

November 14, 1990
Narrative for Salmon Quadrangle
Dillon Resource Area Management Plan/EIS

Introduction

The Salmon Quadrangle (SQ) is located along the northwest side of the Dillon Resource Area (DRA). The western one-third is in Idaho and contains the town of Salmon and the Salmon River (The River of No Return). The Montana portion is all within the DRA and has two small towns, Grant in the southeast corner and Jackson, in the north-central area. The DRA boundary follows the Idaho-Montana line which is also the Continental Divide and the crest of the Bitterroot Range.

Along the western edge of the SQ, entirely in Idaho, U.S. 93 stretches from the northwest corner to the southwest corner. No federal or state highways are present in the Montana portion. Beaverhead County Route 324 is along the southeastern edge of the SQ for a distance of about 9 miles. County Route 278 serves the northeastern one-quarter of the SQ. It goes through Jackson to Wisdom, 19 miles north, and to Dillon, 47 miles southeast. Several graveled roads are widely spaced through the remaining area.

The principal drainage is the north-flowing Big Hole River and its tributaries which drain the northwest one-half of the DRA portion of the SQ. The southern one-quarter is drained by east-flowing Horse Prairie Creek and the northeast one-quarter by south and southeast-flowing Grasshopper Creek.

Outcrops of Mesozoic sediments are limited to the southeastern part of the SQ where several outcrops of the Tertiary-Cretaceous Beaverhead Formation occur, surrounded by younger Tertiary valley fill. These outcrops are on the McKenzie Thrust System in the Frontal Fold and Thrust Zone and appear to be associated with the downthrown side of fault traces that experienced recurrent movements during Cretaceous through Paleocene time.

Outcrops of Paleozoic rocks are recognized at the southeast edge of the SQ, in Ts. 8 and 9 S., associated with outcrops to the east. A Mississippian outcrop in T. 5 S., R. 12 W., may be a remnant of the Frontal Fold and Thrust Belt that was not consumed by the Pioneer Batholith. Cambrian and Devonian rocks in Ts. 6 and 7 S., R. 12 W., appear to be "piggybacked" on an eastward salient of the Grasshopper Thrust Plate. Cambrian rocks in T. 5 S., Rs. 14 and 15 W., rest unconformably on middle Protozoic rocks of the Missoula Group (upper Belt).

Tertiary sediments are the most prevalent outcrop in the southeastern portion of the DRA portion of the SQ. The remaining area is about evenly divided between the Proterozoic Belt rocks of the Grasshopper Thrust Plate and the Quaternary glacial moraines, outwash and alluvium which conceal much of the older geologic features and formations.

A sizable area is intruded by the Pioneer Batholith, in the northeast corner, the Bloody Dick Stock in the east-central area, and the Carmen Stock in the northwest-central area along the Idaho boundary.

Although widespread in the Idaho portion of the SQ, the Yellowjacket Formation of early Belt age does not occur in the Montana portion except for 2 or 3 square miles in T. 9 S., R. 15 W., where the Miner Lake-Beaverhead Divide Fault zone intersects the Horse Prairie Fault zone.

One well has been drilled on the DRA portion of the Salmon Quadrangle. The Amoco 2 Hirschy SE NW NW sec. 31, T. 4 S., R. 15 W., was drilled to 9,550 feet in 1983. It bottomed in Proterozoic Belt rocks which were topped at 9,341 feet. About 6 miles to the east, the Belt is on outcrop and is identified as Missoula Group. The well is about 7 miles northwest of the town of Jackson and is near the center of the down-faulted graben block forming the upper Big Hole Tertiary basin.

No Mesozoic or Paleozoic rocks were noted in this well. Tertiary volcanics of middle Eocene age are in contact with the Proterozoic. Upper Eocene sediments of the Middle Renova Formation are deposited on these volcanics. The top of the volcanics from 8388 to 8457 show sonic log porosity of 14 to 18 percent. A drill stem test (DST) over this interval recovered only mud. Shut-in pressure (SIP) was 3538 pounds, and bottom hole temperature (BHT) was 181° Fahrenheit (F). A DST was also taken at 8036-8074 which recovered only mud with a SIP of 2685 pounds and a BHT of 178° F. Cores were cut from 7858 to 8023 identifying the lithology as tuff and tuffaceous shales, silts, and sands with a considerable amount of lignitic material. Two DSTs recovered only mud. SIPs were 2032 and 2595 pounds. BHTs were 180° and 173° F. A core in the upper part of the middle Renova Formation (possibly middle Oligocene age) at 7576-7606 found shale, conglomerates, and lignitic sand.

The top of the Renova was picked at 6,710 feet (possibly lower Miocene Cabbage Patch equivalent). A core at 6552-6594 had a poor recovery of only 15 feet of conglomerate, sandy to silty, slightly calcareous, and slightly lignitic. This may be Middle Miocene Six-Mile Creek Formation.

The base of the Pliocene might be at 5523 and the top at 3084 feet. There are favorable reservoir beds between 3995 and 5135.

Quaternary Pleistocene glacial outwash material was probably the section drilled from 3084 to surface.

Because of the probable thickness of the Belt age rocks on the Grasshopper plate, a test of subthrust Mesozoics and Paleozoics is unlikely in the foreseeable future. The projected depth of 25,340 feet to Archean is allowing for only 8000 feet of Belt. There could be over 20,000 feet of Belt thickness.

Consequently, the primary occurrence potential for oil and gas on the Grasshopper Plate rests with the Tertiary sediments. The No. 2 Hirschy well indicates that reservoir rocks are present. A considerable amount of lignite appears to be present and is source material for gas. There may be no source material for oil. The temperatures measured in the DSTs indicate that these Tertiary sediments have just entered the oil window; but, without source material, only gas will continue to generate. The temperature gradient indicates that these Tertiary rocks need to be currently buried below 7,400 feet to be capable of generating oil.

Basin and Range type of graben faulting appears to have occurred in the upper Big Hole Valley west, northwest, east, and south of Jackson, and east and southeast of Salmon, Idaho; also north of the Horse Prairie Fault and southeast of Bloody Dick stock. Documentation of lignitic lithologies, thicknesses of sediments (depths to source and reservoir beds) and temperature gradients are not available except for the Big Hole Basin.

Occurrence Potential

There is no oil or gas production on this quadrangle nor in nearby areas. Therefore, no "HIGH" occurrence potential is indicated on the SQ.

The Tertiary basins discussed previously are rated as "MODERATE" occurrence potential pending further drilling activity. In addition, the southeast portion of this quadrangle is in the Frontal Fold and Thrust Belt and only about 15 miles west of a well in the Dillon Quadrangle which had oil and gas shows.

Large areas of the SQ are classified as "LOW" occurrence potential primarily because they are on the Grasshopper Thrust Plate but not in areas of known graben faulting with subsequent Tertiary deposition of any consequence to oil and gas generation. The principal non-Quaternary sediments are middle Belt (Missoula and Lemhi Groups and the Swauger Formation). The probable thickness of the Grasshopper Plate is about 24,000 feet where Missoula Group Belt equivalents are mapped and 26,000 feet where Lemhi Group and Swauger Formation are mapped. The potential for hydrocarbons within the Belt sediments must be rated as "LOW" at this time. The edges of the Tertiary graben basins are also rated as "LOW" although this could be in error due to possible drag folding against the fault planes forming structural traps on the downside.

The areas of "VERY LOW" occurrence potential include the intrusive igneous rocks of the Pioneer Mountains batholith, the Bloody Dick stock, and the Carmen stock. In addition, the outcrop area of the lower Belt Yellowjacket Formation is rated as "VERY LOW." The Yellowjacket outcrop is confined to the expression of the combined Medicine Lodge Thrust Plate and the Cabin Thrust Plate in this area. These thrusts are in the Cordilleran Thrust Belt. The chance for reaching post-Proterozoic potential sediments with a test well are very slim and very deep.

Development Potential

There are no "HIGH" development potential areas on the SQ.

The small area of "MODERATE" potential in T. 10 S., R. 12 W., is in the McKenzie Thrust system of the Frontal Fold and Thrust zone and associated with three wells to the south on the Leadore Quadrangle.

The area of "LOW" development potential in Ts. 7 through 9 S., R. 12 W., is also on the McKenzie Thrust System and as prospective as the areas to the east and south which are off of the SQ. However, it seems that those areas will more likely

host the next exploration efforts because they are closer to well data control.

The upper Big Hole Basin, Ts. 4 through 6 S., Rs. 15 through 17 W., is classified as "LOW." The previously mentioned AMOCO 2 Hirschy well established that a significant Tertiary sedimentary section of about 9300 feet exists in this area. About 7 miles north, and off of the SQ, the AMOCO 1 Hirschy found 15,900 feet of Tertiary resting on Pre-Cambrian. The Pre-Cambrian top is nearly 6500 feet structurally lower than in the 2 Hirschy. However, the Renova top was only 300 feet lower. Both wells appear to have had gas shows. Since this area is about 50 miles from the nearest gas line, and these "gas shows" are non-commercial, the upper Big Hole basin is rated as "LOW" development potential.

Most of the lands in the quadrangle are classified as "VERY LOW" development potential. With the exception of the southeast corner, this quadrangle is considered gas-prone. The Tertiary targets are also fairly deep and pipelines are quite distant.

One well is expected in the upcoming 15 years, 2 at most. A Tertiary test in the Big Hole Basin will probably be at least 8500 feet deep. A Paleozoic test near Grant would probably be about 13,000 feet deep.

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