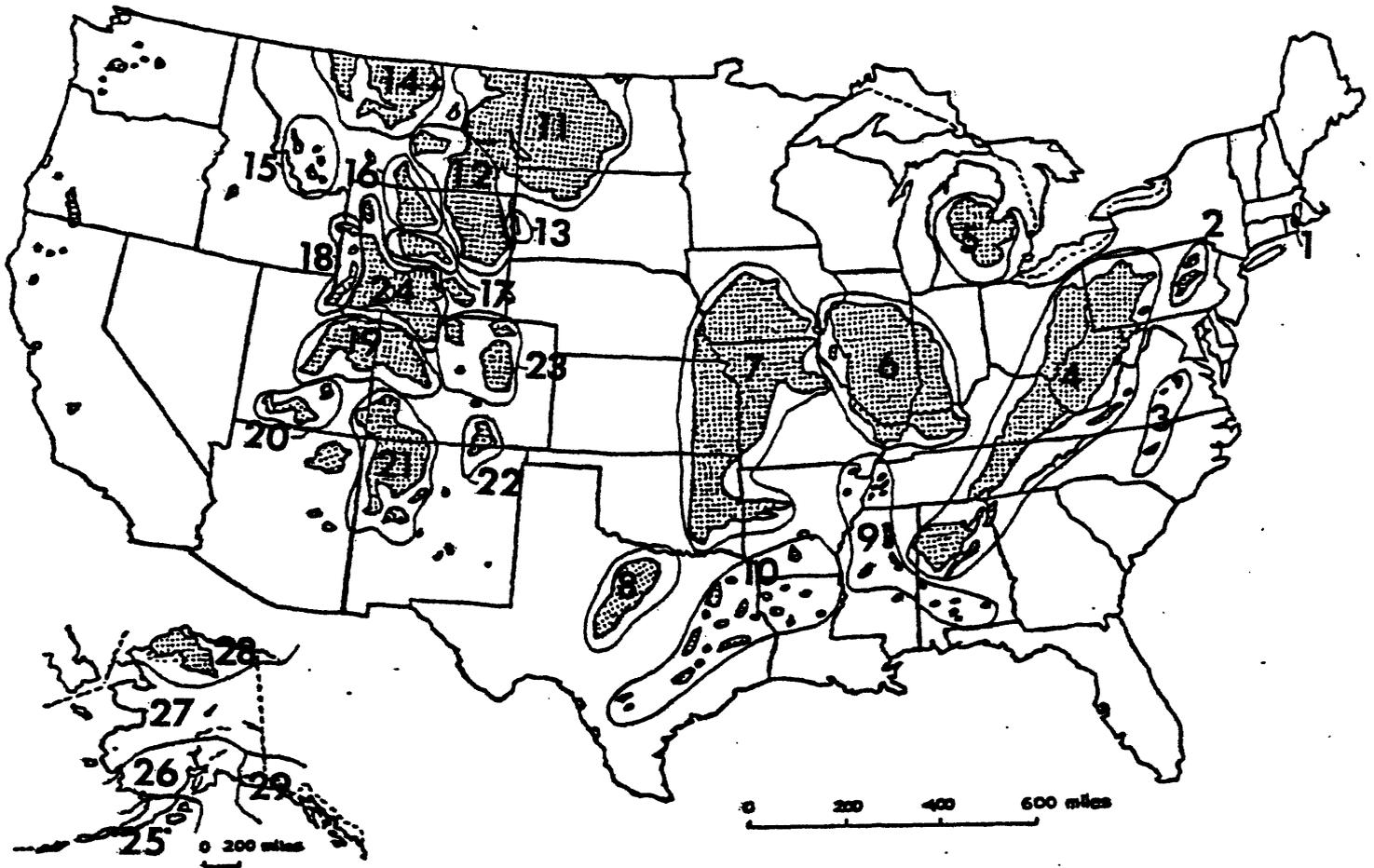
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EXPLANATION

Provinces

1. Alaska
2. Eastern
3. Gulf
4. Interior
5. Northern Great Plains
6. Pacific Coast
7. Rocky Mountain

Figure 3. - Coal provinces of the conterminous United States and Alaska.

Figure 4. - Coal regions of the conterminous United States and Alaska.

field is also used for miscellaneous data items such as geologic "group".
The term "group" is included after the group name to distinguish it from
a true district entry, e.g. Pottsville Group.

FORMATN is the formation name.

BED is the coal bed name.

SYSTEM is the geological age designation.

SERIES is the name given to a subdivided system.

Table 2 shows the ordered relationship between System and series.

Table 2. - Geological age names used with WCOAL, ECOAL, and NEWCOAL

System	Series
Tertiary ---	Pliocene
	Miocene
	Oligocene
	Eocene
	Paleocene
Cretaceous ---	Upper
	Lower
Jurassic ---	Upper
	Middle
	Lower
Triassic ---	Upper
	Middle
	Lower
Permian --	Upper
	Lower
Pennsylvanian --	Upper
	Middle
	Lower
Mississippian --	Upper

QUAD is the topographic quadrangle name and refers to the quadrangle for which the resource tonnage estimate was made. Very few resources estimates have been reported on a quadrangle basis.

BYEAR is the base year for which estimates were made of the tonnages of coal. As an example, 51 indicates that the estimates are for remaining resources as of 1951; 00 indicates that the tonnage estimate is of original coal resources (as of the date of the source document).

SOURCE is the publication from which the data were taken.

YEAR is the publication year of the source document.

THICKNS is the coal thickness code. The possible values of THICKNS are shown in Table 3.

OVRBRDN is the overburden thickness code. The possible values of OVRBRDN are shown in Table 3.

RELIABL is the reliability code given to a tonnage estimate. The possible values of RELIABL are shown in Table 3.

MAJRANK is the name used for the four major categories of coal rank: anthracite, bituminous, subbituminous, and lignite.

MINRANK is the subdivision of the major rank where reported.

TONNAGE is the estimated coal resource in millions of short tons to two decimal places. A tonnage value exists for every unique combination of thickness code, overburden code, reliability code, location, and bed.

The order of the data items and their maximum length are shown in Table 4.

Table 3. - List of ECOAL/WCOAL/NEWCOAL variables.

```
state           state name
county          county name
pmerid          principal meridian
twnship         township number
ns              direction of township (n or s)
range           range number
ew              direction of range (e or w)
section         section number
aapgprv         aapg province number

coalprv         coal province name
region          coal region name
field           coal field name
district        local area designator
formatn         formation name
bed             coal bed name
system          geologic age & system
series          geologic age & series

quad            topographic quadrangle name
byear           base year for tonnage estimates
                    00 means original data
                    51 means data taken as of 1951
source          source document
year            publication year of source document

thickns         coal bed thickness code
                    1 = 14 to 28 inches
                    2 = 28 to 42 inches
                    3 = greater than 42 inches
                    4 = 2.5 to 5 feet
                    5 = 5 to 10 feet
                    6 = greater than 10 feet
                    7 = unclassified
                    8 = classified by zone
                    9 = less than 14"
ovrbrdn         overburden thickness in feet
                    1 = 0 to 3000
                    2 = 0 to 2000
                    3 = 0 to 1000
                    4 = 1000 to 2000
                    5 = 2000 to 3000
                    6 = greater than 3000
                    7 = strippable
                    8 = unclassified
                    9 = strippable to 1000
```

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Table 3. - List of ECOAL/WCOAL/NEWCOAL variables (continued)

reliabl   reliability code
                           1 = measured
                           2 = measured and indicated
                           3 = indicated
                           4 = inferred
                           5 = unclassified
                           6 = hypothetical

majrank   rank of coal
                           anth - anthracite
                           bit - bituminous
                           subbit - subbituminous
                           lignite - lignite

minrank   rank of coal
                           lv bit - low-volatile bituminous
                           mv bit - medium-volatile bituminous
                           hv bit - high-volatile bituminous
                           hv bit a - high-volatile bituminous a
                           hv bit b - high-volatile bituminous b
                           hv bit c - high-volatile bituminous c
                           subbit a - subbituminous a
                           subbit b - subbituminous b
                           subbit c - subbituminous c

tonnage   coal resource in millions of short tons ... a
tonnage record exists for every unique combination
of thickness code, overburden code, reliability code,
rank code, and location category, as well as certain
stratigraphic designations

Table 4. - List of ECOAL/WCOAL/NEWCOAL data items and their maximum length.

28 ITEMS	OUTTAPE LENGTH
1. STATE	a16
2 COUNTY	a24
3. PMERID	i8
4. TWNSHIP	f12.3
5. TNS	a4
6. RANGE	f12.3
7. REW	a4
8. SECTION	f12.3
9. AAPGPRV	i8
10. COALPRV	a16
11. REGION	a24
12. THICKNS	i8
13. FIELD	a16
14. DISTRCT	a24
15. OVRBRDN	i8
16 FORMATN	a16
17. BED	a20
18. RELIABL	i8
19. SYSTEM	a16
20. QUAD	a28
21. BYEAR	i8
22. SERIES	a16
23. SOURCE	a20
24. YEAR	i8
25. MAJRANK	a16
26. MINRANK	a16
27. ID	i8
28. TONNAGE	f12.3

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State, county, and bed are the same as for ECOAL/WCOAL/NEWCOAL:

STATCOD and CNTYCOD are the FIPS (U.S. National Bureau of Standards, 1970) codes for State and county.

STATMOD is used only with Pennsylvania and Kentucky data. For Pennsylvania data, a statmod of 1 is used to indicate anthracite samples; a statmod of 2 indicates bituminous samples. In Kentucky a statmod of 1 indicates Eastern Kentucky data; a statmod of 2 indicates Western Kentucky data.

MINECOD, TOWNCOD, and BEDCOD are the U.S. Bureau of Mines codes for mines, towns, and coal beds. Bed names have been added by USGS from a table of bedcodes and related bed names by State supplied by USBM. In many cases the USBM bedcode has several bednames associated with it. In these cases, the bed name corresponding to the bed name used in the ECOAL/ WCOAL/NUCOAL resource files within the immediate geographic area was entered into the BED data item.

SIZENO is the USBM size code with a range as shown in Table 5. All other variables are described in Table 6.

MAJRANK and MINRANK were computer calculated from data on a dry basis.

Table 5. Bituminous, subbituminous, and lignite sizes.

Size number	Size definition
01*	Run-of-mine or crushed run-of-mine
02 to 09	Single screened lump coal with defined minimum size limit. Examples: 8" lump; 5" lump; 2" lump; 1/2" lump; etc.
11 to 19	Double screened egg coal. Examples: 10" x 2-1/2"; 8" x 4"; 7" x 3"; 6" x 1"; etc.
20 to 30	Double screened stove coal. Examples: 5" x 2"; 4-1/2" x 2-1/2"; 4" x 1-1/2"; 3" x 1-5/8"; etc.
31 to 43	Double screened nut coal. Examples: 2-1/2" x 1-1/8"; 2" x 3/4"; 1-14" x 3/4"; 1-1/2" x 1/2"; etc.
44 to 48 and 50 and 51	Double screened stoker coal. Examples: 1-5/8" x 3/8"; 1-1/2" x 3/16"; 1-1/8" x 3/8"; 1" x 1/2"; etc.
49*	1-1/4" x 1/4"
52*	1" x 3/8"
53*	1" x 1/4"
54*	1" x 3/16"
55 to 63	Smaller sized double screened stoker coal. Examples: 7/8" x 3/8"; 3/4" x 1/4"; etc. Stoker coal with mesh as minimum size limit. Examples: 1-1/2" x 10 mesh; 1-1/4" x 28 mesh; 1" x 10 mesh; 3/4" x 28 mesh; etc.
64 to 69	Generally single screened slack coal with the larger maximum size limits. Examples: 7" x 0; 5" x 0; 2 3/4" x 0; etc. Some smaller stoker coal. Examples: 1/2" x 3/16"; 1-1/4" x 1/16"; 1/8" x 28 mesh; etc.
68*	3" x 0
70*	2-1/2" x 0
71 to 73, 75, 79, and 80	Single screened slack coal. Examples: 2-1/4" x 0; 2" x 0; 1-5/8" x 0; etc. Modified slack coal. Examples: Modified 2" x 0; Modified 1" x 0; etc.
74*	1-1/2" x 0
76*	1-1/4" x 0
77*	1" x 0

Table 5. - Bituminous, sub-bituminous, and lignite sizes (continued)

Size number	Size definition
78*	7/8" x 0
81*	3/4" x 0
82*	5/8" x 0
85*	1/2" x 0
83, 84, 86, 87, and 91	Single screened slack coal with smaller maximum size limits. Examples: 7/16" x 0; 3/16" x 0; etc.
88*	3/8" x 0
90*	1/4" x 0
92*	1/8" x 0
98*	Middlings
99*	Face or channel

Most inch designations are based on round hole or round hole equivalent screening.

Numbers used exclusively for only one size of coal at all mines are denoted by asterisks and their respective exclusive size definitions.

All other numbers will represent the same size at the same mine but may represent different size definitions at different mines. For exact size definition of any listed number at any listed mine, please contact the Energy Information Administration, U.S. Department of Energy, Washington, D.C.

Table 6. - List of BMALYT variables.

STATE	STATE NAME
STATCOD	STATE FIPS CODE
STATMOD	STATE MODIFIER (PA & KY)
	PA: 1 = anth 2 = bit
	KY: 1 = east 2 = west
COUNTY	COUNTY NAME
CNTYCOD	COUNTY FIPS CODE
MINECOD	USBM MINE CODE
TOWNCOD	USBM TOWN CODE
BED	BED NAME
BEDCOD	COAL BED CODE
SIZENO	USBM SIZE CODE
	01 = RUN-OF-MINE OR CRUSHED RUN-OF-MINE
	02-98 = SCREENING SIZES
	99 = FACE OR CHANNEL SAMPLE
ANALYR	YEAR OF ANALYSIS
	LAST 2 DIGITS (E.G. 19xx)
TIPDEL	TIPPLE/DELIVERED CODE
	T = TIPPLE
	D = DELIVERED
TONSAMP	TONNAGE SAMPLED (IN SHORT TONS)
PROXNO	NUMBER OF PROXIMATE ANALYSES
MOISTUR	PER CENT MOISTURE - AS RECEIVED
VOLMAT	PER CENT VOLATILE MATTER - DRY BASIS
FIXEDC	PER CENT FIXED CARBON - DRY BASIS
ASH	PER CENT ASH - DRY BASIS
SULFUR	PER CENT SULFUR - DRY BASIS
BTU	BTU VALUE - DRY BASIS
ULTNO	NUMBER OF ULTIMATE ANALYSES
HYDROGN	PER CENT HYDROGEN - DRY BASIS
CARBON	PER CENT CARBON - DRY BASIS
NITROGN	PER CENT NITROGN - DRY BASIS
OXYGEN	PER CENT OXYGEN - DRY BASIS
ASHSFNO	NUMBER OF ASH SOFTENING TEMPERATURE ANALYSES
ASHSOFT	ASH SOFTENING TEMPERATURE IN DEGREES FAHRENHEIT
FSILO	FREE SWELLING INDEX - LOW
FSIHI	FREE SWELLING INDEX - HIGH
HGILO	HARDGROVE GRINDABILITY INDEX - LOW
HGIHI	HARDGROVE GRINDABILITY INDEX - HIGH
PREPCOD	PREPARATION CODE
	R = RAW
	P = PARTIALLY WASHED
	W = WASHED
MAJRANK	RANK CALCULATED BY ASTM CLASSIFICATION
MINRANK	RANK CALCULATED BY ASTM CLASSIFICATION

These apparent ranks have been computer calculated by applying ASTM formula (Am. Soc. Testing and Materials, 1975, p. 215) to each analysis stored in the file and recorded as MAJRANK & MINRANK. The exception to this is in the Fort Union region of Montana, North Dakota, and South Dakota where the formula produced a calculated subbituminous ranking. In this region the rank is considered to be lignite, and so it is recorded is lignite in the BMALYT file.

Proximate and ultimate variables were received from USBM on a dry basis and are stored as such in the data base.

For detailed work with the BMALYT file, it is critical for the user to be aware of all of the variables for a sample, particularly SIZENO and PREPCOD.

The order of the data items in BMALYT and their maximum length are shown in Table 7.

Table 7. — List of BMALYT data items and their maximum length.

	34 ITEMS	OUTTAPE LENGTH
1.	STATE	a16
2.	STATCOD	i8
3.	STATMOD	i8
4.	COUNTY	a24
5.	CNTYCOD	i8
6.	MINECOD	i8
7.	TOWNCOD	i8
8.	BED	a20
9.	BEDCOD	i8
10.	SIZENO	i8
11.	ANALYR	i8
12.	TIPDEL	a4
13.	TONSAMP	i8
14.	PROXNO	i8
15.	MOISTUR	f12.3
16.	VOLMAT	f12.3
17.	FIXEDC	f12.3
18.	ASH	f12.3
19.	SULFUR	f12.3
20.	BTU	i8
21.	ULTNO	i8
22.	HYDROGN	f12.3
23.	CARBON	f12.3
24.	NITROGN	f12.3
25.	OXYGEN	f12.3
26.	ASHSFNO	i8
27.	ASHSOFT	i8
28.	FSILO	f12.3
29	FSIHI	f12.3
30.	HGILO	i8
31.	HGIHI	i8
32.	PREPCOD	a4
33.	MAJRANK	a12
34.	MINRANK	a12

PHASE II

Phase II is being established and operated concurrently with Phase I but is based on geodetically located point data and contains information on coal quantity and quality in far greater detail than Phase I.

All pertinent geologic and geochemical data will be entered into the computerized system for storage, retrieval, analysis, integration, comparison, synthesis, map plotting, and other manipulation. Several hundred different criteria can be entered into the system for any point of field observation or drill hole record.

The system will be used to calculate coal resources and quality for any geographic area, coal bed, or series of coal beds in relation to sulfur, ash, and major, minor, or trace elements; report in tabular, graph, or any statistical format; derive coal resources and reserves in relation to sulfur, ash, and major, minor, or trace elements; calculate and descriminate overburden categories; and locate through computer analysis the more desirable portions of a coal deposit.

Phase II files – data located by latitude and longitude to nearest degree, minute and second.

To date, more than 30 State agencies and universities have submitted coal samples for geochemical analysis to the USGS. The results of these analyses are included in the USCHEM file.

File Name	Number of records	
USCHEM	4,043	Major, minor, and trace element analyses on coal and related rocks by USGS laboratories. Standard USBM analyses included for many coal samples. Located by lat/long coordinates. Contains all descriptive identifiers listed under ECOAL.

Distribution and number of samples in USCHEM as of 4/16/80.

State	Count	State	Count	State	Count
Alabama	52	Maryland	18	Rhode Island	6
Alaska	123	Massachusetts	5		
Arizona	43	Michigan	3	South Dakota	0
Arkansas	40	Mississippi	13		
		Missouri	143	Tennessee	55
California	1	Montana	478	Texas	31
Colorado	188				
		Nebraska	8	Utah	102
Georgia	0	Nevada	14		
		New Mexico	152	Virginia	149
Idaho	20	New York	0		
Illinois	125	North Carolina	55	Washington	18
Indiana	154	North Dakota	138	West Virginia	316
Iowa	102				
		Ohio	152	Wyoming	879
Kansas	37	Oklahoma	73		
Kentucky	143	Oregon	0		
Louisiana	0	Pennsylvania	207	Total	4,043

Phase II files under testing:

USTRAT – Stratigraphic sequence and drill hole descriptions.

USGEOL – Geologic field notes.

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USCHEM Data File and Variables

State, county, aapgprv, province, region, field district, formation, bed, system and series are the same as for ECOAL/WCOAL/NEWCOAL. All the other variables are described in Table 8.

SPECIAL ATTENTION SHOULD BE GIVEN TO THE INFORMATION LISTED ABOUT THE VALUE REPORTED FOR EACH ELEMENT. THE METHOD OF REPORTING (PERCENT OR PARTS PER MILLION (PPM)), THE PART OF THE SAMPLE ANALYZED (ASH OR WHOLE COAL), AND THE ANALYTICAL METHOD (e.g. SPEC, AA, WETCHEM) VARY WITH EACH ELEMENT. IN SOME CASES THE ANALYTICAL METHOD OR WAY OF REPORTING DATA HAS CHANGED WITH TIME.

The order of the data items in USCHEM, their maximum length and codes used are shown in Table 9.

Table 8. List of USCHEM Variables

state	3	state name
county	3	county name
latitud	1	latitude coordinate
ns	3	direction of latitude (n or s)
longtud	1	longitude coordinate
ew	3	direction of longitude (e or w)
aapgprv	1	aapg province number - see appg-csd geol provinces code map, 1:5,000,000 and aapg bull vol 54, no 7, july 1970, pp 1301-5
coalprv	3	coal province name - see us geol survey prof paper 978, pp 8, 13
region	3	coal region name - see us geol survey prof paper 978, pp 9, 13
field	3	coal field name
district	3	local area designator
formatn	3	formation name
group	3	group name
bed	3	coal bed name
member	3	member name
zone	3	zone name
depth	2	depth to top of sample
sthick	2	sampled thickness
system	3	geologic age: system
series	3	geologic age: series
locname	3	mine or drill hole identifier
quad	3	topographic quadrangle name and series
colectr	3	person collecting or submitting data
fieldno	6	field number assigned by collector/submitter
date	1	yr/mo/dy - date is of meaning to the collector
estrank	3	estimated rank of coal (also includes lithology for coal related rock samples - list dictionary type items in "names" command for all possible ranks and lithologies)

> *anth   = anthracite
> semi anth = semi-anthracite
> *bit   = bituminous
> lv bit   = low volatile bituminous
> mv bit   = medium volatile bituminous
> hv bit   = high volatile bituminous
> hv bit a   = high volatile bituminous a
> hv bit b   = high volatile bituminous b
> hv bit c   = high volatile bituminous c
> *subbit   = subbituminous
> subbit a   = subbituminous a
> subbit b   = subbituminous b
> subbit c   = subbituminous c
> *lignite   = lignite

majrank	3	major rank of coal calculated for U.S.B.M. analyses by ASTM classification (see starred items above)
minrank	3	minor rank of coal calculated for U.S.B.M. analyses by ASTM classification
anida	3	reported analysis identification (alphabetic)
anidn	1	reported analysis identification (numeric)

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Table 8 (continued)

labcode	1	code for laboratory performing analysis

        1 = u.s. bureau of mines
        2 = state university
        3 = state agency
        4 = coal company
        5 = u.s. geological survey
           (and combinations i.e. 15 = usbm & usgs)

samptyp   1   sample type
        1 = channel
        2 = run of mine
        3 = drill core
        4 = other
        5 = grab

analtyp   1   analysis type
        1 = as received
        2 = air dried
        3 = moisture free
        4 = moisture and ash free
        5 = other

valrep   1   values represent
        1 = single sample
        2 = average of more than one sample (composite)
        3 = range of sample values
        4 = composite usbm individual usgs
        5 = composite usgs individual usbm
        9 = sink float (mesh)
      10 = partial seam
      11 = partial upper bench (refers to stratigraphic
           bench, not sample technique)
      12 = partial lower bench
      13 = partial middle bench
      20 = upper bench
      21 = lower bench
      22 = middle bench

othert	3	results of other tests available (y or n) - will later be coded
btu	1	btu value
ashdef	1	ash deformation temperature in fahrenheit
ashsof	1	ash softening temperature in fahrenheit
ashfld	1	ash fluid temperature in fahrenheit
freswel	2	free-swelling index
moistur	2	moisture value in per cent
volmat	2	volatile matter value in per cent
fixedc	2	fixed carbon value in per cent
ash	2	ash value in per cent usbm (750°C)
carbon	2	carbon value in per cent
hydrogn	2	hydrogen value in per cent
oxygen	2	oxygen value in per cent
nitrogn	2	nitrogen value in per cent
sulfur	2	total sulfur value in per cent
sulfate	2	sulfate value in per cent

Table 8 (continued)

```
sulfpyr    2      pyritic sulfur in per cent
sulforg    2      organic sulfur in per cent
adloss     2      air-dried loss in per cent
usgsash    2      ash value in per cent usgs laboratory (525°C)
                  ***usgs analytical methods are given by location of
                      laboratory i.e. (washington:denver)
                  ***the laboratory performing analysis is indicated by
                      anida value
                      i.e. w = washington
                           d = denver
                  ***if the analytical methods used for an element have
                      changed for a laboratory, the methods are given in
                      order of oldest to newest e.g. (spec, inaa-750527,
                      wetchem-760203:spec) with date of conversion of ash
                      or whole coal basis - yr,mo,dy
                  ***usgs types of analyses***
                      wetchem = wet chemical analysis
                                w numbers on ash except hg & f
                                d numbers on ash except as, f, hg, & sb
                      inaa    = instrumental neutron activation analysis
                      na      = delayed neutron activation analysis on
                                whole coal
                      xrf     = x-ray fluorescence
                                w numbers on ash except cl & p
                                d numbers on ash except se
                      spec    = spectrographic on ash
                                for w numbers optical emission
                                for d numbers six-step
                  ***contact usgs - branch of coal resources for specifics***
sio2       5      sio2 value in per cent in ash (spec, xrf:xrf)
                      b = no data available
                      l = less than value shown
                      g = greater than value shown
                      h = not determined due to interference
                      n = not detected
al2o3      5      al2o3 value in per cent in ash (spec, xrf:xrf)
cao        5      cao value in per cent in ash (spec, xrf:xrf)
mgo        5      mgo value in per cent in ash (wetchem·wetchem)
na2o       5      na2o value in per cent in ash (wetchem, inaa:wetchem)
k2o        5      k2o value in per cent in ash (spec, xrf:xrf)
p2o5       5      p2o5 value in per cent in ash (spec, xrf:xrf)
so3        5      so3 value in per cent in ash (spec, xrf:xrf)
cl         5      cl value in per cent in ash (spec, xrf:xrf)
ag         5      ag value in ppm - ash (spec:spec)
as         5      as value in ppm - whole coal (inaa:wetchem)
au         5      au value in ppm - ash (spec:spec)
b          5      b value in ppm - ash (spec:spec)
ba         5      ba value in ppm - ash (spec:spec)
be         5      be value in ppm - ash (spec:spec)
bi         5      bi value in ppm - ash (spec:spec)
br         5      cd value in ppm - ash (aa)
cd         5      cd value in ppm - ash (wetchem:wetchem)
```

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Table 8 (continued)

ce	5	ce value in ppm - ash (spec, inaa - 750727:spec)
co	5	co value in ppm - ash (spec, inaa - 750727:spec,inaa-760819)
cr	5	cr value in ppm - ash (spec, inaa - 750727: spec, inaa-760819)
cs	5	cs value in ppm - ash (spec, inaa - 750727: spec)
cu	5	cu value in ppm - ash (wetchem:wetchem)
dy	5	dy value in ppm - ash (spec:spec)
er	5	er value in ppm - ash (spec:spec)
eu	5	eu value in ppm - ash (spec, inaa - 750727:spec)
f	5	f value in ppm - whole coal (wetchem:wetchem)
ga	5	ga value in ppm - ash (spec:spec)
gd	5	gd value in ppm - ash (spec:spec)
ge	5	ge value in ppm - ash (spec:spec)
hf	5	hf value in ppm - ash (spec, inaa - 750727:spec)
hg	5	hg value in ppm - whole coal (wetchem:wetchem)
ho	5	ho value in ppm - ash (spec:spec)
in	5	in value in ppm - ash (spec:spec)
ir	5	ir value in ppm - ash (spec:spec)
la	5	la value in ppm - ash (spec, inaa - 750727:spec)
li	5	li value in ppm - ash (wetchem:wetchem)
lu	5	lu value in ppm - ash (spec, inaa - 750727:spec)
mn	5	mn value in ppm - ash (spec, wetchem: spec, wetchem)
mo	5	mo value in ppm - ash (spec:spec)
nb	5	nb value in ppm - ash (spec:spec)
nd	5	nd value in ppm - ash (spec:spec)
ni	5	ni value in ppm - ash (spec:spec)
os	5	os value in ppm - ash (spec:spec)
pb	5	pb value in ppm - ash (wetchem:wetchem)
pd	5	pd value in ppm - ash (spec:spec)
pr	5	pr value in ppm - ash (spec:spec)
pt	5	pt value in ppm - ash (spec:spec)
rb	5	rb value in ppm - ash (spec, inaa - 750727:spec)
re	5	re value in ppm - ash (spec:spec)
rh	5	rh value in ppm - ash (spec:spec)
ru	5	ru value in ppm - ash (spec:spec)
sb	5	sb value in ppm - whole coal (inaa:inaa)
sc	5	sc value in ppm - ash (spec, inaa - 750727:spec)
se	5	se value in ppm - whole coal (inaa:inaa)
sm	5	sm value in ppm - ash (spec, inaa - 750804:spec)
sn	5	sn value in ppm - ash (spec)
sr	5	sr value in ppm - ash (spec:spec)
ta	5	ta value in ppm - ash (spec:spec)
tb	5	tb value in ppm - ash (spec, inaa - 750727:spec)
te	5	te value in ppm - ash (spec:spec)
th	5	th value in ppm - whole coal (na:na)
tl	5	tl value in ppm - ash (spec:spec)
tm	5	tm value in ppm - ash (spec:spec)
u	5	u value in ppm - whole coal (na:na)
v	5	v value in ppm - ash (spec:spec)
w	5	w value in ppm - ash (spec:spec)
y	5	y value in ppm - ash (spec:spec)
yb	5	yb value in ppm - ash (spec:inaa - 750727:spec)
zn	5	zn value in ppm - ash (wetchem:wetchem)
zr	5	zr value in ppm - ash (spec:spec)

Table 9. - List of USCHEM data items and their maximum length.

128 ITEMS	OUTTAPE LENGTH
1. STATE	a16
2. COUNTY	a24
3. LATITUD	i8
4. NS	a4
5. LONGTUD	i8
6. EW	a4
7. AAPGPRV	i8
8. COALPRV	a16
9. REGION	a24
10. FIELD	a16
11. DISTRCT	a24
12. FORMATN	a16
13. GROUP	a16
14. BED	a20
15. MEMBER	a16
16. ZONE	a16
17. DEPTH	f12.3
18. SAMPTHK	f12.3
19. SYSTEM	a16
20. SERIES	a16
21. LOCNAME	a28
22. QUAD	a28
23. COLECTR	a20
24. FIELDID	a16
25. DATE	i8
26. ESTRANK	a16
27 MAJRANK	a16
28. MINRANK	a16
29. ANIDA	a4
30. ANIDN	i8
31. LABCODE	i8
32. SAMPTYP	i8
33. ANALTYP	i8
34. VALREP	i8
35. OTHERT	a4
36. BTU	f11.3,a1
37. ASHDEF	f11.3,a1
38. ASHSOF	f11.3,a1
39. ASHFLD	f11.3,a1
40. FRESWEL	f11.3,a1
41. MOISTURE	f11.3,a1
42. VOLMAT	f11.3,a1
43. FIXEDC	f11.3,a1
44. BMASH	f11.3,a1
45. HYDROGN	f11.3,a1
46. CARBON	f11.3,a1
47. NITROGN	f11.3,a1
48. OXYGEN	f11.3,a1
49. SULFUR	f11.3 a1
50. SULFATE	f11.3,a1

Table 9. (continued)

ITEM	OUTTAPE LENGTH
51. SULFPYR	f11.3,al
52. SULFORG	f11.3,al
53. ADLOSS	f11.3,al
54. USGSASH	f12.3
55. SiO_2	f11.3,al
56. Al_2O_3	f11.3 al
57 CaO	f11.3,al
58. MgO	f11.3,al
59. Na_2O	f11.3,al
60. K_2O	f11.3,al
61. Fe_2O_3	f11.3,al
62. MnO	f11.3,al
63. TiO_2	f11.3,al
64. P_2O_5	f11 3,al
65. SO_3	f11.3,al
66. cl	f11.3,al
67. ag	f11.3,al
68. as	f11.3,al
69. au	f11.3,al
70. b	f11.3,al
71. ba	f11.3,al
72. be	f11.3,al
73. bi	f11.3,al
74. br	f11.3,al
75. cd	f11.3,al
76. ce	f11.3,al
77. co	f11.3,al
78. cr	f11.3,al
79. cs	f11.3,al
80. cu	f11.3,al
81. dy	f11.3,al
82. er	f11.3,al
83. eu	f11.3,al
84. f	f11.3,al
85. ga	f11.3,al
86. gd	f11.3,al
87. ge	f11.3,al
88. hf	f11.3,al
89. hg	f11.3,al
90. ho	f11.3,al
91. in	f11.3,al
92. ir	f11.3,al
93 la	f11.3,al
94. li	f11.3,al
95. lu	f11.3,al
96. mn	f11.3,al
97. mo	f11.3,al
98. nb	f11.3,al
99. nd	f11.3,al

Table 9. (continued)

	ITEM	OUTTAPE LENGTH
100.	ni	f11.3,a1
101.	os	f11.3,a1
102.	pb	f11.3,a1
103.	pd	f11.3,a1
104.	pr	f11.3,a1
105.	pt	f11.3,a1
106.	rb	f11.3,a1
107.	ru	f11.3,a1
108.	rh	f11.3,a1
109.	ru	f11.3,a1
110.	sb	f11.3,a1
111.	sc	f11.3,a1
112.	se	f11.3,a1
113.	sm	f11.3,a1
114.	sn	f11.3,a1
115.	sr	f11.3,a1
116	ta	f11.3,a1
117.	tb	f11.3,a1
118.	te	f11.3,a1
119.	th	f11.3,a1
120.	tl	f11.3,a1
121.	tm	f11.3,a1
122.	u	f11.3,a1
123.	v	f11.3,a1
124.	w	f11.3,a1
125.	y	f11.3,a1
126.	yb	f11.3,a1
127.	zn	f11.3,a1
128.	zr	f11.3,a1

References Cited

American Society for Testing and Materials, 1975, Annual Book of ASTM
   Standards; part 26, Gaseous Fuels; Coal and Coke; Atmosphere Analysis:
   Philadelphia, p. 212-388.

Averitt, Paul, 1975, Coal resources of the United States, January 1, 1974:
   U.S. Geological Survey Bulletin 1412, 131 p.

Barnes, F. F., 1961, Coal fields of the United States - Sheet 2, Alaska:
   U.S. Geological Survey, scale 1:5,000,000.

Cargill, S. M., Olson, A. C., Medlin, A. L., and Carter, M. D., 1976, PACER -
   Date entry, retrieval, and update for the National Coal Resources Data
   System (Phase I): U.S. Geological Survey Professional Paper 978, 107 p.

Meyer, R. F., 1970, Geologic provinces code map for computer use: American
   Assocociation of Petroleum Geologists Bulletin, v. 54, no. 7, p.
   1301-1305.

National Bureau of Standards, 1970, States and outlying areas of the United
   States: U.S. Dept. Commerce Federal Information Processing Standards
   Pub. 5-1, p. 3-4.

Trumbull, J. V. A., 1960, Coal fields of the United States, exclusive of
   Alaska - Sheet 1: U.S. Geological Survey, scale 1:5,000,000.

U.S. Geological Survey, 1976, Coal resource classification system of the
   U.S. Bureau of Mines and U.S. Geological Survey: U.S. Geological Survey
   Bulletin 1450-B, 7 p.