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GEOLOGY OF THE BULLFROG GOLD DEPOSIT, NYE COUNTY, NEVADA

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The Bullfrog and Montgomery-Shoshone gold deposits are located in the Bullfrog District approximately 3 miles west of Beatty, Nevada in the southern Bullfrog Hills. The deposits, owned by the Bond Gold Corporation, contain combined proven and probable reserves of 18.5 M tons of ore with an average grade of 0.097 oz/t Au and 0.240 oz/t Ag.

Historically, the Montgomery-Shoshone mine was the largest producer in the Bullfrog District. From 1905 until 1911 Montgomery-Shoshone produced approximately 70,000 ounces of gold at an average equivalent gold grade of 0.52 oz/t. Mineralization occurs in veins and related stockwork systems developed along a series of north-striking faults where they intersect a major east-northeast-striking fault. These faults cut a volcanic sequence of welded rhyolitic tuffs. The east-northeast-striking fault, or Contact Fault, has been intruded by a hydrothermally altered basalt dike. High grade veins provided the bulk of the ore mined, and the surrounding stockwork zone in wall rocks was left largely unexploited. The Montgomery-Shoshone property was acquired in 1982 by the St. Joe American Corporation who focused on the stockwork mineralization. By 1985 a mineral inventory had been developed there, and an open pit design was proposed.

From St. Joe's district-wide reconnaissance efforts and detailed work at Montgomery-Shoshone, a regional exploration model was developed. The model was applied and tested during the summer of 1986 in the area around Ladd Mountain which lies approximately 1 mile southwest of the Montgomery-Shoshone mine. The last hole of a 13-hole drilling program intercepted 140 feet of mineralization with an average grade of 0.04 oz/t Au, including a 5 foot intercept of quartz vein-breccia which assayed 0.250 oz/t. This hole proved to be the discovery hole for the Bullfrog deposit. Following its discovery in October of 1986, exploration and development drilling of the Bullfrog deposit began in March 1987 and was completed by June 1988. Prestripping and construction was begun in August 1988 and completed by June 1989. The first gold was poured in July of 1989.

Outcrops in the Bullfrog District consist chiefly of a sequence of Miocene volcanic and volcaniclastic rocks of silicic to intermediate composition belonging to the Timber Mountain Tuffs (10-12 m.y.). This sequence forms the upper structural plate of a major detachment fault, a trace of which is exposed along the southern flank of the Bullfrog Hills. The underlying structural plate is composed of Paleozoic sedimentary and Precambrian metamorphic basement rocks considered to belong to a metamorphic core complex. The volcanic units of the upper plate have a metamorphic core complex. The volcanic units of the upper plate have been tilted and rotated in a series of east-facing blocks bounded by north-striking, predominantly west-dipping normal faults. This set of faults has been interpreted to be a series of low-angle listric splays which extend upward from the main detachment fault into the overlying volcanic rocks. A second series of east-northeast-striking, north-dipping faults were classified as tear faults which developed as a result of differential movement within the volcanic plate as it underwent lateral displacement along the main detachment surface. Field evidence form both regional-scale and pit-scale mapping suggests that these two fault sets developed more or less contemporaneously. Although the structural interpretations are consistent with a regional detachment model, specific details remain largely unverified at this time.

The principal mineralization control at Bullfrog is a silicified breccia developed along a low-angle, west-dipping fault which cuts the detached upper structural plate. This fault, named the Middle Plate Fault, separates an upper section of rhyolitic rocks from a lower section of locally flow-banded andesite and thinly stratified volcaniclastic sediments. Gold mineralization is strongest in dilatant and brecciated zones adjoining the Middle Plate Fault and locally developed sympathetic structures where average grades of the infilling vein-breccia range from 0.3-0.5 oz/t Au. Gold contents of the enclosing stockwork and silicified breccia zones are more variable and lower grade, ranging from 0.015 to 0.010 oz/t Au. Mineralization consists of electrum and acanthite, accompanied by pyrite and minor base metal sulfides contained in open-space filling quartz and manganiferous calcite. The rhyolitic tuffs in the hanging wall have undergone weak to moderate sericitization and local silicification related to mineralization. Hydrothermal adularia has been locally observed in rare high-grade fractures containing visible gold. The andesite in the footwall contains a propylitic assemblage consisting mainly of chlorite K-feldspar, calcite, and disseminated pyrite. Minor quartz-adularia veinlets also occur in the andesite.

Detailed studies of hand specimens, drill core and underground workings have identified five hydrothermal stages at Bullfrog. Earliest of these is devitrification of rhyolitic host rocks accompanied by boiling of high salinity fluids at temperatures near 350° C. These data correspond to a lithostatic overburden of approximately 2000 feet which agrees with estimates based on volcanic stratigraphy. Metallization began with quartz-pyrite veinlets and disseminated pyrite subsequent to devitrification. Main stage gold deposition occurred in a single stage, following major brecciation, from solutions with temperatures of approximately 210° C and salinities less than 1.7 equivalent weight percent NaCl. Gold mineralization was followed by hypogene oxidation of pyrite and dissolution of calcite related to dilute fluids slightly cooler than those related to gold mineralization. This oxidation produced a mixture of manganese and iron oxides which form veinlets and more massive pods distinguishable by a dark brown to black color.

Field and laboratory relationships indicate that the mineralization at Bullfrog and Montgomery-Shoshone is spatially related to a regional detachment fault system, but that gold was deposited from weakly saline, moderate-temperature fluids typical of epithermal systems, rather than from more highly saline fluids typical of some other detachment-gold systems.

REWARD

(Request for Proposals)

Geologic Quadrangle Maps of Nevada

The Nevada Bureau of Mines and Geology (NBMG), with partial financial support from the Geological Society of Nevada (GSN), offers a $2,500 reward for good geologic maps of 7.5-minute quadrangles in Nevada. The maps will be published by NBMG.

Anyone may apply. Graduate students and professors are encouraged to do so, as are consulting geologists and other geologists.

Proposals should be limited to five pages and should include a description of the general geology and geologic problems in the quadrangle, a promised date at which the geologic map will be completed in draft form for review, a resume (including dates on which degrees were granted, a list of proposer's five most relevant publications or company/consulting reports, and employment history), and two letters of reference.

Proposals will be reviewed by a committee that will evaluate whether the individual appears to be capable of producing a good geologic map (including both bedrock and Quaternary features), whether the individual is likely to produce the map in the allocated time, and whether the area to be mapped is of interest to the membership of GSN.

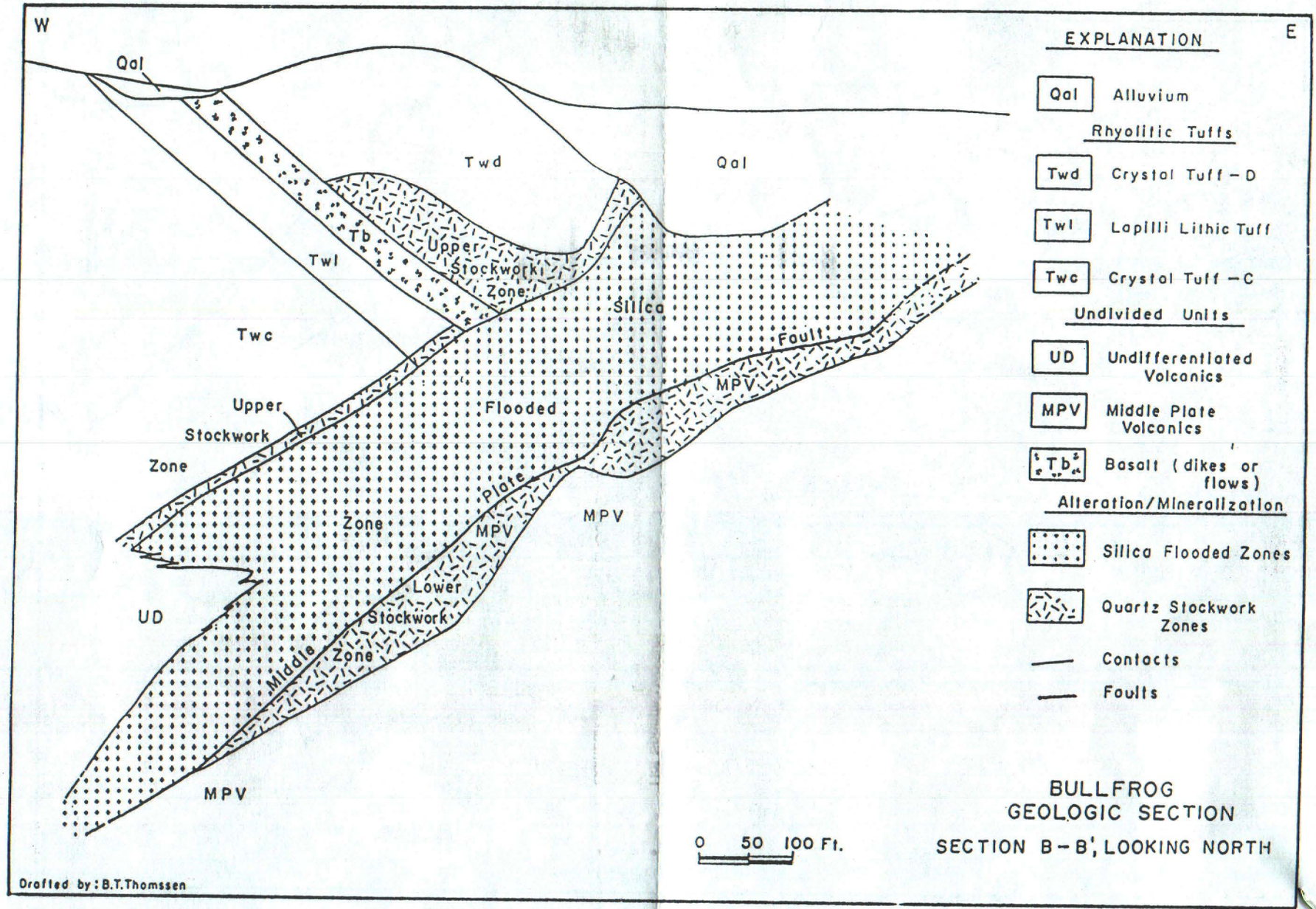
Please submit proposals no later than February 28, 1991 to

Jonathan G. Price, Director/State Geologist
Nevada Bureau of Mines and Geology
Mail Stop 178
University of Nevada, Reno
Reno, Nevada 89557-0088

Awards will be made no later than April 15, 1991.

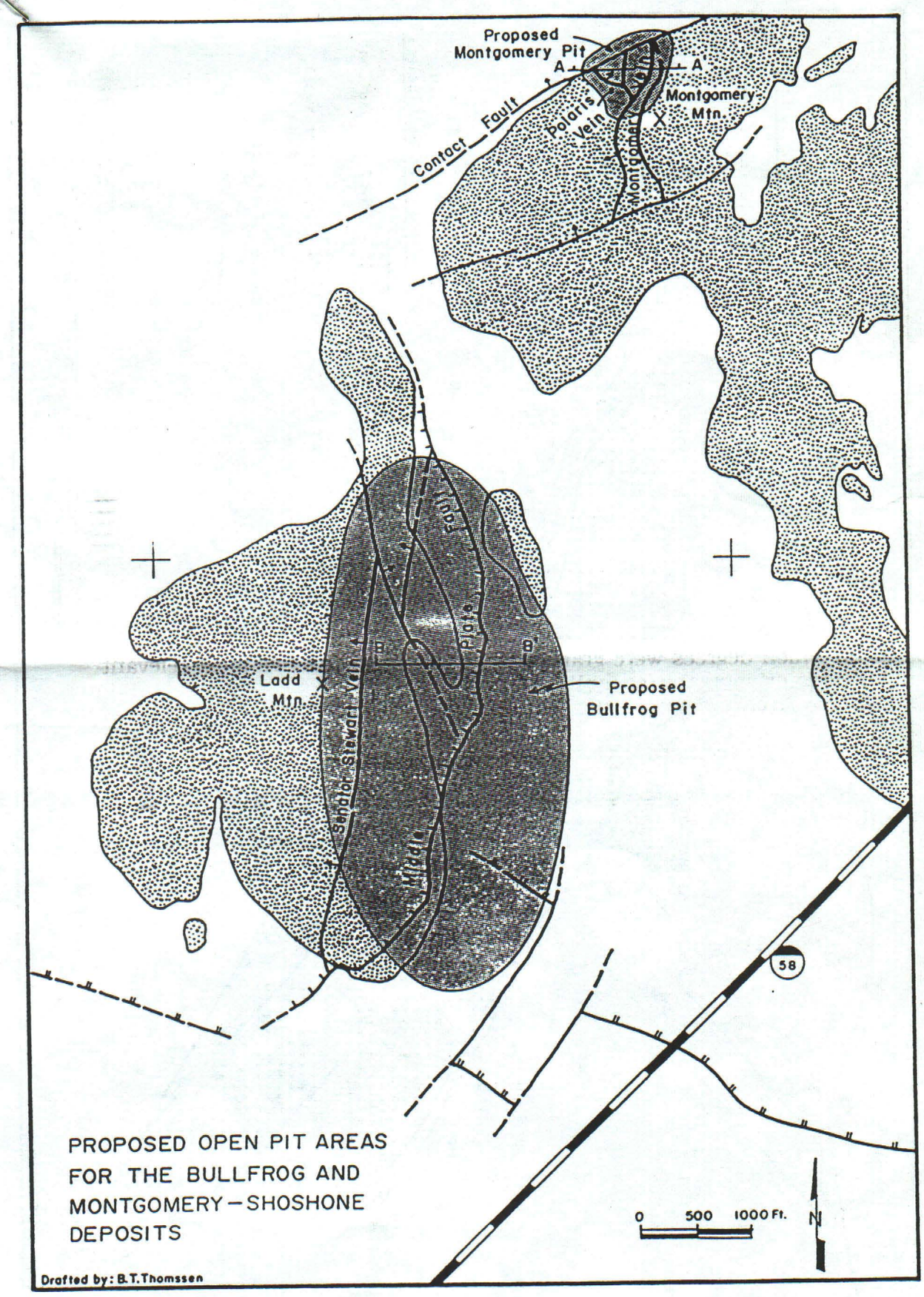
The stipend will be distributed as follows:

$500 initially to help defray field expenses,
$500 upon receipt of three copies of a colored draft map for review, and
$1500 upon acceptance for publication by NBMG.



BULLFROG
GEOLOGIC SECTION

SECTION B – B', LOOKING NORTH



PROPOSED OPEN PIT AREAS
FOR THE BULLFROG AND
MONTGOMERY – SHOSHONE
DEPOSITS

Drafted by: B.T. Thomssen