BEDROCK GEOLOGIC MAP OF THE COLFAX NORTH 7 ½ MINUTE QUADRANGLE, WHITMAN COUNTY, WASHINGTON

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INTRODUCTION

The bedrock geologic map of the Colfax North quadrangle was constructed primarily from examination of major outcrops and water well drill logs (Table 1). Regional geologic maps by Swanson and others (1980) and Gulick (1994) were also used. Geologic mapping of the Columbia River Basalt Group (CRBG) was facilitated by the readily identifiable Roza flow that separates the Priest Rapids from the uppermost Grande Ronde throughout the quadrangle.

Distribution of loess of the Palouse Formation is not illustrated on the map in keeping with the emphasis on bedrock geology. For the same reason colluvium next to topographic highs of pre-CRBG units is also not shown. However, alluvium and colluvium associated with the major streams is illustrated, because modern stream sediment patterns help interpret bedrock contacts and structural relationships in basalt terrains (Bush and others, 1998). With the exception of exposures along the Palouse River, continuous outcrops are rare and contacts between basalt and the older units are covered with loess and colluvium. Therefore, many of the contact lines are interpretive.

The lack of exposures and deep drill data make structural interpretations on the Colfax North quadrangle difficult to determine. However, the basalts are not horizontal and in general dip to the west. Two monoclinal folds were mapped in the eastern part of the map area. Knowledge of surrounding geology on a regional scale was used to help understand the structural features illustrated on the Colfax quadrangle.

DESCRIPTION OF MAP UNITS

QUATERNARY DEPOSITS

Qac Alluvium and Colluvium (Holocene) – Stream, slope-wash, and debris-flow deposits in drainage areas. Composition consists of loess, basalt, and pre-CRBG materials. In the Palouse River, mixtures of granule and sand-sized basalt and quartz fragments are common. Locally near outcrops, cobbles and pebbles of basalt dominate. In the intermittent drainages reworked loess is more common.

Ql Palouse Formation (Pleistocene) – Silty and clayey loess of the Palouse hills. Shown in cross-section only.

COLUMBIA RIVER BASALT GROUP

The stratigraphic nomenclature of the Columbia River Basalt Group (CRBG) is based on that presented by Swanson and others (1979). The sequence is divided into four formations: from base upward, these are the Imnaha Basalt, Grande Ronde Basalt, Wanapum Basalt, and Saddle Mountains Basalt. On the Colfax North quadrangle, no units of the Imnaha and Saddle Mountains formations were noted. At the surface, outcrops of the Priest Rapids and Roza members of the Wanapum Basalt and the upper part of the Grande Ronde Basalt were identified.

WANAPUM FORMATION

Tpr Priest Rapids Member (Miocene) – Medium- to coarse-grained basalt with phenocrysts of plagioclase and olivine in a groundmass of intergranular pyroxene, illmenite blades, and minor devitrified glass. Other workers have previously identified and described these flows (Wright and others, 1973; Swanson and others, 1979). These flows have reverse magnetic polarity (Wright and others, 1973; Swanson and others, 1979). The basalt is exposed in quarries and road cuts, and crops out along the upper slopes of the Palouse River throughout the quadrangle.

Tr Roza Member (Miocene) – Consists of flows of basalt with abundant plagioclase phenocrysts. The phenocrysts average about 10 mm across and occur with phenocrysts of olivine and augite in an intergranular groundmass. The Roza is approximately 200 feet in thickness at Colfax and thins eastward towards Smoot Hill, Kamiak Butte, and Pullman. The Roza has not been identified in Pullman wells to the southeast. Outcrops are common in downtown Colfax and along the Palouse River.

GRANDE RONDE FORMATION

Tgr_{N2}, Tgr_{R2} (Miocene) – Consists of flows of fine-grained to very fine-grained aphyric basalt. Small exposures occur at the lowest elevations in Colfax and at several locations along the banks of the Palouse River. Swanson and others, (1980) indicate that the flows belong to the N2 magnetostratigraphic unit. Flows of the R2 magnetostratigraphic unit are depicted only in the cross-section. Wells in Colfax penetrate at least 750 feet of Grande Ronde. Geophysical data suggest the basalts are considerably thicker (Klein and others, 1987).

Tl LATAH FORMATION (Miocene) – Consists of clay, silt, sand, and minor gravel deposits that on the Colfax North quadrangle form thin interbeds above and below the Roza Member. The sand is angular to subrounded, poorly sorted, and consists primarily of quartz with muscovite common in places. The term “Latah Formation” is typically used on the eastern side of the Columbia Plateau for any sequence of sediment interlayered with or associated with Miocene basalt flows of the CRBG. The interbed between the lowermost Wanapum and the upper Grande Ronde is referred to as the Vantage Member (Siems and others, 1974). On the Colfax North quadrangle, there are several small exposures of Latah Formation that occur above and below the Roza flow. Well data show that these interbeds are generally continuous between wells, but typically are less than 15 feet thick. Exposures of the interbeds were not large enough to illustrate on the map. Water-well logs of Colfax city wells show some interbeds in the Grande Ronde sequence (Walters and Glancy, 1969).

GENERAL GEOLOGIC DISCUSSION

Regionally, the basalt units on the Colfax North quadrangle are part of the Palouse Slope located on the eastern edge of the Columbia Plateau (Reidel and others, 2002). That slope dips in a westerly direction. The Palouse River flows southwest across the quadrangle and then turns to the northwest in Colfax. The basalts only drop approximately 200 feet in elevation across the quadrangle but the rate of drop is not consistent. Two monoclinal folds were mapped along the Palouse River. The most rapid drop in elevation occurs on the southwestern side of those folds.

Examination of outcrops at several locations along the Palouse River shows that the river is located on the uppermost Grande Ronde along most of its course. The nature of the exposures suggests that the uppermost Grande Ronde in this area consists of the same flow or flow units.

The folds illustrated on the map were detectable because the Roza flow can be mapped in detail along the Palouse River valley walls.

GENERAL HYDROGEOLOGIC DISCUSSION

The simple surface geology would suggest consistent hydrogeologic conditions across the quadrangle. However, Grande Ronde production in the northeastern part is different from the southeastern part. In the southwestern part there is a very narrow (<1 mile) “dry” zone that can be traced in a northwest direction beginning on the south at the old town of Parvin on the Colfax South quadrangle and extending into the Colfax North quadrangle to at least as far north as the Palouse River. The southernmost monocline marks the approximate location of this zone. Wells in this zone are dry or have very little production. For example, at Parvin there were historically small, but useable springs for domestic water sources. The springs are located near the Priest Rapids-Roza contact. However, two wells drilled at Parvin to over 400 feet are dry. The chips were examined and consisted of light-weight vesicular material suggesting location near to a

vent. Swanson and others (1980) have documented the presence of northwest-trending dikes for the Roza flow, but they are located to the west near Winona.

Drillers and local farmers note that deep wells (500-700 ft.) extending into the Grande Ronde with some production have been drilled on both sides of this dry zone. The dry zone seems to divide the nature of Grande Ronde production on the Colfax quadrangle into a northeastern and southeastern part.

Two large springs are located in the northeastern part of the quadrangle near Glenwood. In 1969, these two springs from the upper Grande Ronde were flowing at a rate of 625 gallons each (Walters and Clancy, 1969). These springs have been the primary source of water for the city of Colfax. City wells in Colfax have deeper water levels (Walters and Glancy, 1969), and at least two wells were drilled to depths of 600 and 750 feet into the Grande Ronde (Walters and Glancy, 1969). The lack of major production from shallow intervals in Colfax within the Grande Ronde indicates a significant change in ground-water movement. The Wanapum-Grande Ronde contact west of the city must increase its rate of drop in elevation westward and southwestward at the same time that the flows in the Grande Ronde thicken (Waters and Glancy, 1969; Swanson and others, 1980). Regional ground-water flow west of Colfax should be west and southwest towards Pasco. Perhaps it is these southwest- and west-dipping basalt units that are removing water from the upper Grande Ronde in the southwest part of the quadrangle.

The physiographic map shows two northwest-trending linear features that correspond to Clear Creek and the dry zone previously discussed. These linears are so straight that they could be faults and/or fracture zones, instead of monoclinal folds as mapped. Regardless, any of the three features discussed can produce barriers to lateral ground-water flow or conduits for vertical flow. Although the nature of the structure is not known, it is concluded that structural control by northwest features may be the cause of the springs and the dry zone. The southern linear may be a barrier to southwest flow, which could explain the lack of shallow Grande Ronde production in Colfax.

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Table 1 - Wells used in Construction of Bedrock Map of the Colfax North 7 ½ Minute Quadrangle, Whitman County, Washington.

Well No.	Original Owners Name	Total Depth (ft)	Overburden Thinkness (ft)	Geologic & Other Comments	Sources *
W-1	Brian Aase	235	23	No interbeds noted	Visual
W-2	Charles GupTill	239	119	Starts in Priest Rapids, no interbed noted	Visual
W-3	Martha Brooks	255	21	Starts in Priest Rapids, no interbed noted	Visual
W-4	Paul Faires	255	12	Starts in Priest Rapids, no interbed noted	Visual
W-5	Larry Jones	285	18	All Grande Ronde	Visual
W-6	Jerry James	450	18	Top of Roza 120 ft., top of Grande Ronde at 400 ft.?	Visual
W-7	Jim Hayes	257	2	Interpreted as all Grande Ronde	
W-8	Dennis Mcdonald	300	36	Interpreted as all Grande Ronde	Verbal
W-9	Dennis Mcdonald	305	11	Interpreted as all Grande Ronde	
W-10	Lynn Enos	70	23	In top of Grande Ronde?, large volume of water in 1974.	Verbal
W-11	Colfax Maintenance	100	25	At Priest Rapids	Verbal
W-12	Harold Knopes	70	18	Base of Priest Rapids at 70 ft.	Visual
W-13	Harold Herrman	188	9	Base of Priest Rapids at 80 ft., top of Roza at 88 ft.	
W-14	Bob Schohz	600	40	Interpreted Priest Rapids 40 - 95 ft., Roza 225 - 497 ft., Grande Ronde 497 - 600 ft.	Visual
W-15	Farrell Cockran	325	10	Roza at 160 - 323 ft.	Visual
W-16	Kelly Luccy	385	19	Roza at 175 - 385 ft.	Visual
W-17	John Davidson	115	18	Top of Roza 47 ft.	Visual
W-18	City of Colfax Well 2	600	29	All Grande Ronde, originaly yielded ~700 gpm.	Walters & Glancy 1969
W-19	City of Colfax Well 3	750	28	Possible Roza, Grande Ronde contact at 103 ft.	Walters & Glancy 1970

* Visual location of building's and well log location matched.
Verbal means some individual was contacted who verified location.