(200)
T67r
no. 323

DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

PREPARED AS PART OF THE INTERIOR DEPARTMENT PROGRAM
FOR DEVELOPMENT OF THE MISSOURI RIVER BASIN

(200)
T67r
no. 323

U.S. GEOLOGICAL SURVEY DENVER
JUL 06 1983
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PRELIMINARY REPORT
PLATE 2

TRACE ELEMENTS INVS.
REPORT 323

U.S. GEOLOGICAL SURVEY MENLO PARK
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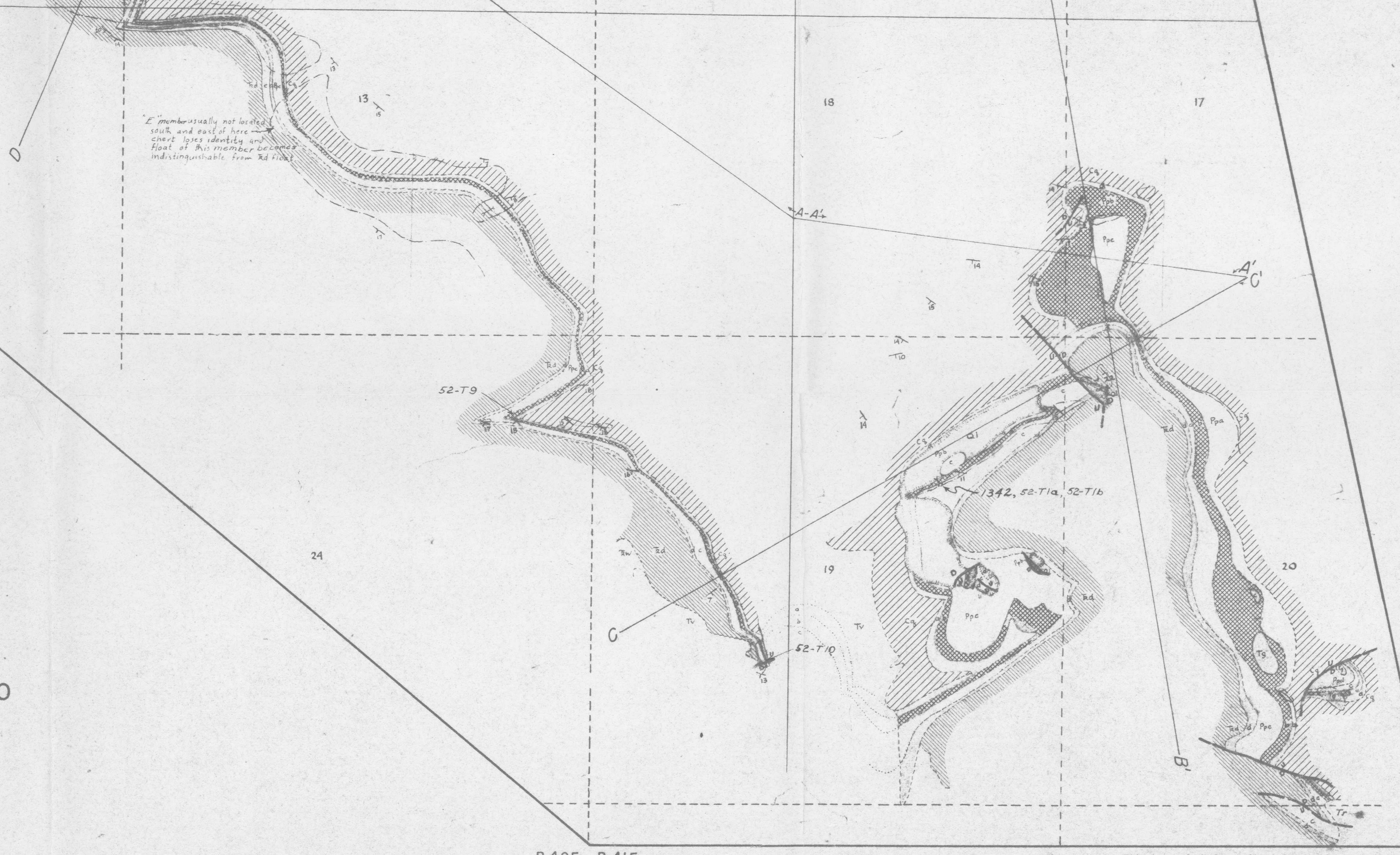
PLEASE R... ...KET
IN BACK ... ...LUME




## EXPLANATION

| | | |
|---|---|---|
| QUATERNARY | Un | Unmapped because of unscalable cliffs and snowfields |
| | Qs | Snowfield |
| | Ql | Landslide |
| | Qt | Talus slope |
| | Qal | Alluvium |

*UNCONFORMITY*

| | | |
|---|---|---|
| TERTIARY (?) | Tg | Gravels: Locally form a veneer on ridges and spurs, range from pebble to boulder size, include igneous, metamorphic, and sedimentary rock types |

*UNCONFORMITY*

| | | |
|---|---|---|
| | Tr | Rhyolite |

*UNCONFORMITY*

| | | |
|---|---|---|
| Eocene (?) | Tb | Beaverhead formation (?): Red siltstone and claystone occur in one patch on crest of range, overlie Mississippian rocks |

*UNCONFORMITY*

| | | |
|---|---|---|
| TRIASSIC — Lower Triassic | Trw | Woodside formation: Siltstone, calcareous, red |
| | Trd | Dinwoody formation: Limestone, cherty, dolomitic, argillaceous; white, buff, brown; thin-bedded; siltstone in lower part |

Phosphoria formation:

| | | |
|---|---|---|
| PERMIAN | Ppe | E member: Chert, grades upward into siltstone; mapped locally as $Ppe_1$ and $Ppe_2$ |
| | $Ppe_2$ | $Ppe_2$: Siltstone |
| | $Ppe_1$ | $Ppe_1$: Chert |
| | Ppd | D member: Phosphatic shale, black, with oolitic phosphate rock at base |
| | Ppc | C member: Limestone, fossiliferous with local interbedded chert conglomerate, overlain by sandstone containing rod-like concretions; mapped locally as $Ppc_1$ and $Ppc_2$ |
| | $Ppc_2$ | $Ppc_2$: Sandstone |
| | $Ppc_1$ | $Ppc_1$: Limestone |
| PERMIAN | Ppb | B member: Phosphate rock, hard, pisolitic, some interbedded quartzite |
| | Ppa | A member: Limestone and calcareous siltstone, contains pyrite nodules. Included in Ppc where Ppb is absent |

*UNCONFORMITY*

| | | |
|---|---|---|
| PENNSYLVANIAN | Cq | Quadrant formation: Sandstone, calcareous, dolomitic, locally quartzitic and conglomeratic |

### MAP SYMBOLS

Contacts

- Area of outcrop
- Contact
- Indefinite contact, approximately located by float, topography, or vegetation; includes gradational and inferred contacts
- Concealed contact
- Landslide boundary
- Snow cover boundary
- Talus cover boundary
- Unmapped due to unscalable cliffs

Faults

- Fault (U, upthrown side; D, downthrown side)
- Fault, approximately located, or inferred

Bedding

- Strike and dip of beds

Surface openings

- Trench (Number indicates lot number of phosphate sampling program trench) — 1251

TRUE NORTH — MAGNETIC NORTH — $18\frac{1}{2}°$

APPROXIMATE MEAN DECLINATION, 1952

# GEOLOGIC MAP
OF THE
# CENTENNIAL RANGE, MONTANA-IDAHO
## PHOSPHATE DEPOSITS

By Fred S. Honkala

Scale 1:12000

0 1000 2000 3000 4000 Feet

This is a preliminary field map subject to corrections and has not been edited or reviewed for conformity with U.S. Geological Survey standards and nomenclature