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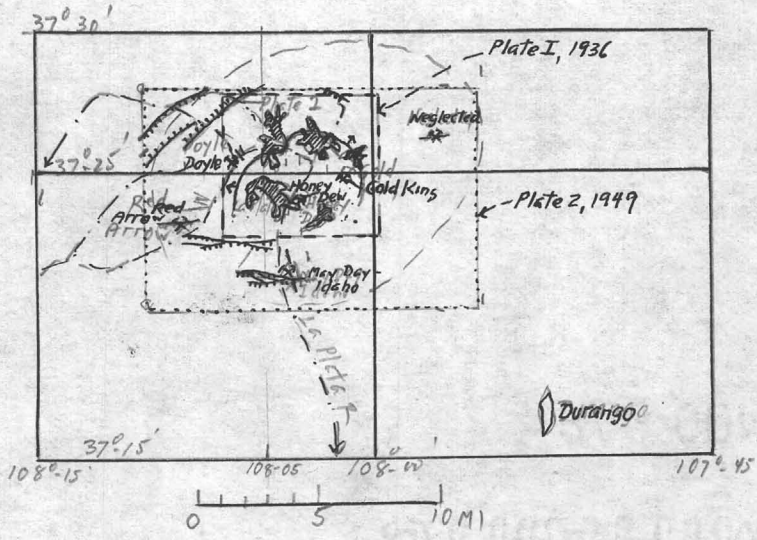

37° 30'
Plate I, 1936
Neglected
37° 25'
Doyle
Honey Dew
Gold King
Plate 2, 1949
Red Arrow
May Day Idaho
Plate 1
Durango
37° 15'
108° 15'
108° 05'
108° 00'
107° 45'
0
5
10 MI

GSA S.P. 76, 1963, p 286

Evolution of the Allard Stock, La Plata Mountains, Colorado

DOME- NO COMPRESSION

LA PLATA, COLO.

E.B.Eckel: Resurvey of the Geol.& Ore Depositsof the La Plata Min. Distr.,Colo.

Colo.Sci.Soc.Proc. vol.13,-9,1936,507-547.

Ku Dakota ss
Up.Ju ss shale. Morrison.La Plata ls at base,top8' Replaced by py.CM.
~~JxTxx~~ Entrada ss massive,200'.Imp.veins here
Dolores:Mudstones,fg.ss Wide strong veins in Entrada ~~ss~~ above pinch below in Dolores.

J-Tr Cutler Red Arkosic ss,,cgl.,limy sh,mudstones,

Permian Rico. Sh.,ss,thin sandy ls.

Penn.Hermosa Ss,sh,ls.Basal formation in district.

Structure: 15 mi.dome,blending into SW flank of far broader San Juan uplift.Beyong L.P.dome beds flat..Stocks cut across seds without disturbing their structure,hence had little direct influence on shape of dome. But thick extensive sills must have played large part in the doming.

Man veins in central part of district follow minor flts.which radiate in general from center of La Plata uplift "and probably developed in response to tensional stresses set up during the formation of the dome." p. 530.

On outskirts of this sharp dome are a series of large faults nearly barren of ODs and which offer slight suggestion of concentric arranegment about the uplift. Another series of short discontinuous minor flts radiate from center of dome and contain ODs in many places. Ore skips big shear faults,favors tension fissures.

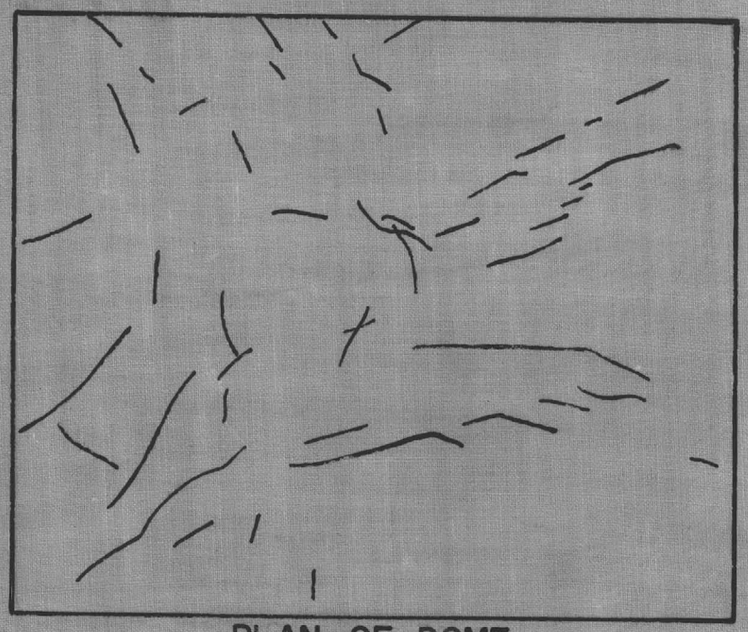
Gold-silver tellurides. Arg tetrah.,ruby silvers,py,ccpy,PbS ZnS. Gangue qtz.,claced/

Neglected mine,one of main producers,E-W radial fault,E of apex. In fresh red shales,arkosic ss of Cutler,dip E,SE,to 10o.These cut by S-dipping,E plunging @ 20° porphry mass 50' thick,250' high.Feeder for sills Strong flt zone paralels pkr.chimney;s.twithin the dike.s.t. along HW or FW.N orFW side has moved up and to E steeply. First period of fracturing,,solutions rising along same channel as did porphyry silicified the incompe.WRs;these later sheared,brecciated,breccia cemented by qtz. Main shoot along chimney,pitches same.

Qtz s.t.drusy. Steaks and irreg.masses of tell. Tell.line vugs in qtz.

Tension along radiating fractures:uplift only.Wide fissures in brittle rock,mushy shale above and below:soft rock thinned under doming by plastic flow.Brittle rock had to break.

Wasser

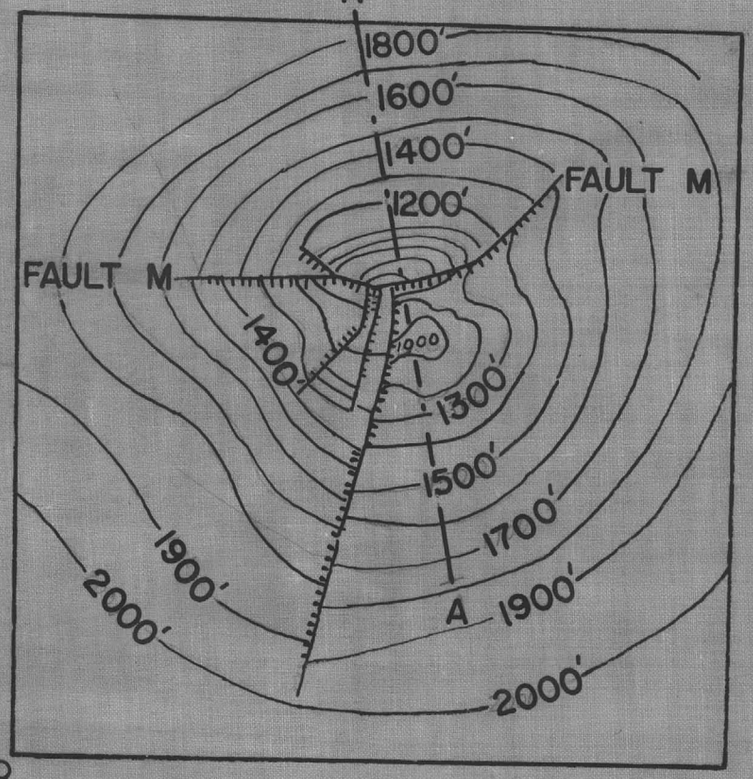


A

PLAN OF DOME

0 5 INCHES

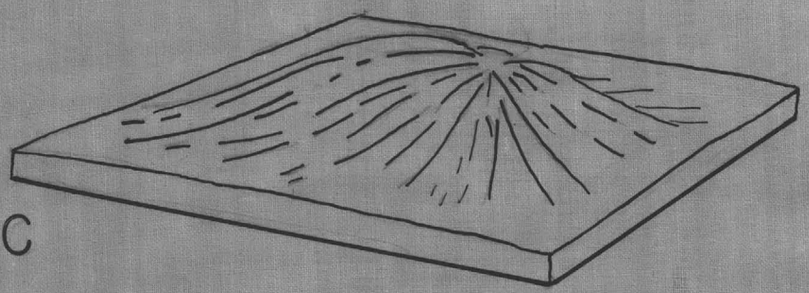
CROSS SECTION



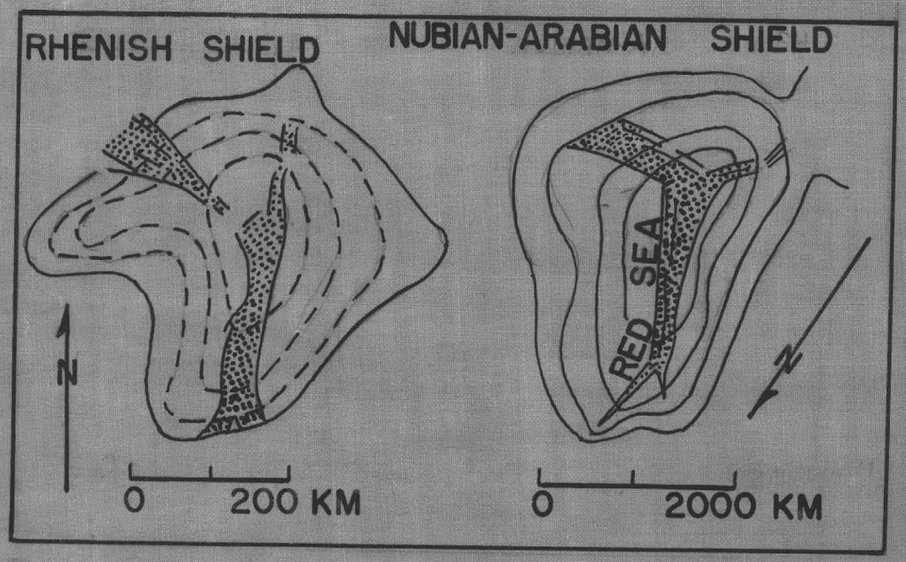
B

0 5 MILES

A' A



C



D

FIG. 3 — 4 1/2" —

43.0

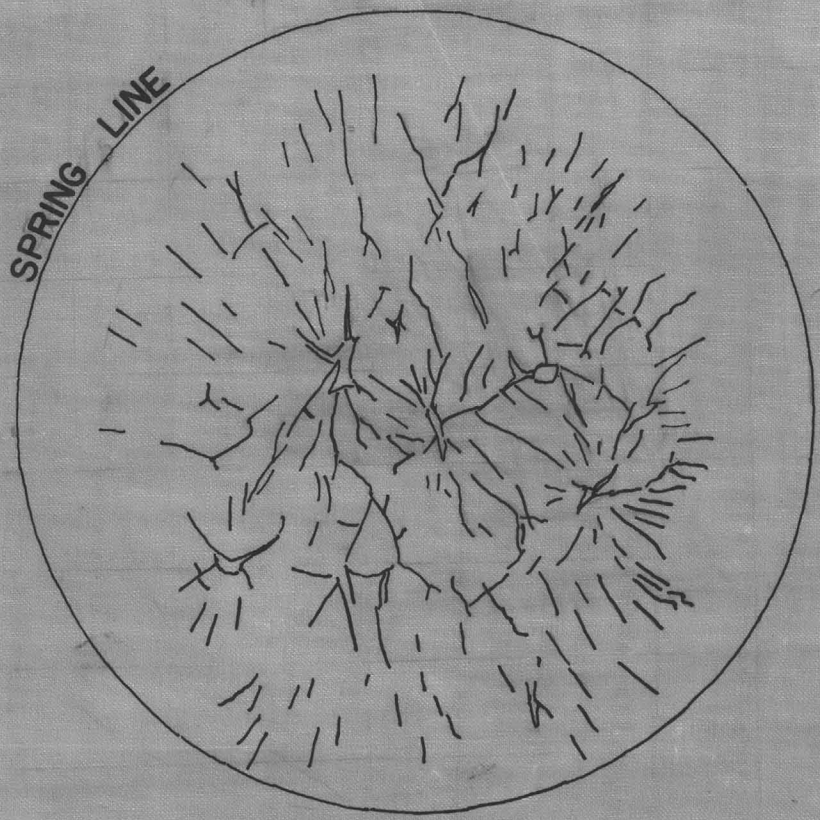
Delete border

Wexler

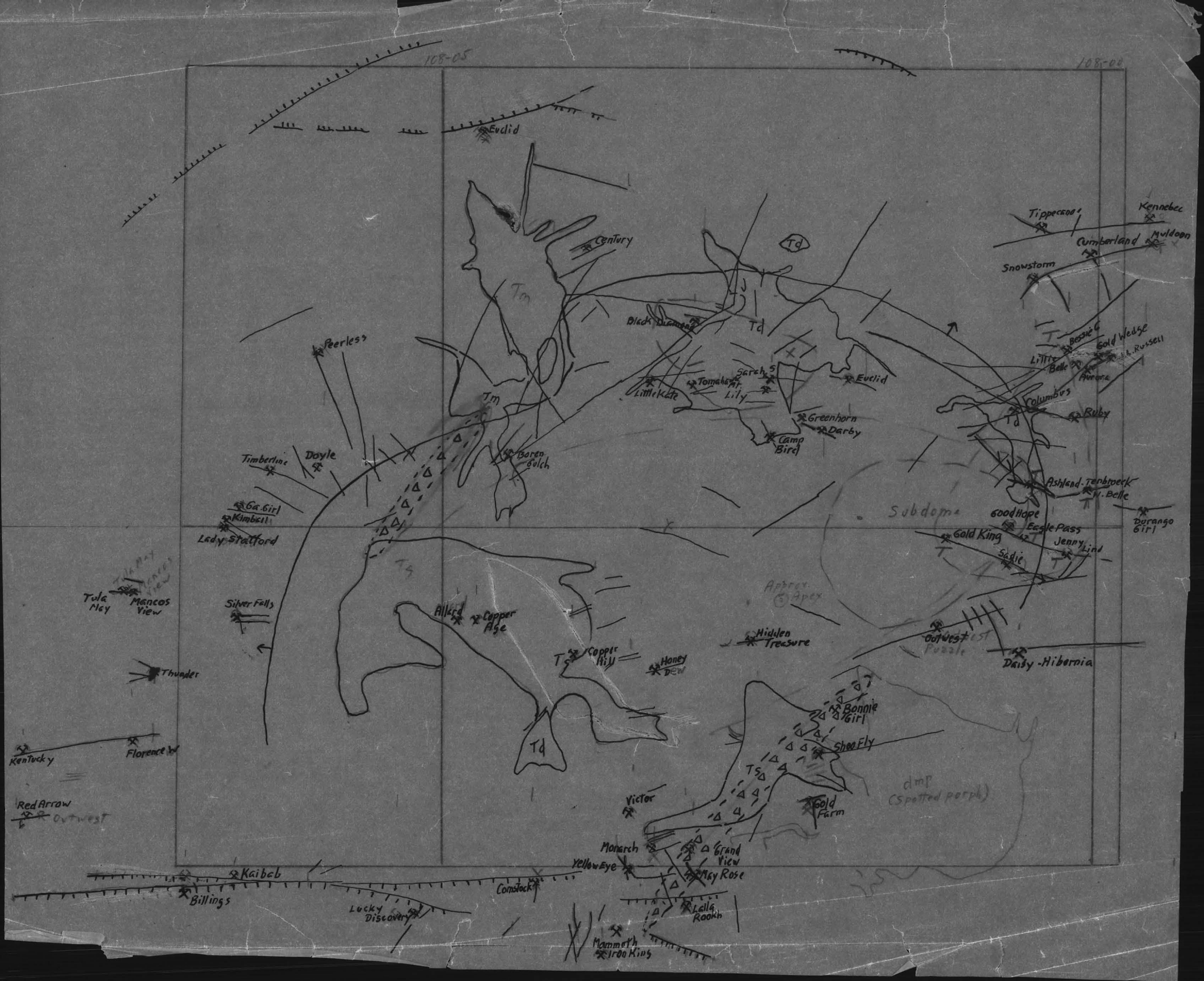
— 2½" —

~~S border~~

FIG. 2



59.7


108-05
108-00
Euclid
Century
Td
Tm
Black Diamond
Peerless
Little Kate
Tomahawk
Mt. Lily
Sarah S
Euclid
Greenhorn
Darby
Camp Bird
Boren Gulch
Timberline
Doyle
Ga. Girl
Kimball
Lady Stratford
Tula May
Mancos View
Silver Falls
Allard
Copper Age
Copper Hill
Honey Dew
Hidden Treasure
Thunder
Kentucky
Florence
Red Arrow
Outwest
Victor
Monarch
Yellow Eye
Kaibab
Billings
Comstock
Lucky Discovery
Mammoth Iron King
Lella Rookh
May Rose
Grand View
Gold Farm
Bonnie Girl
Shoo Fly
Tippecanoe
Kennebec
Cumberland
Muldoon
Snowstorm
Bessie G
Gold Wedge
Little Belle
A. Russell
Aurora
Columbus
Ruby
Ashland
Tenbroeck
N. Belle
Durango Girl
Good Hope
Eagle Pass
Gold King
Jenny Lind
Sadie
Subdome
Apex
Outwest
Puzzle
Daisy
Hibernia
dmp (spotted porph)

LA PLATA

Eckel, 1936: The general structural picture of the La Plata Mountains is that of a relatively sharp dome in the sedimentary and igneous rocks. On the outskirts of the dome there is a series of faults of large discplacemet, which are nearly or quite barren of ore deposits and which offer a slight suggestion of concentric arrangement about the uplift. Another series of short, discontinuous faults of small displacement radiate from the center of the dome and contain ore deposits in many places. P.531.

Eckel, 1949: From the outskirts of the dome, the rocks rise gradually toward toward the center, with dips of 5 to 20, until they reach the steep hinge fold that is the most striking feature of the structure....The zone involved in this hinge fold..is irregular in plan but has the general shape shape of a horsehoe, with the open end toward the south....

Along this hinge zone the beds generally dip outward at angles of 25 to 60....Both inside and outside of the hinge the beds flatten abruptly ... In places the rocks are sheared and brecciated along the fold, and, as shiwn on the geologic map,, many of the ore-bearing fractures are concentrated within or near it....(The hinge) shows clearly in somecross sections, such as A-A' and C-C',...but it does not show in some others, such as B-B'...Tjis This difference in expression is partly due to the fact that the steepness of the fold varies from place to place, and partly n inaccuracies in the topographic base map, whicn preculde accurate plotting of the geologic features. P.43.

Nearly half od the 6000' uplift of the base of the Dolores is..accounted for by sills that are actually exposed. Presumably the Hermosa and lower sedimentary beds that have not yet been exposed by erdoion also contain intercalatee sills..Iv the proportion of sills to sedimentary rocks is constant througout the stratigraphic section, the aggregate thickness of porphyry is ample to account for the entire uplift..If, on the other hand, less porphyry is associated with the Hermosa beds than with the Cutler and younger ones, it is necessary to suppose that before or during the porphyry intrusions the basement rocks were pushed upward by somelocalized force..The latter supposition gains some weight from the fact that an upthrust of this sort might rradily produce the steep hinge fold, whereas it is more diffivult to understand how the simple intturion of porphyry bodies cojld achieve such an effect.

In places the rocks yieldedto the uplifting forces by faulting rather than by folding..This faulting resulted in the strong barren faults in the northwestern and southern parts of the district/ Many minor faults, were formed at about the same time as a result of the tensional stresses set up by the doming. These faults, some of which were later filled with ore in places, are most numerous along the horseshoe-shaped hinge fold, where the stresses were greatest.

In the La Platas

Rensselaer H. Toll
1958a University Ave.
Berkeley, Calif.

Mining Flourishes in Norway

The year 1939 was good, but the future is obscure because of war conditions on the Continent

K. L. Böckman
Tidsskrift for Kjemi og Bergvesen
Röros, Norway

LA PLATA COMPARED TO RICO.

Both domes;both on SW flank of San Juan uplift. But while Rico dome shows pre-Θ in eroded core, La Plata dome shows as deepest formation exposed, top 500' of Hermosa. Formations as high as Morrison are extensively exposed only 2 mi.plus from apex.

Structure: Both strictly autochthenous: outside of domes beds flat or have gentle regional dip SW away from San Juan major uplift. Each about same size: 12-15 mi.diameter.

Intensity of doming also seems about the same:dips of 5-20 common; La Plata shows local dips up to 60°. But while at Rico sills caused relatively small % of doming, Eckel ascribes a large part of the La Plata doming to the many thick porphyry sills there.

In strong contrast to Rico,faults are comparatively rare.at La Plata.,but there are local small folds imposed on the dome,not all of which are caused by intrusion of sills. ~~Faultx xxmx~~ Many La Plata veins in central part of district along minor faults which ~~in xxxxxxx~~ "radiate in general from the center of the La Plata uplift and probably developed in response to tensional stresses set up during the formation of the dome." p.530.

However,as at Rico,at La Plata there is a series of major faults, nearly or quite barren of ore ,which offer a slight suggestion of concentric arrangement aboutnthe uplift (upthrown sides toward apex of dome). In contrast to these barren synthetic faults is the "series of short,discontinuous fults of small displacement" which "radiate from the center of the dome and contain ore deposits in many places." p.531.

At Newman Hill, Rico,both concentric and radial faults carry ore or are associated with (blanket) ore. Elsewhere chief ore-bearers,outside of other blankets, are radial minor faults. La Plata dome may be more symmetrical than Rico,

Sediments as Loci for Ore Deposits:

Rico:Great bulk of ore in Hermosa

La Plata, Colo. This is one of the laccolithic masses near the San Juan uplift, along the SW spoke of the wheel.

Oldest rock Penn. ss., sh., ls. Permian sh., ss, cgl. / soft except where baked Juratrias ark. ss cgl sh (limy) mudstone / soft, yielding except where baked Ju up. ss, sh. Ku Dakota ss.

Dolores at base of Upper Jurassic shale-prevented open fissures. Wide strong veins in Entrada ss above pinch out going down into Dolores. Imp. veins in Entrada. Ls in Morrison replaced by ore. At bottom.

Intrusions near apex of dome irregular, dio-to M-P. Many sills, some laccolithic (soft rocks). Sills decrease away from center. Early intrusions (sills) as usual. No CM. Sills brittle, fracture well, open fissures. Porphyry dikes accompanied by silicif. haloes, hence fissures intersecting dikes or running along them are likely to be mineralized because they are in brittle rock. Dikes being brittle tabular masses in soft rock (where unbaked) veins are apt to follow them anyway. Same thing at Pachuca, both with regarc to dikes in soft HT (hydrothermally) altered andesite, and tabular masses of silica which ascended tight fractures in soft rock and silicified the walls: vein, ore in such masses, pinched out where fracture left brittle silica and entered soft mushy HT altered rock.

Next monzonite, stock or stocks. Mt. Moss stock. / CM Then diorite CM. Lewis Mt. stock. Now the M and dio stocks cut thru seds without locally disturbing them, which is good argument that the domal uplift took plade after intrusion of these stocks, whole mess uplifted together. Intrusives swell in shale, narrow in silic. beds like Entrada ss. As sual, last stage basic dikes.

Dome blends sonwhat into SW flank of San Juan uplift (cf. Cerillos-Sandia). Beds dip away in all directions fron the 15 mi. dome; outside all flat. While the major stocks app. did no doming, intrusion of large amots P as sills aroubd center, thinning outward, caused a large part of doming Important faults are few (the more perfect the doming, the fewer the flts)

TODD-CALIFORNIA SHIPBUILDING CORPORATION
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P. O. BOX 29
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Many veins in central part follow faults radiating in general from the center of the domeand "probably developed in response to tensional stresses set up during the formation of the dome" (p.530).

Produced over $4,000,000 Au.,over $1,000,000 Ag. Gold-silver tellurides,free gold. Argentif.tetrahedrite,stephanite etc. py,ccpy,ZnS,PbS stibnite. Gangue qtz.,chalced. Main ore brearers Entrada and Morrison, brittle. T ese circle the dome far from center. Neglected vein inlong a porphyry dike radial to dome (E-W, E of dome)Repeated openings. Presence of wide fissures in brittle rock with mushy shale above and below good evidence of fissuring thru uplift.How else? Stretching, soft rock thinned by plastic flow;brittle couldn't,had to break.

I'm not quite half thru the alphabet nor thrut he list of domal ore districts either;but I had better turn to the more elongated domes grading to anticlinal forms. Time forbids more than a few brief mentions.

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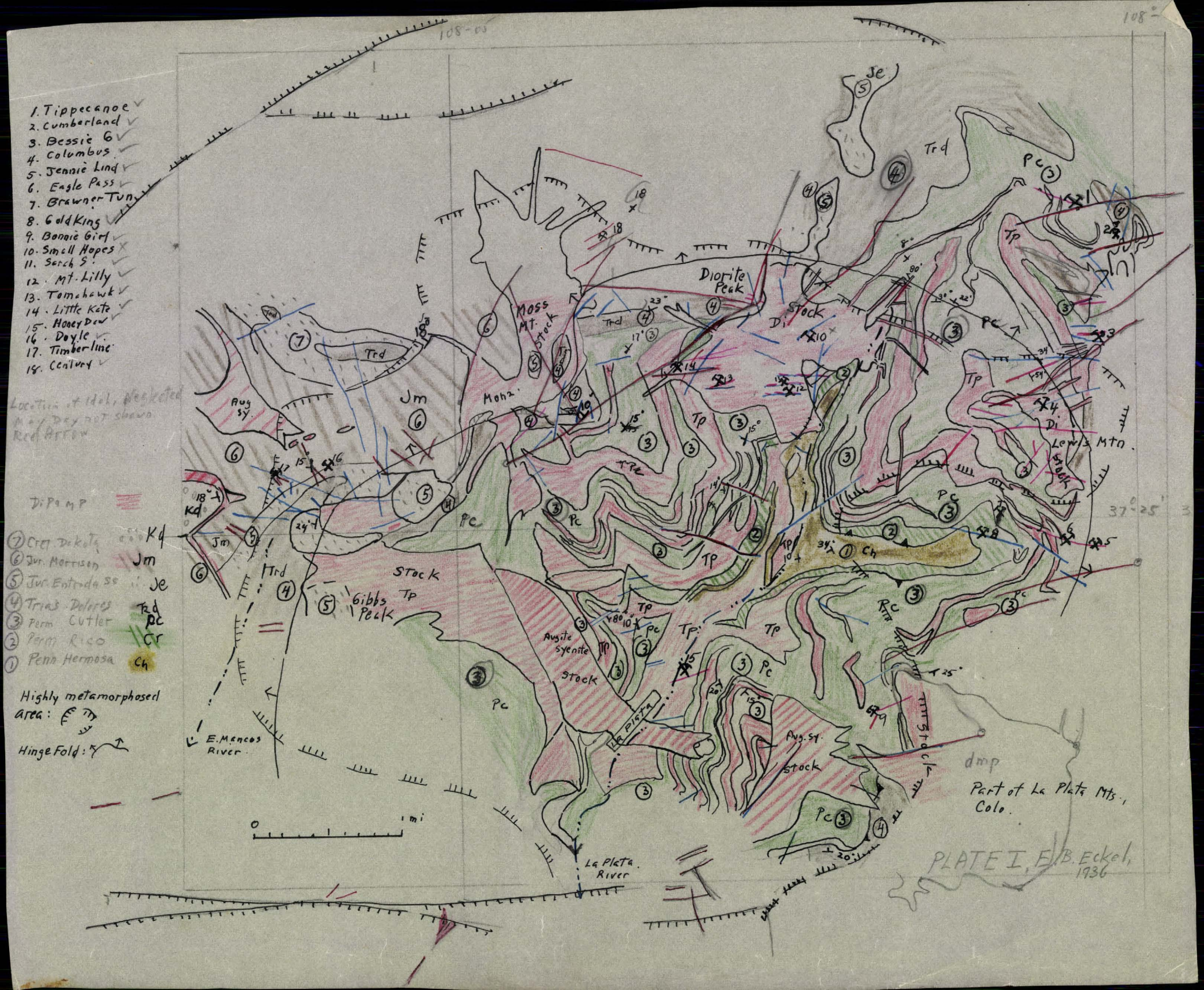
1. Tippecanoe
2. Cumberland
3. Bessie 6
4. Columbus
5. Jennie Lind
6. Eagle Pass
7. Brawner Tun.
8. Gold King
9. Bonnie Girl
10. Small Hopes
11. Sarch S.
12. Mt. Lilly
13. Tomahawk
14. Little Kate
15. Honey Dew
16. Doyle
17. Timberline
18. Century
Location of idol, sketched May Day not shown. Red Arrow
Di Pa m P
(7) Cret. Dakota Kd
(6) Jur. Morrison Jm
(5) Jur. Entrada ss Je
(4) Trias Dolores Trd
(3) Perm Cutler Pc
(2) Penn Rico Cr
(1) Penn Hermosa Ch
Highly metamorphosed area:
Hinge Fold:
0 1 mi
Moss Mt. Stock
Diorite Peak
Di Stock
Lewis Mtn.
Di Stock
Gibbs Peak
Stock
Augite Syenite Stock
Aug. Sy. Stock
Stock
E. Mancos River
La Plata
La Plata River
dmp
Part of La Plata Mts., Colo.
PLATE I, E. B. Eckel, 1936
37°25'

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

COLORADO
LA PLATA QUADRANGLE

Henry Gannett, Chief Topographer.
E.M. Douglas, Topographer in charge.
Triangulation and Topography by Frank Tweedy.
Surveyed in 1895.

SCALE 1:62500

1 ½ 0 1 2 3 4 MILES

3000 0 3000 6000 9000 12000 15000 18000 21000 FEET

1 .5 0 1 2 3 4 5 KILOMETERS

CONTOUR INTERVAL 100 FEET
DATUM IS MEAN SEA LEVEL

INTERIOR—GEOLOGICAL SURVEY, WASHINGTON, D.C. 1956

Polyconic projection. To place on 1927 North American datum move projection lines 200 feet south and 900 feet east

Surveyed by reconnaissance methods

Adjacent maps with spirit level control may not join this sheet exactly

COLO.
LA PLATA
N3715-W10800/15

1895

FOR SALE BY U.S. GEOLOGICAL SURVEY, FEDERAL CENTER, DENVER, COLORADO OR WASHINGTON 25, D.C.
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

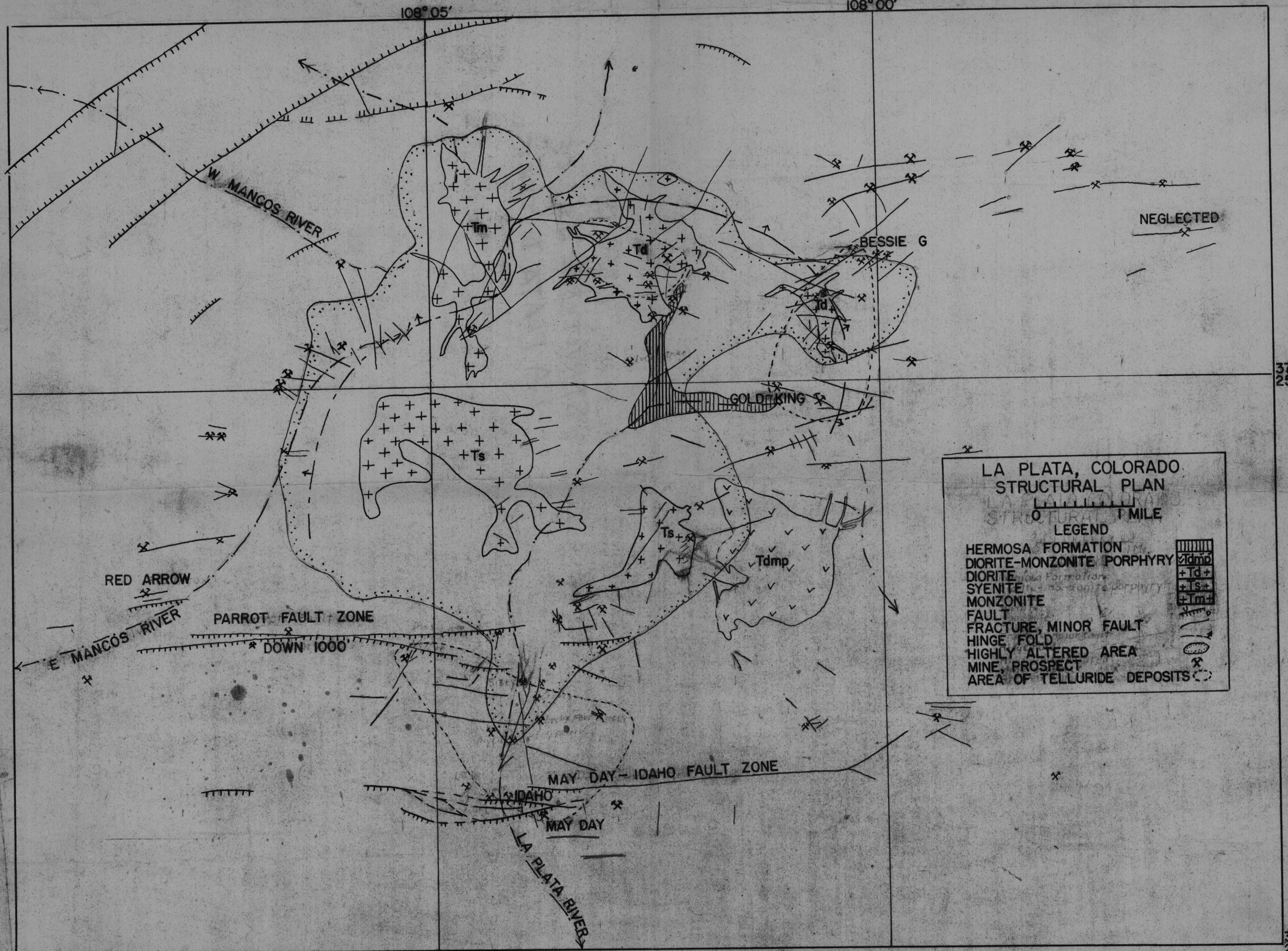
108° 05′
108° 00′
37° 25′
37° 20′
W MANCOS RIVER
E MANCOS RIVER
Tm
Td
Ts
Tdmp
BESSIE G
NEGLECTED
GOLD KING
RED ARROW
PARROT FAULT ZONE
DOWN 1000′
MAY DAY - IDAHO FAULT ZONE
IDAHO
MAY DAY
LA PLATA RIVER
LA PLATA, COLORADO
STRUCTURAL PLAN
0 1 MILE
LEGEND
HERMOSA FORMATION
DIORITE-MONZONITE PORPHYRY
DIORITE
SYENITE
MONZONITE
FAULT
FRACTURE, MINOR FAULT
HINGE FOLD
HIGHLY ALTERED AREA
MINE, PROSPECT
AREA OF TELLURIDE DEPOSITS

PLATE 2

~~PLATE 2~~ FIG. 11

STRUCTURAL MAP OF
LA PLATA DISTRICT

PLATE 2
(in pocket)

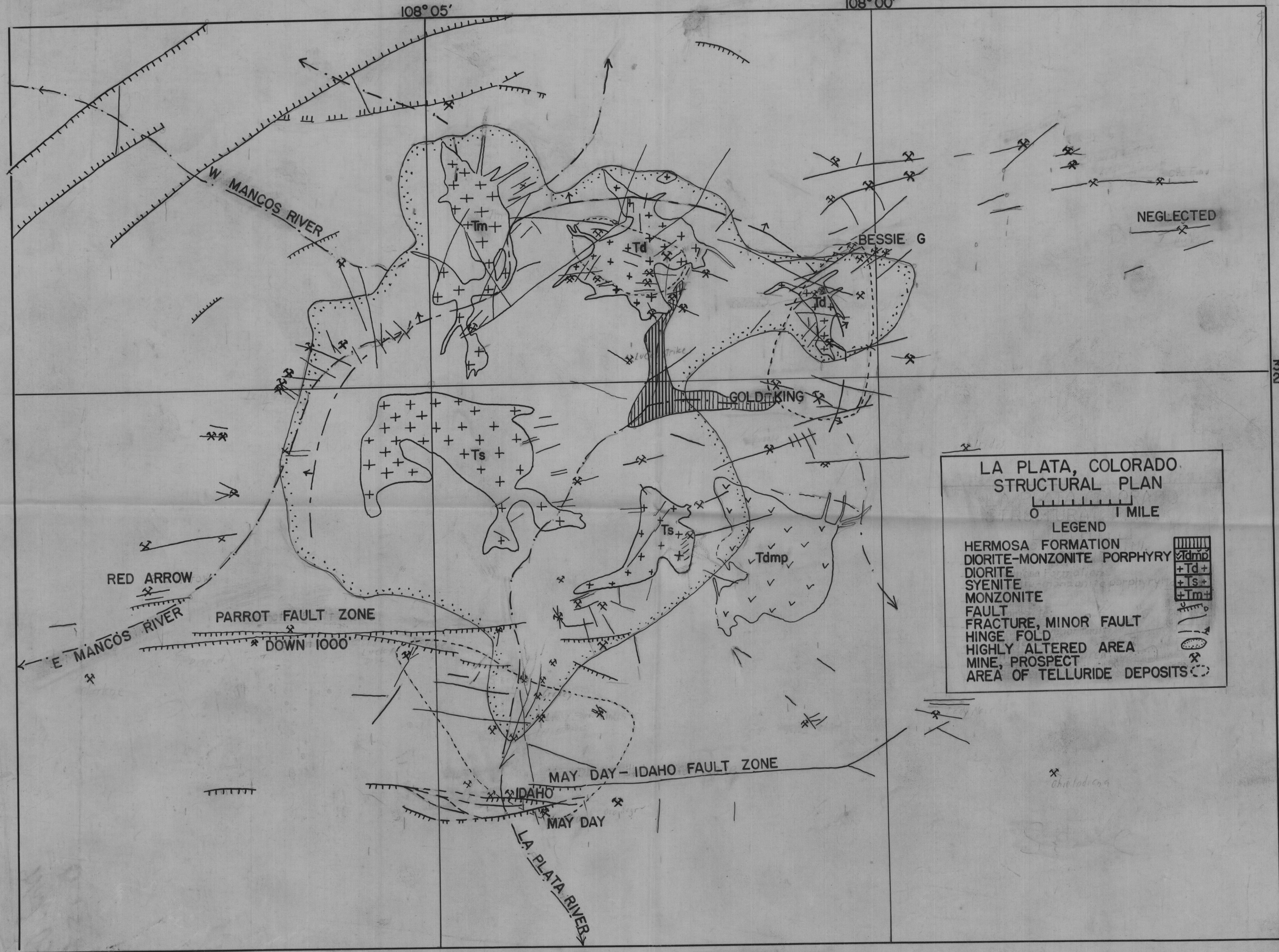
108° 05'
108° 00'
37° 25'
37° 20'
W. MANCOS RIVER
E. MANCOS RIVER
Tm
Td
Ts
Tdmp
Jd
BESSIE G
NEGLECTED
GOLD KING
RED ARROW
PARROT FAULT ZONE
DOWN 1000'
MAY DAY - IDAHO FAULT ZONE
IDAHO
MAY DAY
LA PLATA RIVER
LA PLATA, COLORADO
STRUCTURAL PLAN
0
1 MILE
LEGEND
HERMOSA FORMATION
DIORITE-MONZONITE PORPHYRY
DIORITE
SYENITE
MONZONITE
FAULT
FRACTURE, MINOR FAULT
HINGE FOLD
HIGHLY ALTERED AREA
MINE, PROSPECT
AREA OF TELLURIDE DEPOSITS

FIG. 11