PETROGRAPHY

Sample No. RRGE-1 (5005' core; Raft River Geothermal Area)

Rock Name: Gneissic Quartz Monzonite

Major and Minor Constituents

K feldspar
quartz
plagioclase (oligoclase-andesine)
biotite (altered to chlorite)

Accessories

muscovite (from K feldspar)
epidote (from plagioclase)
carbonate (hydrothermal?)

PETROGENESIS

The gneissic fabric of this rock is dominantly derived from cataclasis. It may have developed during emplacement....and in that case, it would be more properly called a "protoclastic" fabric.

The chloritization of the biotite, saussuritization of the plagioclase and introduction of carbonate indicates late stage hydrothermal activity.

It would be interesting to compare the recrystallization age of the schist terrane to that of the quartz monzonite to determine whether the hydrothermal alteration is later than these earlier events.

PETROGRAPHIC ANALYSIS

Sample No. RRGE-1 (4650' core; Raft River Geothermal Well)

Rock Name: Phyllitic Schist

Major and Minor Constituents

quartz
muscovite (var. sericite)
albite
biotite (incipient)

Accessory Minerals

tourmaline (zoned)
carbonaceous material

PETROGENESIS

This rock was derived from the synkinematic recrystallization of a parent argillaceous sediment. The assemblage quartz-albite-muscovite ($\pm$ incipient biotite) is stable under conditions of the "greenschist facies." The presence of incipient biotite would imply that recrystallization temperatures had just attained those of the biotite isograd (if the biotite was in equilibrium with the synkinematic assemblage. The question here is whether the biotite is later than the synkinematic assemblage(?), and due to superimposed hornfelsing from the thermal pulse accompanying the emplacement of the underlying quartz monzonite pluton. If the later case applies, late biotite should increase in volume and grain size in core samples taken from increasing depth.

Accessory tourmaline grains display some overgrowth textures, but these grains may record a history dating back to clastic source rocks.

The phyllitic schist is a typical product of regional metamorphism.

X-Ray Analysis

RRGE # 3, 3A, 3B

BSU 7-15-76

Sample Depth (ft)	Comments	Montmorillonite	Illite	Kaolinite	Zeolite	Calcite	Other
2805	Core #1	Xs	Xm	Xw	possibly Analcite	X	
2807-8		Xs	Xw	Xw	Possibly Analcite	X	
2809		Xs	Xs	Xw	Analcite	X	
2815		Xs	Xvw	Xw	possibly Analcite	X	
"Top"	Core #2	Xm [1]	Xm	Xs [1]	possibly Analcite		Penninite
"Bottom"		Xw [1]	Xs	Xm [1]	Analcite		possibly Penninite
No depth	Core #3	Xs	Xw			X	
3973-4		Xs [1]	Xw	Xw [1]	Analcite	X	Penninite, & pyrophyllite or hydrobiotite
3979-80		Xs [1]	Xvw			X	possibly Penninite
4950-60	Core #3B	Xs	Xm-s	Xm-s		X	
4970-80		Xs	Xm-s	Xm-s		X	possibly Penninite
4990-5000		Xs	Xs	Xm-s		X	possibly Penninite
4259	Core #3A	Xs	Xw	Xm	possibly Analcite	X	possibly Penninite
4980-5000		Xs	Xm	Xw		X	possibly pyrophyllite
5320-5340		Xs	Xw	Xw-m		X	possibly Pyrophyllite & Penninite
5420-5440		Xs	Xs	Xm-s	possibly Analcite	X	
5620-5630		Xs	Xm-s	Xw-m		X	
5760-5770		Xw	Xs [2]	Xw			
5860-5870		possibly	Xs	Xm	possibly Analcite	X	

Notes: 1 Could be part penninite
2 Mica group; could be muscovite

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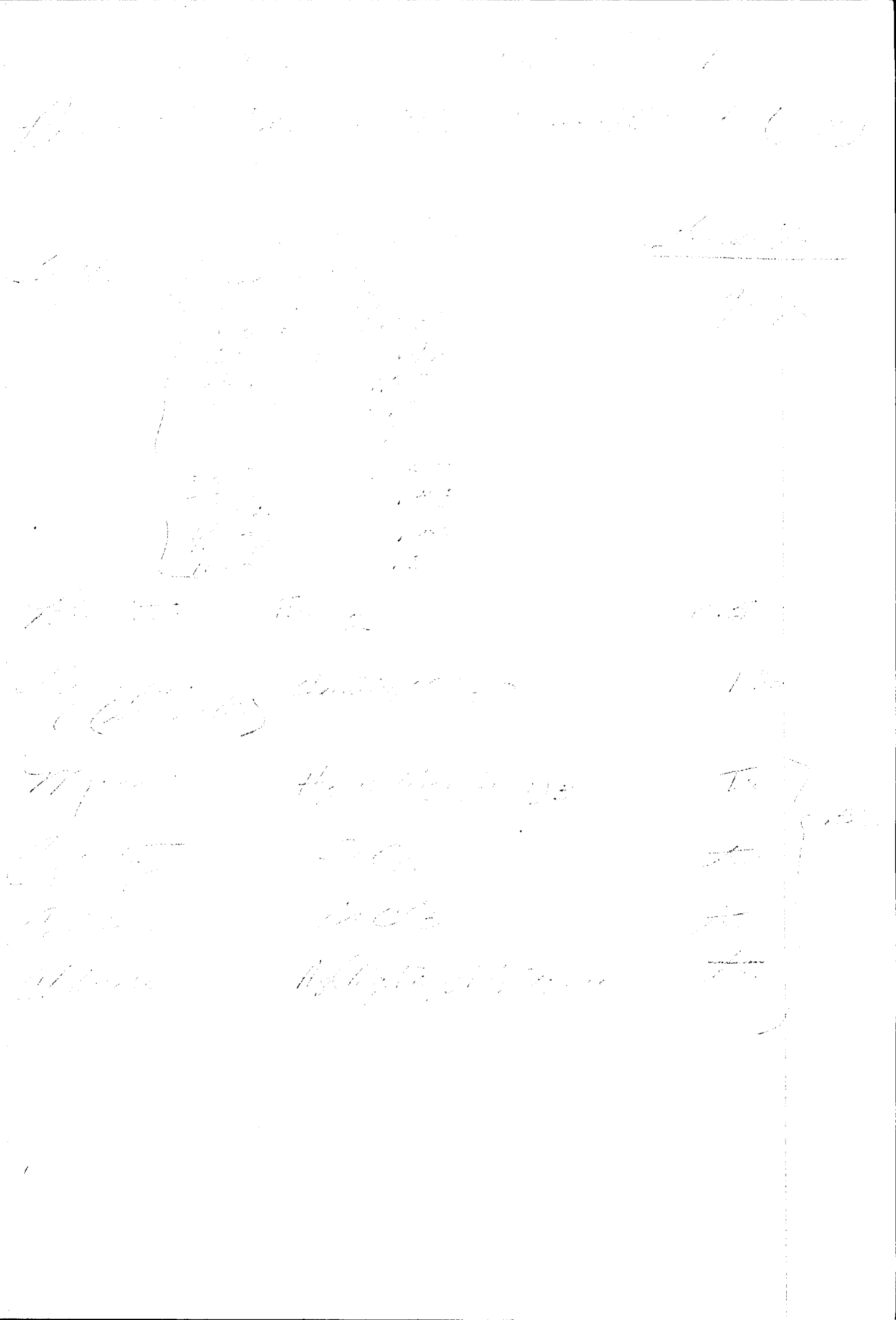

R.R.G.E. #2 Preliminary Results from X-ray Analysis

C.R. Nichols and C.W. Bryan

Depth in Feet	Montmorillonite	Mixed Layering	Chlorite	Mica	Calcite	Illite	Clinoptilolite
922	X				X		X
1000	X						X
1100	X						X
1200	X				X	X	X
1300	X				X		X
1400	X				X		X
1500							
1600	X	X			X		
1700		X					
1800							
1900		X					
2000		X					
2100			X		X	X	
2200		X					
2300		X	X			X	
2400		X					
2500		X					
2600							
2700							
2800		X					
2900			X				
3000							
3100			X				
3200			X				
3300			X				
3400			X				
3500			X				
3600			X				
3700		X	X				
3800		X	X			?	
3900							
4000							
4100			X				
4200							
4300							
4400			X	X			
4500			X				
4600			X				
4700				X			
4800			X	X			

Depth/Feet	Montmori-lonite	Mixed Layering	Chlorite	Mica	Calcite	Illite	Clinoptilolite
4900			X	X			
5000			X	X			
5100				X			
5200			X	X			
5300				X			
5400			X	X			
5500				X			

RAFT RIVER INT. #3 PRELIMINARY RESULTS FROM X-RAY ANALYSIS IN C. R. NICHOLS, C. W. BRYAN

DEPTH FEET	MONTMORILLONITE	MIXED LAYERING	CHLORITE	MICA	CALCITE	ILLITE	FELDSPAR	HIGH CATION CLAYS	CLINOPTILOLITE	
263			✓							
331	✓				✓					
382.5	✓									
409	✓									
498	✓					✓		✓		
560.5	✓			✓			✓			
705	✓		✓	✓	✓				✓	
731	✓		✓	✓	✓				✓	
792	✓				✓				✓	
823			✓							
836										
896	✓					✓				
850										
902				✓						
918	✓				✓			✓		
956	✓		✓	✓						
969	✓			✓						
992			✓	✓						
1004	✓	✓ ?	✓		✓					
1067	✓		✓							
1079	✓		✓			✓				
1099										
1107	✓ T.S.		✓			✓				
1128	✓						✓			
1132	✓	✓								
1147		✓	✓					✓		
1156										
1177		✓								
1201					✓					
1219			✓							
1251		✓	✓							
1265		✓	✓			ILLITE - DEAD ~~0.0~~	MICA			
1330		✓	✓					✓		
1423		✓	✓			✓		✓		

Bulk

Depth	High Order Clay	Calcite	Chlorite	Feldspar	Illite	Kaolinite	Mica	Montmor./Illonite	Sedimented	Heated	Glycolated	Powder	Notes
263			✓						✓				Chlorite Altering From B[illegible]
331		✓						✓	✓		✓		No illite??
✓ 382.5								✓	✓		✓		
409								✓	✓		✓		Extensive [illegible]
441								✓	✓		✓		Altered Biotite
✓ 458	✓				✓			✓	✓	✓	✓		PHLOGOPITE 8.9°; 6.59 Å [illegible]
✓ 560.5				✓?			✓	✓	✓	✓	✓		Biotite Rich - Some [illegible]
✓ 705		✓	✓				✓	✓	✓	✓	✓		?78 peak, [illegible] Clinoptilolite
731		✓	✓				✓	✓	✓	✓	✓		9.?? ZEOLITE Clinoptilolite
✓ 792		? ✓						✓	✓				[illegible] " "
✓ 823			✓						✓	✓	✓		
836									✓		✓		
✓ 846					✓		?	✓	✓	✓	✓		
880									✓				
✓ 902						✓	✓		✓		✓		31.7 ZEOLITE
✓ 918	✓							✓	✓	✓	✓		
✓ 956			✓				✓	✓	✓	✓			31.7 ZEOLITE
969			?				✓	✓	✓	✓			
992			✓				✓		✓	✓	✓		
1004			✓					✓	✓	✓	✓		EXPANDING CHLORITE?
1067			?					✓	✓	✓	✓		
✓ 1079			✓		✓	?	[illegible]	✓	✓	✓	✓		CHLORITE PEAK NOT SHARPENED WHEN HEATED
1095				?					✓		✓		
1107			✓		✓	?			✓				11.6? + 31.7 ZEOLITES
1128				?					✓	✓			TOO THIN
1132			~~✓~~					✓	✓		✓		
✓ 1147	✓		✓						✓		✓		31.7 EXPANDING CHLORITE
1156									✓	? ✓	? ✓		
1177	?								✓	✓	✓		MONT. OR EXPANDING VERMICULITE/CHLORITE
1201									✓				29° ZEOLITE (3.09 Å)?
✓ 1219			✓						✓				GOOD CHLORITE PATTERN!
✓ 1251			✓						✓	✓	✓		EXPANDING CHLORITE PEAKS SHIFTED
✓ 1265			✓		✓				✓	✓	✓		31.65 ZEOLITE EXPANDING VERMICULITE CHLORITE
✓ 1330	✓		✓						✓	✓	✓		HIGH ORDER OF CLAYS; + EXPANDING CHLORITE
✓ 1423	✓		✓		✓				✓	✓	✓		HIGH ORDER CLAY, ~~[illegible]~~ EXPANDING CHLORITE OR VERMICULITE

✓ Thin Sections made

Raft River Inter. #3 (USGS)

R.R. INT. #3 X-RAY DIFFRACTION TABLE 1-2-75

DEPTHS	MONTMORILLONITE	CHLORITE	QUARTZ	KAOLINITE	ILLITE
226	?	✓	✓		
263	✓	✓	✓		
33½ [illegible]	?	?	✓		
371	✓	✓			
371 (GLYCOLATED)	✓				
382.5	✓	✓			
409	?				
409 (HEATED)	✓				
123'		✓	✓		
141'	?	?	✓		
158'	?	?	✓		
198'	?	✓	✓		
512'			✓		
560.5' (GLYCOLATED)	?	?	✓		
592'	✓		✓		
655'					
655' (HEATED)	?	?	✓		
705'	✓			✓	
731'	?	?	✓		
792'		✓	✓		
823'			✓		
836'		✓	✓		
846'		✓	✓		
880'					
902'		✓	✓		
918'		✓	✓		
956'		✓			
956' (GLYCOLATED)			✓		
965'		✓	✓		
992' (HEATED)					
1014'		✓	✓		
1067'		✓	✓		
1079'			✓		
1095'		✓	✓		
1107'		✓	✓		
1128'		✓	✓		
1132'		✓	✓		
1158'					
1147'		✓	✓		
1177'		✓	✓		
1201'					
1219'		✓	✓		
1251'			✓		
1265'					
1330'		✓	✓		
1355'		✓	✓		