GEOLOGY OF THE PERSHING MINING DISTRICT, PERSHING COUNTY, NEVADA

by

Richard L. Dixon

Geology 451

Mackay School of Mines
University of Nevada

July 18, 1966

CONTENTS

(CONTENTS-continued)

ABSTRACT

Field studies near the Pershing Mining District, Pershing County, Nevada, during the summer of 1966 disclosed an overturned sequence of sedimentary rocks of Late Triassic age. The geologic picture is obscurred by at least sets of normal faults. A possible minor "thrust" fault was discovered.

INTRODUCTION

LOCATION

The study area is 20 miles east of Lovelock, Pershing County, Nevada, at a latitude of 40°8' N. and a longitude of 118°10' W. (Figure 1, Index Map). The Pershing Mining District encompasses the site of investigation.

PURPOSE

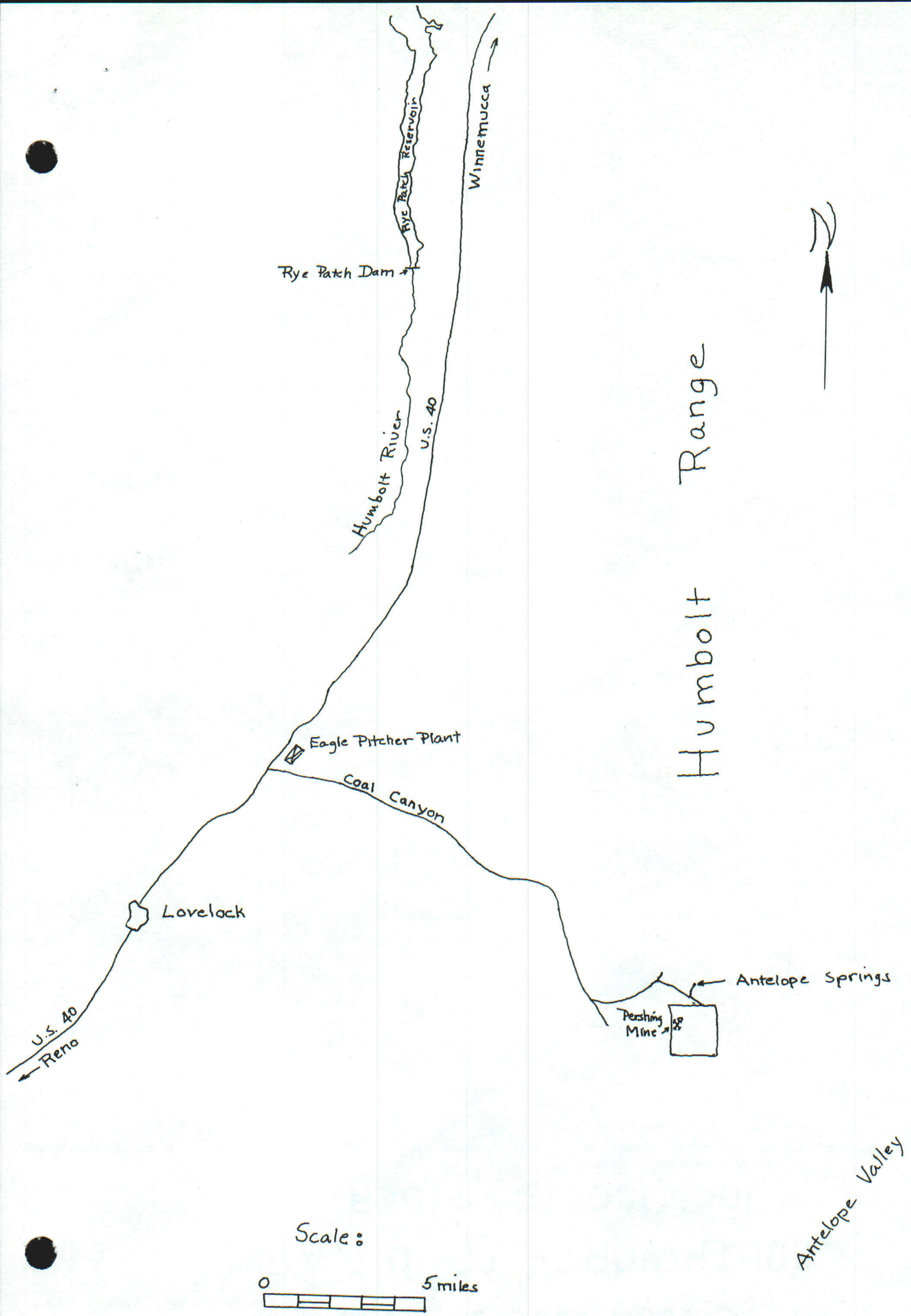
The purpose of this study was to construct a topographic map using alidade and plane table surveying methods, to map the geology in a sedimentary terrane, and to interpret the observed features.

ACCESSIBILITY

Access to the objective area is provided by numerous unmaintained gravel roads. Only during unusually severe winter storms would the region be inaccessible.

CULTURE

Mining is the principal human activity. Cinnabar is found in the Pershing Mining District, and Nevada Barth Corporation is mining magnetite in open-pit operations several miles to the south. Until the construction of Rye Patch Dam near Lovelock and diversion of waters of


Rye Patch Reservoir
Winnemucca
Rye Patch Dam
N
Humbolt River
U.S. 40
Humbolt Range
Eagle Pitcher Plant
Coal Canyon
Lovelock
Antelope Springs
Pershing Mine
U.S. 40
Reno
Antelope Valley
Scale:
0
5 miles

the Humboldt River, cattle were grazed in the lower valleys where grass flourished.

PHYSICAL FEATURES

The Humboldt Range trends to the north and has an elevation of 9,834 feet at Star Peak. Tilted fault blocks are the main type of hills; the southern faces are generally more precipitous than the northern faces. Valleys bordering the Humboldt Range are 8 to 10 miles wide. Drainage is to Antelope Valley on the southeast.

CLIMATE

Mean annual precipitation is less than 3 inches with the largest increment falling as snow during the winter months. Brief thunder-showers are common during the summer.

VEGETATION

Sage and rabbit brush are the principal plants in this arid region. Trees are noticeably absent and grass only grows near Antelope Springs.

PREVIOUS WORK

Early geological work in the Humboldt Range, formerly called the Koipato Range, was conducted by the Fortieth Parallel Survey (Hague, Arnold, and Emmons, S. F., 1877). Several publications concerning the Rochester Mining District appeared earlier in the present century (Schrader, F. C., 1914) and (Knopf, Adolph, 1924). Geological mapping of the entire Buffalo Mountain Quadrangle was done by Wallace and others (1959). The summer field geology class of the Mackay School of Mines, University of Nevada, mapped in the area to the north in 1964 under the direction of Dr. M. H. Hibbard.

FIELD WORK

Field studies were conducted from June 8 to June 17, 1966, using alidade and plane table surveying methods to assemble a topographic base map on which to plot geology. A scale of 500 feet to the inch and a 50 foot contour interval were used. Slightly more than one square mile was mapped in detail.

REPORT PREPARATION

Although the field work was a cooperative effort with partners, the writer believes that the entire sedimentary section at the Pershing Mining District is overturned and wrote this report accordingly.

ACKNOWLEDGEMENTS

The author wishes to acknowledge the invaluable assistance of his field partners, M. M. Muller, Jr., and S. L. Williams. Thanks are extended to Dr. E. R. Larson of the Geology Department at the Mackay

School of Mines, University of Nevada, Reno, Nevada, for supervision and suggestions in the field.

STRATIGRAPHY

The principal stratigraphic units exposed in the Pershing Mining District are limestones, dolomitic breccias, sandstones, siltstones, and shales which are considered by Wallace and others (loc. cit.) to be Late Triassic in age (Figure 2, Stratigraphic Section). Field evidence suggests that the entire section is overturned in a southwesterly direction and will be discussed in a later section of this report. Comparison with the adjacent map area revealed a wide degree of variability in thickness within individual units.

Did you see this?

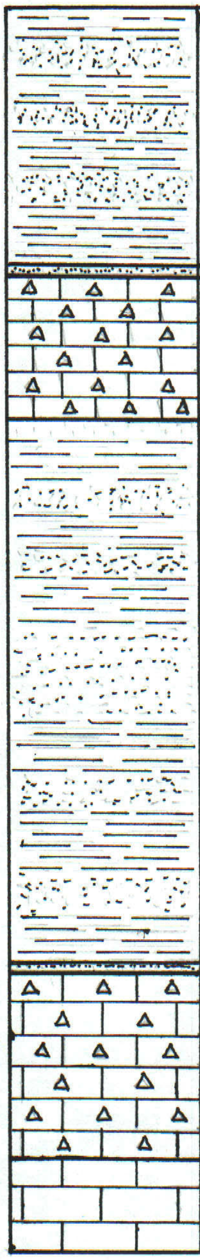
LIMESTONE

Light to dark gray, fine grained, thickly to very thickly bedded, pitted (marangue) weathering surfaces, coarse sand to cobble size chert fragments, locally displays peculiar swirls and bioclastic material, cliff-forming, limestone (calcarenite). This unit attains a stratigraphic thickness of 150 feet, shows lateral variations in thickness and texture, and is considered by Wallace and others (loc. cit.) to be equivalent to the Dun Glen Formation. White calcite fills many fractured zones in this limestone.

LIMESTONE BRECCIA

Light to medium gray, fine to coarse grained calcareous matrix, granule to cobble size clasts of medium gray limestone, locally frac-

STRATIGRAPHY



425′	pale red, orange, light gray, olive green, grayish-brown sandstones, orange fissile shales, light gray limestone interbeds. Forms slopes and gentle hills.
40′	medium gray, fine grained, orthoquartzite
225′	buff to light gray, cliff-forming, fossiliferous, dolomitic breccia.
855′	variegated and interbedded, fine grained, siliceously cemented sandstones, siltstones, and moderately fissile shales.
10′	light brown, well sorted, friable sandstone
300′	light to medium gray, fine to coarse grained, slope forming, limestone breccia
150′	light to dark gray, fine grained, thickly bedded limestone.

Figure 2. Upper Triassic stratigraphic section, Pershing Mining District, Pershing County, Nevada.

tured and filled with white calcite, poorly sorted, slope forming, 300 feet thick, limestone breccia. This may be an intraformational conglomerate (sharpstone conglomerate of Woodford, 1925) derived from the disruption of the underlying limestone. If this observation is valid, the beds are overturned. The angular and subangular clasts indicate little or no transportation and rounding.

SANDSTONE

Light brown, well sorted (1/4 mm. to 1 mm. grain size), friable, subrounded, 3 to 10 feet thick, dark brown weathering, slope forming, locally cross-bedded, quartzose sandstone with biotite flakes (less than 2 percent). The contact with the underlying limestone breccia is apparently conformable. There is no indication of graded bedding.

INTERBEDDED SANDSTONES, SILTSTONES, AND SHALES

Variegated and interbedded, generally fine grained (1/256 mm. to 1/2 mm.), individual lithologies well sorted, 855 feet thick, siliceously cemented sandstones, siltstones, and moderately fissile shales.

DOLOMITIC BRECCIA

Buff to light gray, dolomitic cobbles with fine grained dolomitic matrix, subrounded cobbles and pebbles, one percent dark chert pebbles, some hematitic fragments, cliff-forming, 225 feet thick, contains silicified cup corals in adjacent area (Richard Grabowski, personal comm., 1966), locally contains slight amounts of calcareous material. Quicksilver mineralization is concentrated in this unit.

ORTHOQUARTZITE

Medium gray, fine grained (1/16 mm. to 1/4 mm.), well sorted, well indurated with siliceous cement, brown weathering, manganese dioxide dendrites, rounded grains, orthoquartzite (more than 98 percent quartz). Contact with dolomitic breccia appears conformable. This unit is 40 feet thick.

INTERBEDDED SANDSTONE, SILTSTONE, SHALE, AND LIMESTONE

Pale red, orange, light gray, olive green, locally cross-bedded, grayish-brown thinly bedded sandstones, non-calcareous orange fissile shales, light gray, fine grained limestone interbeds, units generally form slopes and gentle hills, 425 feet exposed in map area.

S T R U C T U R E

GENERAL FEATURES

The Humboldt Range is a north trending up-faulted mountain block of the Basin and Range type that is bounded by alluvium-filled graben valleys. Strata in the map area are overturned to the southwest, strike in a northwesterly direction, and dip moderately to steeply to the northeast. Numerous northwest and north trending normal faults complicate the structure (Figure 3, Structural Cross-Section). Only very minor, localized folds were observed in the dark gray limestone.

FOLDS

Numerous folds within the dark gray limestone plunge steeply to the southeast. Such folding is restricted to this rock unit and probably occurred after partial lithification, but before deposition of the overlying strata. A large-scale fold as one might expect to explain the overturning of the entire sequence was not revealed in the map area. not likely

FAULTS

Three types of normal faults are present in the study area: (1) the boundary Basin and Range faults, (2) northwest trending high-angle normal faults which dissect the main horst into several subsidiary blocks, and (3) the northerly oriented high-angle normal faults that may explain many of the saddles across the ridges. Nearly every mine and prospect pit displays slickensides and brecciation.

Small-scale horizontal movements along the top (structurally the bottom) of the dolomitic breccia resulted in a 2 to 10 foot thick mylonite zone in the ridge near the Pershing Mine. It is highly probable that this minor "thrusting" occurred <u>after</u> the structure was overturned since the less competent sandstone would provide a good movement surface for the structurally higher, massive sheets of dolomitic breccia. The writer believes that this slight movement is Late Mesozoic or Early Tertiary as shown by Tertiary block faulting of the described thrust zone.

BEDDING PLANE STRUCTURE

Structures closely resembling flute casts were observed in the quartzose sandstone in contact with the limestone breccia. The orientation suggests that the beds are overturned. This supports the previous evidence discussed under stratigraphy.

Did you see this? where?

GEOMORPHOLOGY

The main types of landforms around the Pershing area are a series of parallel tilt block mountains (Johnson, Douglas, 1929) and hogbacks that are superimposed on a large horst of Basin and Range origin. Strike valleys separate the ridges and are generally two to three times as wide. Extensive pedimentation is not present.

Resistant dolomitic breccia and limestone constitute most of the precipitous slopes of the elevated fault blocks. Fine textured sediments (shale, siltstone, etc.) underlie most of the valleys.

Parallelism of the ridges and associated faults suggests a common origin for these features. The ridges trend northwest and owe their asymmetry to strata that dips to the northeast. Slopes on the southwest are usually steeper.

This area would be classified in the youthful cycle of erosion in an arid region for the following reasons: (1) the block mountains are generally sharp and angular, (2) slope profiles are often assymmetrical, (3) the faces of the blocks are fault scarps (but range-front Basin and Range surfaces may be fault-line scarps), (4) maximum relief is attained in youth in the arid erosional cycle(Davis, W. M., 1905), and (5) dissection of the highlands is progressing while the adjacent enclosed basins are aggrading.

GEOLOGIC HISTORY

During Late Triassic time a eugeosyncline developed in the western half of Nevada. The eugeosyncline is characterized by extreme variations in tectonic conditions and complex relationships of positive and negative elements. This is clearly demonstrated by the diverse sediments seen in the field.

Relatively shallow conditions likely prevailed during deposition of the dark gray limestone which contains abundant organic remains. The overlying (structurally lower) limestone breccia may represent an intraformational breccia derived from the previous limestone unit.

Uplift of an adjacent sourceland provided siliceous material for the quartzose sandstone. Biotite flakes suggest an igneous source. The subrounding and well sorting are indicative of a fair distance of transportation.

Relative subsidence occurred next as evidenced by a marked decrease in grain size of the clastic sediments. The interbedding and repetition of sandstones, siltstones, and shales indicate oscillatory movements that are very characteristic of an unstable shelf that may have supplied detrital material.

The overlying (now structurally lower) dolomitic breccia contains subrounded clasts, suggesting some transport before deposition. This rock unit differs from the previously described limestone breccia because it has no adjacent limestone (source of other breccia) or dolomite and the coarse clastics display some rounding.

Some degree of tectonic stability followed as shown by the presence of orthoquartzite which maintains a fairly constant thickness of 40 feet. Nearly pure quartz sandstone is associated with stable shelf areas. The orthoquartzite suggests that the eugeosyncline achieved some tectonic stability and was shallow.

Oscillatory movements allied with eustatic changes may have provided detritus for the ensuing sandstones, siltstones, shales, and limestones which reach an aggregate thickness of 425 feet in the measured section.

Preservation of this sequence indicates that it was buried until the region was subjected to Tertiary uplift. Diabasic sills intruded the strata during burial and possess a coarse texture signifying deep intrusion. Tertiary extrusive volcanic rocks cap the sequence north of the map area. Faulting has altered the topography through the Tertiary and probably into Recent time. Denudation processes finalize the present geologic picture.

REFERENCES CITED

Davis, W. M., 1905, The geographical cycle in an arid climate: Jour. Geol., 13, pp. 381-407.

Hague, Arnold, and Emmons, S. F., 1877, Descriptive geology: U. S. Geol. Expl. 40th Par., vol. 2, p. 713.

Johnson, Douglas, 1929, Geomorphic aspects of rift valleys; compt. rend., 15^{e} congr. intern. geol., pt. 2, pp. 354-373.

Knopf, Adolph, 1924, Geology and ore deposits of the Rochester District, Nevada: U. S. Geol. Surv. Bull., 762, 78 p.

Schrader, F. C., 1914, The Rochester mining district, Nevada: U. S. Geol. Surv., Bull. 580-M, p. 325-372.

Wallace, R. E., Silberling, N. J., Irwin, W. P., and Tatlock, D. B., 1959, Preliminary geologic map of the Buffalo Mountain quadrangle, Nevada: U. S. Geol. Surv. Min. Inv. Field Map MF-220.

Woodford, A. O. 1925, The San Onofre breccia: Bull. Univ. Calif., Dept. Geol., vol. 15, p. 183.

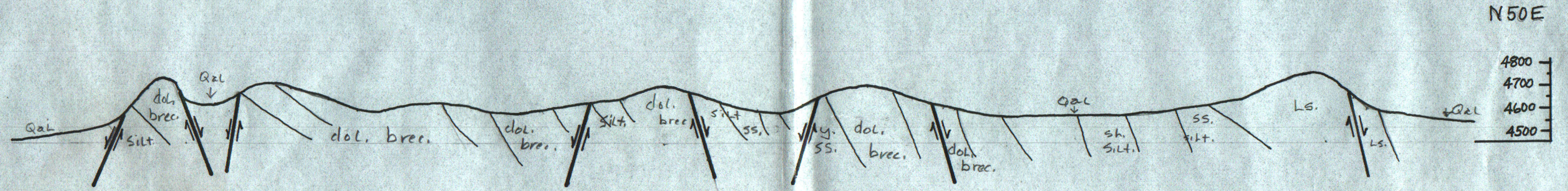


Figure 2. Structural Cross-Section

which one?
A B or C

268
Item 7